SIEMENS

SIMATIC HMI

HMI device
PP 17-I PN PROFIsafe, PP 17-II PN,
PP 17-II PN PROFIsafe

Operating Instructions

Legal information

Warning notice system

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

> ### ⚠ DANGER
> indicates that death or severe personal injury **will** result if proper precautions are not taken.

> ### ⚠ WARNING
> indicates that death or severe personal injury **may** result if proper precautions are not taken.

> ### ⚠ CAUTION
> with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

> ### CAUTION
> without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

> ### NOTICE
> indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

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

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Proper use of Siemens products

Note the following:

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

Trademarks

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

Disclaimer of Liability

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

Preface

Purpose of the operating instructions

These operating instructions provide information based on the requirements defined by DIN 8418 for mechanical engineering documentation. This information relates to the place of use, transport, storage, mounting, use and maintenance.

These operating instructions are intended for:

- Project planning engineers
- Users
- Commissioning engineers
- Maintenance personnel

Please read the chapter "Safety instructions and general notes (Page 25)" carefully.

Basic knowledge required

General knowledge of automation technology and process communication is required to understand the operating instructions.

It is also assumed that those using the operating instructions have experience with personal computers and knowledge of Microsoft operating systems.

You must be familiar with the STEP 7 user program.

Knowledge of safety engineering and fail-safe systems is required for using PP 17-I PN PROFIsafe and PP 17-II PN PROFIsafe.

Scope of the operating instructions

The operating instructions applies to the following HMI devices:

- PP 17-I PN PROFIsafe
- PP 17-II PN
- PP 17-II PN PROFIsafe

Registered trademarks

The following designations marked with the protective note ® are registered trademarks of the Siemens AG:

- HMI®
- SIMATIC®
- WinCC®

Information on fail-safe operation of the PROFIsafe devices

The following sections of these operating instructions contain important information on fail-safe operation of PROFIsafe devices:

- Fail-safe operation of the PROFIsafe devices (Page 23)
- Standards for PP 17-I PN PROFIsafe and PP 17-II PN PROFIsafe (Page 27)
- Requirements for the fail-safe operation of a PROFIsafe device (Page 40)
- Wiring the emergency stop button of a PROFIsafe device as fail-safe (Page 48)
- Rear operator controls, LEDs and Ports of the PROFIsafe devices (Page 67)
- Configuring the HMI device (Page 75)
- Fail-safe operation of the PROFIsafe device (Page 87)
- Technical specifications of PP 17-I PN PROFIsafe (Page 103)
- Technical specifications of the digital inputs and digital outputs of PP 17-I PN PROFIsafe (Page 104)
- Technical specifications of PP 17-II PN PROFIsafe (Page 108)
- Technical specifications of the digital inputs and digital outputs of PP 17-II PN PROFIsafe (Page 109)
- Response times of the PROFIsafe devices (Page 111)
- Inputs and outputs of the PROFIsafe devices (Page 113)

Position in the information landscape

These operating instructions form part of the SIMATIC HMI documentation. You can obtain an overview of SIMATIC hardware and SIMATIC software products and SIMATIC systems and information that can be called up in PDF format in various languages at the following address:

"http://support.automation.siemens.com"

Screens

These operating instructions depict the HMI device in the form of photographs. Newer versions of the HMI device may differ from the photographs.

Documentation for fail-safe systems

- System description "Safety technology in SIMATIC S7"

  – Provides general information on the use, structure, and mode of operation of the fail-safe automation systems S7 Distributed Safety and S7 F/FH Systems

  – Contains detailed technical information which can be represented for the fail-safe technology both in S7-300 and S7-400.

  – Contains information about the calculation of monitoring and reaction times of the fail-safe systems S7 Distributed Safety and of S7 F/FH Systems.

- "S7 Distributed Safety, Configuring and Programming" Manual / Online Help

  Describes the configuration of the F-CPU and of the fail-safe I/O and the programming of the F-CPU in F-FBD or F-LAD

- "Automation System S7-400, CPU Data" Reference Manual

  Describes the standard functions of CPU 416F-3 PN/DP, CPU 414-3 PN/DP and CPU 416-3 PN/DP

- "Automation System S7-300, CPU Data" Reference Manual

  Describes the standard functions of CPU 315F-2 PN/DP, CPU 317F-2 PN/DP, CPU 315-2 PN/DP and CPU 317-2 PN/DP

Conventions

The following text notation will facilitate reading these operating instructions:

Notation	Scope
"Add screen"	• Terminology that appears in the user interface, for example dialog names, tabs, buttons, menu entries • Inputs required, for example limit values, tag values. • Path information
"File > Edit"	Operating sequences, for example, menu entries, shortcut menu commands
<F1>, <Alt+P>	Keyboard operation

Please observe notes labeled as follows:

Note

Notes contain important information concerning the product, its use or a specific section of the documentation to which you should pay particular attention.

Representatives and offices

If you have any further questions relating to the products described in this manual, please contact your local representative at the Siemens branch nearest you.

Locate your contact person at "http://www.siemens.com/automation/partner".

Training center

Siemens AG offers a variety of training courses in order to familiarize you with automation systems. Please contact your regional training center, or our central training center in 90327 Nuremberg, Germany, for details.

Phone: +49 (911) 895-3200

Internet: "http://www.sitrain.com"

Technical support

Technical support for all industry sector products is available as follows:

Using the web form to request support
"http://www.siemens.com/automation/support-request"

Phone: + 49 180 5050 222

Fax: + 49 180 5050 223

Additional information about our technical support is available in the Internet at "http://support.automation.siemens.com".

Service & Support in the Internet

Service & Support provides additional comprehensive information on SIMATIC products through online services at "http://support.automation.siemens.com":

- The newsletter offers you the latest information about your products
- A large document base is available using our Service & Support search engine
- A forum for global exchange of information by users and experts
- Current product information, FAQs and downloads
- You local representative
- Information about on-site services, repairs, spare parts, and more

Recycling and disposal

Due to the low levels of pollutants in the HMI devices described in these Operating Instructions, they can be recycled. For environment-friendly recycling and disposal of your old equipment, contact a certified disposal facility for electronic scrap.

Table of contents

Overview

<div style="text-align: right;">

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1.1   Product Overview

Application scenarios of the HMI device

The HMI device shows you operating states of a machine or plant. You can actively control a running process based on this information.

The HMI device is designed for mounting in control panels and replaces keys, switches and LEDs that are individually mounted. You mount the HMI device in a mounting cut-out and connect it to the SIMATIC controller via PROFINET. The HMI device is pre-configured and is operational almost immediately. In comparison to conventional wiring, substantially less time is needed for commissioning and the device provides increase security against failure during runtime.

Using PP 17-I PN PROFIsafe and PP 17-II PN PROFIsafe in fail-safe mode.

Thanks to the integrated PROFIsafe communication, the HMI device can be used in fail-safe mode for simple emergency stop applications. SIL3/PL e is achieved for safety-related signals.

1.2　　Configuration of PP 17-I PN PROFIsafe
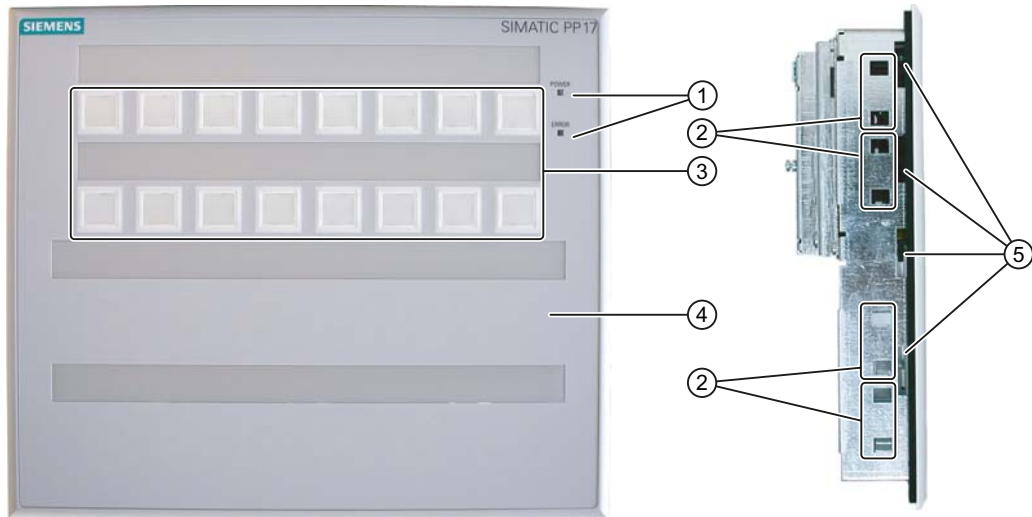
Front view and side view

①	"Power" LED and "Error" LED
②	Oblong hole for a mounting clamp
③	Keys with integrated LEDs
④	Mounting position for standard components
⑤	Opening for labeling strips
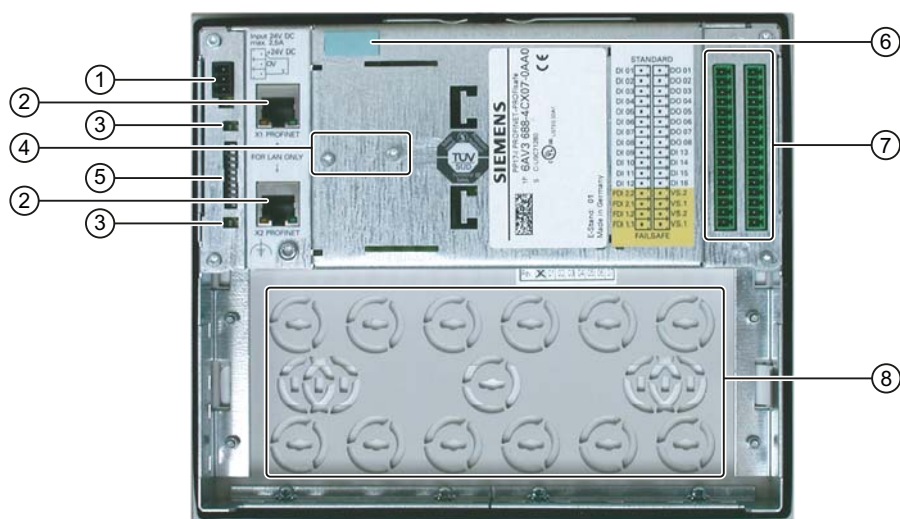
Rear view

①	Interface for the power supply
②	PROFINET interface
③	LEDs for monitoring the PROFINET communication
④	Screws for fastening the strain relief plate of the PROFINET connector
⑤	DIP switch for setting the PROFIsafe address interfaces
⑥	Printable label for identifying the HMI device, for example, with the device name
⑦	Digital Inputs and Outputs
⑧	Knockout apertures for mounting standard components

Green, printable labels are supplied with the HMI device. They can be attached at position ⑥ shown in the figure or above the DIP switches for setting the PROFIsafe address.

1.3   Configuration of PP 17-II PN

Front view and side view
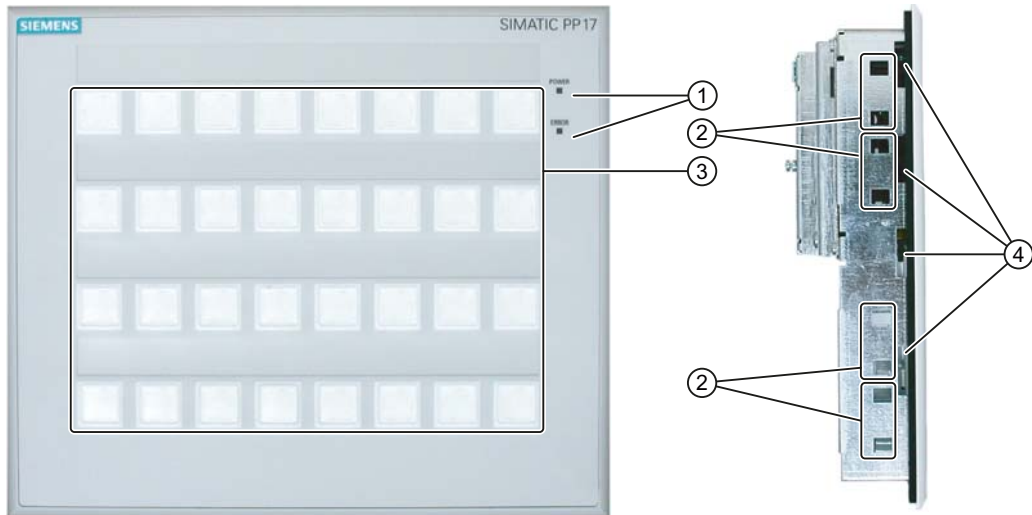
①	"Power" LED and "Error" LED
②	Oblong hole for a mounting clamp
③	Keys with integrated LEDs
④	Opening for labeling strips
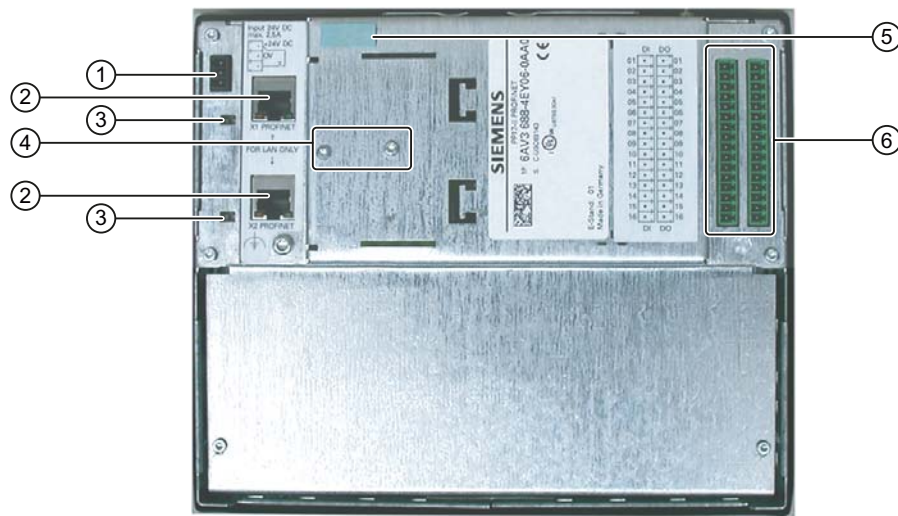
Rear view

①	Interface for the power supply
②	PROFINET interface
③	LEDs for monitoring the PROFINET communication
④	Screws for fastening the strain relief plate of the PROFINET connector
⑤	Printable label for identifying the HMI device, for example, with the device name
⑥	Digital inputs and outputs

Green, printable labels are supplied with the HMI device. They can be attached at position ⑤ shown in the figure.

1.4 Configuration of the PP 17-II PN PROFIsafe
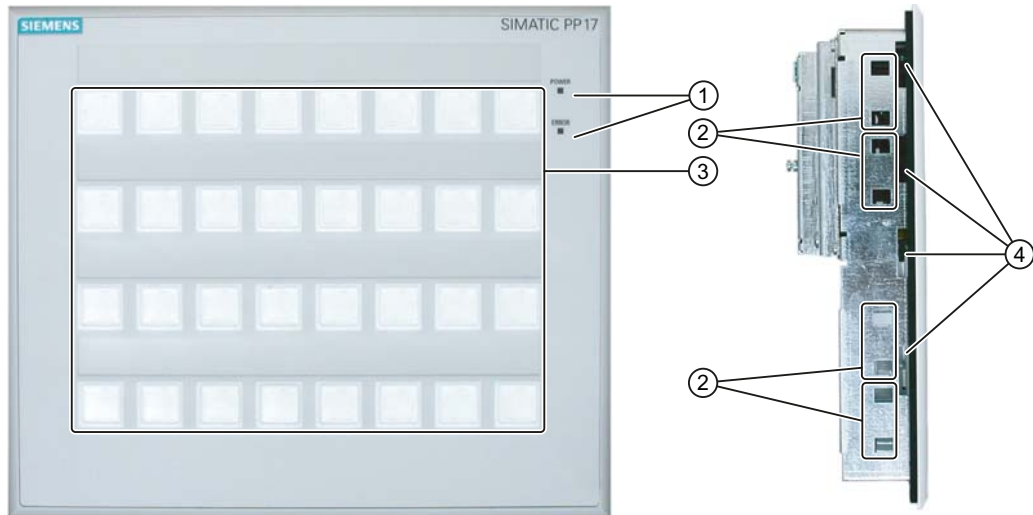
Front view and side view

①   "Power" LED and "Error" LED
②   Oblong hole for a mounting clamp
③   Keys with integrated LEDs
④   Mounting position for standard components

Rear view
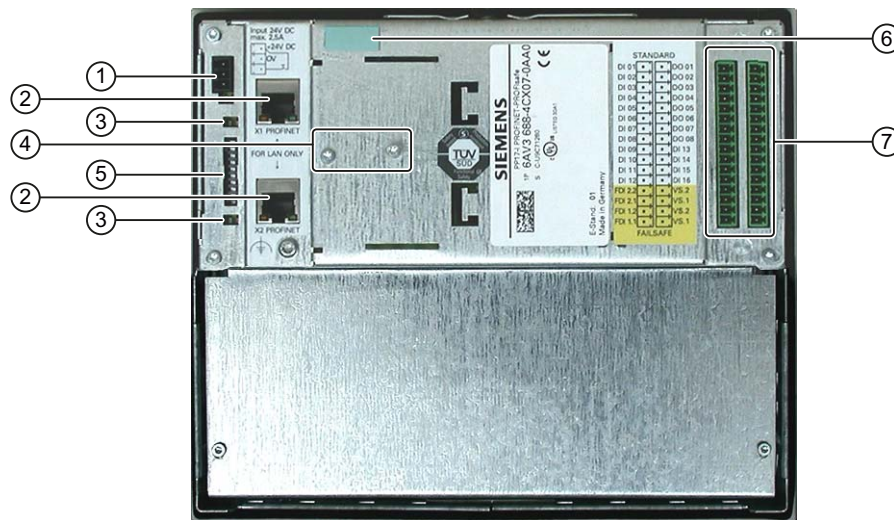
①	Interface for the power supply
②	PROFINET interface
③	LEDs for monitoring the PROFINET communication
④	Screws for fastening the strain relief plate of the PROFINET connector
⑤	DIP switch for setting the PROFIsafe address interfaces
⑥	Printable label for identifying the HMI device, for example, with the device name
⑦	Digital inputs and outputs

Green, printable labels are supplied with the HMI device. They can be attached at position ⑥ shown in the figure or above the DIP switches for setting the PROFIsafe address.

1.5   Accessories

Accessory kit

The accessory kit contains the following:

- A terminal block for the power supply
- Two coded terminal blocks for the digital inputs and outputs
- A strain relief plate for the PROFINET connector
- Eight mounting clamps for mounting the HMI device
- Green labeling strips

Additional documents may be enclosed with the accessory kit.

Labeling strips

You can order a set of perforated labeling strips for the HMI device with the order number 6AV3 671-8CB00.

1.6 Functional scope of PP 17-I PN PROFIsafe

Performance features

The HMI device offers a wide range of features that can be used without the need for programming:

- Short-stroke keys with two-color flat surface LEDs
- 16 digital inputs and 8 digital outputs for standard mode
- All short-stroke keys and digital inputs can also be individually configured as switches
- Integrated lamp test
- Integrated flash rate
- LED colors red, green, yellow
- Communication via PROFINET
- Perforated cut-outs for 22.5 mm standard add-on components such as key switches and emergency stop buttons.
- SIMATIC HMI device design, gaplessly buttable
- Fail-safe mode of maximum 2 emergency stop buttons using PROFIsafe communication
- Simultaneous standard mode and fail-safe mode

Expandable with standard components

The functionality of the HMI device can be extended with 22.5 mm standard components (hereafter referred to as "standard components"), for example lamps or key switches. If you wish to use additional standard components, mount them in the perforated cut-outs in the lower half of the HMI device. Wire the components either directly or with the standard digital inputs and standard digital outputs of the HMI device.

In fail-safe mode, up to four emergency stop buttons (two-channel with break contact) can be connected to the fail-safe channels. The design of these components has to correspond to the selected safety class.

Keys of the HMI device

The keys of the HMI device can be configured as keys or switches. The following figure shows when the corresponding bit for the key is set or reset in the controller for both configurations.

Configuration	Bit set	Bit reset
Key	Key pressed	Key released
Switch	Key pressed the first time and then released	Key pressed the second time and then released

Additionally installed standard components can also be configured as keys or switches. For this purpose, the standard digital input to which the standard component is wired should be configured as button or switch.

All buttons and standard digital inputs are configured as buttons by default.

LEDs

LEDs are integrated into the keys of the HMI device. The LEDs indicate whether or not specific bits are set in the controller.

The LEDs can light continuously or flash in various colors (red, green, yellow).

Enable input

You can use the enable input to disable the standard mode of the HMI device. The HMI device then operates in monitoring mode in which the following restrictions are in effect:

● The inputs are locked, no signal transitions are reported to the controller.

● The state of all keys previous to the locking continues to be reported to the controller until the device returns to normal operation.

The fail-safe mode of the HMI device is not affected by the enable input.

See also

Bit assignment in the process image for PP 17-I PN PROFIsafe (Page 115)

1.7   Functional scope of PP 17-II PN

Performance features

The HMI device offers a wide range of features that can be used without the need for programming:

● Short-stroke keys with two-color flat surface LEDs

● Additional 16 digital inputs and 16 digital outputs for wiring external encoders and sensors

● All short-stroke keys and digital inputs can also be individually configured as switches

● Integrated lamp test

● Integrated flash rate

● LED colors red, green, yellow

● Communication via PROFINET

● SIMATIC HMI device design, gaplessly buttable

Expansion with external input/output components

The functionality of the HMI device can be extended using input/output components, for example lamps or key switches. Wire the components to the digital inputs and digital outputs of the HMI device.

