

# SIEMENS

## SIMATIC HMI

### HMI device PP 17-I PROFIsafe

#### Operating Instructions

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## Safety Guidelines

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.



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### Danger

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

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### Warning

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

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### Caution

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

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### Caution

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

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### Notice

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

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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.

## Prescribed Usage

Note the following:



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### Warning

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

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## 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

This operating instruction manual provides information based on the requirements defined by DIN 8418 for mechanical engineering documentation. This information relates to the device, its place of use, transport, storage, installation, use and maintenance.

These operating instructions are intended for:

- Project planning engineers
- Users
- Commissioning engineers
- Service technicians
- Maintenance technicians

Read the information provided in the section "Safety Instructions and General Notes" when using the HMI device in hazardous areas.

## Basic Knowledge Required

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

Experience in the use of personal computers and knowledge of Microsoft operating systems is required as well.

You should also know how to work with the basis software, STEP 7. This information is provided in the manual, "Programming with STEP 7 V5.3".

In addition, knowledge of safety engineering and system knowledge of fail-safe engineering are required.

## Operating Instructions' Range of Validity

These operating instructions apply to the HMI device PP 17-I PROFIsafe.

## Information about Fail-safe Operation of the HMI Device

The following sections of these operating instructions contain important information about the fail-safe operation of the HMI device:

Chapter no.	Title
1.6	Fail-safe Mode
2.2	Standards, Certificates and Approvals
3.7	Prerequisites for fail-safe operation
4.4	Wiring a Standard Component
5.2	Backside HMI Components, LEDs and Ports
6	Configuring the HMI device
7	Fail-safe Mode
9.3	Specifications for the Digital Inputs and Outputs
9.4	Response Times
9.5.3	Digital Inputs and Outputs

## Position in the Information Landscape

These instructions are part of the SIMATIC HMI documentation. The following provides an overview of the information available regarding usage of the HMI:

## Operating Instructions

- Operating instructions for SIMATIC Push Button Panels
  - PP7, PP17-I, PP17-II
  - PP 17-I PROFIsafe
- Operating instructions for other SIMATIC HMI devices
  - OP 73micro, TP 177micro
  - OP 73, OP 77A, OP 77B
  - TP 177A
  - TP 170micro, TP 170A, TP 170B, OP 170B
  - Mobile Panel 170
  - TP 270, OP 270
  - MP 270B
  - MP 370
- Operating instructions (compact) for the SIMATIC HMI devices OP 77B and Mobile Panel 170

## Documentation for Fail-safe Systems

- System description "Safety engineering in SIMATIC S7"
  - Provides an overview of the application, configuration, and function principle of S7 Distributed Safety and S7 F/FH fail-safe automation systems
  - Contains a summary of detailed technical information on fail-safe engineering in S7-300 and S7-400
  - Includes monitoring and reaction time calculation for S7 Distributed Safety and S7 F/FH fail-safe systems
- Manual / Online-help "S7 Distributed Safety Configuring and Programming"
 

Describes the configuration of the fail-safe CPU and fail-safe I/O and the programming of the fail-safe CPU in F-FBD and F-LAD.
- Reference manual "S7-400 Automation Systems, CPU data"
 

Describes the standard functions of the CPU 416F-2
- Reference manual "S7-300 Automation Systems, CPU data"
 

Describes the standard functions of the CPU 315F-2 and CPU 317F-2

## Online Availability

Technical documentation on SIMATIC products and SIMATIC systems is available in PDF format in various languages at the following addresses:

- SIMATIC Guide Technical Documentation in German:  
["http://www.ad.siemens.de/simatic/portal/html\\_00/techdoku.htm"](http://www.ad.siemens.de/simatic/portal/html_00/techdoku.htm)
- SIMATIC Guide for Technical Documentation in English:  
["http://www.ad.siemens.de/simatic/portal/html\\_76/techdoku.htm"](http://www.ad.siemens.de/simatic/portal/html_76/techdoku.htm)

You will find the valid GSD file for the HMI device and the FB "F\_PP17I\_SIL3" needed for attaining SIL3/Cat. 4 on the Internet at the following URL:

["http://www.siemens.com/automation/support"](http://www.siemens.com/automation/support)

## Screens

The HMI device is sometimes shown in the form of photographs in these operating instructions. The photographs of the HMI device may differ slightly from the factory state of the HMI device.

## Conventions

Text is highlighted as follows to simplify reading the operating instructions:

Notation	Scope
"Add screen"	Terminology that appears in the user interface, e.g., dialog names, tabs, buttons, menu entries Required parameters such as limit values, tag values Path information
"File > Edit"	Operation sequences such as menu commands, context menu commands
<F1>, <Alt+P>	Keyboard operation

Please observe notes labeled as follows:

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**Note**

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

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## Registered Trademarks

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- HMI®
- SIMATIC®
- SIMATIC HMI®
- SIMATIC ProTool®
- SIMATIC WinCC®
- SIMATIC WinCC flexible®
- SIMATIC PP 17-I PROFIsafe®

## 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.

You can locate your contact partner at:

["http://www.siemens.com/automation/partner"](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 the central Training Center in D 90327 Nuremberg, Germany.

Telephone: +49 (911) 895-3200

Internet: ["http://www.sitrain.com/"](http://www.sitrain.com/)

## Technical Support

You can contact Technical Support for all A&D products

Using the support request form on the web at  
["http://www.siemens.de/automation/support-request"](http://www.siemens.de/automation/support-request)

Telephone: + 49 180 5050 222

Fax: + 49 180 5050 223

Further information about our technical support is available on the Internet at  
["http://www.siemens.com/automation/service"](http://www.siemens.com/automation/service).

## Service & Support on the Internet

Service & Support offers online services for additional, comprehensive information on SIMATIC products at

["http://www.siemens.com/automation/support"](http://www.siemens.com/automation/support):

- The newsletter offers you the latest information about to 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
- Your local Automation & Drives representative
- Information about on-site services, repairs, spare parts and lots more is available on our "Services" pages.





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# Overview

## 1.1 Product Overview

### Application Scenarios of the HMI Device

The HMI device is used to display the operating states of machines or plants and to control the process.

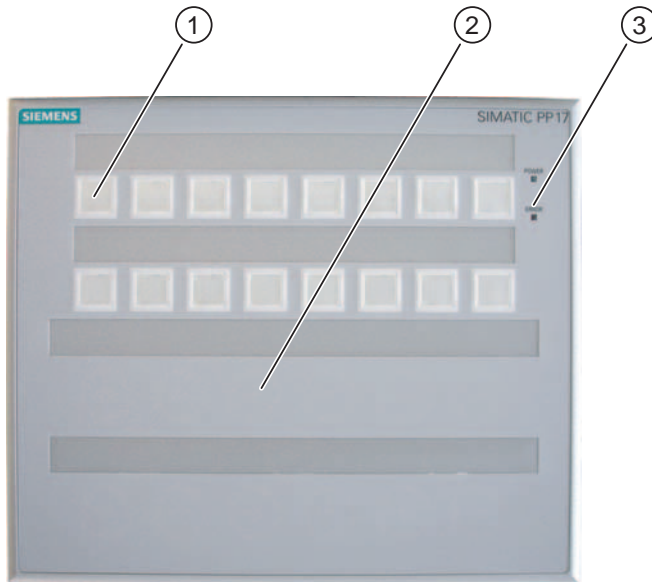
The HMI device is designed for mounting in control panels and replaces keys, switches and LEDs that are individually mounted. You should install the HMI device in an installation cutout and connect it to a PLC of type SIMATIC CPU 416F-2, CPU 315F-2 or CPU 317F-2 via PROFIBUS. The HMI is pre-configured 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.

### Use 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. Concerning safety relevant signals, at least SIL2/category 3 can be achieved. You should integrate a supplied FB "F\_PP17I\_SIL3" into your STEP 7 safety program for use cases requiring the higher SIL 3/category 4.

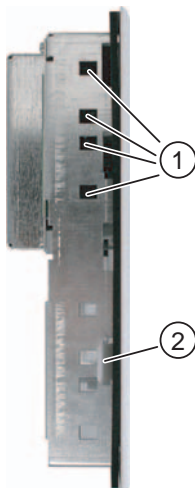
## 1.2 Design of the HMI Device

### Front view of the HMI device



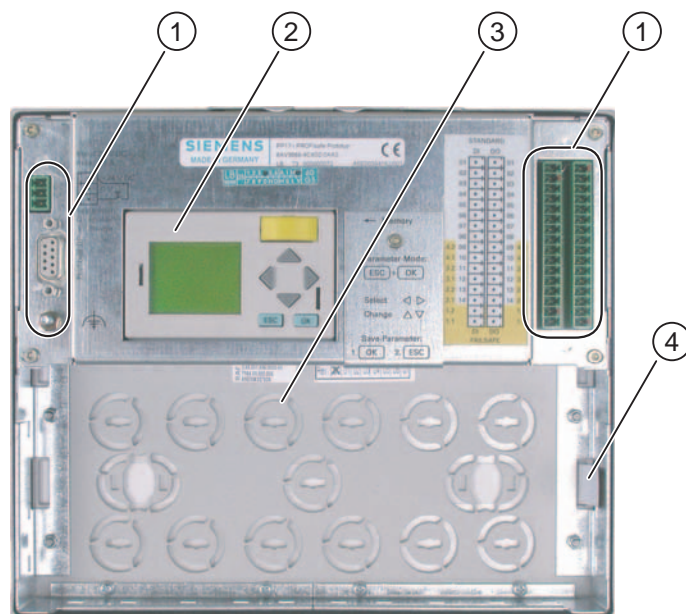
- ① Keys with integrated LEDs
- ② Mounting position for standard components
- ③ "Power" LED and "Error" LED

### Side view of the HMI device



- ① Clamping recess
- ② Labeling strips

## Rear view of the HMI device



- ① Ports
- ② Configuration module
- ③ Knockout apertures for mounting standard components
- ④ Labeling strips

## 1.3 Accessories

### Accessory kit

The accessory kit contains the following:

- A terminal block for the power supply
- Two coded non-interchangeable terminal blocks for the digital inputs and outputs
- Eight spring clamps for mounting the HMI device

Additional documents may be enclosed with the accessory kit.

### Labeling strips

The HMI comes with a sheet of removable labeling strips.

Additional sets of labeling strips can be ordered under order number 6AV3 671-8CB00.

## 1.4 Functional Scope

### Performance features

The HMI device offers a wide range of features that can be used without having to program it:

- Short-stroke keys with two-color flat surface LEDs
- Additional 24 V digital inputs and outputs (maximum of 14 can be used in 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
- Configurable pulse stretching
- Pre-perforated cut-outs for 22.5 mm standard add-on components such as key switches and emergency stop
- SIMATIC HMI device design, gaplessly buttable
- Fail safe mode of maximum 4 emergency stop buttons by means of PROFIsafe communication
- Simultaneous standard mode and fail-safe mode

### Expandable with Standard Components

The functionality of the HMI can be extended with 22.5 mm standard components (hereafter referred to as "standard components"), e.g. with lamps or key switches. If you wish to use more standard components, mount them in the pre-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.

In fail-safe mode, one 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 category.

### Buttons/Switches

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

Configuration	Bit set	Bit reset
Button	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.



### Pulse Stretching

The signal pulse for all operations initiated by pressing buttons on the PLC can be lengthened in order to ensure reliable switch/key polling by the PLC even when pressed very briefly.

### LEDs

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

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

### Enable Input

Enable input disables the standard mode of the HMI. 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 PLC.
- The state of all keys previous to the locking continues to be reported to the PLC until the device returns to normal operation.

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

## 1.5 Communication with PLCs

### Compatible PLCs

The HMI device is approved for use with one of the following PLCs:

- SIMATIC CPU 416F-2
- SIMATIC CPU 315F-2
- SIMATIC CPU 317F-2

### Protocols

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

- for standard communication: PROFIBUS DP V.1, although alarm diagnostics are not supported
- for fail-safe communication: PROFIsafe Mode V1.0

## 1.6 Fail-safe Mode

### Requirement

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

- SIMATIC S7 Distributed Safety as of V5.3

### 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 a safe state is achieved in every situation. An immediate shutdown therefore does not pose a danger to people or the environment.

### Fail-safe Application of the HMI Device

PP 17-I PROFIsafe is a DP-slave on PROFIBUS DP.

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 via the fail-safe protocol, PROFIsafe.

SIL2/cat. 3 and SIL3/cat. 4 can be achieved with the HMI device by means of appropriate configuration of the safety functions in STEP 7 and the optional package "S7 Distributed Safety".

Fail-safe mode of the HMI differs from standard mode essentially in that for each fail-safe channel, two digital inputs and two digital outputs are used to relay the fail-safe input signals from the HMI to the CPU. The signals are monitored for errors during the communication. In the event of a fault, the HMI 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 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 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 fault  
Communication between the HMI as DP-slave and the CPU as DP Master has been interrupted (e.g. due to wrong PROFIBUS address or PROFIsafe address).
- HW fault  
External wiring or internal hardware fault, data corruption or procedure error.
- Configuration error  
Error in the PROFIsafe configuration

## Enable Input

### Note

#### Enable input does not affect the fail-safe channels

The enable input of the HMI 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 PLC.

## Example Configuration of an F System with a Fail-safe HMI Device

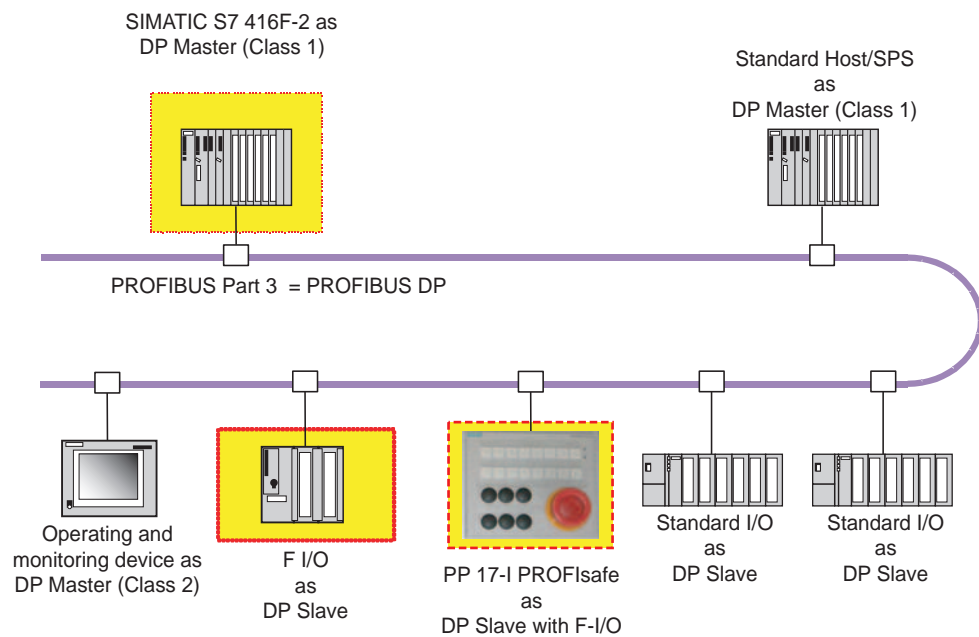


Figure 1-1 Simultaneous operation of fail-safe and standard stations

In the depicted configuration, each DP-slave communicates with just one DP-master. The PP 17-I PROFIsafe communicates exclusively with the SIMATIC S7-416F-2 in this case.



## Safety Instructions and General Notes

### 2.1 Safety Instructions

#### Working on the cabinet



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**Warning****Open equipment**

The HMI device is an open equipment. This means that the HMI device may only be installed in cubicles or cabinets, whereby the device can be operated from the front panel.

Access to the cubicle or cabinet in which the HMI device is installed should only be possible by means of 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.

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#### High frequency radiation

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**Notice****Unintentional operating situations**

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

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### 2.2 Standards, Certificates and Approvals

#### Valid approvals



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**Caution****Valid approvals**

The overview below provides information on available approvals

The HMI device itself is certified as shown on the label on its rear panel.

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### CE approval



The automation system 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:

- 89/336/EEC "Electromagnetic Compatibility" (EMC guideline)
- 98/37/EG Directive of the European Parliament and Council of 22 June 1998 on the approximation of the laws and administrative regulations of the Member States concerning machinery

#### EC declaration of conformity

The EC declarations of conformity are kept available for the responsible authorities at the following address:

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

### UL certification



Underwriters Laboratories Inc. conforming to

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

or



Underwriters Laboratories Inc. conforming to

- 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 T4
- Class I, Zone 2, Group IIC T4

### (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	Name
Standards/Directives Functional Safety	IEC 61508-1 to 4
Standards/Directives Process engineering	VDI/VDE 2180-1 to 5
	IEC 61511
Standards/Directives Machine Safety	98/37/EC
	EN 60204-1
	NFPA 79
	IEC 62061
	prEN 954
	DRAFT ISO 13849
Standards/Directives Burner Management Systems	EN 50156-1
Standards/Directives PROFIsafe	PROFIBUS PROFIsafe V1.30 (June 2004)
	PROFIBUS PROFIsafe Edition 2/2003

### Requesting Certificates from the Technical Inspectorate

Copies of certificates can be obtained 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

## 2.3 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

## 2.4 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 "Directives for interference-free installation of PLCs" and the "PROFIBUS Networks" manual also apply for the installation of the HMI device.

### 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.

Table 2-1 Pulseshaped Interference

Pulse-shaped interference	Tested with	Corresponds to test intensity
Electrostatic discharge conforming to IEC 61000-4-2	Air discharge: 8 kV Contact discharge: 4 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 S7 300 PLC, Installation, chapter "Lightning and overvoltage protection").		
<ul style="list-style-type: none"> <li>Asymmetric coupling</li> </ul>	2 kV power cable DC voltage with protective elements 2 kV signal/data cable, > 30 m, with protective elements as required	3
<ul style="list-style-type: none"> <li>Symmetric coupling</li> </ul>	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.

Table 2-2 Sinusoidal Interference

Sinusoidal interference	Test values	Corresponds to test intensity
RF interference (electromagnetic fields) <ul style="list-style-type: none"> <li>• conforming to IEC 61000-4-3</li> <li>• conforming to IEC 61000-4-3</li> </ul>	10 V/m with 80 % amplitude modulation of 1 kHz in the range from 80 MHz to 1 GHz and 1.4 GHz to 2 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

Table 2-3 GSM/ISM field interferences of different frequencies (EN 298: 1998)

System	Frequency	Test level	Modulation
GSM	890-915 MHz	20 V/m	Pulse modulation 200 Hz
GSM	1710-1785 MHz	20 V/m	Pulse modulation 200 Hz
GSM	1890 MHz	20 V/m	Pulse modulation 200 Hz
ISM	433.05-434.79 MHz	20 V/m	AM, 80%, 1 kHz
ISM	83.996-84.004 MHz	20 V/m	AM, 80%, 1 kHz
ISM	167.992-168.008 MHz	20 V/m	AM, 80%, 1 kHz
ISM	886.000-906.000 MHz	20 V/m	AM, 80%, 1 kHz

Table 2-4 ISM field interferences of different frequencies (EN 298: 1998)

System	Frequency	Test level	Modulation
ISM	6.765-6.795 MHz	20 V	AM, 80%, 1 kHz
ISM	13.553-13.567 MHz	20 V	AM, 80%, 1 kHz
ISM	26.957-27.283 MHz	20 V	AM, 80%, 1 kHz
ISM	40.66-40.70 MHz	20 V	AM, 80%, 1 kHz
ISM	3.370-3.410 MHz	20 V	AM, 80%, 1 kHz
ISM	13.533-13.533 MHz	20 V	AM, 80%, 1 kHz
ISM	13.567-13.587 MHz	20 V	AM, 80%, 1 kHz

Table 2-5 Additional special frequencies according to DIN IEC 61326-3

System	Frequency	Test level	Modulation
Various mobile and SRD	137-174 MHz	20 V/m	AM, 80 %, 1 kHz
Amateur	430-470	20 V/m	AM, 80 %, 1 kHz
ISM only region 2	902-928	20 V/m	AM, 80 %, 1 kHz
GSM	925-960	20 V/m	Pulse modulation 200 Hz
GSM	1805-1880	20 V/m	Pulse modulation 200 Hz
UMTS	1900-2025	20 V/m	Pulse modulation 200 Hz
UMTS	2110-2200	3 V/m	Pulse modulation 200 Hz
ISM	2400-2500	3 V/m	AM, 80 %, 1 kHz
UMTS	2500-2690	3 V/m	Pulse modulation 200 Hz

**Emission of radio interference**

Emission of electromagnetic interference conforming to 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

**Additional Measures**

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

## 2.5 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.

Table 2-6 Transport and Storage Conditions

Type of condition	Permitted range
Drop test (in transport package)	≤ 1 m
Temperature	−20 to +70° C
Air pressure	from 1030 to 581 hPa
Max. pressure difference (front/rear)	2 hPa
Relative humidity	≤ 90%, 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 <sup>2</sup>
Shock conforming to IEC 60068-2-29	250 m/s <sup>2</sup> , 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 dewing has developed, wait approximately 4 hours before you switch on the HMI device.

---

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.



## Planning Application

### 3.1 Checklist for fail-safe operation

#### Application Planning

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

#### Check list for application planning

Step	Information	Check
Check the ambient climatic and mechanical conditions	Chapter 3.2	
Define the mounting position, installation location and mounting type of the HMI.	Chapter 3.3	
Preparation of the mounting cutout	Chapter 3.4	
Check that the requirements for insulation voltage, protection class and seal tightness will be met if the HMI is used in this way.	Chapter 3.5	
Check that the allowed nominal line voltages are met	Chapter 3.6	
For fail-safe mode: Determination of safety class (SIL2/cat. 3 or SIL3/cat. 4) that is to be achieved	Chapter 3.7	
Selection of sensors that fulfill the fail-safe mode requirements	Chapter 3.7	

### 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.

Table 3-1 Mechanical environmental conditions

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 about the type and scope of testing for mechanical environmental conditions.

Table 3-2 Check of mechanical ambient conditions

The check includes	Test standard	Remarks
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 $\pm$ direction of axis in each of the three axes vertical to each other

### Climatic ambient conditions

The HMI device may be used under the following climatic ambient conditions:

Table 3-3 Climatic ambient conditions

Ambient conditions	Permitted range	Remarks
Temperature <ul style="list-style-type: none"> <li>• Vertical mounting</li> <li>• Inclined mounting</li> </ul>	from 0 to 55° C from 0 to 55° C	See the "Mounting positions and type of fixation" section
Relative humidity	$\leq 95\%$	Without condensation, corresponds to a relative humidity, stress class 2 conforming to IEC 61131, part 2
Air pressure	1030 to 706 hPa	
Pollutant concentration	SO <sub>2</sub> : < 0.5 ppm; relative humidity < 60 %, no condensation H <sub>2</sub> S: < 0.1 ppm; relative humidity < 60 %, no condensation	Check: 10 ppm; 4 days  Check: 1 ppm; 4 days

### 3.3 Mounting Positions and Type of Fixation

#### Mounting position

The HMI device is designed for mounting in racks, cabinets, control boards and 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.

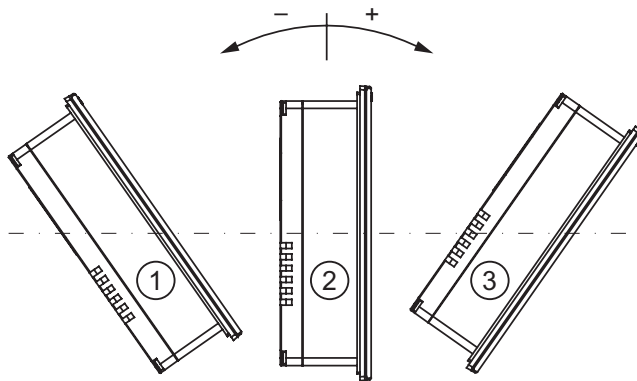


Figure 3-1 Permitted mounting positions

	Mounting position	Deviation from the vertical
①	Inclined	$\leq -35^\circ$
②	Vertical	$0^\circ$
③	Inclined	$\leq 35^\circ$

#### 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

Spring clamps are provided for mounting the device. Hook the clamps into the recesses of the HMI device. The overall HMI device dimensions are not exceeded by this.

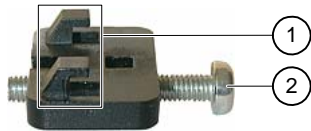


Figure 3-2 View of a mounting clamp

- ① Hooks
- ② Recessed head screw

### 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.

Bus connector	Mounting Depth
Without	53 mm
With angled bus connector Order no.: 6ES7 972-0BB10-0x70	75 mm
With non-angled bus connector Order no.: 6GK1 500-0EA00	130 mm

### Mounting Several 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 spring 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.

### Preparing the mounting cut-out

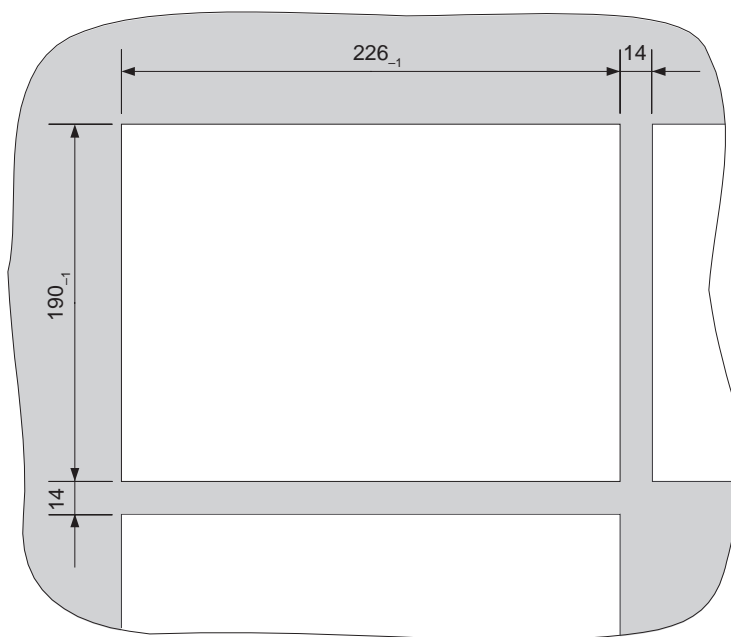
The degrees of protection are only guaranteed when the following is observed:

- Material thickness at the mounting cut-out: 2 mm to 6 mm
- The deviation from plane for the panel cut-out is  $\leq 0.5$  mm

This condition must be fulfilled for the mounted HMI device.

- Permissible surface roughness in the area of the seal:  $\leq 120$   $\mu\text{m}$  (friction coefficient 120)

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



### 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:

Table 3-4 Test Voltages

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 strength at the mounting cut-out is at least 2 mm.
- The deviation from the plane of the mounting cut-out in an installed HMI device is  $\leq 0.5$  mm.
- When mounting standard components, the membrane on the front of the HMI device should only be cut for the area of the knockout aperture.

### 3.6 Nominal Voltages

The following table details the allowed nominal line voltages and associated tolerance ranges.

Nominal voltage	Tolerance range
+24 VDC	20.4 V to 28.8 V (-15%, +20%)

### 3.7 Prerequisites for fail-safe operation

#### Achievable Safety Classes (SIL)

The following safety classes can be achieved with the HMI device:

- SIL2/Cat. 3
- SIL3/Cat. 4



---

#### Warning

##### Safety Class SIL3/Cat. 4

Safety class SIL3/cat. 4 can only be achieved with FB "F\_PP171\_SIL3". This function block is provided on the CD which contains these operating instructions.

The following applies when integrating the FB:

- It must be ensured that the FB will be called in the control program.
  - The FB parameters must be clearly assigned to the HMI device with SIL3/cat. 4.
- 



---

#### 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.

To achieve SIL3 (AK6/Category 4), suitably qualified sensors are necessary. The sensors used must fulfill the standards IEC/EN 60947-5-1 and IEC/EN 60947-5-5 (VDE 0660, section 200).



### 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

Emergency stop is detected using the following configuration:

- With redundant connection of two single-channel sensors (normally open switches).



### 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.



### Caution

All digital inputs and digital outputs that are not assigned to a fail-safe channel may not be connected with low-impedance (short-circuited).