Keys of the HMI device

The keys of the HMI device can be configured as keys or switches. The following figure shows when the corresponding bit for the key is set or reset in the controller for both configurations.

Configuration	Bit set	Bit reset
Key	Key pressed	Key released
Switch	Key pressed the first time and then released	Key pressed the second time and then released

External standard components wired to the digital inputs can also be configured as keys or switches. To do this, configure the digital input wired to the standard component as a key or switch.

In the factory state all keys and digital inputs are configured as keys.

LEDs

LEDs are integrated into the keys of the HMI device. The LEDs indicate whether or not specific bits are set in the controller.

The LEDs can light continuously or flash in various colors (red, green, yellow).

Enable input

You can use the enable input to disable the standard mode of the HMI device. The HMI device then operates in monitoring mode in which the following restrictions are in effect:

- The inputs are locked, no signal transitions are reported to the controller.
- The state of all keys previous to the locking continues to be reported to the controller until the device returns to normal operation.

See also

Bit assignment in the process image for PP 17-II PN (Page 117)

1.8 Functional scope of PP 17-II PN PROFIsafe

Performance features

The HMI device offers a wide range of features that can be used without the need for programming:

- Short-stroke keys with two-color flat surface LEDs
- 16 digital inputs and 8 digital outputs for standard mode
- All short-stroke keys and digital inputs can also be individually configured as switches
- Integrated lamp test
- Integrated flash rate

- LED colors red, green, yellow

- Communication via PROFINET

- SIMATIC HMI device design, gaplessly buttable

- Fail-safe mode of maximum 2 emergency stop buttons using PROFIsafe communication

- Simultaneous standard mode and fail-safe mode

Expandable with standard components

The functionality of the HMI device can be extended using input/output components, for example lamps or key switches. Wire the components to the digital inputs and digital outputs of the HMI device.

In fail-safe mode, up to four emergency stop buttons (two-channel with break contact) can be connected to the fail-safe channels. The design of these components has to correspond to the selected safety class.

Keys of the HMI device

The keys of the HMI device can be configured as keys or switches. The following figure shows when the corresponding bit for the key is set or reset in the controller for both configurations.

Configuration	Bit set	Bit reset
Key	Key pressed	Key released
Switch	Key pressed the first time and then released	Key pressed the second time and then released

Additionally installed standard components can also be configured as keys or switches. For this purpose, the standard digital input to which the standard component is wired should be configured as button or switch.

All buttons and standard digital inputs are configured as buttons by default.

LEDs

LEDs are integrated into the keys of the HMI device. The LEDs indicate whether or not specific bits are set in the controller.

The LEDs can light continuously or flash in various colors (red, green, yellow).

Enable input

You can use the enable input to disable the standard mode of the HMI device. The HMI device then operates in monitoring mode in which the following restrictions are in effect:

- The inputs are locked, no signal transitions are reported to the controller.

- The state of all keys previous to the locking continues to be reported to the controller until the device returns to normal operation.

The fail-safe mode of the HMI device is not affected by the enable input.

1.9 Communication with PLCs

Compatible controllers for PP 17-I PN PROFIsafe

The HMI device has been released for the operation with a controller of the following type:

- SIMATIC F-CPU 300
- SIMATIC F-CPU 400

Compatible controllers for PP 17-II PN

The HMI device has been released for the operation with a controller of the following type:

- SIMATIC CPU 300
- SIMATIC CPU 400

Compatible controllers for PP 17-II PN PROFIsafe

The HMI device has been released for the operation with a controller of the following type:

- SIMATIC F-CPU 300
- SIMATIC F-CPU 400

Protocols

The HMI device uses the following protocols for communication with the controller:

- PROFINET IO for standard communication
- PROFIsafe Mode V2.0 for fail-safe communication of PP 17-I PN PROFIsafe and PP 17-II PN PROFIsafe

1.10   Fail-safe operation of the PROFIsafe devices

Configuration tools and add-on packages

For fail-safe operation of the HMI device, the following software is required:

- STEP 7 V5.4 SP4 or higher
- SIMATIC S7 Distributed Safety as of V5.4
- HSP for PP17-I PN PROFIsafe and PP17-II PN PROFIsafe

Fail-safe automation system

Fail-safe automation system (F systems) are used in plants requiring higher levels of safety.

F systems control processes in such a way that residual error probability is taken into consideration to achieve a safe state when a shutdown occurs. An immediate shutdown therefore does not pose a danger to people or the environment.

Fail-safe application of the HMI device

The PROFIsafe device is a PROFINET IO device on Industrial Ethernet.

In fail-safe mode the HMI device registers the signal states of compatible emergency stop buttons and transmits corresponding safety frames to CPU. The CPU and HMI device communicate with each other using the fail-safe protocol, PROFIsafe.

The HMI device can operate in fail-safe mode conforming to SIL3/PL e if the safety functions are appropriately configured in STEP 7 with the "S7 Distributed Safety" add-on package.

Fail-safe mode of the HMI device differs from standard mode essentially in that for each fail-safe channel, two digital inputs and two encoder voltages are used to relay the fail-safe input signals from the HMI device to the CPU. The signals are monitored for errors during the communication. In the event of a fault, the HMI device is placed into a safe state (1oo2 evaluation of the sensor).

The HMI device can be operated simultaneously in standard mode and fail-safe mode.

Diagnostic function of the HMI device

The fail-safe HMI device includes a non-configurable diagnostic function. The diagnostics are always activated and are automatically made available by the HMI device in STEP 7 and passed on to the CPU in the event of a fault.

Enable input

Note

Enable input does not affect the fail-safe channels

The enable input of the HMI device does not affect the digital inputs for the fail-safe channels. Fail-safe inputs are not locked when the HMI device is locked by an enable input. Emergency stop signals are always forwarded to the controller.

Example configuration of a fail-safe system with a fail-safe HMI device

SIMATIC S7-416F-3
PN/DP
as PROFINET IO
controller

Standard
Host/PLC
as PROFINET IO
controller

ET 200S station
with
IM 151-3 PN

PROFINET

HMI and
monitoring device

F I/O as
PROFINET IO
Device

PP 17-I PN PROFIsafe
as PROFINET IO
device

PP 17-II PN
as PROFINET IO
device

PP 17-II PN PROFIsafe
as PROFINET IO device
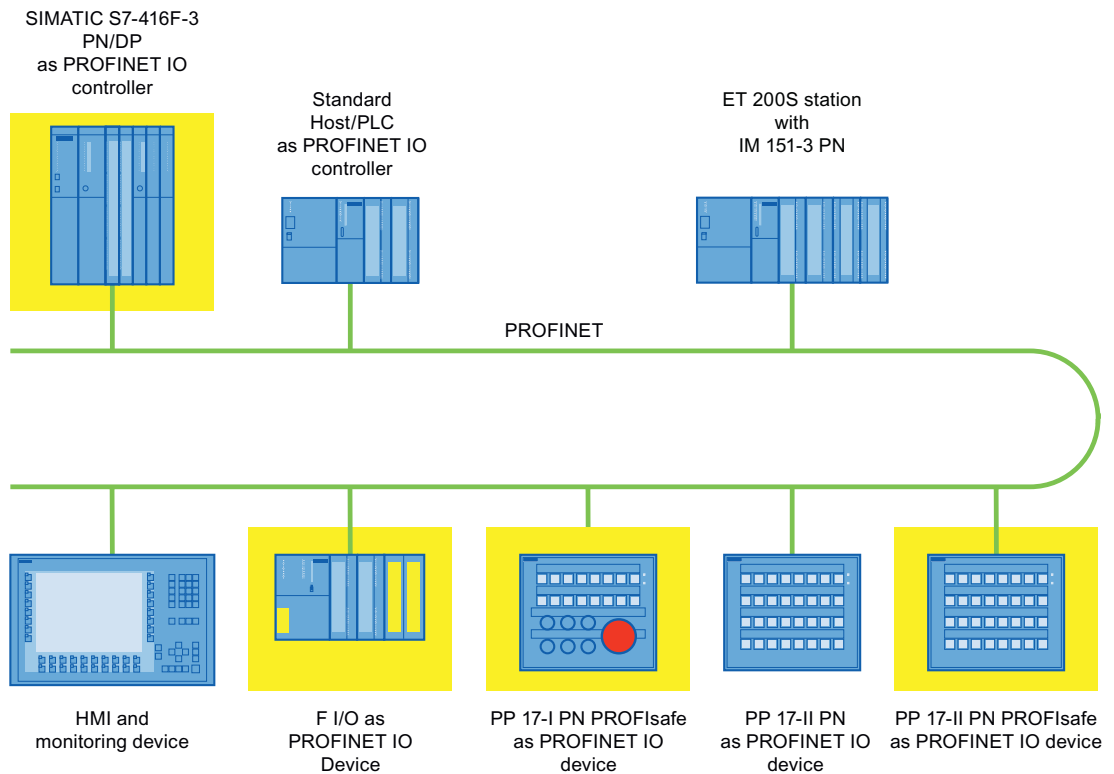
The example shows the simultaneous operation of fail-safe and standard stations.

In the example, each PROFINET IO device communicates with just one PROFINET IO controller. The PROFIsafe device communicates here exclusively with the F-PROFINET IO controller.

Safety Instructions and General Notes

<div align="right">

2

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2.1   Safety Instructions

Working on the cabinet

⚠ WARNING
Open-type resource
The HMI device is an open-type resource. This means that the HMI device may only be installed in enclosures or cabinets that allow the device to be operated from the front side.
Access to the enclosure or cabinet in which the HMI device is installed should only be possible using a key or tool and for personnel who have received instruction or are authorized.
Danger, high voltage
Opening the cabinet will expose high voltage parts. Contact with these parts could be fatal.
Switch off the power supply to the cabinet before opening it.

Potentially explosive atmospheres

When operating the HMI device in hazardous areas the following warning applies.

⚠ WARNING
Explosion Hazard
Do not disconnect while circuit is live unless area is known to be non-hazardous. Substitution of components may impair suitability for Class I, Division 2 or Zone 2.

High frequency radiation

NOTICE
Unintentional operating situations
High frequency radiation, from mobile phones for example, can cause unintentional operating situations.

Prescribed usage

⚠ WARNING
Commissioning of the HMI device is forbidden until it has been absolutely ensured that the machine in which the HMI device is to be installed complies with Directive 98/37/EC.

2.2 Approvals

Valid approvals

⚠ CAUTION
Valid approvals
The following overview shows possible approvals.
The HMI device itself is certified as shown on the label on its rear panel.

CE approval

C E

The HMI device meets the general and safety-related requirements of the following EC directives and conforms to the harmonized European standards (EN) for programmable logic controllers published in the official gazettes of the European Union:

- 2004/108/EC "Electromagnetic Compatibility" (EMC Directive)
- 2006/95/EC "Electrical Equipment Designed for Use within Certain Voltage Limits" (Lowvoltage Directive)

EC Declaration of Conformity

The EC Declarations of Conformity are kept available for the responsible authorities at the following address:

Siemens AG
Industry Sector
I IA AS RD ST PLC
P.O. Box 1963
D-92209 Amberg, Germany

UL approval

c (UL) us

Underwriters Laboratories Inc. in accordance with

- UL 508 (Industrial Control Equipment)
- CSA C22.2 No. 142, (Process Control Equipment)

or

Underwriters Laboratories Inc. in accordance with

- UL 508 (Industrial Control Equipment)
- CSA C22.2 No. 142, (Process Control Equipment)
- UL 1604 (Hazardous Location)
- CSA-213 (Hazardous Location)

Approved for use in

- Class I, Division 2, Group A, B, C, D or
- Class I, Zone 2, Group IIC or
- non-hazardous locations

Tick-mark for Australia

The HMI device fulfills the requirements of standard AS/NZS 2064 (Class A).

2.3 Standards for PP 17-I PN PROFIsafe and PP 17-II PN PROFIsafe

(German) Technical Inspectorate Certificates and Standards

The HMI device is certified according to the following standards. The latest version/edition of the standard can be found in the report for the Technical Inspectorate Certificate.

Standards/guidelines	Label
Standards/Directives Functional Safety	IEC 61508-1 to 4
	DIN EN ISO 13849-1
Standards/Directives Fundamental Safety	IEC 61131-2
Standards/Directives Machine Safety	EN 60204-1
	NFPA 79
	IEC 62061
	IEC 61511
	EN 418

Requesting Certificates from the Technical Inspectorate

You can obtain copies of certificates from the Technical Inspectorate at the following address:

Siemens Aktiengesellschaft
Automation & Drives
A&D AS RD ST PLC
PO Box 1963
D-92209 Amberg, Germany

You can find the certificates from the Technical Inspectorate in the Internet at the following address:

"http://support.automation.siemens.com"

2.4   Notes about Usage

Use in Industry

The HMI device is designed for industrial use. The following standards are met:

- Requirements of the emission of interference EN 61000-6-4: 2001
- Requirements for noise immunity EN 61000-6-2: 2001

Residential Use

If the HMI device is used in a residential area, you must take measures to achieve Limit Class B conforming to EN 55011 for RF interference.

Suitable measures to achieve Limit Class B for suppression of radio interference include:

- Installation of the HMI device in a grounded control cabinet
- Use of filters in electrical supply lines

Individual acceptance is required.

2.5   Electromagnetic compatibility

Introduction

The HMI device fulfills requirements of the EMC directive of the domestic European market and other requirements.

EMC-compliant installation of HMI devices

An EMC-compliant installation of the HMI device and the use of interference-proof cables form the basis of trouble-free operation. The following documentation applies to the mounting of the HMI device:

- The description "Directives for interference-free installation of PLCs"
- The manual "PROFINET System Description"

Pulseshaped Interference

The following table shows the electromagnetic compatibility of modules compared to pulse-shaped interference. These specifications only apply when the HMI device meets the specifications and directives regarding electrical installation.

Pulse-shaped interference	Tested with	Corresponds to test intensity
Electrostatic discharge conforming to IEC 61000-4-2	Air discharge: 8 kV Contact discharge: 6 kV	3
Burst pulses (high-speed transient interference) conforming to IEC 61000-4-4	2 KV power supply cable 2 KV signal cable, > 30 m 1 KV signal cable, < 30 m	3
High-power surge pulses conforming to IEC 61000-4-5, external protective circuit required (refer to Automation System S7 300, Installation, chapter "Lightning and overvoltage protection").		
Asymmetric coupling	2 kV power cable DC voltage with protective elements 2 KV signal/data cable, > 30 m, with protective elements as required	3
Symmetric coupling	1 kV power cable DC voltage with protective elements 1 KV signal cable, > 30 m, with protective elements as required	3

Sinusoidal interference

The table below shows the EMC properties of the modules with respect to sinusoidal interference. These specifications only apply when the HMI device meets the specifications and directives regarding electrical installation.

Sinusoidal interference	Test values	Corresponds to test intensity
HF radiation (electromagnetic fields) according to IEC 61000-4-3	• 80% amplitude modulation at 1 kHz with 10 V/m in the range of 80 MHz to 1 GHz with 3 V/m in the range 1.4 GHz to 2 GHz with 1 V/m the range 2 GHz to 2.7 GHz • 10 V/m with 50 % pulse modulation at 900 MHz 10 V/m with 50 % pulse modulation at 1.89 GHz	3
RF interference current on cables and cable shielding conforming to IEC 61000-4-6	Test voltage 10 V at 80 % amplitude modulation of 1 kHz in the range from 9 kHz to 80 MHz	3

Emission of radio interference

The table below shows the emission values of electromagnetic interference conforming to EN 55011, limit value class A, Group 1, measured at a distance of 10 m:

From 30 MHz to 230 MHz	< 40 dB (V/m) quasi-peak
From 230 MHz to 1000 MHz	< 47 dB (V/m) quasi-peak

Note

Additional measures

Before you connect an HMI device to the public network, ensure that it is compliant with Limit Class B conforming to 55022.

2.6 Transport and Storage Conditions

Mechanical and climatic transport and storage conditions

The transport and storage conditions of this HMI device exceed requirements conforming to IEC 61131-2. The following specifications apply to the transport and storage of an HMI device in its original packing.

The climatic conditions comply to the following standards:

- IEC 60721-3-3, Class 3K7 for storage
- IEC 60721-3-2, Class 2K4 for transport

The mechanical conditions are compliant with IEC 60721-3-2, Class 2M2.

Type of condition	Permitted range
Drop test (in transport package)	≤ 1 m
Temperature	–40 to +70° C
Atmospheric pressure	from 1030 to 581 hPa
Max. pressure difference (front/rear)	2hPa
Relative humidity	≤95%, w/o condensation
Sinusoidal vibration conforming to IEC 60068-2-6	5 Hz to 9 Hz: 3.5 mm 9 Hz to 150 Hz: 9.8 m/s^2
Shock conforming to IEC 60068-2-29	250 m/s^2, 6 ms, 1000 shocks

---

NOTICE
Ensure that no condensation (dewing) develops on or inside the HMI device after transporting it at low temperatures or after it has been exposed to extreme temperature fluctuations. The HMI device must have acquired room temperature before it is put into operation. Do not expose the HMI device to direct radiation from a heater in order to warm it up. If dew has developed, wait approximately four hours until the HMI device has dried completely before switching it on.

Prerequisite for the trouble-free and safe operation of the HMI device is proper transport and storage, installation and assembly and careful operation and maintenance.

Warranty for the HMI device is deemed void if these specifications are ignored.

Application planning

<div style="text-align: right; font-size: 3em;">3</div>

3.1 Check list for "Application planning"

Introduction

Before deploying the HMI device, you should check that the planned application of the HMI device complies with the following conditions.

Check list

Step	Information	Check
Check the ambient climatic and mechanical conditions	Mounting Information (Page 34)	
Define the mounting position, installation location and mounting type of the HMI device	Mounting Positions and Type of Fixation (Page 36)	
Preparation of the mounting cut-out	Preparing for Mounting (Page 37)	
Check that the requirements for insulation voltage, protection class and seal tightness will be met if the HMI is used in this way	Information on insulation tests, protection classes and degrees of protection (Page 39)	
Check that the allowed nominal line voltages are met	Nominal Voltages (Page 40)	
Selection of sensors that fulfill the fail-safe mode requirements	Requirements for the fail-safe operation of a PROFIsafe device (Page 40)	

3.2 Mounting Information

Mechanical and climatic conditions of use

The HMI device is intended for installation in weatherproof permanent locations. The conditions of use are compliant with requirements to DIN IEC 60721-3-3:

- Class 3M3 (mechanical requirements)
- Class 3K3 (climatic requirements)

Use with additional measures

Examples of applications where the use of the HMI device requires additional measures:

- In locations with a high degree of ionizing radiation
- In locations with extreme operating conditions resulting from situations as follows:
  - Corrosive vapors, gases, oils or chemicals
  - Electrical or magnetic fields of high intensity
- In plants requiring special monitoring features, for example:
  - Elevator systems
  - Systems in especially hazardous rooms

Mechanical environmental conditions

The mechanical ambient conditions for the HMI device are specified in the following table in terms of sinusoidal vibration.

Frequency range in Hz	Continuous	Infrequently
$10 \leq f \leq 58$	Amplitude 0.0375 mm	Amplitude 0.075 mm
$58 \leq f \leq 150$	Constant acceleration 0.5 g	Constant acceleration 1 g

Reduction of vibration

If the HMI device is subjected to greater shocks or vibrations, you must take appropriate measures to reduce acceleration or amplitudes.

We recommend fitting the HMI device to vibration-absorbent material (on metal shock absorbers, for example).

Testing for mechanical ambient conditions

The following table provides information on the type and scope of tests for mechanical ambient conditions.

The check includes	Test standard	Comments
Vibrations	Vibration testing in accordance with IEC 60068, Part 2–6 (sine)	Type of vibration: Transitional rate of the frequency: 1 octave/minute. $10 \leq f \leq 58$, constant amplitude 0.075 mm $58 \leq f \leq 150$, Constant acceleration 1 g Vibration duration: 10 frequency cycles per axis in each of the three axes vertical to each other
Shock	Shock testing in accordance with IEC 60068, Part 2 – 29	Type of shock: Half-sine Shock intensity: Peak value 15 g, duration 11 ms Direction of impact: 3 shocks in ± direction of axis in each of the three axes vertical to each other

Climatic ambient conditions

The table below shows the climatic ambient conditions at which the HMI device may be operated.

Ambient conditions	Permitted range	Comments
Temperature • Vertical mounting • Inclined mounting	 0 to 55° C 0 to 55° C	See the "Mounting positions and type of fixation" section
Relative humidity	≤ 95%	Without condensation, corresponds to a relative humidity, stress class 2 conforming to IEC 61131, part 2
Atmospheric pressure	1030 to 706 hPa	
Pollutant concentration	SO_2: < 0.5 ppm; Relative humidity < 60 %, no condensation	Check: 10 ppm; 10 days
	H_2S: < 0.1 ppm; Relative humidity < 60 %, no condensation	Check: 1 ppm; 10 days

3.3 Mounting Positions and Type of Fixation

Mounting position

The HMI device is designed for mounting in:

- Racks
- Cabinets
- Control boards
- Consoles

In the following, all of these mounting options are referred to by the general term "cabinet".

The HMI device is self-ventilated and approved for vertical and inclined mounting in stationary cabinets.
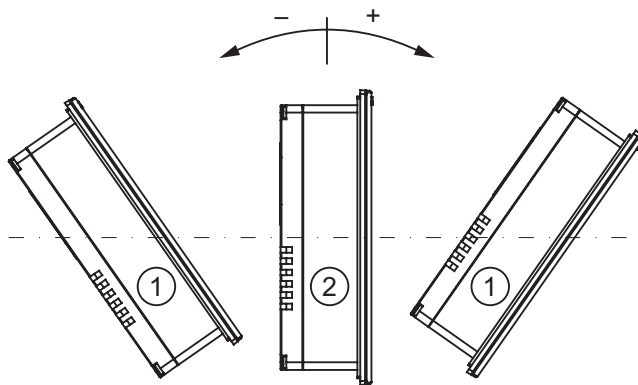
Permitted mounting positions

	Mounting position	Deviation from the vertical
①	Inclined	≤ 35°
②	Vertical	0°

CAUTION
Impermissible ambient temperatures
Do not operate the HMI device without auxiliary ventilation if the maximum permissible ambient temperature is exceeded. The HMI device may otherwise get damaged and its approvals and warranty will be void!