### 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, 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 e.g. 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, the following cable lengths must be maintained:
  - Unshielded cables: Max. 1 m
  - Shielded cables: Max. 10 m

## Mounting and Connecting

### 4.1 Checklist for fail-safe operation

#### Mounting and Connecting

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

#### Check list for mounting and connecting

Step	Information	Check
Check that the contents of the package are complete and have not been damaged in transit.	Chapter 4.2	
Mounting the required standard components	Chapter 4.3	
Wiring the standard components	Chapter 4.4	
Mounting the HMI in the prepared mounting cutout	Chapter 4.5	
Connecting the equipotential bonding to the HMI	Chapter 4.6.2	
Connecting the power supply to the HMI	Chapter 4.6.3	
Connecting the controller to the HMI	Chapter 4.6.4	
Switching on and testing the HMI	Chapter 4.7	

### 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 Mounting Standard Components

### Introduction

Where required, 22.5 mm diameter standard components e.g. key switches and emergency stop buttons can be built into the HMI. 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.

- Emergency stop button

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

Use one of the oval shaped cut-out openings in the middle row for mounting the emergency stop button with or without protective collar. These cut-out openings are constructed so that you can position the emergency stop button further to the right or left dependent on which of the crescent-shaped die-cast pieces have been broken out.

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

- Other standard components

All of the other standard components can be mounted in any of the cut-out openings.



### Example mounting position

The following pictures show the recommended configuration of standard components and emergency stop buttons:

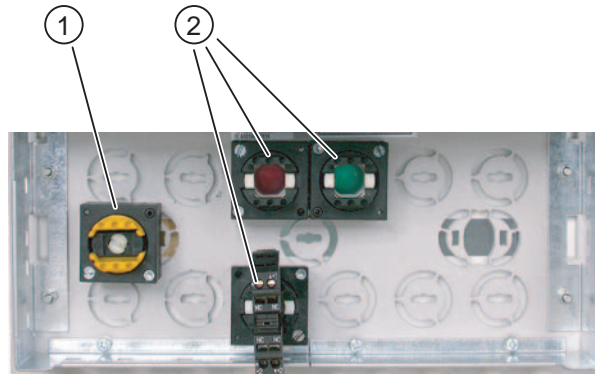


Figure 4-1 Rear view

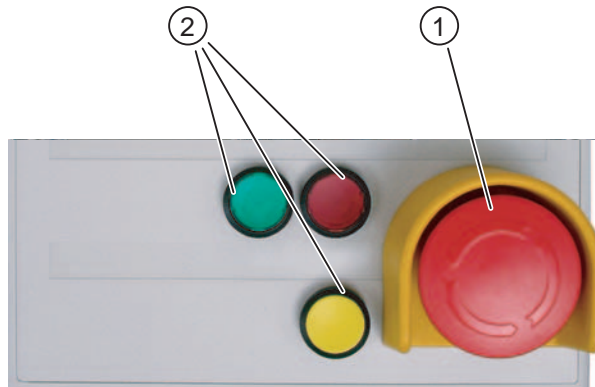


Figure 4-2 Front view

- ① Emergency stop button
- ② Standard components

### Mounting Standard Components

Proceed as follows:

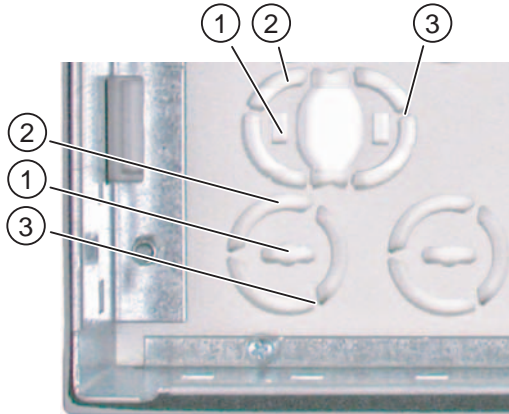


Figure 4-3 Knockout aperture for standard component

1. Use a sharp knife to cut a slit into the membrane on the front of the HMI device where you want the oblong hole ①.
2. Cut the membrane along the outer edge ② of the desired breakout aperture so that the cut-out membrane section only remains attached to the remaining membrane where it covers the three small webs ③.

---

#### Note

The membrane on the front of the HMI device should only be cut for the knockout aperture in order to maintain an IP65 degree of protection for the front surface after the mounting of the standard component.

---

3. Place a screwdriver into the elongated slot ① of the cut-out opening and turn the screwdriver until the pre-stamped die-cast piece detaches.
4. Remove the detached piece.
5. Position the standard component into the empty cut-out opening.
6. Secure the standard component.

#### Result

The required control elements are mounted and can be wired.

#### See also

Front-sided Control Elements and Displays (Page 5-1)

## 4.4 Wiring a Standard Component

### Introduction

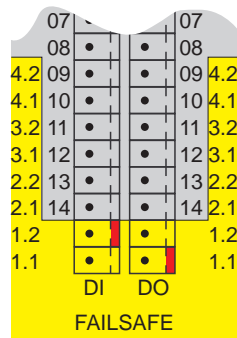


Figure 4-4 Labels on the digital inputs and outputs (section)

There are 16 digital inputs (DI) and 16 digital outputs (DO) on the rear of the HMI device. The bottom two digital inputs (DI1.1 and DI1.2) and digital outputs (DO1.1 and DO1.2) form fail-safe channel 1 and are pre-set for the fail-safe wiring of an emergency stop button.

The next three input pairs and output pairs can be used optionally:

- as fail-safe channels 2 to 4 for fail-safe wiring (DI2.1 to DI4.2 and DO2.1 to 4.2) of a further three emergency stop buttons  
or
- for non-fail-safe wiring of six standard components (DI14 to DI09 and DO14 to DO09)

The number of required emergency stop keys must match the number set in HW Config of the STEP 7 project ("Emergency Stop" parameter of the object properties of the slots hosting "PP17\_S Inputs / Outputs"). The default value for this parameter is "4", i.e. four emergency stop keys are used and no non-fail-safe standard components.

The upper eight pairs of digital inputs (DI08 to DI01) and digital outputs (DO08 to DO01) are used for the wiring of standard components in standard mode.

---

### Caution

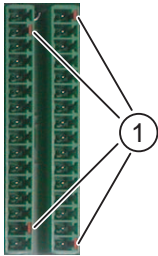
#### Fail-safe Mode

The HMI device can only recognize two-channel equivalent sensor signals.

The design of the emergency stop keys used must conform to the selected safety category.

---

## Rules for Wiring



- ① Reverse polarity protection
- Only use the supplied coded terminal blocks to perform the wiring.
- Wire the fail-safe channels gapless from bottom to top.

Example: Connecting two emergency stop buttons

- Connect emergency stop button 1 to the F channel 1 (DI1.1, DI1.2 and DO1.1, DO1.2)
- Connect emergency stop button 2 to the F channel 2 (DI2.1, DI2.2 and DO2.1, DO2.2)
- Wiring of an emergency stop button to the fail-safe channel 3 without assignment of fail-safe channels 1 and 2 is not allowed.



---

### Warning

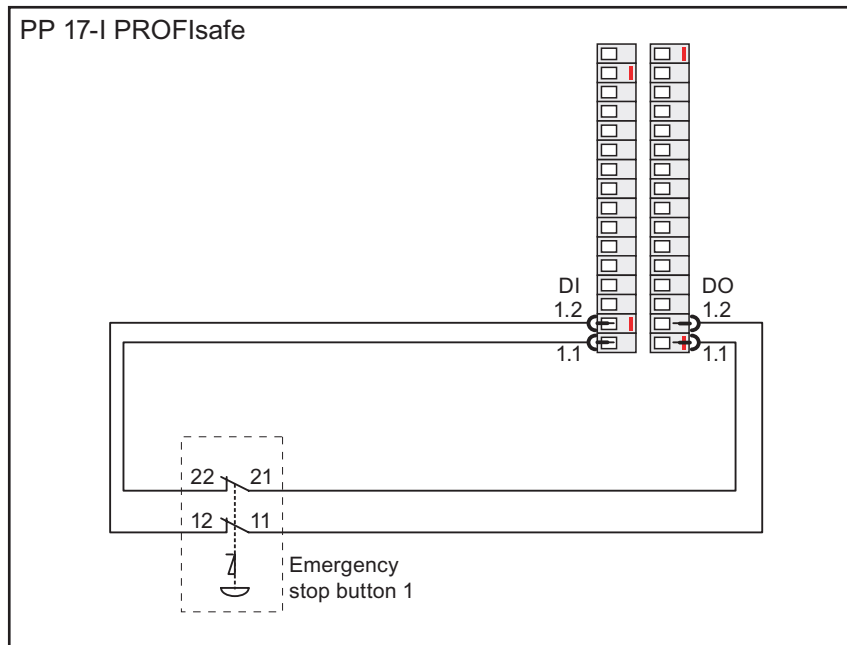
All digital inputs and digital outputs that are not assigned to a fail-safe channel may not be connected with low-impedance (short-circuited).

---

## Fail-safe Wiring of Emergency Stop Buttons

Proceed as follows:

1. Connect emergency stop key 1 to the F channel 1 (digital inputs DI1.1 and DI1.2, digital outputs DO1.1 and DO1.2)



2. If you wish to use another emergency stop key, wire it to the F channel 2 (digital inputs DI2.1 and DI2.2, digital outputs DO2.1 and DO2.2)
3. Wire further emergency stop keys to the subsequent F channels gaplessly from bottom to top.
4. Perform a function test after wiring an emergency stop button.

## See also

Front-sided Control Elements and Displays (Page 5-1)

## 4.5 Mounting the HMI device

### Requirement

When mounting an HMI device you will need eight anchor 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.

### Mounting the HMI device

---

#### Notice

Always mount the HMI device according to the 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 device into the mounting cut-out.
3. Place two anchor clamps each above, below and to the sides of the HMI device in the cavities provided.

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.

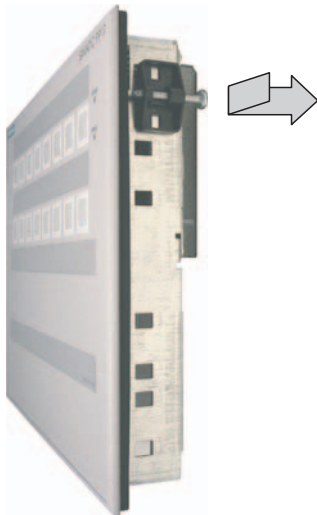


Figure 4-5 Installing the mounting clamp on the HMI device

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

---

**Notice**

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

If it does, dismount the HMI device and repeat steps 1 to 4.

---

**See also**

Accessories (Page 1-3)

## 4.6 Connecting the HMI device

**Requirement**

Additionally installed standard components have been connected to the HMI device. The HMI device must be mounted according to the specifications of these operating instructions.

**Connection sequence**

Connect the HMI device in the following sequence:

1. Equipotential bonding
2. Power supply  
Perform a power-up test to ensure the correct polarity of the power supply.
3. PLC

---

**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.

---

### Connecting the Cables

When connecting the cables, ensure that you do not bend any of the contact pins.

Secure the connectors with screws.

Always use shielded data cable.

Always use standard cables.

For further information, refer to the SIMATIC HMI Catalog ST 80.

**See also**

Safety Instructions (Page 2-1)

**4.6.1 Ports**

**Position of the ports**

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

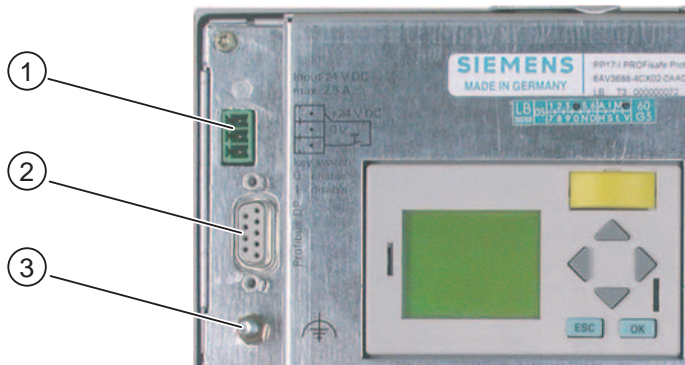


Figure 4-6 Interfaces of the HMI device

- ① Connection for power supply and enable input
- ② RS 485 interface (IF 1B)
- ③ Chassis ground terminal

**See also**

Connecting the equipotential bonding circuit (Page 4-10)

Connecting the power supply (Page 4-13)

Connecting the PLC (Page 4-15)

**4.6.2 Connecting the equipotential bonding circuit**

**Potential differences**

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

Potential differences may develop when a system is connected to different mains.



## General requirements of equipotential bonding

Potential differences must be reduced by means of 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<sup>2</sup>.
- 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 connection diagram.

---

### Notice

#### Grounding conductor

Cable shielding is not suitable for equipotential bonding. Always use the prescribed equipotential bonding conductors. The minimum cross-section of a conductor used for equipotential bonding is 16 mm<sup>2</sup>. When you install PROFIBUS DP networks, always use cables with a sufficient cross-section since otherwise the interface modules may be damaged or destroyed.

---

Connection diagram

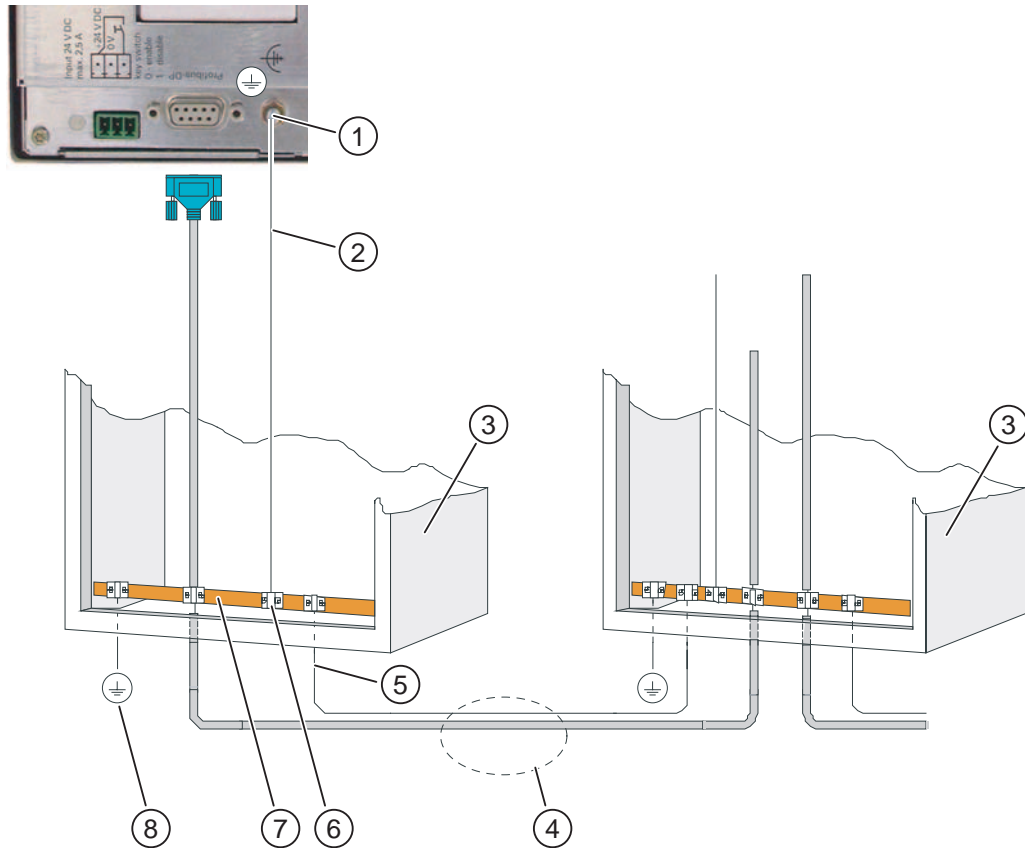


Figure 4-7 Installing the equipotential circuit

- ① Chassis ground terminal on the HMI device (example)
- ② Equipotential bonding conductor cross-section: 4 mm<sup>2</sup>
- ③ Cabinet
- ④ Parallel routing of the equipotential bonding conductor and data cable
- ⑤ Equipotential bonding conductor cross-section: min. 16 mm<sup>2</sup>
- ⑥ Cable clip
- ⑦ Voltage bus
- ⑧ Grounding connection

See also

Electromagnetic compatibility (Page 2-4)  
Ports (Page 4-10)

### 4.6.3 Connecting the power supply

#### Connection diagram

The following figure shows the connection of the HMI device to the power supply.

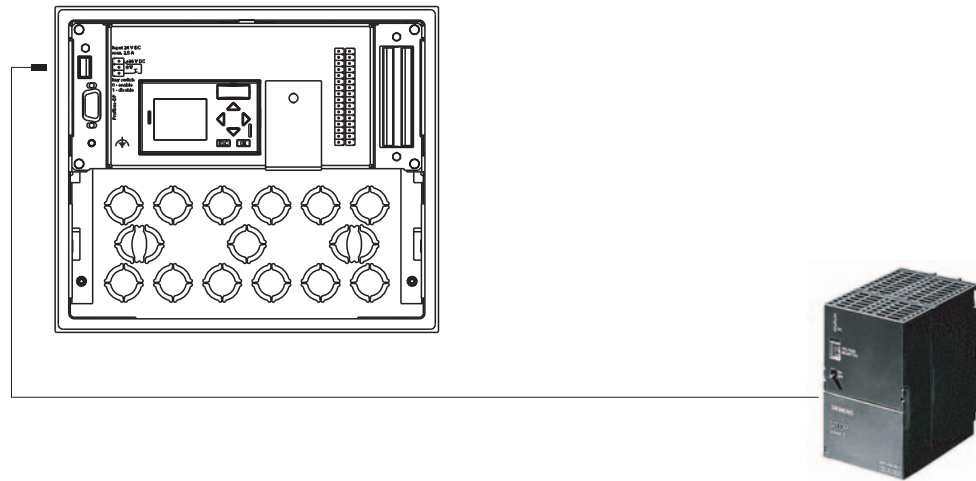


Figure 4-8 Connecting the power supply

#### Note when connecting

The power terminal block is included in the assembly kit and is designed for conductors with a maximum cross-section of 1.5 mm<sup>2</sup>.

### Connecting the terminal block

---

#### Notice

#### Damage

Pressure on the screwdriver may damage the HMI device socket if the terminal block is plugged in when you tighten the screws.

Always remove the terminal block to connect the wires.

---

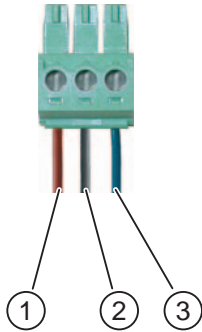


Figure 4-9 Connecting the terminal block

- ① DISABLE (enable input)
- ② GND
- ③ +24 VDC

Connect the power supply cables to the terminal block as shown in the figure above. Ensure that the cables are not crossed. Refer to the label showing the pin-out 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

Ensure safe electrical insulation of the power supply. Always use power supply modules that conform to IEC 364-4-41 or HD 384.04.41 (VDE 0100, Part 410).

Only use power supplies that fulfill the standards SELV (Safety Extra Low Voltage) and PELV (Protective Extra Low Voltage)!

The power supply must always be within the specified range to prevent malfunctions on the HMI device.

#### Equipotential bonding

Therefore, wire the 24 V output of the power supply to the equipotential circuit.

---

### See also

Ports (Page 4-10)

## 4.6.4 Connecting the PLC

### Connection diagram

The following figure shows the connection of the HMI device to the PLC.

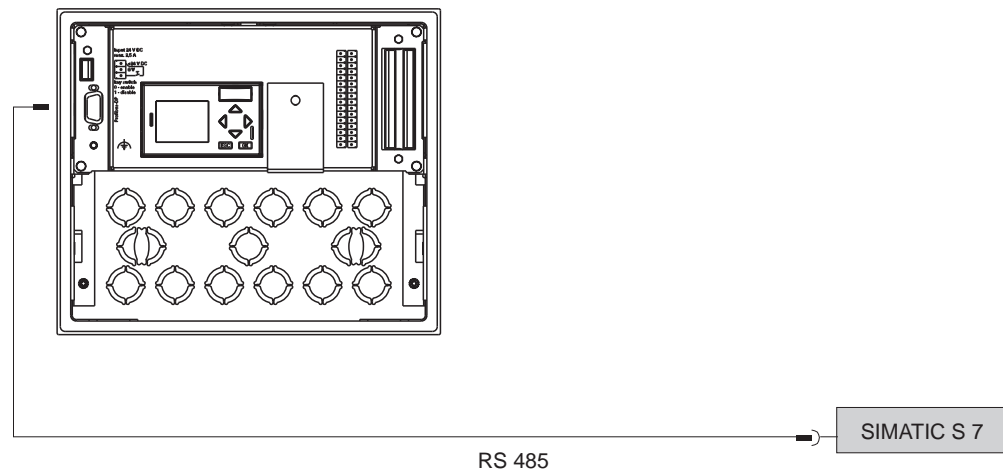


Figure 4-10 Connecting the PLC

---

### Notice

Always use the approved cables to connect a SIMATIC S7 PLC.

---

Standard cables are available for the connection. You will find additional notes on this subject in the SIMATIC HMI Catalog ST 80 or in the SIMATIC NET Catalog IK PI.

### Configuring the interface

A configuration module for configuring the interface to the controller is located on the back of the HMI device.

### See also

Configuring the PROFIBUS DP Interface (Page 6-14)

Ports (Page 4-10)

## 4.7 Switching on and testing the HMI device

### Prerequisites for Fail-safe Operation



---

#### Caution

When using fail-safe mode, always check the following settings in HW Config of the SIMATIC Manager before commissioning:

- The number of connected emergency stop buttons must match the configuration of the HMI device in HW Config.
  - The modules "Emergency Stop SIL2" or "Emergency Stop SIL3" must be configured according to the required safety class.
- 

Activate the host before switching on, otherwise a fault will occur in SIL3/cat. 4.

### Procedure

Proceed as follows:

1. Connect the terminal block 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 following message appears on the display of the configuration module during startup:

```
PP17 V2.xx  
START
```

In this message "2.xx" stands for the fail-safe version of the HMI device.

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.

### 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.
- The following message is shown on the display of the configuration module:

```
PP17 V2.xx  
READY
```

Afterwards, perform a lamp test.

## **Switching Off the HMI Device**

Options for switching off the HMI device:

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

The system goes to a safe state in fail-safe mode.

## **See also**

Front-sided Control Elements and Displays (Page 5-1)

Carry out lamp test (Page 8-3)

Configuring the PROFIBUS DP Interface (Page 6-14)

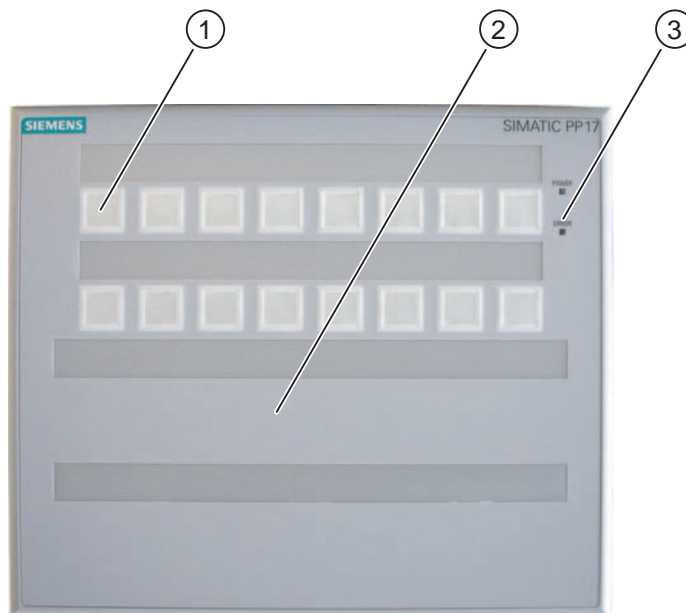




## Control Elements and Displays

### 5.1 Front-sided Control Elements and Displays

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 PLC is set as long as the key is pressed.
- Switch function: Pressing a key sets the corresponding bit in the PLC, a second press of the key sets it back.

Colored surface LEDs are integrated in each key. They can be used to indicate bit states of the connection PLC.

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:

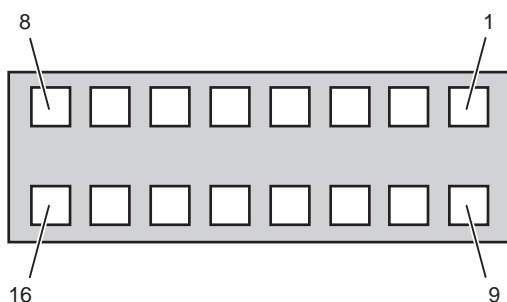


Figure 5-1 Numbering of the keys and LEDs

### LED "POWER"

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 (normal mode)	A PROFIsafe fault has occurred.	Diagnose and rectify the fault.
LED lights (normal mode)	A PROFIBUS fault has occurred.	Diagnose and rectify the fault.
LED blinks (lamp test)	A lamp test is currently being carried out.	End the lamp test by releasing the key assigned to the function or by resetting the two LED bits from the PLC.
LED lights (hardware test mode)	A hardware test is being performed.	Stop the hardware test using the menu of the configuration module or reboot the HMI device.

### Additional Standard Components

Knockout apertures are provided in the lower section of the HMI device for mounting additional standard components. A maximum of 12 additional components can be mounted and connected to the digital inputs outputs on the back of the HMI device.

A maximum of four emergency stop keys 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 5-6)

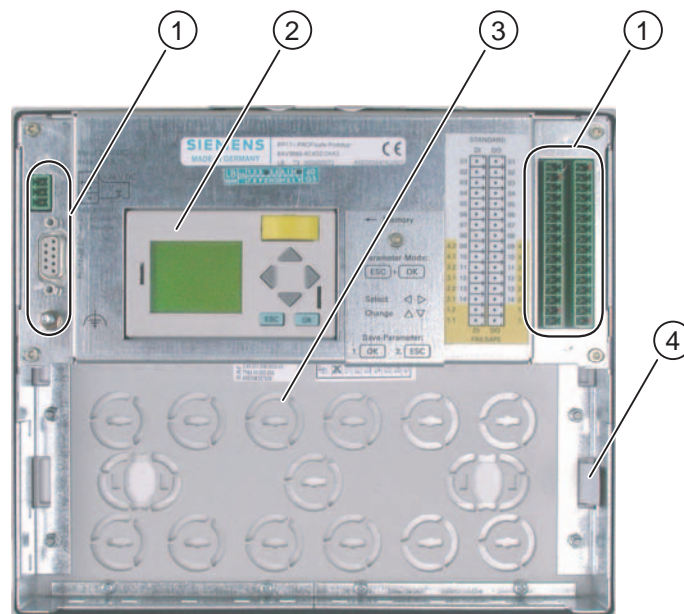
Mounting Standard Components (Page 4-2)

Wiring a Standard Component (Page 4-5)

Carry out lamp test (Page 8-3)

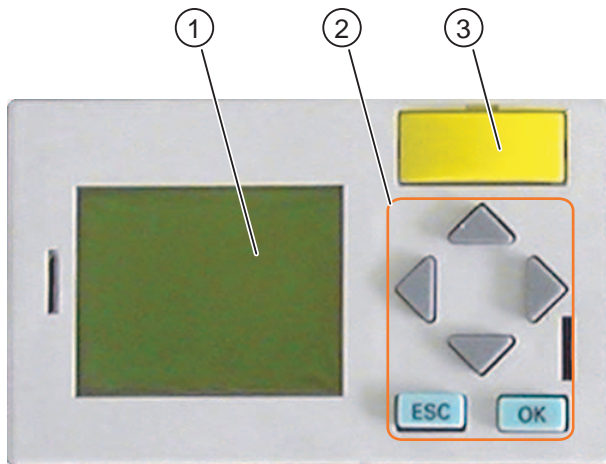
## 5.2 Backside HMI Components, LEDs and Ports

### Back of the HMI Device



- ① Ports
- ② Configuration module
- ③ Knockout apertures for mounting standard components
- ④ Labeling strips

### Configuration Module



- ① Display
- ② Cursor keys and function keys
- ③ Memory module

You can perform the following tasks with the configuration module:

- Configure the HMI-device interface to the PLC
- Perform a hardware test

A menu guides you through both tasks.