Type of fixation

Mounting clamps are provided for mounting the device. Hook the clamps into the recesses of the HMI device. The main dimensions of the HMI device are not exceeded by this.
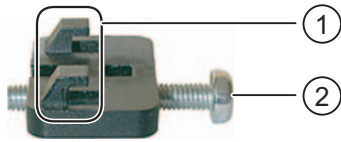
①   Hooks

②   Screws

View of a mounting clamp

Mounting multiple HMI devices

You can seamlessly mount several type PP 17 HMI devices next to each other or underneath each other in the same switching cabinet. When mounting the HMI devices, adjust the mounting clamps of the various devices into the optional cut-outs so that they do not hinder one another.

3.4   Preparing for Mounting

Select the HMI device mounting location

What to observe when selecting the installation location:

- Position the HMI device so that it is not subjected to direct sunlight.
- Position the HMI device to provide an ergonomic position for the operator and select a suitable mounting height.
- Ensure that the air vents are not covered as a result of the mounting.
- Observe the permissible mounting positions for the HMI device.

Degrees of protection

The degrees of protection are only guaranteed when the following is observed:

- The material at the mounting cut-out must be distortion-resistant.
- Thickness of material at the installation cut-out for protection class IP65: 3 to 6 mm
- Permitted deviation from plane at the mounting cut-out: ≤ 0.5 mm

  This condition must be fulfilled for the mounted HMI device.

- Permissible surface roughness in the area of the seal: ≤ 120 µm (friction coefficient 120)

Dimensions of mounting cut-out

You can mounted the HMI devices butted side-by-side or stacked. The figure below shows the required mounting cut-out.

All dimensions in mm
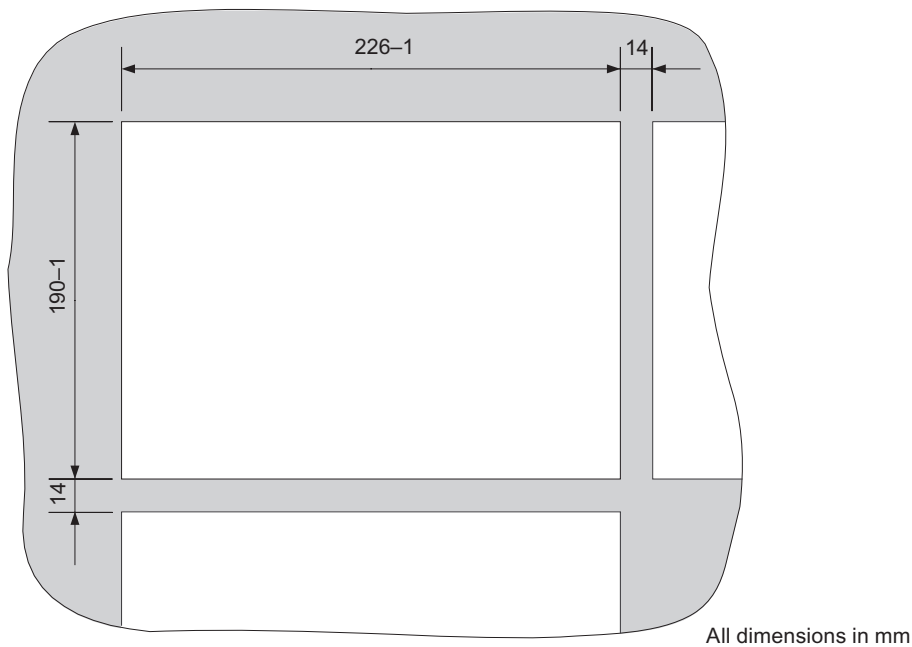
Mounting depth

The mounting depth for the HMI device depends on the type of cabling to the controller. It does not match the external dimensions of the device. Plan a sufficient bending radius for the cable.

We recommend the use of angled PROFINET connectors.

Bus connector	Mounting Depth
Without	53 mm
With angled PROFINET connector Order no.: 6GK1901-1BB20-2A...	75 mm

3.5 Information on insulation tests, protection classes and degrees of protection

Test voltages

Insulation strength is demonstrated in the type test with the following test voltages conforming to IEC 61131-2:

Circuits with nominal voltage Ue relative to other circuits or ground	Test voltage
< 50 V	500 VDC

Protection class

Protection Class I conforming to IEC 60536, i.e. equipotential bonding conductor to profile rail required!

Protection from foreign objects and water

Degree of protection conforming to IEC 60529	Description
Front panel	IP65 in mounted state
Rear	IP20 protection against contact with standard test probes. There is no protection against ingress by water.

The degree of protection provided by the front side can only be guaranteed when the mounting seal lies completely against the mounting cut-out.

NOTICE
Degree of protection IP65 The degrees of protection are only guaranteed when the following is observed: • The material at the mounting cut-out must be distortion-resistant. • The material thickness at the mounting cut-out is at least 3 mm. • The permitted deviation from plane at the mounting cut-out is ≤ 0.5 mm.   This condition must be fulfilled for the mounted HMI device. • The HMI device is secured with 8 mounting clamps. The mounting clamps are hung in the specified positions. • When mounting standard components in the PP17-I PN PROFIsafe, the membrane on the front of the HMI device should only be cut for the area of the knockout aperture.

See also

Mounting the HMI device (Page 50)

3.6 Nominal Voltages

The following figure shows the rated voltage and the corresponding tolerance range.

Nominal voltage	Tolerance range
+24 VDC	19.2 V to 28.8 V (–20 %, +20%)

3.7 Requirements for the fail-safe operation of a PROFIsafe device

Achievable Safety Classes (SIL)

Safety class SIL3/PL e is achieved with the HMI device.

⚠ CAUTION

Perform an acceptance procedure before putting the HMI device into operation.

Requirements for the sensors to be used (emergency stop buttons)

⚠ WARNING

General requirements for sensors

Our electronics are equipped with such safety engineering features as to leave 85% of the maximum permissible probability of hazardous faults for sensors and actuators up to you (this corresponds to the recommended load division in safety engineering between sensing devices, actuating devices, and electronic switching for input, processing, and output).

Note, therefore, that instrumentation with sensors and actuators entails a considerable safety responsibility. Consider, too, that sensors and actuators do not generally withstand proof-test intervals of 10 years (the interval for an external function test according to IEC 61508) without considerable loss of safety.

The probability of hazardous faults and the rate of occurrence of hazardous faults of a safety function must comply with an upper limit determined by a safety integrity level (SIL). You will find a listing of values achieved by the HMI device "Fail-Safe Performance Characteristics" in the specifications for the HMI device.

Suitably qualified sensors are required to achieve SIL3 (PL e). The sensors used must fulfill the standards IEC/EN 60947-5-1 and IEC/EN 60947-5-5 (VDE 0660, section 200).

The contacts of the employed emergency stop button must be weld-resistant in conformity to standard IEC/EN 60947-5.

> ⚠ **WARNING**
>
> The HMI device can only recognize two-channel equivalent sensor signals (break contacts, two-channel).

Error can be detected using the following configurations:

- When connecting non-equivalent sensor signals.
- With redundant connection of a single-channel sensor

> ⚠ **WARNING**
>
> **No redundant connection of two single-channel break contacts**
>
> Ascertain that under no circumstances are two single-channel break contacts redundantly connected as sensor signals. If sensor signals are connected redundantly (break contacts), a fault will only be recognized if one of the sensors is triggered.

Requirements for the duration of sensor signals

> ⚠ **WARNING**
>
> **Minimum duration of sensor signals**
>
> In order to guarantee accurate detection of the sensor signal by the HMI device, you must ensure that the sensor signals have a minimum duration of 50 ms. This is ensured by the usage of push-to-lock emergency stop buttons.

Requirements for cables

The cables used must meet the following requirements:

- The unique assignment of terminals to sensors must be ensured.
- Cables laid outside of the switching cabinet must be laid separately in accordance with the relevant standards, for example, in stable pipes or cable ducts. This is intended to prevent short-circuits and cross-circuits.
- When wiring external emergency stop buttons with the fail-safe channels of the HMI device, the following cable lengths must be maintained:
  - Unshielded cables: Max. 1m
  - Shielded cables: Max. 10 m

Mounting and connecting

<div align="right"># 4</div>

4.1 Checklist for fail-safe operation

Mounting and connecting

The following steps must be taken when mounting and connecting the HMI device.

Check list for mounting and connecting

Step	Check
Checking the package contents (Page 43)	
Installing standard components in a PP 17-I PN PROFIsafe (Page 44)	
Wiring standard component on a PROFIsafe device (Page 47)	
Wiring the emergency stop button of a PROFIsafe device as fail-safe (Page 48)	
Wiring input and output components (Page 50)	
Mounting the HMI device (Page 50)	
Connecting the equipotential bonding circuit (Page 54)	
Connecting the power supply (Page 56)	
Connecting the PLC (Page 57)	
Switching on and testing the HMI device (Page 61)	

4.2 Checking the package contents

Check the package contents for visible signs of transport damage and for completeness.

NOTICE
Do not install parts damaged during shipment. In the case of damaged parts, contact your Siemens representative.

Keep the supplied documentation in a safe place. The documentation belongs to the HMI device and is required for subsequent commissioning.

4.3 Installing standard components in a PP 17-I PN PROFIsafe

Introduction

If required, 22.5 mm diameter standard components, for example, key switches and emergency stop buttons can be built into the HMI device. The installation in the lower section of the HMI device front is prepared by a pre-perforated cut-out with oblong holes.

Mount the standard components before mounting the HMI device itself in the switchgear cabinet.

Determine mounting position

If you want to mount several standard components, first plan what component should be mounted in which position. Refer to the dimension drawing of the HMI device, see Dimension drawing of PP 17-I PN PROFIsafe (Page 101).

- Emergency stop button

  We recommend mounting a maximum of one emergency stop button in the HMI device. You can install any planned additional emergency stop buttons in the environment of the HMI device in other positions on your system. In doing so, consider the maximum allowed cable length.

  Use one of the oval shaped knockout apertures in the middle row for mounting the emergency stop button with or without protective collar. These knockouts are constructed so that you can position the emergency stop button further to the right or left. In this case, break out the middle and one other of the two crescent-shaped die-cast pieces on the side.

  When planning, please consider that an emergency stop button needs more space on the front side of the HMI device than other standard components.

- Other standard components

  All of the other standard components can be mounted in any of the knockout aperture.

Example mounting position

The following figures show the recommended configuration of standard components and emergency stop buttons:
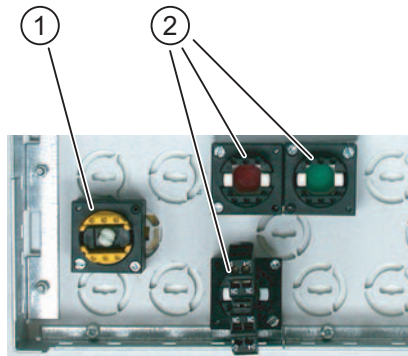
Rear view
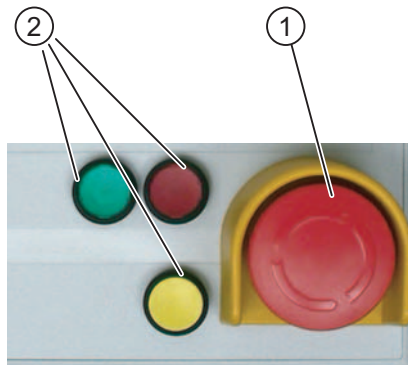
①   Emergency stop button

②   Standard component

Front view

Mounting standard components

Proceed as follows:
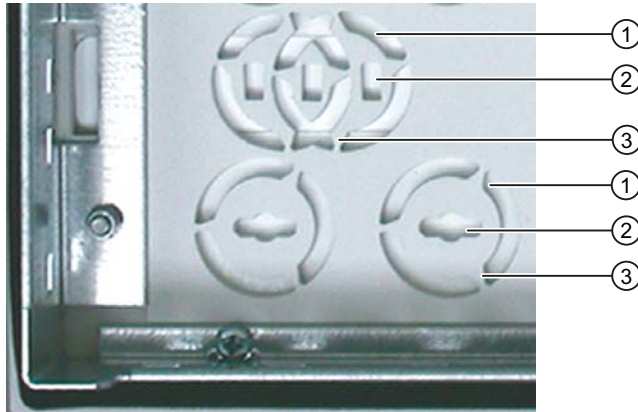
1. Using a sharp knife, cut a slot in the keyboard cover at the selected oblong hole.

2. Cut the keyboard cover along the knockout ①.

NOTICE
Maintaining degree of protection IP65
The degree of protection IP65 for the front of the HMI device must be maintained after the mounting of the standard component.
Therefore, only cut the keyboard cover on the front of the HMI device in the area of the knockout.

3. Insert a screwdriver into the oblong hole ① of the knockout and turn the screwdriver until the ribs detach.

   If you want to mount an emergency stop button, also break out one of the side knockout pieces.

4. Remove the knockout piece.

5. Position the standard component into the empty knockout.

6. Secure the standard component.

Result

The required operator control is mounted and can be wired.

See also

Front operator controls and displays of the PP 17-I PN PROFIsafe (Page 63)

Dimension drawing of PP 17-I PN PROFIsafe (Page 101)

4.4 Wiring standard component on a PROFIsafe device

Introduction

The following digital inputs and digital outputs are located on the rear of the HMI device:

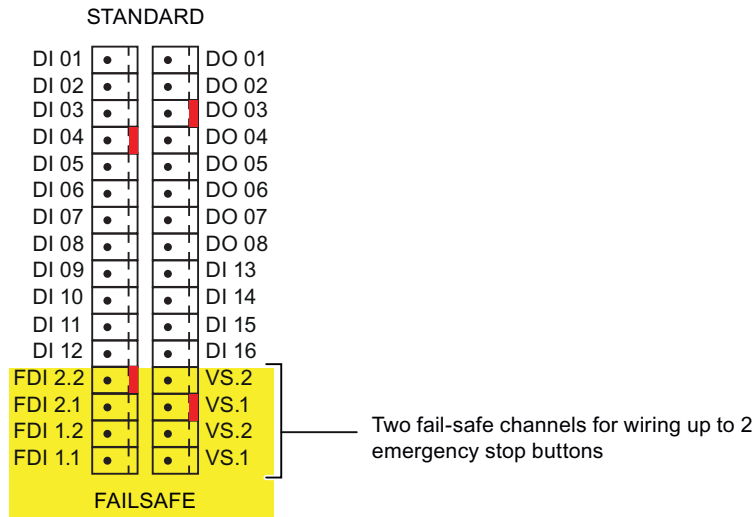- 16 digital inputs (DI) for **non**-fail-safe wiring of standard components
- 8 digital outputs (DO) for **non**-fail-safe wiring of standard components

STANDARD

DI 01	•		•	DO 01
DI 02	•		•	DO 02
DI 03	•		•	DO 03
DI 04	•		•	DO 04
DI 05	•		•	DO 05
DI 06	•		•	DO 06
DI 07	•		•	DO 07
DI 08	•		•	DO 08
DI 09	•		•	DI 13
DI 10	•		•	DI 14
DI 11	•		•	DI 15
DI 12	•		•	DI 16
FDI 2.2	•		•	VS.2
FDI 2.1	•		•	VS.1
FDI 1.2	•		•	VS.2
FDI 1.1	•		•	VS.1

FAILSAFE

Two fail-safe channels for wiring up to 2 emergency stop buttons

Coding of the terminal block

The terminal blocks contained in the accessory kit are coded at the following positions:

- Digital inputs FDI 2.2 and DI 04
- Digital outputs VS1 and DO 03

Only use the supplied coded terminal blocks to perform the wiring.

Wiring non-fail-safe standard components

1. Wire the standard component to the digital inputs or digital outputs labeled white.

See also

Front operator controls and displays of the PP 17-I PN PROFIsafe (Page 63)

4.5 Wiring the emergency stop button of a PROFIsafe device as fail-safe

Introduction

Note the following safety information:

| CAUTION |
| --- |
| **Fail-safe operation** |
| The HMI device can only recognize two-channel equivalent sensor signals. |
| The design of the emergency stop buttons used must conform to the safety category SIL3/PL e. |
| **HMI device without emergency stop button** |
| The HMI device is designed for the use of at least one emergency stop button. |
| If you operate the HMI device without a wired emergency stop button, "emergency stop" is automatically detected and the value "0" is sent to the CPU. |
| Do not wire fail-safe channels on which no emergency stop button is wired. |

Rules for wiring

- Only use the supplied coded terminal blocks to perform the wiring.
- Wire the fail-safe channels from bottom to top.

  If only one emergency stop button is wired, always connect it to fail-safe channel 1 (FDI1.1, FDI1.2 and VS1, VS2).

- Do not wire fail-safe channels on which no emergency stop button is wired.

Fail-safe wiring of emergency stop buttons

Proceed as follows:

1. Wire emergency stop button 1 to the digital inputs and supply voltages of F channel 1 as follows:

   – From supply voltage VS 1 to digital input FDI 1.1

   – From supply voltage VS 2 to digital input FDI 1.2
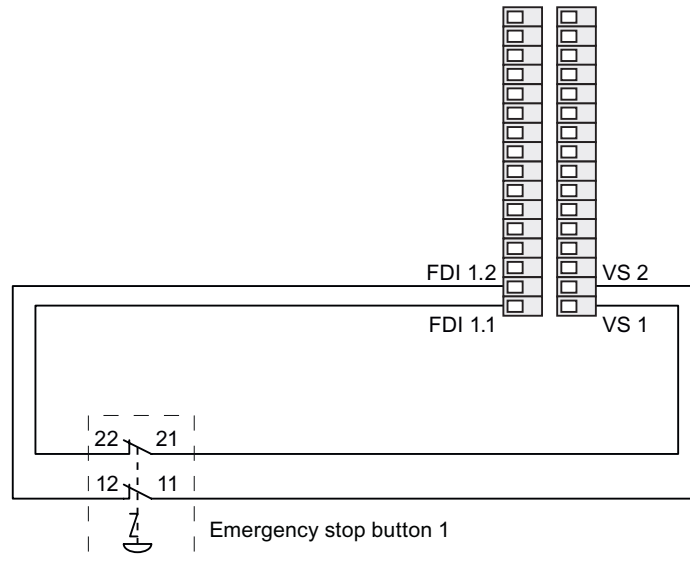
2. If you want to wire and additional emergency stop button, wire it in similar fashion in pairs to the digital inputs and supply voltages of the fail-safe channel 2.

3. Perform a function test after wiring an emergency stop button.

Note

If you have wired a second emergency stop button, you need to activate it in HW Config of the STEP 7 project. To do this, activate the option "Second 2-channel emergency stop button" in the object properties of slot 2 in the "Parameters" tab.

See also

Front operator controls and displays of the PP 17-I PN PROFIsafe (Page 63)

4.6 Wiring input and output components

Digital inputs and outputs

The rear of the HMI device features 16 digital inputs, DI01 to DI16. The digital outputs are as follows:

- PP17-I PN PROFIsafe and PP17-II PN PROFIsafe: 8 DO
- PP17-II PN: 16 DO

You can wire external input and output components installed in your system to these digital inputs and digital outputs.

Rules for wiring

Only use the supplied terminal blocks to perform the wiring.

See also

Rear operator controls, displays and interfaces of the PP 17-II PN (Page 70)

4.7 Mounting the HMI device

Requirement

When mounting an HMI device you will need eight mounting clamps from the accessories.

The mounting seal must be available on the HMI device. If the mounting seal is damaged, order a replacement seal. The mounting seal is part of the associated service pack. You can order the service package with the order number 6AV3 678-3XC30.

Mounting the HMI device

NOTICE
Always mount the HMI device according to the operating instructions in this manual.

Proceed as follows:

1. Check that the mounting seal is fitted on the HMI device.

   Do not install the mounting seal turned inside out. This may cause leaks in the mounting cut-out.

2. Working from the front, insert the HMI device into the mounting cut-out.

3. Insert a mounting clamp into a recess of the HMI device.

   If you wish to mount several devices butted gaplessly, ensure that the mounting clamps do not hinder one another. Use alternative recesses for the mounting clamps if necessary.

4. Fasten each mounting clamp by tightening its screws. The permitted torque is 0.15 Nm.

5. Repeat step 3 and 4 for all mounting clamps until all required clamps are tightened.

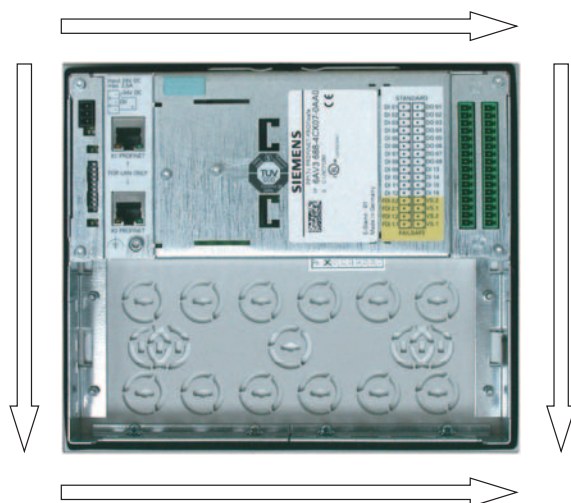| NOTICE |
| --- |
| Check the fit of the mounting seal on the front. The mounting seal must not protrude from the HMI device.

If necessary, repeat steps working steps 1 to 5. |

Position of the mounting clamps

In total, you will need 8 mounting clamps for the installation.

The following figure shows the counting direction for the mounting clamps with PP 17-I PN PROFIsafe as an example.

The following figure shows the positions of the mounting clamps. Observe the counting direction. The position indicated corresponds to the first recess occupied for each mounting clamp in the counting direction. The inserted mounting clamp covers several recesses.