All parameters for the interface to the PLC are saved in the memory module of the HMI device. The memory module can be removed and used in another HMI device. Therefore it is not necessary to reconfigure the interface when exchanging the HMI electronics or the entire HMI device.

---

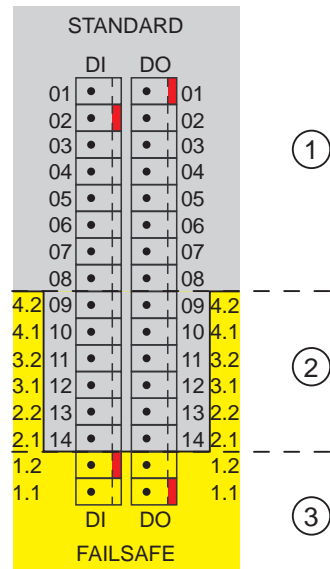
#### Note

A memory module for a PP17-I standard device may not be used for a fail-safe PP 17-I PROFIsafe.

---

## 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.



- ① Digital inputs DI01 to DI08, digital outputs DO01 to DO08
- ② Configurable:
  - Standard digital inputs DI09 to DI14, standard digital outputs DO09 to DO14
  - or
  - F channels 2 to 4: DI2.1 to DI4.2 and DO2.1 to DO4.2
- ③ F channel 1: DI1.1 and DI1.2, DO1.1 and DO1.2

Each F channel uses two digital inputs and two digital outputs. You set the number of F channels used in STEP 7.

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

- Grey background: Assignment for standard mode
- Yellow background: Assignment for fail-safe mode

## 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 PLC.

**See also**

- Design of the HMI Device (Page 1-2)
- Testing Hardware (Page 8-1)
- Configuring the PROFIBUS DP Interface (Page 6-14)
- Wiring a Standard Component (Page 4-5)
- Configuring the HMI device in STEP 7 (Page 6-6)

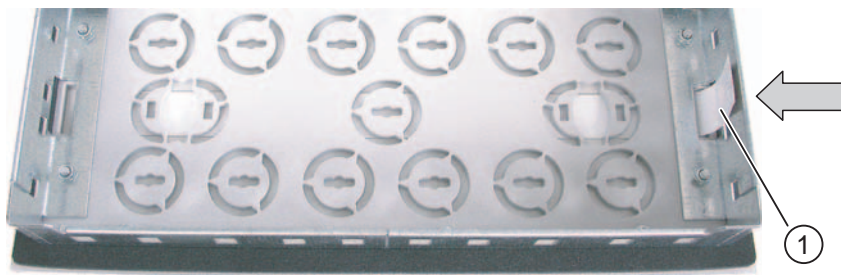
## 5.3 Labeling of Keys or Standard Components

### Labeling of Keys or Standard Components

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

The HMI comes with a sheet of removable labeling strips.

Additional sets of labeling strips can be ordered under 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.

---

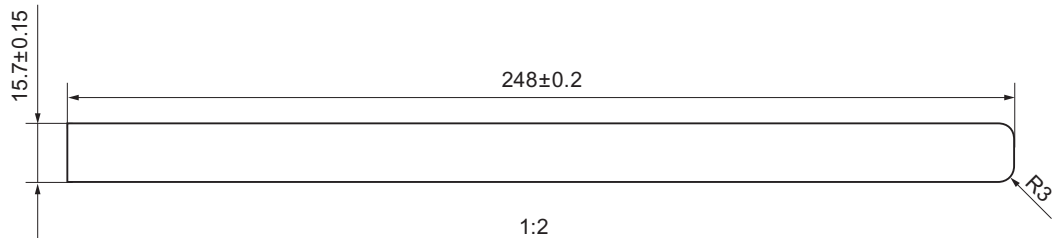
**Note**

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.

---

## Printing Labeling Strips

The labeling strips have the following dimensions:



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

["http://www.siemens.com/automation/support"](http://www.siemens.com/automation/support)

Observe the information in this file.

Printable foil or paper can be used as labeling strips. The permitted thickness of the labeling strip is 0.15 mm.

## Procedure

Proceed as follows:

1. Edit and then print the template.

You can also print blank templates and label them manually.

---

### Notice

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

---

2. Cut out labeling strips  
Clip the corners of the labeling strips to make it easier to insert them into the guides.
3. Remove any old labeling strips.
4. Slide the labeling strips into the guide.

---

### Note

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

---

5. Slide the labeling strips into the guide up to the end stop.

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

## See also

Front-sided Control Elements and Displays (Page 5-1)





## Configuring the HMI device

### 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.

#### Requirements

- The HMI is mounted and connected
- The FB "F\_PP17I\_SIL3" 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: Integrate GSD file from CD in STEP 7	Menu command in HW Config of SIMATIC Manager: "Tools > Install GSD file..."	Chapter 6.2	
Configuring the module "PP17_S inputs / outputs"	SIMATIC Manager HW Config, object properties of module "PP17_S inputs / outputs", tabs "Configure" and "Address / ID"	Chapter 6.3 Chapter 6.4	
Configuration for modules "Emergency Stop SIL2" or "Emergency Stop SIL3"	SIMATIC Manager HW Config, object properties of module "Emergency stop SIL2" or "Emergency stop SIL3" tabs "Address / ID" and "PROFIsafe"	Chapter 6.3 Chapter 6.4	
If "Emergency stop SIL3" is configured: FB "F_PP17I_SIL3" integrate in safety program and wire up	Safety program S7 Distributed Safety	Chapter 6.5	
Configure PROFIBUS-DP interface	Configuration module on the backside of the HMI device	Chapter 6.6	
Testing Hardware	Configuration module on the backside of the HMI device	Chapter 8.2	

### Further Information

You will find further information regarding 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 Integrating the GSD File in STEP 7

### Principle

If the HMI device is not listed in the hardware catalog of HW Config, you need to integrate the valid GSD (device database) files for the HMI device in the STEP 7 database. The GSD files are available on the documentation CD or in the Internet at the following address:

["http://www.siemens.com/automation/support"](http://www.siemens.com/automation/support)

### Integrating a GSD File

Proceed as follows:

1. Select the menu command "Options > Install GSD Files..." in the "HW Config" of the SIMATIC Manager.
2. Use the "Browse" function to open the drive where the GSD file is located (if you are using the CD, the CD drive of your PC).

The GSD files in the selected folder are displayed.

3. Select the desired GSD file and click on "Install".

The desired GSD file is then integrated into the STEP 7 database.

### Result

The HMI device is now shown in the hardware catalog of HW Config and can be inserted into a project.

### See also

Configuring the HMI device in STEP 7 (Page 6-6)

## 6.3 Communication between the HMI Device and the PLC

### Introduction

You configure the communication between the HMI device and PLC in the HW Config of the STEP 7 project.

You configure the parameters in the object properties of the following modules:

- "PP 17-I PROFIsafe inputs / outputs"
- "Emergency Stop SIL2" or "Emergency Stop SIL3"

### Object Properties of the Module "PP 17-I PROFIsafe inputs / outputs"

- Tab "Configure":

Parameter	Meaning
Number of emergency stops	Number of fail-safe wired emergency stop buttons (1 to 4)
Pulse stretching n*20 ms	Short touch of the key increases the specified value by 20 ms.
Lamp test	The lamp test is carried out by pressing the defined key
Function key 1 ... Function key 16	Function mode of respective key as button or switch
Function digital input 1 ... Function digital input 14	Function mode of respective digital input in standard mode: As button or switch
Mode LED 1 ... Mode LED 16	Configurable mode of respective LED: <ul style="list-style-type: none"> <li>• Flashing green</li> <li>• Yellow</li> <li>• Flashing red</li> <li>• Flashing yellow</li> </ul> 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.

- Tab "Address / ID":

Parameter	Meaning
Input > Address > Start of Address Area	Start of address range in which the standard digital inputs of the HMI are mapped. Predefined: 512 If you wish to call the signals of the standard digital inputs via a process image, enter an address range < 512.
Input > Process Image	Process image to which the address range belongs You can only select a process image if the address range is < 512.
Output > Address > Start of Address Area	Start of address range in which the standard digital outputs of the HMI device are mapped. Predefined: 512 If you wish to call the signals of the standard digital outputs via a process image, enter an address range < 512.
Output > Process Image	Process image to which the address range belongs You can only select a process image if the address range is < 512.

**Object Properties of Module "Emergency Stop SIL2" or "Emergency Stop SIL3"**

- Tab "Address / ID":

Parameter	Meaning
Output > Address > Start of Address Area	Start of address range in which the standard digital outputs of the fail-safe channels are mapped. Predefined: 520 If you wish to call the signals of the fail-safe channels via a process image, enter an address range < 512.
Output > Process Image	Process image of the address area You can only select a process image if the address range is < 512.
Input > Address > Start of Address Area	Start of address range in which the standard digital inputs for the fail-safe channels are mapped. Predefined: 520 If you wish to call the signals of the digital inputs for fail-safe channels via a process image, enter an address range < 512.
Input > Process Image	Process image to which the address range belongs You can only select a process image if the address range is < 512.

- Tab "PROFIsafe":

Parameter	Meaning
F_Check_SeqNo	Inclusion of the sequence numbers in the consistency check (CRC) of the fail-safe user data frame These parameters cannot be changed.
F_SIL	Safety class of the fail-safe HMI device <ul style="list-style-type: none"> <li>• With "Emergency Stop SIL2": SIL2 (corresponds to category 3)</li> <li>• With "Emergency Stop SIL3": SIL3 (corresponds to category 4)</li> </ul> These parameters cannot be changed.
F_CRC_Length	Length of the CRC signature. These parameters cannot be changed.
F_Par_Version	Selected PROFIsafe mode. These parameters cannot be changed.
F_Source_Add	PROFIsafe address used to uniquely identify the source. The address is assigned automatically. The "F_Source_Add" parameter can have a value between 1 and 65534.
F_Dest_Add	PROFIsafe address used to uniquely identify the destination. The address is assigned automatically. The "F_Dest_Add" parameter can have a value between 1 and 1022. You can change the value for "F_Dest_Add". The value set for F_Dest_Add must be entered on the HMI device as a PROFIsafe address.
F_WD_Time	Watchdog time in the fail-safe DP standard slave A valid current safety message frame must come from the F CPU within the monitoring time period. Otherwise, the fail-safe DP standard slave goes to the safe state. The "F_WD_Time" parameter can be set in 1 ms increments.. The monitoring time should be between 150 ms and 1000 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 optional package S7 Distributed Safety. You can find the current version of this table on the Internet at the following address: <a href="http://www.siemens.com/automation/support">"http://www.siemens.com/automation/support"</a> , article 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.

---

**Further Information about Configuring F I/Os in STEP 7**

You will find further information regarding 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".

**See also**

Configuring the PROFIBUS DP Interface (Page 6-14)

Configuring the HMI device in STEP 7 (Page 6-6)

General Specifications (Page 9-1)

## 6.4 Configuring the HMI device in STEP 7

### Introduction

To enable communication between the PLC and the HMI device, you need to configure the HMI device in "HW Config" of the SIMATIC Manager.

### Requirement

- The HMI device has been inserted into the STEP 7 project.  
If the HMI device is not listed in the hardware catalog of HW Config, you need to integrate the valid GSD (device database) files for the HMI device in the STEP 7 database.
- The "Emergency Stop SIL2" or "Emergency Stop SIL3" module is inserted.
- The "PP 17-I PROFIsafe in / outputs" module is inserted.

---

**Note**

The HMI must always include module "PP 17-I PROFIsafe in / outputs" in HW Config.

---

## Configure slot for "PP 17-I PROFIsafe inputs / outputs"



---

### Caution

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

---

1. In the context menu for "PP 17-I PROFISAFE inputs / outputs" select the "Object properties" entry.  
The "Properties DP Slave" dialog window opens.
2. In the "Configure" tab, open the folder "Station parameters > device specific parameters".
3. Enter the number of emergency stop buttons used.
4. Enter a value for the pulse stretching.
5. If necessary, select a different key for the lamp test.
6. Define the the individual keys and digital inputs for standard mode either as buttons or switches.
7. Set the mode for each LED.
8. Switch to the "Address / ID" tab.  
The start value for both address ranges are predefined with the value "512" for both the "Input" and "Output" groups. The signals for the standard digital inputs and outputs of the HMI device are mapped in the given address ranges.
9. Check the predefined start values of the address ranges.
10. If necessary, change the address range. If you wish to call the signals of the digital inputs or digital outputs via a process image, enter an address range < 512.
11. Only if the address range < 512: Select another process image for the start of the address range if necessary.
12. Save your settings with "OK".

### Configure PROFIsafe parameters for slot "Emergency Stop SIL2" or "Emergency Stop SIL3"

1. In the context menu for "Emergency Stop SIL2" or "Emergency Stop SIL3" select the "Object properties" entry.  
The "Properties DP Slave" dialog window opens.  
In the "Address / ID" tab, the start address ranges for the "Inputs" and "Outputs" groups are both predefined with the value "520". The signals for the standard digital inputs and outputs of the fail-safe channels are mapped in the given address ranges.
2. Check the predefined start values of the address ranges.
3. If necessary, change the address range. If you wish to call the signals of the digital inputs or digital outputs via a process image, enter an address range < 512.
4. Switch to the "PROFIsafe" tab.
5. Check the parameters shown.
6. If you want to change a parameter, select it and click on the "Change Value" button.  
A selection dialog is displayed listing the possible parameter values.
7. Select the desired value and close the dialog with "OK".
8. Change other parameters if you wish and then 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 PLC.

### Further Information about Configuring F I/O in STEP 7

Further information about configuring F I/O in STEP 7 is available in the manual, "S7 Distributed Safety Configuring and Programming".

### See also

- Front-sided Control Elements and Displays (Page 5-1)
- Integrating the GSD File in STEP 7 (Page 6-2)
- Overview (Page 6-9)
- Assignment of PLC Bits in the Process Images (Page 9-9)
- Digital Inputs and Outputs (Page 9-8)
- Communication between the HMI Device and the PLC (Page 6-3)



## 6.5 Configure FB "F\_PP17I\_SIL3"

### 6.5.1 Overview

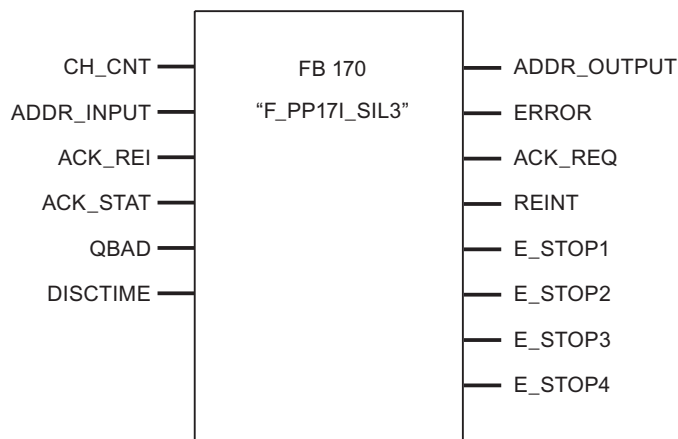
#### SIL3/Cat. 4

Should safety class SIL3/cat. 4 be required, the FB "F\_PP17I\_SIL3" must be called in the safety program. This FB is supplied on a CD together with the documentation for the HMI device.

You can also find the FB on the Internet at the following address:

["http://www.siemens.com/automation/support"](http://www.siemens.com/automation/support)

#### Configuring in STEP 7



The following must be observed when integrating the FB "F\_PP17I\_SIL3" into the control program:

- The FB must be configured so that it is uniquely associated to the HMI device with SIL3/cat. 4.
- The inputs and outputs of the FB are not automatically defined with valid values and must be manually wired as part of the configuration.

Please take special care that the values for the parameters "ADDR\_INPUT" and "ADDR\_OUTPUT" match the values that are configured in HW Config for the input and output ranges of the process image.

---

#### Note

In SIL3/ Cat. 4 access to the start range of the process image is not allowed.

---

Detailed information about configuring the HMI device as a fail-safe DP standard slave is available in the manual, "Distributed Safety - Configuration and Programming".

### Determining the Version of FB "F\_PP17I\_SIL3" in STEP 7

Proceed as follows:

1. Open the "LAD/STL/FBD" editor in STEP 7.
2. Navigate in the left pane to "Libraries > F\_FB\_PP17I\_SIL3 > F\_FB\_PP17I".
3. In the shortcut menu for the "FB 170" entry, select the "Object Properties" command.
4. Select the "General Part 2" tab.
5. The version of the FB "F\_PP17I\_SIL3" is shown in the field "Version (Header)"

## 6.5.2 FB170 "F\_PP17I\_SIL3"

### Validity

This description applies to version 2.3 of the FB "F\_PP17I\_SIL3".

### Purpose

The FB "F\_PP17I\_SIL3" is required in order to achieve safety class SIL3/cat. 4 with PP 17-I PROFIsafe.

The FB "F\_PP17I\_SIL3" fulfills the following tasks:

- You can use the FB SIL3/cat. 4 to determine which emergency stop button has been pressed.

In order to do so, you query the state of outputs E\_STOP1 to E\_STOP4 of the FB.

- The FB produces a test pattern which assists in the investigation of errors during discrepancy evaluation.

The test pattern is transferred to the HMI device from the FB via the configured output byte. The HMI device then returns this test pattern back to the FB's configured input byte. If the HMI device returns a faulty test pattern, discrepancy evaluation is started. After an assignable time interval (the so called discrepancy time) has elapsed, a check is performed to determine whether or not the discrepancy still exists. If so, then a discrepancy error exists. This will be reported to the ERROR output.

- After passivation of the HMI device, the FB executes the reintegration following user acknowledgement.

### Fail-safe I/O DB

An F-I/O DB is automatically generated for each F-I/O when the program is compiled by HW Config. The F-I/O DB contains variables that the user has to evaluate in the safety program.

Detailed information regarding the accessing F-I/Os and working with F-I/O DBs can be found in the "SIMATIC S7-Distributed Safety Configuration and Programming" manual in the "F-I/O access" chapter.

## Mode of operation

The FB "F\_PP17I\_SIL3" creates a test pattern. This test pattern is output to the PP 17-I PROFIsafe and then read back. If a faulty test pattern is read back, a discrepancy error is determined following the expiration of the discrepancy time.

If an emergency stop button is pressed, the following procedure is initiated:

- The fail-safe channels associated with the pressed emergency stop button are excluded from the test.
- The associated output E\_STOPn will be set to "0".
- The remaining fail-safe channels will continue to be queried and tested.

In case of error the following procedure is initiated:

- All emergency stop outputs E\_STOP1 to E\_STOP4 will be set to "0" (passivated).
- The error output ERROR will be set to "1".
- In the event of communications errors, the input data will be set to "0".
- Errors will be stored so that an acknowledgement request can take place after the fault is eliminated.

## Transient behavior

---

### Notice

The startup behavior of the FB "F\_PP17I\_SIL3" has changed as of version 2.3 and is not compatible with version 2.1. A user acknowledgement is no longer necessary following startup.

Behavior at reintegration and startup is now identical.

---

The FB "F\_PP17I\_SIL3" outputs all possible test patterns at startup (floating "0" at all bit positions).

The following options are available for evaluating the test pattern:

- If the test pattern is read back without errors, the outputs E\_STOP1 to E\_STOP4 are output.
- If the test pattern is read back with errors, a startup error is recognized. The error output ERROR will be set to "1". Cause for the startup error can be a PP 17-I PROFIsafe which is turned off, for example.

## Malfunction

In the following cases, the output ERROR will be set to "1":

- A value has been configured for input CH\_CNT outside of the range 1 to 4.
- A discrepancy error has occurred.
- QBAD = 1 has been signaled from the F-I/O DB.
- A startup error has occurred.

**Note**

Set the watchdog interrupt to no longer than 200 ms. Otherwise, the FB will recognize a startup error.

**Inputs**

Parameters	Data type	Description
CH_CNT	INT	Number of emergency stop buttons used Range: 1 to 4 If you configure a value outside of the range, the parameter ERROR will be set to "1". You have to supply the parameter CH_CNT with a constant value. A change during operation or the use of a variable (bit memory, for example) is not permitted.
ADDR_INPUT	WORD	Start address of the inputs in process image The value must match the value configured in HW Config. In each case, only lower value byte of the given input word will be evaluated.
ACK_REI	BOOL	Acknowledge switch (input, memory bit, or higher-level user interface) for acknowledgement after passivation.
ACK_STAT	BOOL	Configure bit 2.2 of the F-I/O DB for this input (ACK_REQ). ACK-REQ = 1 signalizes that a user acknowledgement is required for the reintegration of the affected F-I/O. The F system sets ACK_REQ = 1 as soon as the error has been corrected and a user acknowledgement is possible. After successful acknowledgement, ACK_REQ is reset to 0 by F system.
QBAD	BOOL	Configure bit 2.1 of the F-I/O DB for this input (QBAD). QBAD indicates if an F-I/O passivation has occurred.
DISCTIME	TIME	Discrepancy time for error The discrepancy time has to be longer than three times the cyclic interrupt time. If the discrepancy time is less than three times the cyclic interrupt time, the availability of the plant is reduced because a sporadic discrepancy error may occur.

## Outputs

Parameters	Data type	Description
ADDR_OUTPUT	WORD	Start address of the outputs in process image The value must match the value configured in HW Config. In each case, only lower value byte of the given output word will be evaluated.
ERROR	BOOL	In the following cases, the output ERROR will be set to "1": <ul style="list-style-type: none"> <li>• A value has been configured for input CH_CNT outside of the range 1 to 4.</li> <li>• A discrepancy error has occurred.</li> <li>• QBAD has been signaled from the F-I/O DB.</li> <li>• A startup error has occurred.</li> </ul>
ACK_REQ	BOOL	ACK_REQ = "1" indicates that the error that lead to passivation has been rectified and can therefore be re-acknowledged.  ACK_REQ = 1 signalizes that acknowledgement via user acknowledgement on input ACK is required. The F application module sets ACK_REQ = 1 as soon as the HMI device has been reintegrated. After successful acknowledgement, the F application module resets ACK_REQ to 0.
REINT	BOOL	Configure bit 0.2 of the F-I/O DB for this input (ACK_REI). In order to reintegrate the F-I/O after an error has been eradicated, a user acknowledgement with positive edge to the variable ACK_REI of the F-I/O DB is required.
E_STOP1 E_STOP2 E_STOP3 E_STOP4	BOOL	Displays the status of the emergency stop channels. 0 = Emergency stop depressed or error 1 = Emergency stop not depressed  The values can be reused for example in process visualization or in the application program.

## See also

Error Elimination and Reintegration (Page 7-9)

## 6.6 Configuring the PROFIBUS DP Interface

### Introduction

You can configure the PROFIBUS-DP interface using the configuration module on the back of the HMI device. The configured parameters are stored in the memory module of the HMI device.

A menu guides you through the configuration.

### Configuration in the Factory State

The HMI device is configured as follows in the factory state:

Parameter	Meaning	Default setting
DP-ADR	PROFIBUS address	3
F_ADR	PROFIsafe address	0
BAUDRATE	Bus speed	1.5 Mbaud

---

#### Note

The HMI device cannot be used in fail-safe mode with this setting because no valid PROFIsafe address is set.

---

### Requirement for the Configuration

The configuration module on the back of the HMI device is accessible.

The HMI device is connected to the power supply and PLC.

You know the values for the following parameters in HW Config of the STEP 7 project:

- PROFIBUS address
- PROFIsafe address (only required for fail-safe operation)
- Baud rate of the bus speed

---

#### Note

Ensure that you configure the HMI-device values to match the values defined in HW Config of the STEP 7 project.

---

### Procedure - Setting Parameters

1. When the HMI device starts up, press the keys  +  on the configuration module.

The configuration mode is activated. The display shows the menu command "DEFAULT YES/NO".

2. Select "NO" with the  and  keys and confirm your selection with .

3. In menu "DP-ADR" use the ▲ and ▼ keys to set the same PROFIBUS address as is configured in HW Config of the STEP 7 project for the HMI device and confirm with  .  
  
If you want to configure multidigit addresses, use the ◀ and ▶ keys to swap between the digits.
4. In menu "F-ADR" set the same PROFIsafe address as is configured for the "Emergency-Stop" slot in HW Config of the STEP 7 project.
5. In menu "BAUDRATE" set the same speed as is configured for PROFIBUS in HW Config of the STEP 7 project.
6. Exit configuration mode with  .  
  
The specified parameters are now saved. The HMI device resumes normal operation.

### Procedure - Resetting to Factory State

1. When the HMI device starts up, press the keys  +  on the configuration module.  
  
The configuration mode is activated. The display shows the menu command "DEFAULT YES/NO".
2. Select "YES" with the ▲ and ▼ keys and confirm your selection with  .
3. Exit configuration mode with  .  
  
All parameters have now been reset to the factory state. The HMI device resumes normal operation.

### Result

The specified parameters are stored in the memory module of the configuration module.

### See also

- Connecting the PLC (Page 4-15)
- Backside HMI Components, LEDs and Ports (Page 5-3)
- Communication between the HMI Device and the PLC (Page 6-3)





# Fail-safe Mode

## 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 device communicate with each other via the safety oriented PROFIsafe protocol.

---

#### Note

Activate the host before switching on, otherwise a fault will occur under SIL3/cat. 4.

---

### Safety Functions

During fail-safe operation, safety mechanisms are activated in both HMI device 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 depressed
- A fault 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 safe mode and the HMI device rendered passive. Substitution values will be set up on all fail-safe digital inputs instead of process values. 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

If an internal fault in the HMI device is recognized (for example an internal overvoltage in SIL2/ cat. 3) the following reactions occur:

- All four emergency stop buttons will be activated.
- The PROFIsafe CRC will be corrupted.
- Communication will be broken.
- The HMI device will be rendered passive.

See also

- Prerequisites for fail-safe operation (Page 3-8)
- Query the State of the Emergency Stop Buttons (Page 7-2)
- Error Diagnostics (Page 7-6)
- Error Elimination and Reintegration (Page 7-9)

7.2 Query the State of the Emergency Stop Buttons

Dependent on safety class

The method for determining which emergency stop button has been pressed depends on the safety class (SIL2/cat. 3 or SIL3/cat. 4).

Safety class SIL2/cat. 3

If you want to determine which emergency stop button was pressed under safety class SIL2/cat. 3, address the first four bits in the process image given for the inputs of slot emergency-stop SIL2.

The following table shows the configuration of the bits to the emergency stop buttons.

Bit no.	3	2	1	0
Emergency stop button no.	4	3	2	1
Wired to	DI4.1, DI4.2, DO4.1, DO4.2	DI3.1, DI3.2, DO3.1, DO3.2	DI2.1, DI2.2, DO2.1, DO2.2	DI1.1, DI1.2, DO1.1, DO1.2

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 3 pressed": 1011

Alternatively you can read the binary pattern of the input range from FB 215 "F\_ESTOP1". You will find further information regarding this FB in "S7 Distributed Safety Configuring and Programming".

### Safety class SIL3/cat. 4

Should safety class SIL3/cat. 4 be required for the HMI device, the FB "F\_PP17I\_SIL3" must be called in the safety program.

If you want to determine which emergency stop button was pressed under safety class SIL3/cat. 4, query the state of the outputs "E\_STOP1" to "E\_STOP4" of the FB.

The following values can occur on the outputs:

0 = Emergency stop button pressed or fault

1 = Emergency stop button not pressed

---

#### Note

After resetting a pressed emergency stop button, the associated output "E\_STOPn" of the FB will be reset to "1" after a brief time delay. The time delay equals the value set for the parameter "DISCTIME" of the FB.

---

### See also

Error Diagnostics (Page 7-6)

Overview (Page 7-1)

FB170 "F\_PP17I\_SIL3" (Page 6-10)

## 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 digital inputs for fail-safe channels to safe mode, i.e. the fail-safe channels of this HMI device are rendered passive. The HMI device reports the detected error to CPU via the slave diagnostics. In event of a passivation, substitution values (0) will be set up for the safety program on the fail-safe digital inputs instead of the current process values.

### Passivation

The HMI device is passivated in the following situations:

- When the HMI device is started (startup).
- Configuration errors (errors in the PROFIsafe configuration, e.g. F\_WD\_TIME too short).
- When errors occur in the fail-safe communication between the F CPU and the HMI device via the PROFIsafe safety protocol (communication error).
- Hardware errors (e.g. wire breakage, short circuit, discrepancy errors, internal errors of the HMI device).
- When an emergency stop SIL3 is configured without integration of the FB "F\_PP17I\_SIL3".
- When there are parameter assignment errors for the FB "F\_PP17I\_SIL3", parameter CH\_CNT outside of the valid value range, for example.