Page	Number of mounting clamps	Mounting clamp position 1	Mounting clamp position 2
Top	2	1	9
Right	2	1	7
Bottom	2	1	9
Left	2	1	7

See also

Accessories (Page 17)

4.8 Connecting the HMI device

Requirement

- If you have mounted additional standard components in a PP 17-I PN PROFIsafe, these standard components must be connected to the HMI device.
- The HMI device must be mounted according to the specifications of these operating instructions.
- Always use shielded standard cables.

You can find additional information in the Internet at:"http://mall.automation.siemens.com"

Connection sequence

NOTICE
Connection sequence
Always follow the correct sequence for connecting the HMI device. Failure to do so may result in damage to the HMI device.

Connect the HMI device in the following sequence:

1. Equipotential bonding
2. Power supply

   Perform a power-up test to ensure the power supply voltage is connected with the correct polarity.

3. Controller

Disconnect the HMI device by completing the above steps in reverse order.

Connecting the cables

When connecting the cables, make sure that you do not bend any of the contact pins. Secure the connectors with screws.

Use the strain relief plate for the PROFINET connected supplied in the accessory kit.

The pin assignment of the interfaces is described in the specifications.

See also

Safety Instructions (Page 25)
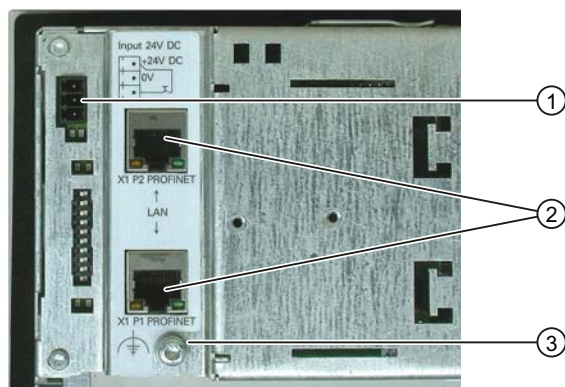
Connecting the power supply (Page 56)

Connecting the PLC (Page 57)

Connecting the equipotential bonding circuit (Page 54)

4.8.1   Ports

Position of the ports

The following figure below shows the interfaces of the HMI device:

①   Connection for power supply and enable input
②   PROFINET interface
③   Ground

4.8.2 Connecting the equipotential bonding circuit

Differences in electrical potential

Differences in potential may occur between spatially separated system parts. The differences in potential can lead to high equalizing currents over the data cables and therefore result in destruction of their ports. Equalizing currents may arise if the cable shielding is terminated at both ends and grounded at different system parts.

Differences in potential may develop when a system is connected to different mains.

General requirements of equipotential bonding

Differences in electrical potential must be reduced using equipotential bonding in order to ensure trouble-free operation of the relevant components of the electronic system. The following must therefore be observed when installing the equipotential bonding circuit:

- The effectiveness of equipotential bonding increases as the impedance of the equipotential bonding conductor decreases or as its cross-section increases.

- If two system parts are connected to each other via shielded data lines with shielding connected to the grounding/protective conductor on both sides, the impedance of the additionally installed equipotential bonding cables may not exceed 10% of the shielding impedance.

- The cross-section of a selected equipotential bonding conductor must be capable of handling the maximum equalizing current. The best results for equipotential bonding between two cabinets were achieved with a minimum conductor cross-section of 16 mm^2.

- Use equipotential bonding conductors made of copper or galvanized steel. Establish a large-surface contact between the equipotential bonding conductors and the grounding/protective conductor and protect these from corrosion.

- Terminate the shielding of the data cable on the HMI device flush and near the equipotential busbar using suitable cable clamps.

- Route the equipotential bonding conductor and data cables in parallel with minimum clearance between these. See the following connection diagram.

NOTICE
Equipotential bonding cable
Cable shielding is not suitable for equipotential bonding. Always use the prescribed equipotential bonding conductors. The minimum cross-section of a cable used for equipotential bonding is 16 mm².

Connection diagram with PP17-I PN PROFIsafe as an example
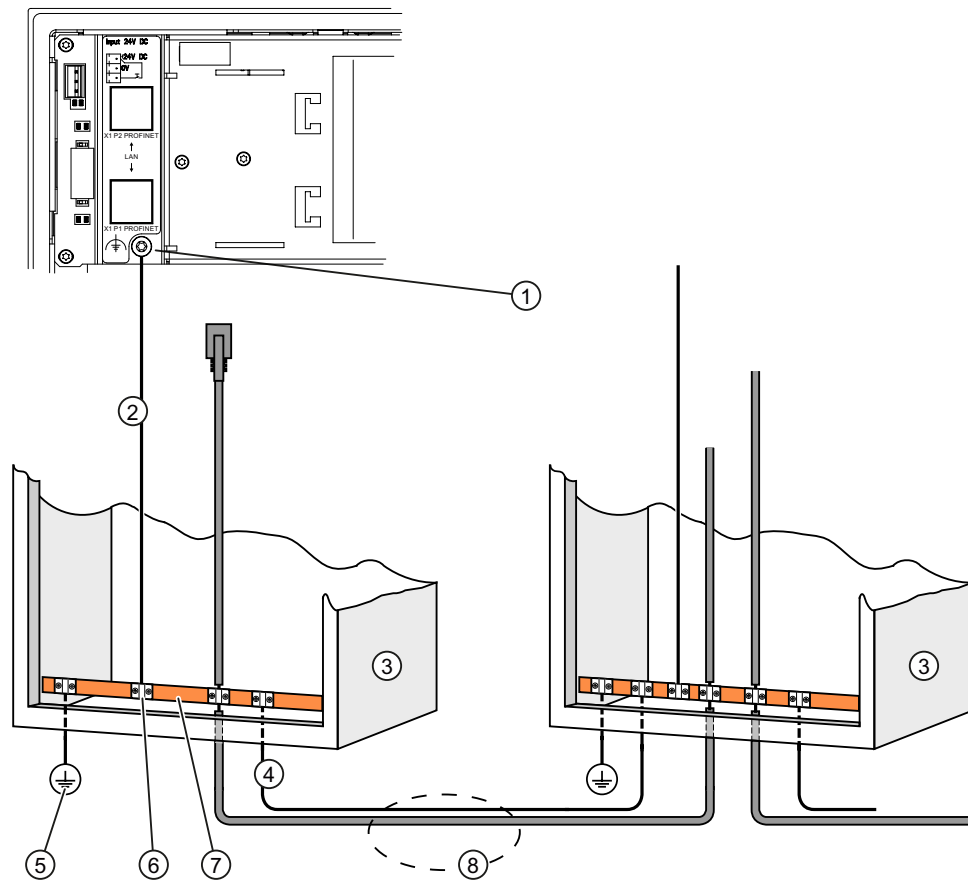
①	Grounding connection on the HMI device
②	Equipotential bonding conductor cross-section: 4 mm^2
③	Cabinet
④	Parallel routing of the equipotential bonding conductor and data cable
⑤	Equipotential bonding cable, minimum cross-section 16 mm^2
⑥	Cable clip
⑦	Voltage bus
⑧	Ground connection

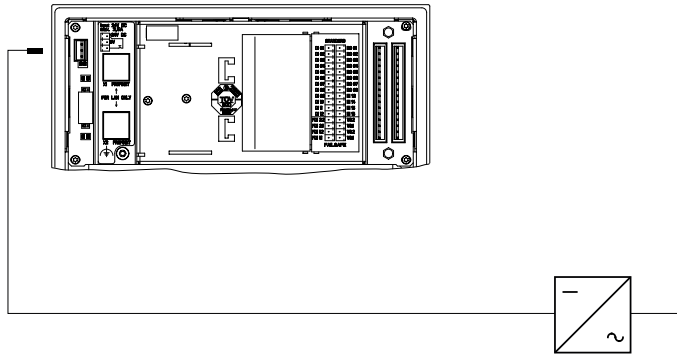**See also**

4.8.3 Connecting the power supply

Wiring diagram

The figure below illustrates the connection between the power supply and the HMI device.

Note when connecting

The plug-in terminal block for connecting the supply voltage is contained in the accessory kit and is designed for cables with a maximum cross-section of 1.5 mm^2.

Connecting the terminal block

NOTICE
Damage
Do not tighten the screws of the terminal block if it is plugged in. The pressure from the screwdriver may otherwise damage the HMI device socket.
Always remove the terminal block to connect the wires.

The following figure shows the connection of the HMI device to the power supply.
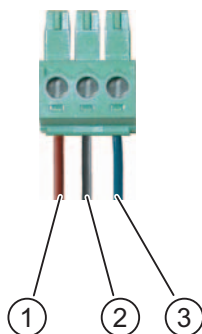
①   DISABLE (enable input)

②   GND

③   +24 VDC

Connecting the terminal block

Do not confuse the lines. Refer to the label for the contact pins on the rear of the HMI device.

Reverse polarity protection

The HMI device is equipped with a polarity reversal protection circuit.

Connecting the power supply

> ⚠️ **CAUTION**
>
> For the 24 VDC supply, use only power supply units with safety isolation complying with IEC 364-4-41 or HD 384.04.41 (VDE 0100, Part 410), for example according to the standards, SELV (Safety Extra Low Voltage) and PELV (Protective Extra Low Voltage).
>
> The supply voltage must be within the specified voltage range. Any other voltage might lead to failure of the HMI device.
>
> Applies to floating system design:
>
> Connect the connection for GND 24 V from the 24 V power supply output to equipotential bonding for uniform reference potential. For this purpose, choose a connecting point that is as close as possible to the center.

See also

Ports (Page 53)

4.8.4 Connecting the PLC

Topology of the PROFINET network

The connection between the HMI device and controller depends on the topology of the PROFINET network.

- Line

  All the communication nodes are connected in series as a bus. The series structure is implemented with switches that are integrated in the PROFINET devices.

- Star

  The communication nodes are connected with a switch, from the Scalance X208 or X204 series for example.

You can find additional information on the topology of PROFINET networks in the system manual, "PROFINET System Description".

Wiring diagram for serial configuration

The figure below illustrates the connection between the HMI device and the controller with a serial configuration.
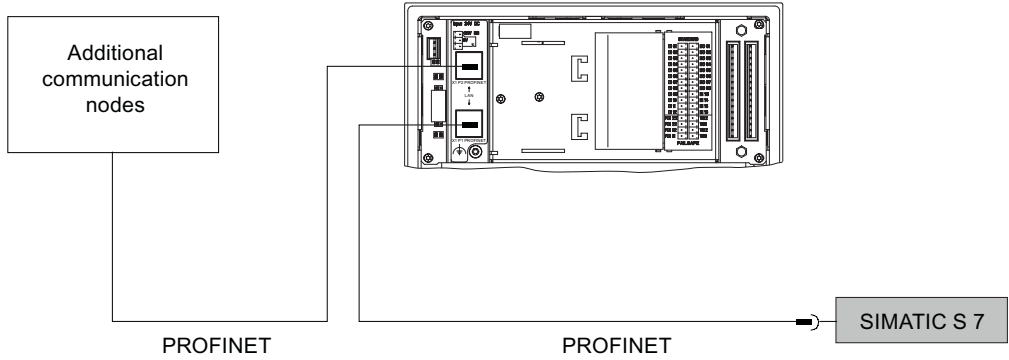
NOTICE
Always use only the approved cables to connect a SIMATIC S7 controller.

Standard cables are available for the connection. You can find additional information in the Internet at "http://mall.automation.siemens.com" or in the SIMATIC NET catalog IK PI.
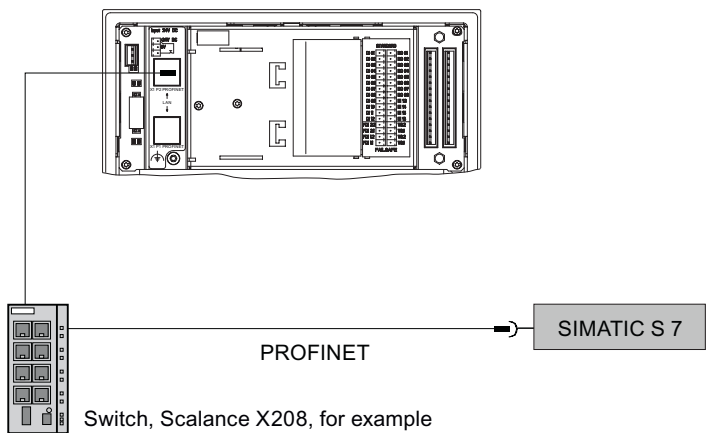
Connecting PROFINET in series

Proceed as follows:

1. Connect the controller to one of the two PROFINET ports on the HMI device.

2. Optional: Connect an additional communication node to the other port of the HMI device.

3. Attach the strain relief plate for the PROFINET connector.

Wiring diagram for star configuration

The following figure shows the connection between the HMI device and the controller with a star configuration.

Switch, Scalance X208, for example

Standard cables are available for the connection. You can find additional information in the Internet at "http://mall.automation.siemens.com" or in the SIMATIC NET catalog IK PI.

Connecting PROFINET as star

Proceed as follows:

1. Connect the switch with a PROFINET cable to the HMI device.
2. Attach the strain relief plate for the PROFINET connector.

Attaching the strain relief plate for the PROFINET connector

The accessory kit contains a strain relief plate for the PROFINET connector.

Note

We recommend the use of angled PROFINET connectors.

Depending on the connector used, attach the plate as follows:

Angled PROFINET connector

1. Loosen the screw ① on the rear of the HMI device.
2. Insert the cable with the PROFINET connector.
3. Insert the plate. Make sure that the cable is placed in the holders. The following figure shows the loose mounted plate for strain relief of the PROFINET connector.
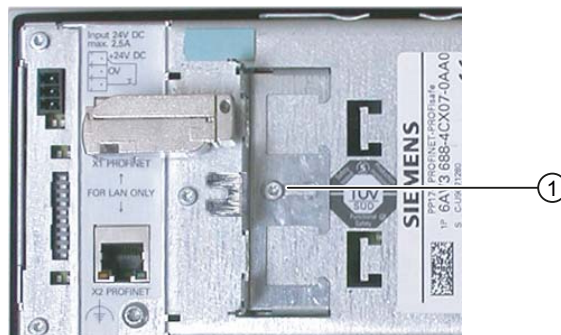
4. Push the plate as far as possible in the direction of the PROFINET connector.
5. Screw the plate tight. The following figure shows the screw-fixed plate for strain relief of the PROFINET connector.
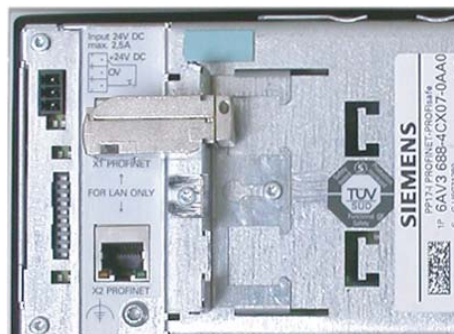
6. Optional: Secure the cable to the cut-outs on the back of the HMI device with the cable cords.
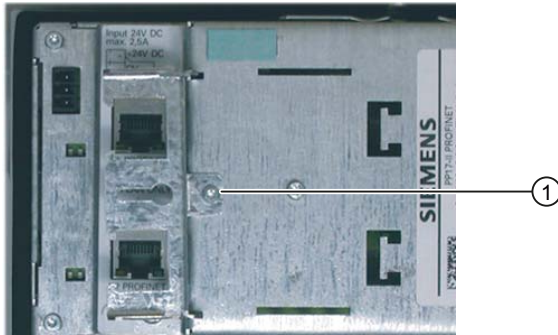
Straight PROFINET connector

1. Loosen the screw ① on the rear of the HMI device.

2. Insert the plate. The following figure shows the loose mounted plate for strain relief of the PROFINET connector.

3. Insert the cable with the PROFINET connector. Make sure that the cable is placed in the holders as shown. The following figure shows the screw-fixed plate for strain relief of the PROFINET connector.
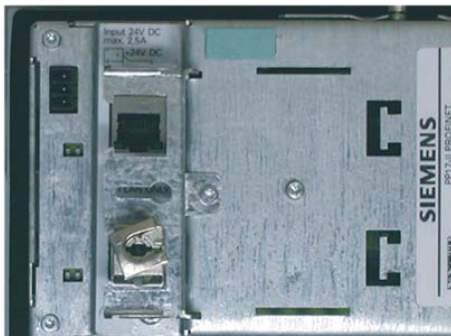
4. Screw the plate tight.

5. Optional: Secure the cable to the cut-outs on the back of the HMI device with the cable cords.

See also

Ports (Page 53)

Setting PROFIsafe destination addresses on the PROFIsafe device (Page 85)

4.9 Switching on and testing the HMI device

Requirements for fail-safe operation

> **⚠ CAUTION**
>
> Before commissioning the device for fail-safe operation, always ensure that the number of connected emergency stop buttons match the number configured in the HMI device.

Procedure

Proceed as follows:

1. Connect the terminal block of the power supply to the HMI device.

2. Switch on the power supply.

   When the power is switched on, the "POWER" LED lights on the front of the HMI device.

   The "ERROR" LED continues to flash until the HMI device has received the configuration data set from the controller.

   The "ERROR" LED goes out. The LEDs on the rear of the HMI device representing the allocated PROFINET slots light up.

If the HMI device does not start, it is possible the wires on the terminal block have been crossed. Check the connected wires and change the connections if necessary.

PROFINET communication

LEDs displaying the status of the PROFINET communication on the respective PROFINET connection are located directly at the PROFINET slot as well as to the side.

The following figure shows the meaning of these LEDs.

LED status	Meaning
Green LED lights	Connection to the IO controller or switch is established. PROFINET communication possible.
Yellow and green LED lights	Data is being sent over the PROFINET connection.

Ready for operation

The following criteria indicates that the HMI device is ready for operation:

- The "POWER" LED on the front of the HMI device is lit.
- The "ERROR" LED is not lit.
- The LEDs on the rear of the HMI device representing the allocated PROFINET slots light up.

Perform a lamp test following commissioning.

Switching off the HMI device

You have the following options for switching off the HMI device:

- Switch off the power supply.
- Disconnect the terminal block of the power supply on the HMI device.

In fail-safe mode of the PROFIsafe device, the system goes to a fail-safe state .
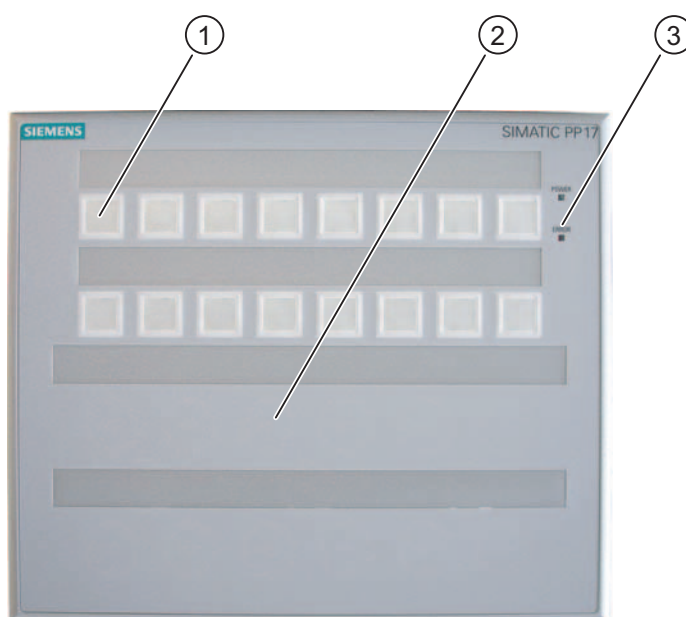
See also

Carry out lamp test (Page 98)

Setting PROFIsafe destination addresses on the PROFIsafe device (Page 85)

Front operator controls and displays of the PP 17-II PN and PP 17-II PN PROFIsafe (Page 65)

Control Elements and Displays

5

5.1 Front operator controls and displays of the PP 17-I PN PROFIsafe

Front of the HMI device

①	Keys with integrated LEDs
②	Mounting position for standard components
③	"Power" LED and "Error" LED

Keys with integrated LEDs

There are 16 short-stroke keys on the front of the HMI device. The individual keys can be configured as keys or switches:

- Button function: The corresponding bit in the controller is set as long as the key is pressed.

- Switch function: Pressing a key sets the corresponding bit in the controller, a second press of the key sets it back.

Colored surface LEDs are integrated in each key. They can be used to represent bit states of the connected controller.

Red, green and yellow can be configured for the LEDs. The LEDs can flash and light continuously.

The keys and LEDs are numbered as follows:

"POWER" LED

The "POWER" LED lights as long as the HMI device is supplied with power.

"ERROR" LED

The LED "ERROR" indicates if the HMI device is in test mode or if an error has occurred.

"ERROR" LED Displays	Cause	Remedy
LED flashes (during startup)	The transfer of the configuration data set from the controller is not yet complete.	Wait until the LED goes out or lights up. The HMI device is operation once the LED goes out.
LED lights (normal mode)	A PROFIsafe fault or a PROFINET fault has occurred.	Diagnose and rectify the fault.

Additional standard components

Knockout apertures are provided in the lower section of the HMI device for mounting additional standard components. The additional components can be connected to the digital inputs and digital outputs on the back of the HMI device.

A maximum of two emergency stop buttons can be operated in fail-safe mode.

Labeling strips

Labels can be applied to the keys and additionally mounted components.

See also

Labeling of Keys or Standard Components (Page 71)

Installing standard components in a PP 17-I PN PROFIsafe (Page 44)

Wiring standard component on a PROFIsafe device (Page 47)

Carry out lamp test (Page 98)

5.2 Front operator controls and displays of the PP 17-II PN and PP 17-II PN PROFIsafe

Front of the HMI device
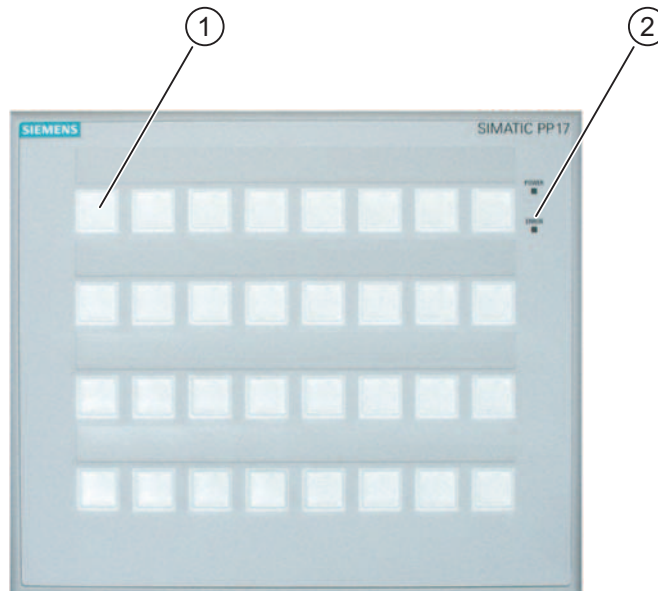
①   Keys with integrated LEDs
②   "Power" LED and "Error" LED
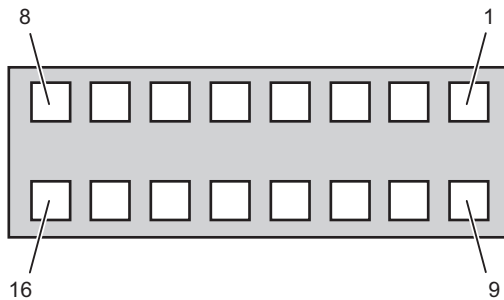
Keys with integrated LEDs

There are 32 short-stroke keys on the front of the HMI device. The individual keys can be configured as keys or switches:

● Button function: The corresponding bit in the controller is set as long as the key is pressed.

● Switch function: Pressing a key sets the corresponding bit in the controller, a second press of the key sets it back.

Colored surface LEDs are integrated in each key. They can be used to represent bit states of the connected controller.

Red, green and yellow can be configured for the LEDs. The LEDs can flash and light continuously.

The keys and LEDs are numbered as follows:

"POWER" LED

The "POWER" LED lights as long as the HMI device is supplied with power.

"ERROR" LED

The LED "ERROR" indicates if the HMI device is in test mode or if an error has occurred.

"ERROR" LED Displays	Cause	Remedy
LED flashes (during startup)	The transfer of the configuration data set from the controller is not yet complete.	Wait until the LED goes out or lights up. The HMI device is operation once the LED goes out.
LED lights (normal mode)	A PROFINET fault has occurred.	Diagnose and rectify the fault.

Labeling strips

Labeling strips can be applied to the keys and additionally mounted components.

See also

Labeling of Keys or Standard Components (Page 71)

Carry out lamp test (Page 98)

5.3 Rear operator controls, LEDs and Ports of the PROFIsafe devices

Rear of the PP 17-I PN PROFIsafe
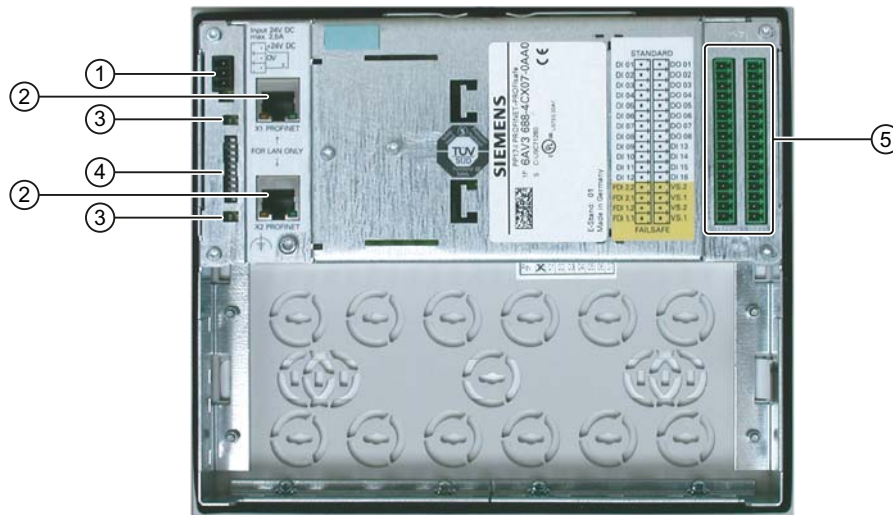
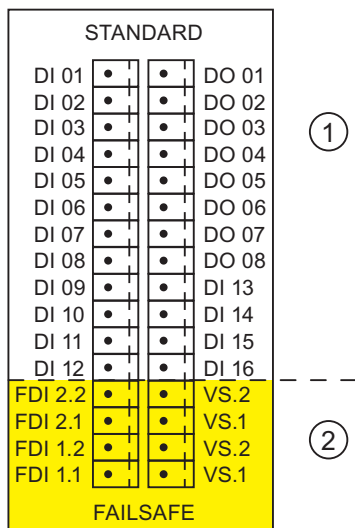### Rear of the PP 17-II PN PROFIsafe

①	Interface for the power supply
②	PROFINET interface
③	LEDs for monitoring the PROFINET communication
④	DIP switch for setting the PROFIsafe address
⑤	Digital inputs and outputs

Digital inputs and outputs

Additionally mounted standard components can be wired via the digital inputs and outputs. Unconnected digital inputs are automatically set to 0.

STANDARD	
DI 01 ●	● DO 01
DI 02 ●	● DO 02
DI 03 ●	● DO 03
DI 04 ●	● DO 04
DI 05 ●	● DO 05
DI 06 ●	● DO 06
DI 07 ●	● DO 07
DI 08 ●	● DO 08
DI 09 ●	● DI 13
DI 10 ●	● DI 14
DI 11 ●	● DI 15
DI 12 ●	● DI 16
FDI 2.2 ●	● VS.2
FDI 2.1 ●	● VS.1
FDI 1.2 ●	● VS.2
FDI 1.1 ●	● VS.1
FAILSAFE	

① Digital inputs DI01 to DI16, digital outputs DO01 to DO08

② F channel 1: FDI1.1 and FDI1.2, VS1 and VS2

     F channel 2: FDI2.1 and FDI2.2, VS1 and VS2

Each F channel uses two digital inputs and two digital outputs. You activate the F channels to be used in STEP 7.

The labels of the digital inputs and outputs are color-coded:

- White background: Digital inputs and digital outputs for standard mode

- Yellow background: F channels for fail-safe operation

Power supply and enable input

On the left side of the HMI device's rear panel there are interfaces for connecting the power supply and enable input. Enable input makes it possible to disable the standard digital inputs of the HMI device.

Note

Enable input does not affect the digital inputs of fail-safe channels

The enable input does not affect the digital inputs assigned with fail-safe channels. Fail-safe inputs are not locked when the HMI device is locked by an enable input. Emergency stop signals are always forwarded to the controller.

PROFINET interfaces

Connect the PROFINET communication to the two PROFINET ports. For a star network topology, connect a switch with one of the two PROFINET ports.

For line network topology, connect one of the two PROFINET ports to the controller. You can connect additional communication nodes to the other port.

LEDs for displaying the PROFINET communication

Each PROFINET port features one green and one yellow LED. These LEDs show the status of the PROFINET communication. To improve the visibility, the LEDs with the same color and function are also located next to each PROFINET port.

The following figure shows the meaning of the LEDs:

Green "LINK" LED	Yellow "RX/TX" LED	Meaning
Off	Off	There is no PROFINET connection.
On	Off	PROFINET communication possible.
On	On	Data is being exchanged over the PROFINET connection.

LEDs for displaying the sensor supply

Two red LEDs, "1VsF" and "2VsF", are located next to the power supply.
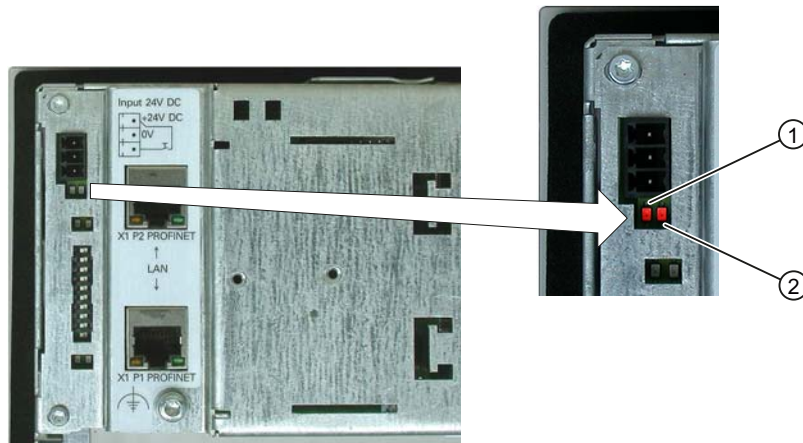
①   Sensor supply 1Vs

②   Sensor supply 2Vs

If one of the external sensor supplies, "1Vs" or "2Vs", fails, the corresponding LED lights up. This information is also provided as a diagnostic message.

5.4   Rear operator controls, displays and interfaces of the PP 17-II PN

Back of the HMI device

①	Interface for the power supply
②	PROFINET interface
③	LEDs for monitoring the PROFINET communication
④	Digital inputs and outputs

Digital inputs and outputs

The HMI device features 16 digital inputs and 16 digital outputs. The digital inputs are located in the left row. The digital outputs are located in the right row. Unconnected digital inputs are automatically set to 0.

Power supply and enable input

On the left side of the HMI device's rear panel there are interfaces for connecting the power supply and enable input. Enable input makes it possible to disable the digital inputs of the HMI device.

PROFINET interfaces

Connect the PROFINET communication to the PROFINET ports.

- For a star network topology, connect a switch with one of the two PROFINET ports.

- For line network topology, connect one of the two PROFINET ports to the controller. You can connect additional communication nodes to the other port.

LEDs for displaying the PROFINET communication

Each PROFINET port features one green and one yellow LED. These LEDs show the status of the PROFINET communication. To improve the visibility, the LEDs with the same color and function are also located next to each PROFINET port.

The following figure shows the meaning of the LEDs:

| Green "LINK" LED	Yellow "RX/TX" LED	Meaning
Off	Off	There is no PROFINET connection.
On	Off	PROFINET communication possible.
On	On	Data is being exchanged over the PROFINET connection.

See also

Wiring input and output components (Page 50)

5.5 Labeling of Keys or Standard Components

Labeling of keys or standard components

You can label keys or standard components in relation to specific projects. Use labeling strips to do so.

We recommend the use of perforated labeling strips. You can order these with the order number 6AV3 671-8CB00.
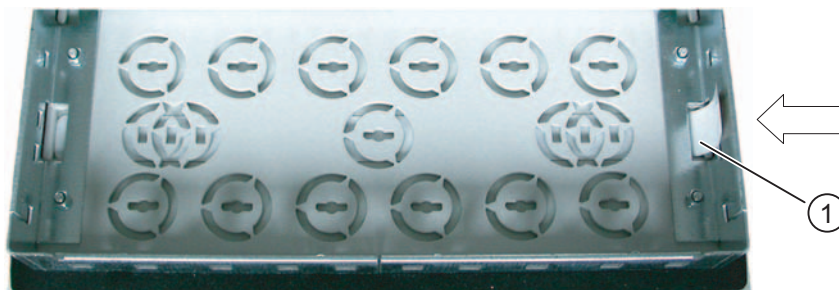
①   Labeling strips, example for the labeling of standard components

The labeling strips can be inserted before or after you install the HMI device.

Note

Shorten or divide labeling strips if the standard components have been mounted in such a way as to prevent the lower part of a labeling strip from being pressed in.

Labeling strips can also be made from printable foil and paper. When selecting a paper or foil, ensure that it has sufficient stiffness. This is needed to insert the labeling strips. Permitted thickness of the labeling strip: 0.15 mm.

Printing labeling strips

The labeling strips have the following dimensions:
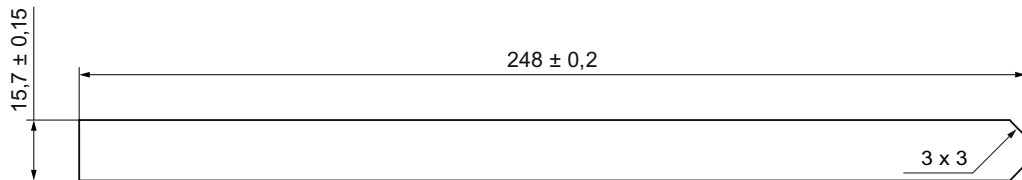
All dimensions in mm

A template for the labeling strips is available as a Word file in the documentation CD or in the Internet at the following address:

"http://www.siemens.com/automation/support"

Observe the information in this file.

Procedure

Proceed as follows:

1. Edit the template.

2. Print the template on a perforated label sheet or on foil or paper.

   You can also print out an empty template and later write on it by hand.

NOTICE
Do not write on the keyboard to label the function keys.

3. If you use a perforated label sheet, tear out the individual labeling strips.

4. If you print the labeling strips on foil or paper, cut out the labeling strips.

   Round off the corners of the labeling strips as shown in the figure above to make it easier to slide them into the guide.

5. Remove any previously existing labeling strips.

6. Slide the labeling strips into the guide.

Note
Wait for the printed labeling strips to dry before you insert them.

7. Slide the labeling strips into the guide up to the stop.

   The labeling strip will protrude approximately 1 cm out of the guide. The template dimensions for the labeling strips are designed so that the labeling is correctly placed for the keys. An interlock is not required for the labeling strips.

When mounting the HMI device, ensure that the labeling strips do not become jammed between the mounting cut-out and the HMI device.

See also

Front operator controls and displays of the PP 17-I PN PROFIsafe (Page 63)

Front operator controls and displays of the PP 17-II PN and PP 17-II PN PROFIsafe (Page 65)

Configuring the HMI device

6

6.1 Checklist for fail-safe operation

Configuration

The configuration steps in STEP 7 and on the HMI device must be carried out before the HMI device can be used.

Requirement

- The HMI device is mounted and connected.
- The HSP is installed in STEP 7.

Check list for configuration

Step	Where?	Information	Check
If the HMI device is not shown in the HW Config hardware catalog: Install the HSP in STEP 7	Menu command in HW Config of SIMATIC Manager: "Tools > Install HW Updates..."	Install the HSP in STEP 7 (Page 76)	
Configure slot 2 of the PP 17-I PN PROFIsafe and PP 17-II PN PROFIsafe	HW Config of the SIMATIC Manager, object properties of the slot 2 module, "Addresses" tab and "Parameters" tab, "Parameters\F Parameters" folder and "Parameters\Emergency Stop Button" folder	Communication between the HMI device and the controller (Page 77) Configuring the HMI device in STEP 7 (Page 82)	
Set PROFIsafe target addresses	DIP switch on the back of the HMI device	Setting PROFIsafe destination addresses on the PROFIsafe device (Page 85)	

Additional information

You can find additional information on the configuration of fail-safe I/Os in STEP 7 in the manual "S7 Distributed Safety Configuring and Programming" and in the system manual "Safety Engineering in SIMATIC S7".

6.2   Install the HSP in STEP 7

Introduction

If the HMI device is not listed in the hardware catalog of HW Config, you need to integrate the valid hardware support package (HSP) for the HMI device in the STEP 7 database. A special hardware update is required for this.

You can find the HSP on the corresponding CD.

Requirement

Note

Close all STEP 7 applications before installing the HSP, for example, the LAD/STL/FBD Editor or the symbol table.


- HW Config opens.

Procedure

Proceed as follows:

1. Select the menu command "Options > Install HW Updates..." in the "HW Config".

   The "Install HW Updates" dialog box opens.

2. In the "HW Updates..." group, select the option button "Copy from data carrier".

3. Click "Execute".

   The "Copy HW Updates" dialog box opens.

4. Select the HW description file *.xml.

5. Click "Open".

   The selected HSP file appears in the "Copy HW Updates" dialog box.

6. Select the corresponding check box.

7. Click "Copy".

   The HSP appears in the "Install HW Updates" dialog box.

8. Select the check box corresponding to the HSP.

9. Click "Install".

   The devices of the HSP appear in the catalog structure of HW Config.
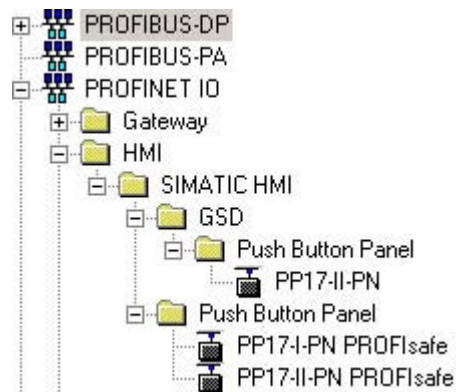
10. Close the "Install HW Updates" dialog box.

Result

The HMI device can be inserted into the project and configured.

See also

Configuring the HMI device in STEP 7 (Page 82)

6.3 Communication between the HMI device and the controller

Introduction

HW Config of the STEP 7 project has to be configured to enable communication between HMI device and controller.

Assign parameters to the object properties of the following modules:

- For PP 17-I PN PROFIsafe:
  - "PP 17-I PN PROFIsafe Slot 0"
  - "PP 17-I PN PROFIsafe Slot 1"
  - "PP 17-I PN PROFIsafe Slot 2"

    This configures the fail-safe operation.

- For PP 17-II PN:
  - "PP 17-II PN Slot 0"
  - "PP 17-II PN Slot 1"

- For PP 17-II PN PROFIsafe:
  - "PP 17-II PN PROFIsafe Slot 0"
  - "PP 17-II PN PROFIsafe Slot 1"
  - "PP 17-II PN PROFIsafe Slot 2"

    This configures the fail-safe operation.

Requirement

The SIMATIC Manager opens in "HW Config".
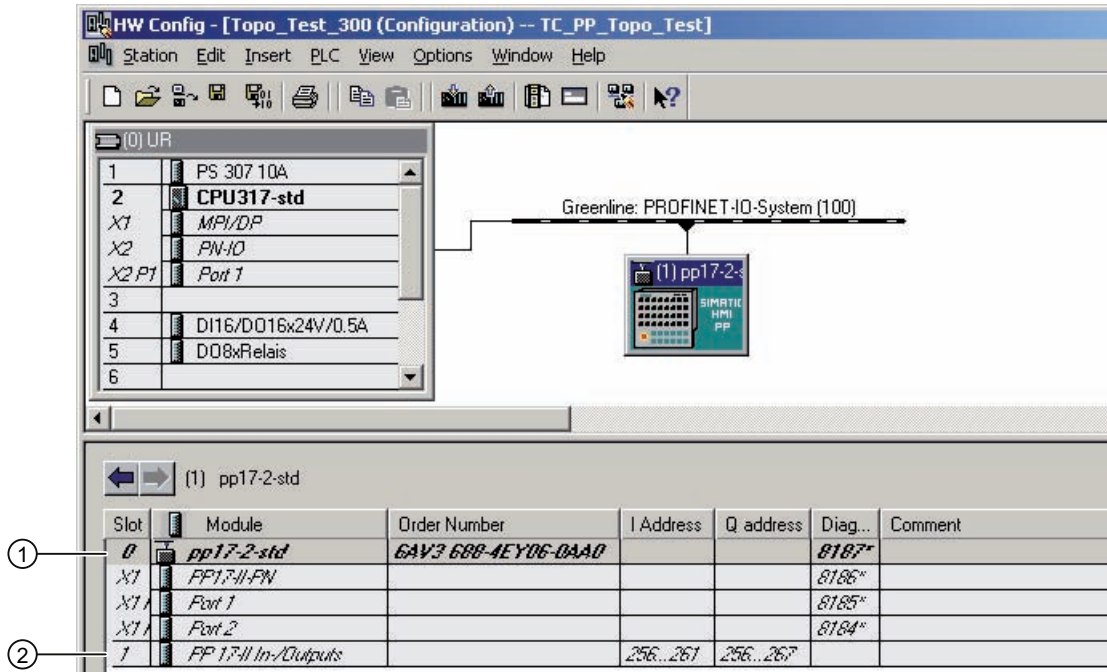
Procedure – Setting object properties Slot 0

The procedure applies to the modules "PP 17-I PN PROFIsafe", "PP 17-II PN", and "PP 17-II PN PROFIsafe". The procedure for slot 0 ① is different from that for the other slots.

Proceed as follows:

1. Double-click the corresponding module in the station window to open the "Properties" dialog box.

   The "Properties – [Name]" dialog box opens.

2. Open the "General" tab.

Parameter	Meaning
Device name	The IO controller addresses the IO device by its device name. The device name must be unique within the network.
	The device name permanently links the HMI device to the configure IP address.
Device number	You can identify an IO device in the user program with its device number. STEP 7 assigns the device number. You can change the device number.

You can find additional information about device names and numbers in the manual "PROFINET System Description".

Procedure – Setting object properties Slot 1

The procedure applies to the modules "PP 17-I PN PROFIsafe", "PP 17-II PN", and "PP 17-II PN PROFIsafe".

Proceed as follows:

1. In the shortcut menu of the slot 1 ②, select the menu command "Object Properties".

   The "Properties – [Name]" dialog box opens.

2. Open the "Addresses" tab.

Parameter	Meaning
Input > Address > Start of Address Area	Start of address range in which the standard digital inputs of the HMI device are mapped. The setting depends on the controller used.
Input > Process Image	Process image to which the address range belongs. This parameter cannot be set with controllers of the SIMATIC CPU 300 type.
Output > Address > Start of Address Area	Start of address range in which the standard digital outputs of the HMI device are mapped. The setting depends on the controller used.
Output > Process Image	Process image to which the address range belongs. This parameter cannot be set with controllers of the SIMATIC CPU 300 type.