---

**Note**

When the HMI device is rendered passive, all fail-safe digital inputs are always assigned the substitute 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 DB. 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.

**Further Information on Passivation**

You will find further information regarding the passivation of F I/Os and F-I/O DBs in the "S7 Distributed Safety Configuring and Programming" manual.

**See also**

Error Diagnostics (Page 7-6)

## 7.4 Troubleshooting Check List

### Narrowing down faults

The following check list will support you in quickly narrowing down faults.

State of the Error LED	Further error patterns	Possible cause	Remedy
Operational phase: Start			
Off	HMI fails to integrate after startup. A system message is displayed on the configuration module of the HMI device.	Dependant on system message, more detailed information under "System messages"	Carry out the remedies as described in System Messages.
Operational phase: Fail-safe mode, lamp test not activated			
Blinks	-	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 diagnosis of numerous simultaneous "faults" with channel numbers of all channels with a configured emergency stop button.	SIL3 is set up and the HMI device receives an invalid test pattern (e.g. because the FB "F_PP17I_SIL3" is missing). Numerous hardware errors have occurred.	Check that FB "F_PP17I_SIL3" is correctly integrated and configured in the safety program. If there is no error in the configuration, check the wiring between the HMI device and all connected emergency stop buttons. If the cause of the fault cannot be located, check the HMI device.
Lit	STEP 7 module diagnosis reports "communication error"	A PROFIBUS fault has occurred. Parameters of the PROFIBUS DP interface do not match the parameters defined in HW Config.	A communication error that affects the HMI device alone suggests a fault in the HMI device. In this case, look for an error in the HMI device first. Check the parameters defined in the configuration module.
	STEP 7 module diagnosis reports "configuration error"	A PROFIBUS fault has occurred. Incorrect settings for the PROFIsafe parameters in HW Config	Check that the PROFIsafe parameters are defined as follows: F_Check_SeqNo = No check F_CRC_Length = Byte CRC F_Dest_Add = PROFIsafe address set on HMI device F_WD_Time = Minimum 2 x cycle time of the monitoring program and > call time of the safety program in time interrupt You will find details regarding the configuration settings under "Communication between the HMI and the PLC"

State of the Error LED	Further error patterns	Possible cause	Remedy
Lit	STEP 7 Module diagnosis reports "error" in channel no. 0 to 3	A PROFIBUS fault has occurred. 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 located, check the HMI device.
No defined state	STEP 7 Module diagnosis reports "Module interrupted" or "Module missing"	The HMI device has failed due to a serious internal fault.	Exchange 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 (displays and messages) are not critical to safety and therefore are not designed to be safety-related functions. That is, they are not tested internally.

### Diagnostic Options for the Fail-Safe HMI Device

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

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

For correct evaluation of LED "ERROR" ensure that the lamp test is not active, as the LED "ERROR" also blinks during lamp testing.

State of the LED "ERROR"	Type of error
Off	No errors have occurred
Blinks	PROFIsafe errors
Lit	PROFIBUS errors

- Diagnostic Functions of the HMI Device  
Slave diagnosis according to PROFIBUS standard IEC 61784-1:2002 Ed1 CP 3/1.
- Error messages on the configuration module on the back of the HMI device.  
The error messages are described in detail in the appendix.

## 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 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 fault  
Communication between the HMI as DP-slave and the CPU as DP Master has been interrupted (e.g. due to wrong PROFIBUS address or PROFIsafe address).
- HW fault  
External wiring or internal hardware fault, data corruption or procedure error.
- Configuration error  
Error in the PROFIsafe configuration

## Reading Out Diagnostic Functions

You can display the cause of the error in the module diagnostics in STEP 7 (see online help for STEP 7).

- Diagnostic information regarding communications errors and configuration errors are always assigned to channel "0".
- Diagnostic information regarding hardware errors are assigned to the fail-safe channels of the HMI device as follows:

Display in STEP 7 (Module diagnosis)	Fail-safe channel on HMI device
Channel 0	fail-safe channel 1 (DI1.1, DI1.2, DO1.1, DO1.2)
Channel 1	fail-safe channel 2 (DI2.1, DI2.2, DO2.1, DO2.2)
Channel 2	Fail-safe channel 3 (DI3.1, DI3.2, DO3.1, DO3.2)
Channel 3	Fail-safe channel 4 (DI4.1, DI4.2, DO4.1, DO4.2)

You can read out diagnostic functions (slave diagnostics) by means of SFC 13 in the standard user program (see System and Standard Functions reference manual).

## Diagnosis of PROFIsafe errors

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

### **Behavior of the HMI device in the event of a serious internal fault**

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

- The connection to PROFIBUS DP 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 diagnosis, the standard diagnosis "Module interrupted" or "Module missing" will be reported.

### **See also**

Error Elimination and Reintegration (Page 7-9)



## 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.

### Error Elimination and Reintegration

Error elimination and reintegration of the HMI device should be undertaken dependent on the type of error recognized:

Error	Error elimination	Reintegration
Communication fault	Set the same PROFIBUS address and PROFIsafe address in the HMI device as is configured in the HW Config. Check the PROFIBUS wiring and eliminate the risk of increased EMC radiation. Switch the HMI device off and on again.	The reintegration occurs after user acknowledgement in the safety program.
HW fault	Check the wiring between the HMI device and all connected actuating devices (emergency stop buttons). Switch the HMI device off and on again.	The reintegration occurs after user acknowledgement in the safety program. If the error persists, exchange the HMI device.
Configuration error	Check the settings of the PROFIsafe parameter settings in "HW Config" of the SIMATIC Manager. Switch the HMI device off and on again.	The reintegration occurs after user acknowledgement in the safety program.

After reintegration, the pending process values at the HMI's fail-safe inputs are provided again for the safety program.

You will find further information regarding the reintegration of F I/Os and the creation of user acknowledgements in the "S7 Distributed Safety Configuring and Programming" manual.



# Maintenance and servicing

## 8.1 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.

---






## 8.2 Testing Hardware

### Introduction

You can test the hardware's functionality using the configuration module on the back of the HMI device. A menu guides you through the test.

### Key Functions of the Configuration Module

The keys of the configuration module have the following functions during the hardware tests:

Key	Function
 + 	If you press this key combination during the startup of the HMI device, the hardware test is activated.
	Scroll to previous menu item.
	Scroll to next menu item.
	The test selected in the menu of the hardware test is now performed. Possible test results: OK: No error occurred ERROR: The tested function unit is defective.

### Functions of the Hardware Test

The hardware test provides the following test functions:

Function	Display on the HMI device	Description
RAM TEST	RAM OK	RAM operability test
EPROM TEST	CHECK SUM xxxx	Display the valid checksum for the respective firmware
DISPL TEST	Code of the pressed key	As long as this function is active, the code of the pressed key will be displayed on the configuration module. Press <ESC> + <OK> to deactivate the function.
KEYB. TEST	LED of pressed key on HMI device lights up yellow.	
EEPROM TEST	EEPROM OK	
ASPC2 TEST	ASPC2 OK	
DIGIO TEST	DI = xxxx DO = xxxx	Xxxx = State of the digital inputs and outputs in hexadecimal format
KEY TEST	xx	State of the enable input
KEYB. ID	xxxx	Key ID: PP17-I: 2010
EXT. MODUL	xxxx xxxx xxxx xxxx	ID of the add-on module
TEST END		End of the hardware test

### Requirements for the Hardware Test

The configuration module on the back of the HMI device is accessible.

The HMI device is connected to the power supply and PLC.

## Performing the Hardware Test

1. On the configuration module, press the keys **ESC** + **▲** when starting the HMI device.  
The hardware test is activated. The display shows the following message:  
Any key to enter display mode
2. Press any key on the configuration module to open the hardware test menu.
3. Select the desired test function with the **▲** and **▼** keys and start the function with **OK**.
4. Perform other test functions if necessary.
5. End the hardware test with the **TEST END** command or by switching off the HMI device.

## See also

Front-sided Control Elements and Displays (Page 5-1)  
Backside HMI Components, LEDs and Ports (Page 5-3)  
Carry out lamp test (Page 8-3)

## 8.3 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.

The function key for the lamp test can be configured in the HW Config of the STEP 7 project. In the factory state, key 1 (upper right) is assigned this function.

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

- The standard digital inputs are disabled. No signal transitions are reported to the PLC.
- The most recent state of all keys continues to be reported to the PLC until the device returns to normal operation. The last key press to be reported to the PLC 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 "ERROR" LED flashes.
  - The LEDs integrated in the keys of the HMI device light up.
  - 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 PLC 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 6-6)

# 8.4 Spare Parts and Repairs

## Repairs

Do not repair the HMI device yourself.

In case of repair, the HMI device must be shipped to the Return Center in Fürth. The HMI device may only be repaired at the manufacturer's site.

The address is:

A&D Return Center

Siemensstr. 2

90766 Fürth, Germany

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

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### Note

The replacement parts package for HMI device PP17 Standard may not be used for the PP 17-I PROFIsafe.

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## **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 (3x block)
- Coded and non-interchangeable terminal blocks for connecting the digital inputs and outputs (16x block each)

The service pack can be ordered from your Siemens representative.





## Technical Data

### 9.1 Dimensional Drawings

Dimension drawing

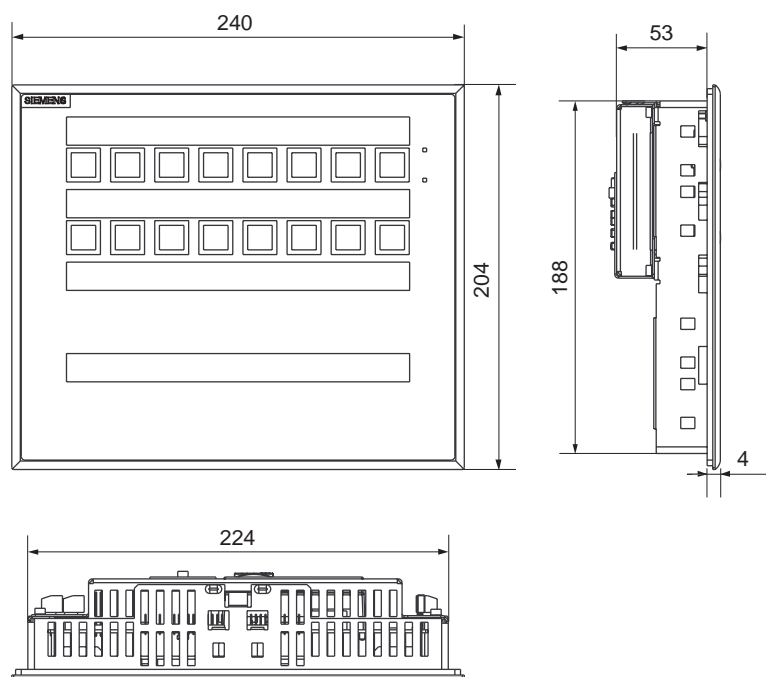


Figure 9-1 Overall dimensions of the HMI device

### 9.2 General Specifications

HMI device

Outer dimensions W x H x D	240 mm x 204 mm x 53 mm
Weight without packing	Approx. 1.13 kg

**Power Supply**

Nominal voltage	+24 VDC
Range, permissible	20.4 V to 28.8 V (-15%, +20%)
Current consumption	
<ul style="list-style-type: none"> <li>• Typical</li> <li>• Power on current surge I<sup>2</sup>t</li> </ul>	<ul style="list-style-type: none"> <li>• 0.4 A</li> <li>• 150 x 10<sup>-3</sup> A<sup>2</sup>s</li> </ul>
Fuse, internal	Electronic

**Fail-safe Mode**



**Warning**

The safety characteristics in the Technical Data apply for a proof-test interval of 10 years and a mean repair time of 8 hours.

Maximum achievable safety class	
according to IEC 61508	SIL3 (with FB "F_PP17I_SIL3")
according to prEN 954	Cat. 4 (with FB "F_PP17I_SIL3")
Safety characteristics	
high demand / continuous mode (PFH: probability of a dangerous failure per hour)	≤ 1.5e-8
Internal test time	< 1 Minute
Maximum request rate	Pressing of an emergency stop button once every 100 minutes
Maximum acknowledgement time for the F-I/O	
<ul style="list-style-type: none"> <li>• for SIL2/Cat. 3</li> <li>• for SIL3/Cat. 4</li> </ul>	<ul style="list-style-type: none"> <li>• 140 ms</li> <li>• 160 ms</li> </ul>
Minimum acknowledgement time for the F-I/O	
<ul style="list-style-type: none"> <li>• for SIL2/Cat. 3 and SIL3/Cat. 4</li> </ul>	<ul style="list-style-type: none"> <li>• 44 ms</li> </ul>
Response times of the fail-safe channels	
<ul style="list-style-type: none"> <li>• for SIL2/Cat. 3</li> <li>• for SIL3/Cat. 4</li> </ul>	<ul style="list-style-type: none"> <li>• 37 to 72 ms</li> <li>• 40 to 72 ms</li> </ul>

## 9.3 Specifications for the Digital Inputs and Outputs

### Digital inputs 24 V

Power supply <ul style="list-style-type: none"> <li>Nominal value</li> <li>Permitted range</li> <li>Value for <math>t &lt; 0.5</math> s</li> </ul>	<ul style="list-style-type: none"> <li>+24 VDC</li> <li>+20.4 to +28.8 V</li> <li>35 V</li> </ul>
Connectable	Keys, switches
Number of digital inputs <ul style="list-style-type: none"> <li>Can only be used for standard mode</li> <li>Can only be used for fail-safe operation</li> <li>Can be optionally used</li> </ul>	<ul style="list-style-type: none"> <li>8</li> <li>1 x 2</li> <li>Standard mode: 6</li> <li>fail-safe mode: 3 x 2</li> </ul>
Electrically isolated from internal logic	No
Input voltage <ul style="list-style-type: none"> <li>Nominal value</li> <li>For signal "0"</li> <li>For signal "1"</li> </ul>	<ul style="list-style-type: none"> <li>+24 VDC</li> <li>0... +5 V</li> <li>15 to 30 V</li> </ul>
Input current for signal "1"	typically 5 mA for 24 V
Delay time for digital inputs	0.3 ms
Connection of mechanical switches	possible
Bounce time	$\leq 10$ ms
Maximum cable length <ul style="list-style-type: none"> <li>For unshielded cables</li> <li>For shielded cables</li> </ul>	<ul style="list-style-type: none"> <li>1 m</li> <li>&gt; 1 m</li> </ul>
Maximum cable length for external emergency stop keys <ul style="list-style-type: none"> <li>For unshielded cables</li> <li>For shielded cables</li> </ul>	<ul style="list-style-type: none"> <li>Max. 1 m</li> <li>Max. 10 m</li> </ul>