3. Open the "Parameters" tab and the "Parameters" folder.

Parameter	Meaning
Key for lamp test	The lamp test is carried out by pressing the defined key. If you enter the value "0", no lamp test is performed.
Function key 1 ... Function key n	Function mode of respective key as button or switch
Function digital input 1 ... Function digital input n	Function mode of respective digital input as button or switch
Mode LED 1 ... Mode LED n	Configurable mode of respective LED: • Flashing green • Yellow • Flashing red • Flashing yellow "Flashing green" is the default setting. The LED reacts according to the configured mode when both bits for the LED have the value "1" in the process image.

Procedure – Setting object properties Slot 2

The procedure applies to the modules "PP 17-I PN PROFIsafe" and
"PP 17-II PN PROFIsafe".

Here you configure the fail-safe mode. You can only change this parameter after you have
entered a password for the safety program. You can find additional information on access
protection in the manual "S7 Distributed Safety, Configuring und Programming."

Proceed as follows:

1. In the shortcut menu of the slot 2, select the menu command "Object Properties".

   The "Properties – [Name]" dialog box opens.

2. Open the "Addresses" tab.

Parameter	Meaning
Output > Address > Start of Address Area	Start of address range in which the standard digital outputs of the fail-safe channels of the HMI device are mapped.
	The default setting depends on the controller used.
Output > Process Image	Process image of the address area
	This parameter cannot be set with controllers of the SIMATIC CPU 300 type.
Input > Address > Start of Address Area	Start of address range in which the standard digital inputs for the fail-safe channels are mapped.
	The default setting depends on the controller used.
Input > Process Image	Process image to which the address range belongs.
	This parameter cannot be set with controllers of the SIMATIC CPU 300 type.

3. Open the "Parameters" tab and the "Parameters/F Parameters" folder.

Parameter	Meaning
F_destination_address	PROFIsafe address used to uniquely identify the destination throughout the network and station.
	The address is assigned automatically. The "F_destination_address" parameter can have a value between 1 and 1022.
	You can change the value for "F_destination_address".
DIP switch position	Binary representation of F_destination_address.
	The setting of all DIP switches on the back of the HMI device must match that shown for the bits. The bits shown here correspond as follows to the DIP switches:
	• Bit 9 = DIP switch 10 (bottom switch)
	• ...
	• Bit 0 = DIP switch 1 (top switch)

Parameter	Meaning
F-monitoring time (ms)	Monitoring time in the fail-safe IO device.
	A valid current safety frame must reach the F-CPU and be returned to the HMI device within the monitoring time period. Otherwise, the fail-safe IO device goes to the safe state.
	The "F-monitoring time" parameter can be set in 10 ms increments. The default monitoring time is 150 ms.
	Use the Excel table "s7cotia.xls" to calculate the monitoring time which corresponds to the availability of the system.
	The Excel file "s7cotia.xls" is part of the S7 Distributed Safety add-on package. You can find the current version of this table on the Internet at the following address:
	"http://www.siemens.com/automation/support ", Contribution ID 19138505.
	You can find the parameters needed to calculate the monitoring time under "General Specifications".

NOTICE
If an error occurs, the monitoring time is included in the ensured reaction time.

4. Open the "Parameters" and the "Parameters/Emergency Stop Button" folder.

   You can set the number of emergency stop buttons used here.

Parameter	Meaning
First 2-channel emergency stop button	The first 2-channel emergency stop button is always activated.
Second 2-channel emergency stop button	If you wire two emergency stop buttons to the HMI device, you need to activate the second 2-channel emergency stop button.

Additional information on configuring fail-safe I/O in STEP 7

You can find additional information on configuring the fail-safe I/O in STEP 7 in the manual "S7 Distributed Safety, Configuring and Programming" and in the system manual "Safety Engineering in SIMATIC S7."

See also

Setting PROFIsafe destination addresses on the PROFIsafe device (Page 85)

Install the HSP in STEP 7 (Page 76)

6.4 Configuring the HMI device in STEP 7

Introduction

You need to configure the HMI device in "HW Config" of the SIMATIC Manager to enable communication between the controller and the HMI device.

Requirement

- The HMI device has been inserted into the STEP 7 project.

  If the HMI device is not shown in the hardware catalog of HW Config under "PROFINET IO > HMI > SIMATIC HMI > Push Button Panels" or under "PROFINET IO > HMI > SIMATIC HMI > GSD > Push Button Panels", install the HSP in STEP 7. See chapter Install the HSP in STEP 7 (Page 76):

  The GSD file for PP17-II-PN will be installed during installation of the HSP2021.

- If you wish to configure slot 2 for the PROFIsafe devices, you need to know the password for the safety program.

- The SIMATIC Manager opens in "HW Config".

Procedure – Configuring slot 0

The procedure for slot 0 ① is different from that for the other slots.

Proceed as follows:

1. Double-click the corresponding module in the station window to open the "Properties" dialog box.

    The "Properties – [Name]" dialog box opens.

2. In the "General" tab, enter a device name that is unique throughout the network.

3. Change the device name of the HMI device if required.

Procedure – Configuring slots X1

Proceed as follows:

1. In the shortcut menu X1 of the slot X1, select the menu command "Object Properties".

    The "Properties – [Name]" dialog box opens.

2. Open the "IO Cycle" tab and go to the "Archiving time" group.

3. Set the required archiving time.

Procedure – Configuring slot 1

Proceed as follows:

1. In the shortcut menu of the slot 1 ②, select the menu command "Object Properties".

    The "Properties – [Name]" dialog box opens.

2. Open the "Addresses" tab.

    In the "Input" and "Output" groups, the start values of the address area are set depending on the controller used. The signals for the standard digital inputs and outputs of the HMI device are mapped in the given address ranges.

3. Check the predefined start values of the address ranges.

4. If necessary, change the address range.

5. Go to the "Parameters" tab.

6. Open the "Parameters" folder.

7. If necessary, select a different key for the lamp test.

8. For each key and digital input, specify whether they should be used as a key or switch.

9. Set the mode for each LED.

10. Save your settings with "OK".

Procedure – Configuring slot 2

Proceed as follows:

> ⚠ **CAUTION**
>
> Ensure that the number of connected emergency stop buttons matches the configuration of the HMI device in STEP 7.

1. In the shortcut menu of the slot, select the menu command "Object Properties".

   A dialog for entering the password opens.

2. Enter the password that was assigned when the safety program was created in Distributed Safety.

   The "Properties – [Name]" dialog box opens.

3. Open the "Addresses" tab.

   In the "Input" and "Output" groups, the start values of the address area are set depending on the controller used. The signals of the F channels of the HMI device are mapped in the specified address ranges.

4. Check the predefined start values of the address ranges.

5. If necessary, change the address range.

6. Go to the "Parameters" tab.

7. Open the "Parameters > F Parameters" folder.

8. If necessary, change the "F_destination_address" parameter.

   Be sure to assign an address that is unique throughout the network and station.

9. Change the F-monitoring time as required.

10. Open the "Emergency stop button" folder.

11. If you wire two emergency stop buttons to the HMI device, activate the second 2-channel emergency stop button.

12. Save your settings with "OK".

Result

The HMI device will now respond in operation according to the new configuration. The states of the digital inputs and outputs of the HMI device are stored in the specified address area of the controller.

Additional information on configuring fail-safe I/O in STEP 7

When the program is compiled by HW Config, one fail-safe I/O data block is automatically generated for each fail-safe I/O. The F-I/O DB contains variables that the user has to evaluate in the safety program.

You can find additional information about configuring fail-safe I/O in STEP 7 in the manual, "S7 Distributed Safety Configuring and Programming". Detailed information about accessing fail-safe I/O and working with fail-safe I/O data blocks can be found in the "Fail-safe I/O Access" chapter.

See also

Setting PROFIsafe destination addresses on the PROFIsafe device (Page 85)

Bit assignment in the process image for PP 17-I PN PROFIsafe (Page 115)

Bit assignment in the process image for PP 17-II PN (Page 117)

6.5 Setting PROFIsafe destination addresses on the PROFIsafe device

Introduction

A PROFIsafe target address is assigned when you add the HMI device in the HW Config of the STEP 7 project. The PROFIsafe target address is the value of the F_destination_address parameter.

You later need to set the same PROFIsafe target address as the one in HW Config using the DIP switches on the back of the HMI device.

Note

Ensure that the HMI device is disconnected from the power before setting the PROFIsafe target address with the DIP switches.

Requirement

- The DIP switches of the HMI device are accessible.
- You know the value of the "DIP switch setting (9.....0)" parameter in HW Config of the STEP 7 project.

Note

Ensure that you configure value on the HMI device to match the value set in HW Config of the STEP 7 project.

Set parameters

Set the DIP switch exactly as shown in the "DIP switch setting (9.....0)" parameter in HW Config.

The bits show here correspond as follows to the DIP switches:

- Bit 9 = DIP switch 10 (bottom switch)
- ...
- Bit 0 = DIP switch 1 (top switch)

> ⚠️ **WARNING**
>
> The PROFIsafe target address of the HMI device must be unique throughout the network and station. You can assign a maximum of 1022 PROFIsafe target addresses in a single system.

Note

If you change the STEP 7 program in a way that changes the PROFIsafe target address, you need to adapt the setting on the HMI device's DIP switch accordingly.

Example

If you set the PROFIsafe target address "383" in HW Config of the STEP 7 project, you will see the following display for the "DIP switch setting (9.....0)" parameter :

0101111111

1 corresponds to switch setting "ON". 0 corresponds to switch setting "OFF".

Set the DIP switch as follows:

Switch	Bit no.	Significance	Address
1	0	1	1
2	1	2	2
3	2	4	4
4	3	8	8
5	4	16	16
6	5	32	32
7	6	64	64
8	7	128	0
9	8	256	256
10	9	512	0
			383

This switch setting corresponds to the binary representation of the address:

1 +2 + 4 + 8 + 16 + 32 + 64 + 256 = 383

Result

The HMI device can be uniquely identified by the configured PROFIsafe target address.

See also

Fail-safe operation of the PROFIsafe device

7

7.1 Overview

Fail-safe mode

You can use the HMI device in standard mode and fail-safe mode simultaneously.

In fail-safe mode the HMI device recognizes signal states from suitable emergency-stop buttons and sends corresponding safety telegrams to the F-CPU where the safety program runs. The F-CPU and HMI communicate with each other via the safety oriented PROFIsafe protocol.

Safety functions

During fail-safe mode, safety mechanisms are activated in both HMI and F-CPU which recognize faults and react to them.

In the following cases, the safety mechanisms will cause the system to be placed in safe mode:

● An emergency stop button has been pressed.

● A diagnosable error has occurred.

Reactions to pressed emergency stop buttons

If an emergency stop button is pressed, the system will be placed in safe mode and stopped. In the control program, you can establish which emergency stop button was pressed. After the danger has been eliminated, the operator resets the emergency stop and the system restarts.

Responses to faults in the system

In the event of a fault, the system is placed in a safe state. The F channels of the HMI device are passivated. This means that all digital inputs of the F channels are detected as "0" and placed in a safe state. Analyze and eliminate the current fault with the help of the various diagnostic tools. Afterwards, the HMI requires reintegrating. The process values are now restored to the digital inputs for F channels.

Reactions to errors in the HMI device

The following reactions occur when an internal error is detected in the HMI device:

● The fails-safe digital inputs are passivated.

● The diagnostic result "Module fault" is sent by the HMI device to the IO controller.

● Communication will be broken.

See also

> Requirements for the fail-safe operation of a PROFIsafe device (Page 40)
>
> Query the State of the Emergency Stop Buttons (Page 88)
>
> Error Diagnostics (Page 91)
>
> Error Elimination and Reintegration (Page 93)

7.2 Query the State of the Emergency Stop Buttons

Process image

> Based on the first two bits in the process image you have specified for the inputs of slot 2, you can determine which emergency stop button has been pressed.
>
> The following table shows the configuration of the bits to the emergency stop buttons.

Bit no.	1	0
Emergency stop button no.	2	1
Wired to	FDI2.1, FDI2.2, VS1, VS2	FDI1.1, FDI1.2, VS1, VS2

> Each bit can be assigned the following values:
>
> 0 = Emergency stop button pressed or fault
>
> 1 = Emergency stop not pressed
>
> Example:
>
> Binary pattern for "Emergency stop button 2 pressed": 01
>
> Alternatively you can read the binary pattern of the input range from FB 215 "F_ESTOP1". You can find additional information on this FB in the documentation "S7 Distributed Safety Configuring and Programming".

See also

> Error Diagnostics (Page 91)
>
> Overview (Page 87)

7.3 Passivation of the HMI device

Reaction to Error in the Fail-safe System

As soon as the HMI device recognizes a fault in fail-safe mode, it switches all F channel for fail-safe channels to the safe state, i.e. the fail-safe channels of this HMI device are rendered passive. Instead of the queued process values, the fail-safe value (0) is set at the fail-safe digital inputs. You cannot configure the fail-safe value.

Detected faults are entered in the diagnostic buffer of the F-CPU and the safety program in the F-CPU is informed.

The HMI device cannot permanently save the fault. When you switch off the HMI device and switch it on again, only one of the existing faults will continue to be detected after startup. If you want to save the faults, program your safety program accordingly.

Passivation

The HMI device is passivated in the following situations:

- When the HMI device is started (startup)
- When configuration errors occur (errors in the PROFIsafe parameters, e.g. F_monitoring_time (ms) is too short)
- When errors occur in the PROFIsafe communication between the F-CPU and HMI device
- When hardware faults occur (for example, wire break, short circuit, discrepancy errors, internal errors of the HMI device)

Note

When the HMI device is rendered passive, all fail-safe digital inputs are always assigned the fail-safe value (0).

Determining passivation

If you want to determine if the HMI device is passive or not, address the "PASS_OUT" variable of the F-I/O. The variable can be assigned the following values:

0 = HMI device not passive

1 = HMI device passive

Reintegration of a fail-safe HMI device

After passivation of the HMI device, the fault must be diagnosed and rectified. Afterwards, the HMI device can be reintegrated.

Additional information on passivation

You can find additional information on the passivation of F I/Os and F-I/O DBs in the "S7 Distributed Safety Configuring and Programming" manual.

See also

7.4 Troubleshooting Check List

Narrowing down faults

When the red "ERROR" LED lights up on the front of the HMI device, the following check list helps you to narrow down the possible cause of the fault.

Other error patterns	Possible cause	Remedy
-	A PROFIsafe fault has occurred.	Interrogate the "DIAG" variable of the F-I/O DB. Carry out the remedies as described in the "S7 Distributed Safety Configuring and Programming" manual.
STEP 7 module diagnostics reports "configuration error".	Incorrect settings for the PROFIsafe parameters in HW Config	Check that the PROFIsafe parameters are defined as follows: F_Target_Address = PROFIsafe address set on HMI device F_monitoring_time = Minimum 2 x cycle time of the monitoring program and > call time of the safety program in time interrupt You can find details about the configuration settings under "Communication between the HMI and the Controller".
	The settings on the DIP switch for the PROFINET interface do not match the parameters defined in HW Config.	Check the DIP switch settings on the back of the HMI device.
STEP 7 module diagnostics reports numerous simultaneous "faults" with channel numbers of all channels with a configured emergency stop button.	Numerous hardware faults have occurred.	Check the wiring between the HMI device and all connected emergency stop buttons. If the cause of the fault cannot be corrected, check the HMI device.
STEP 7 module diagnostics reports "error" in channel number 0 or 1.	A hardware fault has occurred.	Check the wiring between the HMI device and the emergency stop button on the displayed channel. If the cause of the fault cannot be corrected, check the HMI device.
STEP 7 module diagnostics reports "Module interrupted" or "Module missing"	The HMI device has failed due to a serious internal error.	Replace the HMI device.

7.5 Error Diagnostics

Definition

Diagnostics enable you to determine if the signals are being correctly registered in the fail-safe HMI device.

Diagnostic functions

Diagnostic functions , in other words displays and messages, are not critical to safety and therefore are not designed to be safety-related functions. They are therefore not tested internally.

Diagnostic options for the fail-Safe HMI device

The following diagnostic options are available for fail-safe HMI device:

- "ERROR" LED on the front of the HMI device

State of the LED "ERROR"	Type of error
Off	No errors have occurred.
Flashes	During booting: The HMI device is currently receiving the configuration data set from the controller.
Lights	Communication error, hardware fault or configuration error

- Diagnostic Functions of the HMI Device

  Diagnostics according to PROFINET IO standard IEC 61784-1:2002 Ed1 CP 3/3

Diagnostic function the HMI device

The fail-safe HMI device includes a non-configurable diagnostic function. The diagnostics are always activated and are automatically made available by the HMI device in STEP 7 and passed on to the CPU in the event of a fault.

The diagnostic function passes the following diagnostics information to the CPU:

- Communication error

  Communication between the HMI device as IO device and the CPU as IO controller has been interrupted (for example, due to wrong device name or PROFIsafe address).

- Hardware fault

  External wiring or internal hardware fault, data corruption or execution error

- Configuration error

  Error in the PROFIsafe configuration

Reading diagnostic information

If you wish to locate the cause of an error, open the module diagnostics in STEP 7. You can find detailed information in the online help for STEP 7.

The following table shows the diagnostic functions of the HMI device. The diagnostic functions are assigned either to one channel or to the entire module.

Diagnostics function	Error code	LED	Scope of diagnostics
Short-circuit	0x01	"ERROR" lights.	Channel
Internal error	0x09	"ERROR" lights.	Module
Configuration error	0x10	"ERROR" lights.	Module
External auxiliary voltage missing.	0x11	1VsF lights. 2VsF lights.	Module
Communication error	0x13	"ERROR" lights.	Module
Discrepancy error (1oo2 evaluation)	0x19	"ERROR" lights.	Channel

You can also read the diagnostic functions with SFB 52 or SFB 54 in the standard user program. For detailed information, refer to the "System and Standard Functions" reference manual.

Diagnostics of PROFIsafe errors

When diagnosing PROFIsafe errors, address the "DIAG" variable of the F-I/O DB. You can find additional information on F-I/O DBs in the documentation "S7 Distributed Safety Configuring and Programming".

Behavior of the HMI device in the event of a serious internal error

The HMI device reacts as follows when a serious internal error in the HMI device causes the HMI device to fail:

- The connection to PROFINET will be interrupted and the fail-safe channels will be rendered passive.

- No diagnosis will be transmitted from the HMI device. In STEP 7 in module diagnostics, the standard diagnosis "Module interrupted" or "Module missing" will be reported.

See also

Overview (Page 87)

Error Elimination and Reintegration (Page 93)

7.6 Error Elimination and Reintegration

End passivation

When you have eliminated an error that lead to a passivation of the HMI device, you have to reintegrate the HMI device.

Correction and reintegration

The error correction and reintegration of the HMI device should be undertaken dependent on the type of error recognized:

Error	Possible causes of error	Remedy
Short-circuit	Short-circuit in the sensor	Eliminate the short-circuit.
	Cross-circuit in the sensor	Eliminate the cross-circuit.
	Internal error	Replace the HMI device.
Excess temperature	The HMI device switches off because the high or low temperature limits in the device housing have been exceeded.	Check access ambient temperature. Check whether permissible output current of the sensor power supply is exceeded at the ambient temperature. When you have corrected the problem, switch the HMI device off and back on again.
Internal error	Internal error in the HMI device	Replace the HMI device.
Configuration error	The HMI device does not match the configuration. Configuration incorrect	Correct the configuration. Check the communication paths. Correct the configuration.
	The PROFIsafe address on the HMI device is set incorrectly.	Set the DIP switches on the HMI device to match those set in "HW Config" of the SIMATIC Manager. Check the communication paths. When you have corrected the problem, switch the HMI device off and back on again.
Sensor supply missing	The power supply voltage not present or too low.	Check the wiring of the emergency stop buttons. When you have corrected the problem, switch the HMI device off and back on again.
Communication error	The communication between F-CPU and HMI device is interrupted, for example, due to a defective PROFINET connection or EMI that is higher than permissible.	Check the PROFINET cable.
	The PROFIsafe monitoring time set too low.	Increase the value of the "F monitoring time" parameter in "HW Config" of the SIMATIC Manager.
	The configuration of the HMI device does not match the safety program.	Compile the safety program again. Then download the configuration and the safety program to the F-CPU.

Error	Possible causes of error	Remedy
Discrepancy error (1oo2 evaluation)	The process signal is faulty.	Check the process signal.
	The sensor is defective.	If necessary, replace the sensor.
	Short-circuit between the sensor line and the sensor voltage supply line.	Eliminate the short-circuit.
	Wire break in connected sensor cable or the sensor supply cable.	Fix the wire break.

End passivation

When you have eliminated an error that lead to a passivation of the HMI device, you have to reintegrate the HMI device. A user acknowledgement in the safety program may be required for the reintegration of the HMI device. After reintegration, the pending process values at the HMI device's fail-safe channels are provided again for the safety program.

You can find additional information on the reintegration of fail-safe I/Os and the creation of a user acknowledgement in the safety program in the manual "S7 Distributed Safety Configuring and Programming".

Operation of PP 17-II PN

<div align="right">8</div>

Diagnostic features for the HMI device

The red "ERROR" LED is provided on the front of the HMI device as a diagnostic feature:

State of the LED "ERROR"	Type of error
Off	No errors have occurred.
Flashes	During booting: The HMI device is currently receiving the configuration data set from the controller.
Lights	Communication error, hardware fault or configuration error

Service and maintenance

<div align="right">

9

</div>

9.1   Maintenance and Servicing

Scope of maintenance

The HMI device is designed for maintenance-free operation. You should still clean the key membrane regularly, however.

Preparation

⚠ CAUTION
Faulty operation
Always switch off the HMI device before cleaning it. This will ensure that you do not trigger unintended functions when you touch the keys.

Use a cloth dampened with a cleaning agent to clean the equipment. Only use water with a little liquid soap or a screen cleaning foam.

Procedure

Never spray the cleaning agent directly onto the HMI device. Apply it to a cloth. Never use aggressive solvents or scouring powder.

CAUTION
Do not clean the HMI device with compressed air or steam jet blowers.

9.2 Carry out lamp test

Introduction

The lamp test checks the operability of all keys and LEDs on the HMI device. Carry out a lamp test on commissioning and at regular intervals during normal operation.

You can configure the function key for the lamp test in the HW Config of the STEP 7 project. The default is key 1 (upper right).

The HMI device's functions are restricted during the test as follows to prevent unwanted signals being sent to the controller:

● The standard digital inputs are disabled. No signal transitions are reported to the controller.

● The most recent state of all keys continues to be reported to the controller until the device returns to normal operation. The last key press to be reported to the controller will be the pressing of the function key assigned to the lamp test.

Note

The fail-safe channels are not disabled during the lamp test. The emergency stop buttons remain operable.

Requirement

The HMI device is switched on.

Procedure

Proceed as follows:

1. Hold the key down that has been defined for the lamp test.

   The lamp test will be carried out.

   – The LEDs integrated in the keys of the HMI device light up.

   – The "ERROR" LED does not flashes.

   – All standard digital outputs of the HMI device will be set to 1.

2. End the lamp test by releasing the key that has been defined for the lamp test.

   The HMI device resumes normal operation.

Alternative procedure

The lamp test can also be started from the controller by setting both LED bits that are assigned to the lamp test function by means of a suitable program. The state "both bits set" corresponds to the depressed key on the HMI device.

The lamp test can be stopped by re-setting both bits. This corresponds to releasing the key on the HMI device.

See also

Configuring the HMI device in STEP 7 (Page 82)

9.3 Repairs and Replacement Parts

Repairs

Do not repair the HMI device by yourself.

In case the HMI device needs to be repaired, send it to the Return Center in Fürth. The HMI device may only be repaired at the manufacturer's site.

The address is:

Siemens AG
Automation and Drives
Returns Center
Siemensstr. 2
90766 Fürth
Germany

If you use several HMI devices of the same type, we recommend building up a system interruption stock.

NOTICE
Spare parts for PROFIsafe devices
Spare parts for the HMI device PP17-I, order number 6AV3688-3CD13-0AX0, and PP 17-II, order number 6AV3688-3ED13-0AX0, may not be used for the following HMI devices: • PP 17-I PN PROFIsafe • PP 17-II PN • PP 17-II PN PROFIsafe Interruptions may occur if this is not heeded.

Service pack

A service pack can be ordered for servicing purposes. It contains the following spare parts:

- Mounting seal
- Mounting clamps
- Terminal block for connecting the power supply
- Coded terminal blocks for connecting the digital inputs and outputs

You can order the service package with the order number 6AV3678-3XC30 from your local Siemens office.

Technical Data

10

10.1   Dimension drawings

10.1.1   Dimension drawing of PP 17-I PN PROFIsafe

All dimensions in mm
Tolerance ±1 mm

10.1.2 Dimension drawing of PP 17-II PN

All dimensions in mm
Tolerance ±1 mm
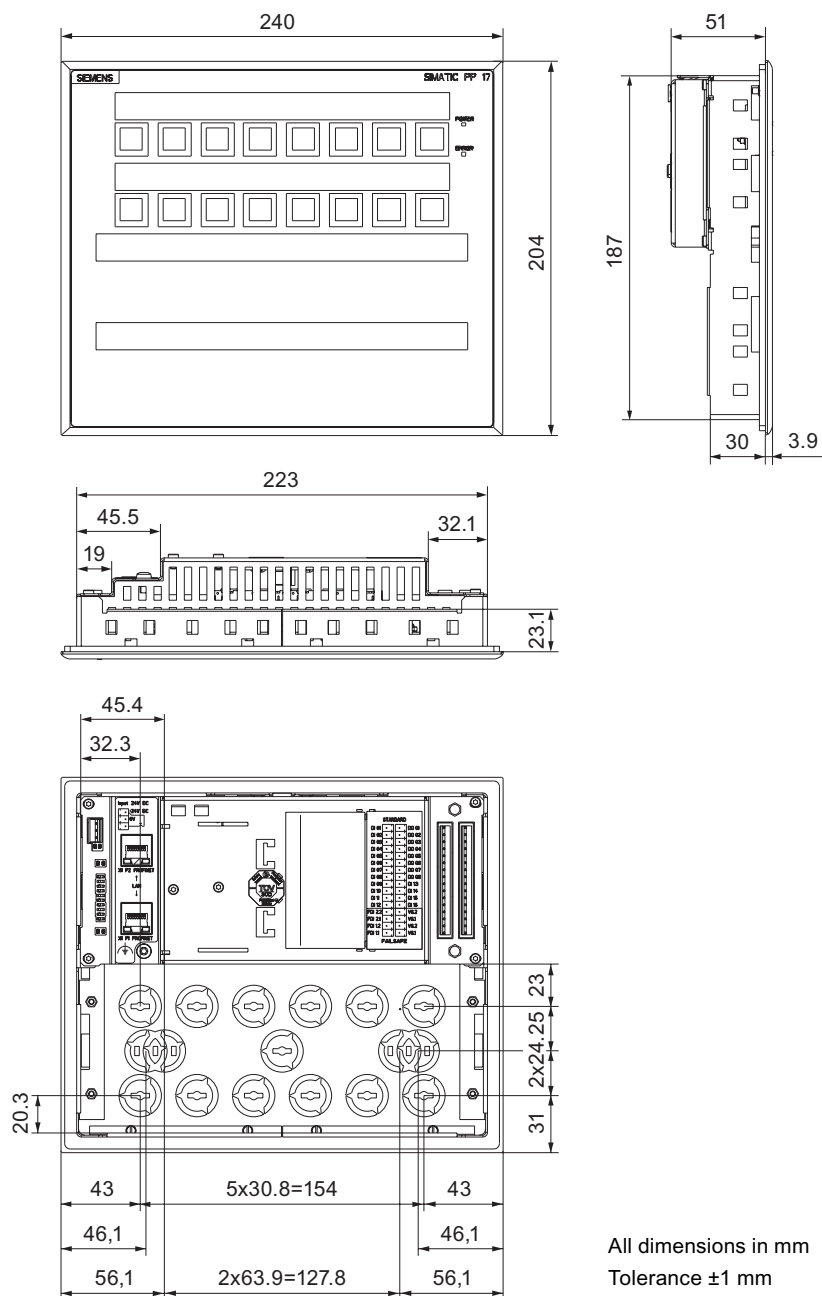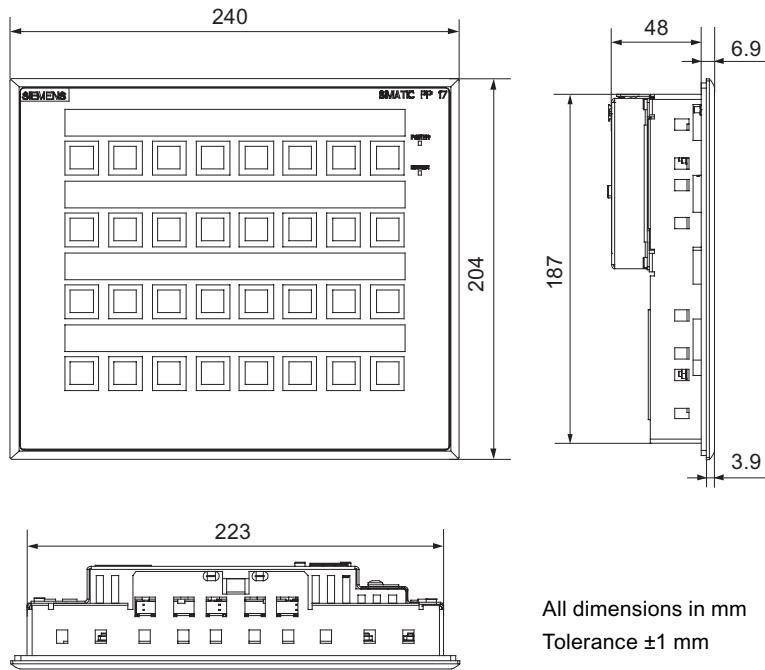
10.1.3 Dimension drawing of PP 17-II PN PROFIsafe

All dimensions in mm
Tolerance ±1 mm
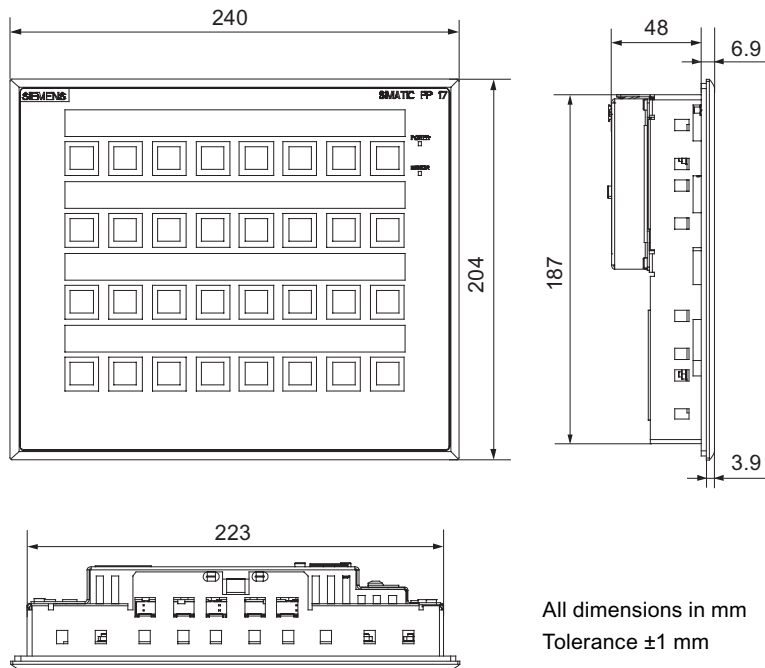
10.2 Technical specifications

10.2.1 Technical specifications of PP 17-I PN PROFIsafe

HMI device

Outer dimensions W x H x D	240 mm x 204 mm x 53 mm
Weight without packaging	Approx. 1200 g

Ports

2 x PROFINET	RJ45, 10/100 Mbps
Digital inputs 24 V • For standard mode • For fail-safe mode	 16 2 x 2
Digital outputs 24 V	8

Supply voltage

Nominal voltage Range, permissible	+24 VDC 19.2 V to 28.8 V (–20 %, +20 %)
Current consumption • Typical • Inrush current I^2t	 • <2.5 A, without load 0.4 A • 150×10^{-3} A^2s
Fuse, internal	Safety fuse 4 A

Fail-safe operation

> ⚠ **WARNING**
>
> The safety characteristics in the specifications apply for a proof-test interval of 10 years and a mean repair time of approx.100 hours.

In accordance with IEC 61508	
Hardware architecture	1oo2D
Classification	Type B
Hardware error tolerance	1
Safe failure fraction	99.3 %
Diagnostic test interval	< 15 minutes
Request rate	< 100 minutes
High demand (PFH: probability of a dangerous failure per hour)	$\leq 1 \times 10^{-8}$
Maximum achievable safety class (SIL)	3

In accordance with DIN EN ISO 13849-1	
Mean time to failure (MTTF$_d$)	60 years
Diagnostic coverage (DC)	99,1 %
Performance level (PL)	e

Non-configurable characteristics of the fail-safe inputs	
Discrepancy time	500 ms
Response times of the fail-safe channels	40 to 70 ms
Input delay	3 ms
Short-circuit test	Cyclic
Behavior after channel faults	Passivate the entire module
Evaluation of the sensors	1oo2 evaluation, equivalent
Behavior at discrepancy	Provide 0 value

10.2.2 Technical specifications of the digital inputs and digital outputs of PP 17-I PN PROFIsafe

Digital inputs 24 V

Supply voltage • Nominal value • Permitted range • Value for t < 0.5 s	 • +24 VDC • +19.2 V to +28.8 V (–20 %, +20 %) • 35 V
Connectable	Keys, switches
Number of digital inputs • For standard mode • For fail-safe mode	 • 16 • 2 x 2
Electrically isolated from internal logic	No
Input voltage • Nominal value • With "0" signal • With "1" signal	 • +24 VDC • 0 V to +5 V • 15 V to 30 V
Input current for signal "1"	Typically 5 mA for 24 V
Delay time for standard digital inputs	0.3 ms
Connection of mechanical switches	Supported
Bounce time	≤ 10 ms

Maximum cable length	
• For unshielded cables	• 1 m
• For shielded cables	• > 1 m
Maximum cable length for external emergency stop buttons	• Max. 1 m
• For unshielded cables	• Max. 10 m
• For shielded cables	

Digital outputs 24 V

Number of digital outputs	8
Electrical isolation	No
Short-circuit protection	Yes
Permitted loads	• Ohmic (0.1 A)
	• Lamps (2 W)
Energy, inductive (max.)	200 mWs
Output voltage	
• With "0" signal	• Max. 2 V (no load)
• With "1" signal	• Min. supply voltage –3 V
Output current	
• With "0" signal	• Max. 1 mA
• With "1" signal	• Cumulative current for all outputs 600 mA
Operating frequency for	
• Ohm	• Max. 100 Hz
• Lamps	• Max. 8 Hz
Maximum cable length	
• For unshielded cables	• 1 m
• For shielded cables	• > 1 m

Enable input

Electrical isolation for internal logic	No
Input voltage	
• Nominal value	• 24 VDC
• For enabled input	• 0 V to 5 V
• For disabled input	• 15 V to 30 V
Input voltage when input disabled	Typically 2 mA for 24 V

10.2.3   Technical specifications of PP 17-II PN

HMI device

Outer dimensions W x H x D	240 mm x 204 mm x 53 mm
Weight without packaging	Approx. 1 400 g

Ports

2 x PROFINET	RJ45, 10/100 Mbps
Digital inputs 24 V	16
Digital outputs 24 V	16

Supply voltage

Nominal voltage	+24 VDC
Range, permissible	19.2 V to 28.8 V (–20 %, +20 %)
Current consumption • Typical • Inrush current I^2t	 • <2.5 A, without load 0.4 A • 150 x 10 $^{-3}$ A^{2}s
Fuse, internal	Safety fuse 4 A

10.2.4   Technical specifications of the digital inputs and digital outputs of PP 17-II PN

Digital inputs 24 V

Supply voltage • Nominal value • Permitted range • Value for t < 0.5 s	 • +24 VDC • +19.2 V to 28.8 V (+20 %, –20 %) • 35 V
Connectable	Keys, switches
Number of digital inputs	16
Electrically isolated from internal logic	No
Input voltage • Nominal value • With signal "0" • With signal "1"	 • +24 VDC • 0 V to +5 V • 15 V to 30 V
Input current for signal "1"	Typically 5 mA for 24 V
Delay time for digital inputs	0.3 ms
Connection of mechanical switches	Supported

Bounce time	≤ 10 ms
Maximum cable length • For unshielded cables • For shielded cables	 • 1 m • > 1 m

Digital outputs 24 V

Number of digital outputs	16
Electrical isolation	No
Short-circuit protection	Yes
Permitted loads	• Ohmic (0.1 A) • Lamps (2 W)
Max. inductive energy	200 mWs
Output voltage • With signal "0" • For signal "1"	 • Max. 2 V (no load) • Min. supply voltage –3 V
Output current • With signal "0" • With signal "1"	 • Max. 1 mA • Cumulative current for all outputs 600 mA per group Group 1: DO1 to DO8 Group 2: DO9 to DO16
Operating frequency for • Ohm • Lamps	 • Max. 100 Hz • Max. 8 Hz
Maximum cable length • For unshielded cables • For shielded cables	 • 1 m • > 1 m

Enable input

Electrical isolation for internal logic	No
Input voltage • Nominal value • For enabled input • For disabled input	 • 24 VDC • 0 V to 5 V • 15 V to 30 V
Input voltage when input disabled	Typically 2 mA for 24 V

10.2.5 Technical specifications of PP 17-II PN PROFIsafe

HMI device

Outer dimensions W x H x D	240 mm x 204 mm x 53 mm
Weight without packaging	Approx. 1 400 g

Ports

2 x PROFINET	RJ45, 10/100 Mbps
Digital inputs 24 V • For standard mode • For fail-safe mode	 16 2 x 2
Digital outputs 24 V	8

Supply voltage

Nominal voltage	+24 VDC
Range, permissible	19.2 V to 28.8 V (–20 %, +20 %)
Current consumption • Typical • Inrush current I^{2}t	 • <2.5 A, without load 0.4 A • 150 x 10^{-3} A^{2}s
Fuse, internal	Safety fuse 4 A

Fail-safe operation

⚠ WARNING
The safety characteristics in the specifications apply for a proof-test interval of 10 years and a mean repair time of approx. 100 hours.

In accordance with IEC 61508	
Hardware architecture	1oo2D
Classification	Type B
Hardware error tolerance	1
Safe failure fraction	99.3 %
Diagnostic test interval	< 15 minutes
Request rate	< 100 minutes
High demand (PFH: probability of a dangerous failure per hour)	≤ 1 x 10^{-8}
Maximum achievable safety class (SIL)	3

In accordance with DIN EN ISO 13849-1	
Mean time to failure (MTTF$_d$)	60 years
Diagnostic coverage (DC)	99.1 %
Performance level (PL)	e

Non-configurable characteristics of the fail-safe inputs	
Discrepancy time	500 ms
Response times of the fail-safe channels	40 to 70 ms
Input delay	3 ms
Short-circuit test	Cyclic
Behavior after channel faults	Passivate the entire module
Evaluation of the sensors	1oo2 evaluation, equivalent
Behavior at discrepancy	Provide 0 value

10.2.6   Technical specifications of the digital inputs and digital outputs of PP 17-II PN PROFIsafe

Digital inputs 24 V

Supply voltage • Nominal value • Permitted range • Value for t < 0.5 s	• +24 VDC • +19.2 V to +28.8 V (–20 %, +20 %) • 35 V
Connectable	Keys, switches
Number of digital inputs • For standard mode • For fail-safe mode	• 16 • 2 x 2
Electrically isolated from internal logic	No
Input voltage • Nominal value • With "0" signal • With "1" signal	• +24 VDC • 0 V to +5 V • 15 V to 30 V
Input current for signal "1"	Typically 5 mA for 24 V
Delay time for standard digital inputs	0.3 ms
Connection of mechanical switches	Supported
Bounce time	≤ 10 ms

Maximum cable length	
• For unshielded cables	• 1 m
• For shielded cables	• > 1 m
Maximum cable length for external emergency stop buttons	• Max. 1 m
• For unshielded cables	• Max. 10 m
• For shielded cables	

Digital outputs 24 V

Number of digital outputs	8
Electrical isolation	No
Short-circuit protection	Yes
Permitted loads	• Ohmic (0.1 A)
	• Lamps (2 W)
Energy, inductive (max.)	200 mWs
Output voltage	
• With "0" signal	• Max. 2 V (no load)
• With "1" signal	• Min. supply voltage –3 V
Output current	
• With "0" signal	• Max. 1 mA
• With "1" signal	• Cumulative current for all outputs 600 mA
Operating frequency for	
• Ohm	• Max. 100 Hz
• Lamps	• Max. 8 Hz
Maximum cable length	
• For unshielded cables	• 1 m
• For shielded cables	• > 1 m

Enable input

Electrical isolation for internal logic	No
Input voltage	
• Nominal value	• 24 VDC
• For enabled input	• 0 V to 5 V
• For disabled input	• 15 V to 30 V
Input voltage when input disabled	Typically 2 mA for 24 V

10.3   Response times of the PROFIsafe devices

Introduction

The response times of the HMI device enter into the calculation of the response time of the fail-safe system. The following figure shows the response times between the IO controller and PP 17-I PROFIsafe.
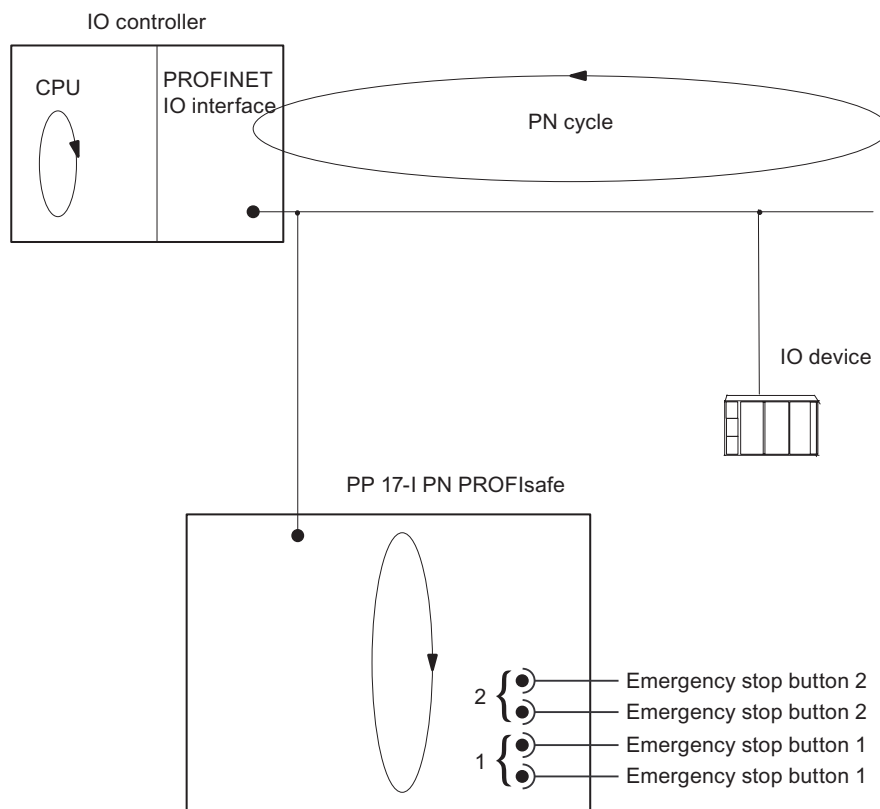
Information regarding the calculation of response times

Information about the response times of IO controller can be found in the manual of the IO controller used.

The "S7 Distributed Safety" add-on package contains an Excel file "s7cotia.xls" for calculating maximum response times. You can find the current version of this table on the Internet at the following address:

"http://www.siemens.com/automation/support", article ID 19138505

You can find additional information on the calculation of response times for fail-safe systems in the manual "Safety Engineering in SIMATIC S7".

Response times for fail-safe channels

The response time is the time between a signal change at the digital input and safe loading of the safety message frame to PROFINET.
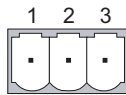
Response time of the HMI device

The actual response time is somewhere between a minimum and a maximum response time. When planning a system, the longest response time must always be anticipated.

The response time of the HMI device is 40 - 70 ms.

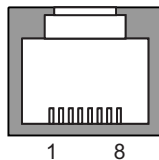## 10.4 Description of Ports

10.4.1 Power supply

Plug connector, 3-pin

PIN	Assignment
1	+24 VDC
2	GND 24 V
3	DISABLE (enable input)

10.4.2 PROFINET

RJ45 plug connector, 8-pin

PIN	Assignment	
1	RxP	Receive data +
2	RxN	Receive data –
3	TxP	Transmit data +
4	GND	Ground
5	GND	Ground
6	TxN	Transmit data –
7	GND	Ground
8	GND	Ground

10.4.3 Inputs and outputs of the PROFIsafe devices

Terminal strip, 16-pin

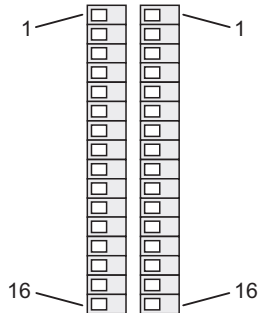| PIN	Left	Right
1	DI01: Digital input 1	DO01: Digital output 1
2	DI02: Digital input 2	DO02: Digital output 2
3	DI03: Digital input 3	DO03: Digital output 3
4	DI04: Digital input 4	DO04: Digital output 4
5	DI05: Digital input 5	DO05: Digital output 5
6	DI06: Digital input 6	DO06: Digital output 6
7	DI07: Digital input 7	DO07: Digital output 7
8	DI08: Digital input 8	DO08: Digital output 8
9	DI09: Digital input 9	DI13: Digital input 13
10	DI10: Digital input 10	DI14: Digital input 14
11	DI11: Digital input 11	DI15: Digital input 15
12	DI12: Digital input 12	DI16: Digital input 16
13	FDI2.2: Fail-safe channel 2, digital input 2	VS2: Fail-safe channel 2, supply voltage 2
14	FDI2.1: Fail-safe channel 2, digital input 1	VS1: Fail-safe channel 2, supply voltage 1
15	FDI1.2: Fail-safe channel 1, digital input 2	VS2: Fail-safe channel 1, supply voltage 2
16	FDI1.1: Fail-safe channel 1, digital input 1	VS1: Fail-safe channel 1, supply voltage 1

See also

Configuring the HMI device in STEP 7 (Page 82)

10.4.4   Inputs and outputs of PP17-II PN

Terminal strip, 16-pin

PIN	Left	Right
1	DI01: Digital input 1	DO01: Digital output 1
2	DI02: Digital input 2	DO02: Digital output 2
3	DI03: Digital input 3	DO03: Digital output 3
4	DI04: Digital input 4	DO04: Digital output 4
5	DI05: Digital input 5	DO05: Digital output 5
6	DI06: Digital input 6	DO06: Digital output 6
7	DI07: Digital input 7	DO07: Digital output 7
8	DI08: Digital input 8	DO08: Digital output 8
9	DI09: Digital input 9	DO09: Digital output 9
10	DI10: Digital input 10	DO10: Digital output 10
11	DI11: Digital input 11	DO11: Digital output 11
12	DI12: Digital input 12	DO12: Digital output 12
13	DI13: Digital input 13	DO13: Digital output 13
14	DI14: Digital input 14	DO14: Digital output 14
15	DI15: Digital input 15	DO15: Digital output 15
16	DI16: Digital input 16	DO16: Digital output 16

See also

Configuring the HMI device in STEP 7 (Page 82)

10.5 Process images

10.5.1 Bit assignment in the process image for PP 17-I PN PROFIsafe

Process image for the standard digital inputs and outputs

The states of HMI device digital inputs and outputs that are used in standard mode are saved independently from the states of the fail-safe channels in their own process images.

Input area in the controller

The keys and digital inputs of the HMI device are mapped to the bits in the input area of the controller as follows:

Byte	Bit assignment							
	Bit 7							Bit 0
Byte n	Key 16	...	...	...	...	...	...	Key 1
Byte n+1	Key 32	...	...	...	...	...	...	Key 17
Byte n+2	DI16	...	...	...	...	...	...	DI01
Byte n+3	DI32	...-	...	...	...	...	...	DI17

Output area of the controller

The LEDs are assigned to the bits in the output area of the controller as follows:

Byte	Bit assignment							
	Bit 7							Bit 0
Byte n	LED 16	...	...	...	...	...	...	LED 1
Byte n+1	LED 16	...	...	...	...	...	...	LED 1
Byte n+2	LED 32	...	...	...	...	...	...	LED 17
Byte n+3	LED 32	...	...	...	...	...	...	LED 17

The following lighting mode of the two LEDs results assigning the corresponding bits to the LEDs of a key:

Example assignment for LED 1

	Bit states			
Bit 0 in byte n (red)	1	0	1	0
Bit 0 in byte n+1 (green)	0	1	1	0
Result	Red	Green	Configurable [1]	Off

[1] This state can be set in HW Config:
- Flashing green (default)
- Yellow
- Flashing yellow
- Flashing red

The digital outputs are mapped to the bits in the output area of the controller as follows:

Byte	Bit assignment							
	Bit 7							Bit 0
Byte n+4	DO08	...	...	...	...	...	...	DO01
Byte n+5	DO08	...	...	...	...	...	...	DO01

The following flash frequencies result from assigning the corresponding bits to an output:

Example assignment for DO01

	Bit states			
Bit 0 in byte n+4	1	0	1	0
Bit 0 in byte n+5	0	1	1	0
Result	On	2 Hz	0.5 Hz	Off

Digital inputs and digital outputs for fail-safe channels

Note

The above mentioned process image is not used for digital inputs and digital outputs that are reserved with a fail-safe channel.

The fail-safe channels occupy the following address areas in the process image of the F-CPU:

Occupied bytes in the F-CPU	
Input area	Output area
x + 0 to x + 5	x + 0 to x + 3

x   The start address for the input and output range.
     The address was entered on the "Addresses" tab in the HW Config in the object properties of the module "PP 17-I PN PROFIsafe Slot 2".

The first two bits in the input range show which emergency stop button has been pressed. The following figure shows the assignment:

Bit no.	1	0
Emergency stop button	2	1

You can find additional information on process images for fail-safe channels in the "S7 Distributed Safety Configuring and Programming" manual.

See also

Configuring the HMI device in STEP 7 (Page 82)

10.5.2 Bit assignment in the process image for PP 17-II PN

Process image for the digital inputs and digital outputs

The states of HMI device digital inputs and outputs are saved independently from the states of the fail-safe channels in their own process images.

Input area in the controller

The keys and digital inputs of the HMI device are mapped to the bits in the input area of the controller as follows:

Byte	Bit assignment							
	Bit 7							Bit 0
Byte n	Key 8	...	...	...	...	...	...	Key 1
Byte n+1	Key 16	...	...	...	...	...	...	Key 9
Byte n+2	Key 24	...	...	...	...	...	...	Key 17
Byte n+3	Key 32	...	...	...	...	...	...	Key 25
Byte n+4	DI08:	...	...	...	...	...	...	DI01
Byte n+5	DI16	...-	...	...	...	...	...	DI09

Output area of the controller

The LEDs are assigned to the bits in the output area of the controller as follows:

Byte	Bit assignment							
	Bit 7							Bit 0
Byte n	LED 8	...	...	...	...	...	...	LED 1
Byte n+1	LED 8	...	...	...	...	...	...	LED 1
Byte n+2	LED 16	...	...	...	...	...	...	LED 9
Byte n+3	LED 16	...	...	...	...	...	...	LED 9
Byte n+4	LED 24	...	...	...	...	...	...	LED 17
Byte n+5	LED 24	...	...	...	...	...	...	LED 17
Byte n+6	LED 32	...	...	...	...	...	...	LED 25
Byte n+7	LED 32	...	...	...	...	...	...	LED 25

The following lighting mode of the two LEDs results assigning the corresponding bits to the LEDs of a key:

Example assignment for LED 1

	Bit states			
Bit 0 in byte n (red)	1	0	1	0
Bit 0 in byte n+1 (green)	0	1	1	0
Result	Red	Green	Configurable [1]	Off

[1] This state can be set in HW Config:
- Flashing green (default)
- Yellow
- Flashing yellow
- Flashing red

The digital outputs are mapped to the bits in the output area of the controller as follows:

Byte	Bit assignment							
	Bit 7							Bit 0
Byte n+8	DO08	...	...	...	...	...	...	DO01
Byte n+9	DO08	...	...	...	...	...	...	DO01
Byte n+10	DO16	...	...	...	...	...	...	DO09
Byte n+11	DO16	...	...	...	...	...	...	DO09

The following flash frequencies result from assigning the corresponding bits to an output:

Example assignment for DO01

	Bit states			
Bit 0 in byte n+8	1	0	1	0
Bit 0 in byte n+9	0	1	1	0
Result	On	2 Hz	0.5 Hz	Off

See also

Configuring the HMI device in STEP 7 (Page 82)

10.5.3 Bit assignment in the process image for PP 17-II PN PROFIsafe

Process image for the digital inputs and digital outputs

The states of HMI device digital inputs and outputs are saved independently from the states of the fail-safe channels in their own process images.

Input area in the controller

The keys and digital inputs of the HMI device are mapped to the bits in the input area of the controller as follows:

Byte	Bit assignment							
	Bit 7							Bit 0
Byte n	Key 8	...	...	...	...	...	...	Key 1
Byte n+1	Key 16	...	...	...	...	...	...	Key 9
Byte n+2	Key 24	...	...	...	...	...	...	Key 17
Byte n+3	Key 32	...	...	...	...	...	...	Key 25
Byte n+4	DI08:	...	...	...	...	...	...	DI01
Byte n+5	DI16	...-	...	...	...	...	...	DI09

Output area of the controller

The LEDs are assigned to the bits in the output area of the controller as follows:

Byte	Bit assignment							
	Bit 7							Bit 0
Byte n	LED 8	...	...	...	...	...	...	LED 1
Byte n+1	LED 8	...	...	...	...	...	...	LED 1
Byte n+2	LED 16	...	...	...	...	...	...	LED 9
Byte n+3	LED 16	...	...	...	...	...	...	LED 9
Byte n+4	LED 24	...	...	...	...	...	...	LED 17
Byte n+5	LED 24	...	...	...	...	...	...	LED 17
Byte n+6	LED 32	...	...	...	...	...	...	LED 25
Byte n+7	LED 32	...	...	...	...	...	...	LED 25

The following lighting mode of the two LEDs results assigning the corresponding bits to the LEDs of a key:

Example assignment for LED 1

	Bit states			
Bit 0 in byte n (red)	1	0	1	0
Bit 0 in byte n+1 (green)	0	1	1	0
Result	Red	Green	Configurable [1]	Off

[1]   This state can be set in HW Config:
- Flashing green (default)
- Yellow
- Flashing yellow
- Flashing red

The digital outputs are mapped to the bits in the output area of the controller as follows:

Byte	Bit assignment							
	Bit 7							Bit 0
Byte n+8	DO08	...	...	...	...	...	...	DO01
Byte n+9	DO08	...	...	...	...	...	...	DO01

The following flash frequencies result from assigning the corresponding bits to an output:

Example assignment for DO01

	Bit states			
Bit 0 in byte n+8	1	0	1	0
Bit 0 in byte n+9	0	1	1	0
Result	on	2 Hz	0.5 Hz	Off

Appendix A

What does ESD mean?

All electronic modules are equipped with highly integrated modules or components. Based on their design, these electronic components are highly sensitive to overvoltage and thus to the discharge of static electricity. These electronic components are therefore specially identified as ESD.

Short description

The following abbreviations are commonly used for electrostatic sensitive devices:

- ESD – **E**lectrostatic **S**ensitive **D**evices
- ESD – **E**lectrostatic **S**ensitive **D**evice as a common international designation

Labeling

ESD modules are labeled with the following symbol:

Electrostatic charge

CAUTION
Electrostatic charge
ESDs may be destroyed by voltages well below the perception threshold of persons. Voltages of this kind develop when a component or an assembly is touched by a person who is not grounded against static electricity. Usually, it is unlikely that damage to an ESD as a result of overvoltage is detected immediately but may become apparent only after a longer period of operation.
Prevent electrostatic charge of your body before you touch the ESD!

Anyone who is not connected to the electrical potential of their surroundings is subjected to electrostatic charge.

The figure indicates the maximum electrostatic charge anyone is subjected to when contacting the materials shown. These values correspond with specifications to IEC 801-2.
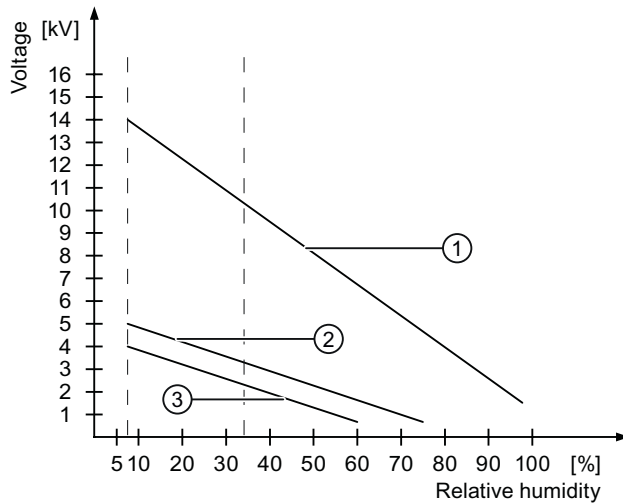
① Synthetic materials

② Wool

③ Antistatic materials such as wood or concrete

Protective measures against discharge of static electricity

CAUTION
Grounding measures
When working with electrostatic sensitive devices, make sure that the person, the workplace and the packaging are properly grounded. This helps to avoid electrostatic charge.

As a rule, only touch the ESD if this is unavoidable. Example: for maintenance. When you touch modules, make sure that you do not touch the pins on the modules or the PCB tracks. This prevents any discharge of static electricity to sensitive component and thus avoids damage.

Discharge electrostatic electricity from your body if you are performing measurements on an ESD. To do so, touch a grounded metallic object.

Always use grounded measuring instruments.

Abbreviations

<div style="text-align: right; font-size: 2em;">B</div>

CPU	Central Processing Unit
CSV	Comma Separated Values
CTS	Clear To Send
DC	Direct Current
DCD	Data Carrier Detect
DIL	Dual-in-Line (electronic chip housing design)
DP	Distributed I/O
DSN	Data Source Name
DSR	Data Set Ready
DTR	Data Terminal Ready
ESD	Electrostatic Discharge, the components and modules endangered by such
EMC	Electromagnetic Compatibility
EN	European standard
ES	Engineering System
ESD	Electrostatic Sensitive Device
F-CPU	Fail-safe Central Processing Unit
GND	Ground
GSD	GSD file / Generic Station Description
HF	High Frequency
HMI	Human Machine Interface
HSP	Hardware Support Package
IEC	International Electronic Commission
IF	Interface
LED	Light Emitting Diode
MMC	Multi-Media Card
MOS	Metal Oxide Semiconductor
MS	Microsoft
MTBF	Mean Time Between Failures
n. c.	Not connected
OP	Operator Panel
PC	Personal Computer
PELV	Protective Extra Low Voltage
PG	Programming device
PL	Performance Level according to DIN EN ISO 13849-1 (fail-safe mode)
PPI	Point to Point Interface (SIMATIC S7)
RAM	Random Access Memory

RTS	Request To Send
RxD	Receive Data
SELV	Safety Extra Low Voltage
SIL	Safety Integrity Level (safety class)
SP	Service pack
PLC	Programmable Logic Controller
STN	Super Twisted Nematic
Sub-D	Subminiature D (plug)
TAB	Tabulator
TCP/IP	Transmission Control Protocol/Internet Protocol
TFT	Thin Film Transistor
TxD	Transmit Data
UL	Underwriter's Laboratory

Glossary

1oo2 evaluation

Type of sensor evaluation - In 1oo2 evaluation, the two input channels are used by a single sensor with branching or two sensors. The input signals are compared internally for equivalence or non-equivalence.

Automation system (AS)

Controller of the SIMATIC S7 series such as a SIMATIC S7-300

Controller

General term for devices and systems with which the HMI device communicates, e.g. SIMATIC S7.

CRC

Cyclic redundancy check

Test values contained in a safety message frame can be backed up as follows:

- The validity of the process values contained in safety message frame
- The correctness of the assigned address relationships
- The safety-related parameters

EMC

Electromagnetic compatibility is the ability of electrical equipment to function properly in its electromagnetic environment without influencing this environment.

Failsafe

Capability of a technical system to remain in a safe state or switch to another safe state immediately after certain failures occur.

Fail-safe mode

See Safety mode.

Fail-safe system, F system

Fail-safe systems are used to control processes in which immediate shutdown results in a safe system status. This means that an immediate shutdown does not result in danger to people or the environment. F systems are used in plants requiring higher levels of safety.

GSD

The GSD file (device master file) contains all the properties of a DP slave or IO device. STEP 7 requires a GSD file for each DP slave and for each IO device to allow the DP slave or IO device to be selected in the module catalog of HW Config.

HSP

Hardware Support Package; add-on package for existing software products to support new hardware.

Notation

System consisting of characters, symbols and rules. In particular used to define the write format of a programming language in data processing.

Passivation

If the F-I/O detects a fault/error, it switches the affected channel or all its channels to the safe state. In other words, channels of this F-I/O are passivated. The F-I/O reports the detected error to CPU via the slave diagnostics. With an F-I/O with inputs, passivation is performed by the the F system by making available substitute values (0) to the safety program instead of the process values queued at the fail-safe inputs. With an F-I/O with outputs, passivation is performed by the the F system by sending substitute values (0) to the fail-safe outputs instead of the output values provided by from the safety program.

Plant

General term referring to machines, processing centers, systems, plants and processes which are operated and monitored on an HMI device.

PROFINET

Within the framework of Totally Integrated Automation (TIA), PROFINET represents an enhancement of the following bus systems:

- PROFIBUS DP as well-established field bus

- Industrial Ethernet as the communication bus for the cell level

The experience gained from both systems has been and continues to be integrated in PROFINET. PROFINET as an Ethernet-based automation standard from PROFIBUS International (PROFIBUS Nutzerorganisation e.V.) defines a vendor-independent communication and engineering model.

PROFINET IO controller

Device used to address the connected IO devices. That is: The IO controller exchanges input and output signals with assigned field devices. The IO controller is often the controller on which the automation program runs.

PROFINET IO device

A PROFINET IO device is a decentralized field device that is assigned to one of the IO controllers (e.g., remote IO, valve terminals, frequency converters, switches)

PROFINET IO

As part of PROFINET, PROFINET IO is a communication concept that is used to implement modular, distributed applications.

PROFINET IO allows you to create automation solutions of the type with which you are familiar from PROFIBUS.

PROFINET IO is implemented by the PROFINET standard for automation devices on the one hand, and on the other hand by the STEP 7 engineering tool.

This means that you have the same application view in STEP 7 regardless of whether you configure PROFINET devices or PROFIBUS devices. Programming your user program is essentially the same for PROFINET IO and PROFIBUS DP if you use the extended blocks and system status lists for PROFINET IO.

PROFIsafe

Fail-safe bus profile of PROFINET for communication between the safety program and the F-I/O in an F system.

PROFIsafe address

Every F-I/O has a PROFIsafe address. This address is used to receive safety frames from the F-CPU or send safety frames to the F-CPU.

Proof-test interval

The proof-test interval is the time period after which a component must be put into fail-safe state. That is, it is replaced by an unused component or it is proven to be completely fault-free.

Reintegration

Once a fault/error has been eliminated, the F-I/O must be reintegrated (depassivated). Reintegration (switching from substitute values to process data) takes place either automatically or following user acknowledgment.

For an F-I/O module with inputs, the process data queued at the failsafe inputs are made available again to the safety program after reintegration. For an F-I/O module with outputs, the output values for fail-safe outputs are sent again by the system to the fail-safe outputs.

Safe state

State of a unit in which safety is assured. In other words, the risk is acceptably low because it has been established that safety-related malfunctions do not occur or because of the safety measures taken to prevent possible safety-related malfunctions.

The basic principle of the safety concept in a fail-safe system is the existence of a safe state for all process variables.

Safety class

Safety integrity level in accordance with IEC 61508 and prEN 50129. The higher the safety integrity level (SIL), the more comprehensive are the measures to avoid systematic errors and control systematic errors and random hardware failures.

Safety function

Safety function is a mechanism integrated in fail-safe I/Os and CPUs, enabling them to be used in fail-safe systems. In accordance with IEC 61508: a safety function is implemented by a safety system to ensure that the system is kept in a safe state or brought into a safe state in the event of a particular fault. (user safety function)

Safety mode

Operating mode of the HMI device in which safety-related communication can be performed via safety frames.

Safety-related communication

Communication used to exchange fail-safe data.

Sensor evaluation

There are two types of sensor evaluation:

- 1oo1 evaluation: Sensor signal is read once
- 1oo2 evaluation: The sensor signal is read twice by the same F-I/O and compared internally.

Standard mode

Operating mode of an HMI device in which only standard communication is possible and safety-related communication cannot be performed via safety frames.

STEP 7

Programming software SIMATIC S7, SIMATIC C7 and SIMATIC WinAC controllers.

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