### Digital outputs 24 V

Number of digital outputs	14
Groups of digital outputs <ul style="list-style-type: none"> <li>• Digital output DO1 to DO4</li> <li>• Digital outputs DO5 to DO8</li> <li>• Digital outputs DO9 to DO12</li> <li>• Digital output DO13 to DO14</li> </ul>	<ul style="list-style-type: none"> <li>• Group 1</li> <li>• Group 2</li> <li>• Group 3</li> <li>• Group 4</li> </ul>
Electrical isolation	No
Short-circuit protection	Yes
Permitted loads	<ul style="list-style-type: none"> <li>• resistive</li> <li>• Lamps</li> </ul>
Max. inductive energy	200 mWs
Output voltage <ul style="list-style-type: none"> <li>• For signal "0"</li> <li>• For signal "1"</li> </ul>	<ul style="list-style-type: none"> <li>• max. 2 V (no load)</li> <li>• Min. supply voltage -3 V</li> </ul>
Output current <ul style="list-style-type: none"> <li>• For signal "0"</li> <li>• For signal "1"</li> </ul>	<ul style="list-style-type: none"> <li>• Max. 1 mA</li> <li>• Cumulative current for all outputs 300 mA</li> </ul>
Operating frequency for <ul style="list-style-type: none"> <li>• Ohm</li> <li>• Lamps</li> </ul>	<ul style="list-style-type: none"> <li>• Max. 100 Hz</li> <li>• Max. 8 Hz</li> </ul>
Maximum cable length <ul style="list-style-type: none"> <li>• for unshielded cables</li> <li>• for shielded cables</li> </ul>	<ul style="list-style-type: none"> <li>• 1 m</li> <li>• &gt; 1 m</li> </ul>

### Enable output

Electrical isolation for internal logic	No
Input voltage <ul style="list-style-type: none"> <li>• Nominal value</li> <li>• for enabled input</li> <li>• for disabled input</li> </ul>	<ul style="list-style-type: none"> <li>• 24 VDC</li> <li>• 0... 5 V</li> <li>• 15...30 V</li> </ul>
Input voltage when input disabled	typically 2 mA for 24 V

## 9.4 Response Times

### Introduction

The reaction times of the fail-safe modules enter into the calculation of the reaction time of the F-system.

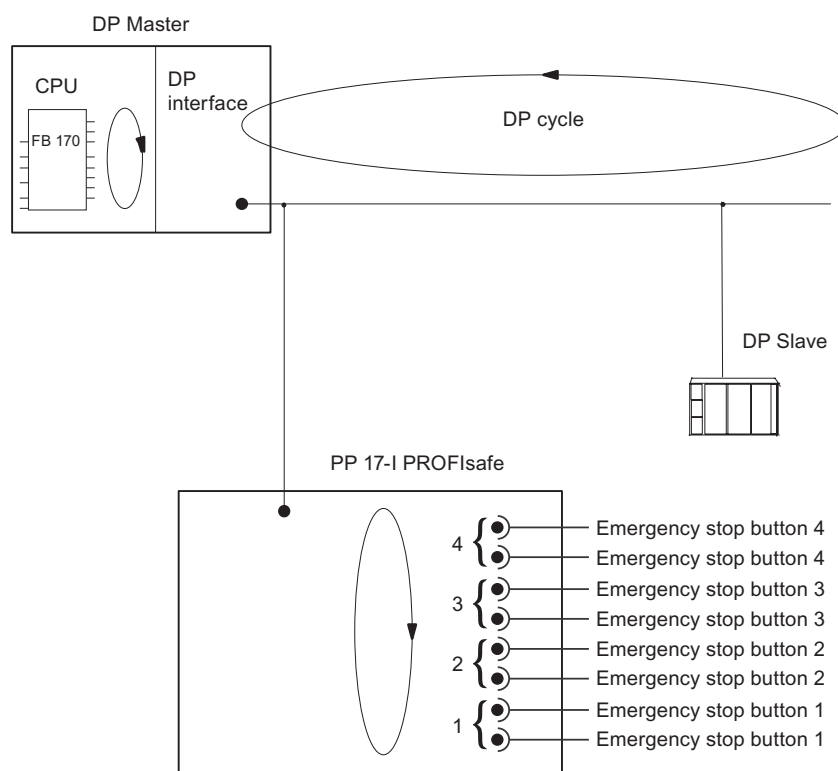


Figure 9-2 Response times between DP Master and PP 17-I PROFIsafe

### Information Regarding the Calculation of Response Times

Notes regarding the response times of DP Master can be found in the manual of the DP Master used.

The optional package "S7 Distributed Safety" 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"](http://www.siemens.com/automation/support), article ID 19138505

You will find further information regarding 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 PROFIBUS.

### **Response Times of HMI Devices**

The alarm view functionality is based on the type of HMI device used.

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

### **See also**

General Specifications (Page 9-1)

## 9.5 Description of Ports

### 9.5.1 Power supply

Plug connector, 3-pin

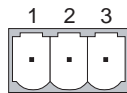


Figure 9-3 Power supply pin assignment

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

### 9.5.2 RS 485 (IF 1B)

Sub-d socket, 9-pin, with screw lock

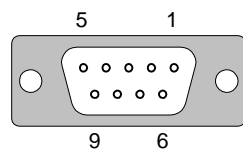


Figure 9-4 RS 485 interface pin assignment

PIN	Assignment
1	n.c.
2	n.c.
3	Data channel B (+)
4	n.c.
5	GND 5 V, floating potential
6	+5 VDC, floating potential
7	n.c.
8	Data channel A (-)
9	n.c.

### 9.5.3 Digital Inputs and Outputs

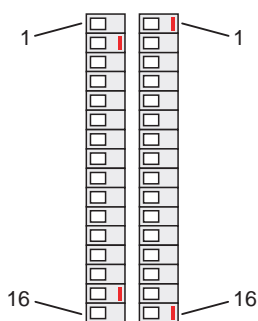


Figure 9-5 Assignment of digital inputs (left) and digital outputs (right).

#### Digital inputs

PIN	Assignment standard mode	Assignment fail-safe mode
1	DI01: Digital input 1	–
2	DI02: Digital input 2	–
3	DI03: Digital input 3	–
4	DI04: Digital input 4	–
5	DI05: Digital input 5	–
6	DI06: Digital input 6	–
7	DI07: Digital input 7	–
8	DI08: Digital input 8	–
9	DI09: Digital input 9	DI4.2: Fail-safe channel 4, digital input 2
10	DI10: Digital input 10	DI4.1: Fail-safe channel 4, digital input 1
11	DI11: Digital input 11	DI3.2: Fail-safe channel 3, digital input 2
12	DI12: Digital input 12	DI3.1: Fail-safe channel 3, digital input 1
13	DI13: Digital input 13	DI2.2: Fail-safe channel 2, digital input 2
14	DI14: Digital input 14	DI2.1: Fail-safe channel 2, digital input 1
15	–	DI1.2: Fail-safe channel 1, digital input 2
16	–	DI1.1: Fail-safe channel 1, digital input 1



## Digital outputs

PIN	Assignment standard mode	Assignment fail-safe mode
1	DO01: Digital output 1	–
2	DO02: Digital output 2	–
3	DO03: Digital output 3	–
4	DO04: Digital output 4	–
5	DO05: Digital output 5	–
6	DO06: Digital output 6	–
7	DO07: Digital output 7	–
8	DO08: Digital output 8	–
9	DO09: Digital output 9	DO4.2: Fail-safe channel 4, sensor supply 2
10	DO10: Digital output 10	DO4.1: Fail-safe channel 4, sensor supply 1
11	DO11: Digital output 11	DO3.2: Fail-safe channel 3, sensor supply 2
12	DO12: Digital output 12	DO3.1: Fail-safe channel 3, sensor supply 1
13	DO13: Digital output 13	DO2.2: Fail-safe channel 2, sensor supply 2
14	DO14: Digital output 14	DO2.1: Fail-safe channel 2, sensor supply 1
15	–	DO1.2: Fail-safe channel 1, sensor supply 2
16	–	DO1.1: Fail-safe channel 1, sensor supply 1

### See also

Configuring the HMI device in STEP 7 (Page 6-6)

## 9.6 Assignment of PLC Bits in the Process Images

### 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 Range in the PLC

The keys and digital inputs of the HMI device are mapped to the bits in the input range of the PLC 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	DI08:	...	...	...	...	...	...	DI01
Byte n+3	-	-	DI14	...	...	...	...	DI09

### Output Range of the PLC

The LEDs are assigned to the bits in the output range of the PLC 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

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

Table 9-1 Example assignment for LED 1

	Bit States			
Bit 0 in byte n	1	0	1	0
Bit 0 in byte n+1	0	1	1	0
Result	red	green	configurable <sup>1)</sup>	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 range of the PLC as follows:

Byte	Bit assignment							
	Bit 7							Bit 0
Byte n+4	DO08	...	...	...	...	...	...	DO01
Byte n+5	DO08	...	...	...	...	...	...	DO01
Byte n+6	-	-	DO14	...	...	...	...	DO09
Byte n+7	-	-	DO14	...	...	...	...	DO09

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

Table 9-2 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	0.5 Hz	2 Hz	Off

### Digital inputs and digital outputs for fail-safe channels

The number of fail-safe channels is configurable. Depending on this, a number of digital inputs and digital outputs will no longer be available for standard mode.

---

#### 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 use their own process images.

You will find further information regarding 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 6-6)



## Appendix

### A.1 ESD Directives

#### 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 discharge of static electricity. These electronic components are therefore specially identified as ESD.

#### Abbreviation

The following abbreviations are commonly used for electrostatic sensitive devices:

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

#### Labeling

ESD modules are labeled with the following symbol:



Figure A-1 ESD label

## 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.

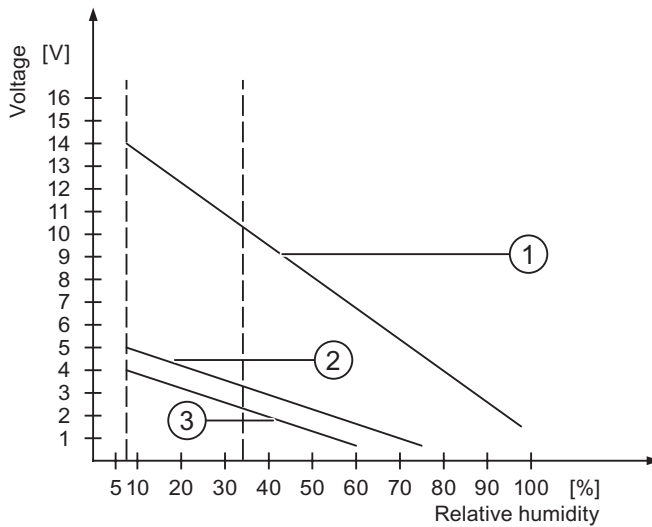


Figure A-2 Electrostatic voltages with which a person can be charged.

- 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.

## A.2 System Alarms

### "ERROR" LED Displays

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 (normal mode)	A PROFIsafe fault has occurred.	Diagnose and rectify the fault.
LED lights (normal mode)	A PROFIBUS fault has occurred.	Diagnose and rectify the fault.
LED blinks (lamp test)	A lamp test is currently being carried out.	End the lamp test by releasing the key assigned to the function or by resetting the two LED bits from the PLC.
LED lights (hardware test mode)	A hardware test is being performed.	Stop the hardware test using the menu of the configuration module or reboot the HMI device.

### Messages on the Configuration Module

The following error messages are shown on the display of the configuration module at the back of the HMI device:

Alarm	Cause	Remedy
Error message in hardware test mode	A defect in the HMI device's electronics has been detected.	Return the device for repair.
EEPROM ERR	The memory module is defect or not available.	Install a memory module. Replace the current memory module, if necessary.
EEPROM INV	The memory module contains invalid data.	Check that the correct memory module has been used. Configure the interface on the HMI device again.
NO PLC	Connection to the PLC cannot be established because <ul style="list-style-type: none"> <li>• a bus cable is defect or</li> <li>• the interface configuration is incorrect.</li> </ul>	Check all cables and plugs. Check the configuration of the interface on the HMI device.
PP START	There is a connection fault.	Check the network configuration and the configuration of the interface on the HMI device.
DIAG-ERROR	There is a short circuit in one of the digital outputs.	Check the wiring of the digital outputs.



## Abbreviations

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
EMC	Electromagnetic Compatibility
EN	European standard
ES	Engineering System
ESD	Electrostatic Discharge, the components and modules endangered by such
ESD	Electrostatic Sensitive Device
F-CPU	Fail-safe Central Processing Unit
GND	Ground
HF	High Frequency
HMI	Human Machine Interface
IEC	International Electronic Commission
IF	Interface
Cat.	Category according to prEN 954-01 (fail-safe mode)
LED	Light Emitting Diode
MMC	Multi-Media Card
MOS	Metal Oxide Semiconductor
MPI	Multipoint Interface (SIMATIC S7)
MS	Microsoft
MTBF	Mean Time Between Failures
n. c.	Not connected
OP	Operator Panel
PC	Personal Computer
PG	Programming device
PLC	Programmable Logic Controller
PPI	Point to Point Interface (SIMATIC S7)

## *Abbreviations*

### *A.2 System Alarms*

---

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
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.

## AG

PLC of the SIMATIC S5 series such as the AG S5-115U, for example

## AS

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

## Configuration module

Module on the back of the HMI device. The configuration module is used to configure the HMI device's interface to the controller and to conduct the hardware test.

## EMC

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

## Encoder 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.

## 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 communication

Communication used to exchange fail-safe data.

### Fail-safe DP standard slave

Standard slaves operated on PROFIBUS with the DP protocol and the PROFIsafe bus profile. They respond according to the standard IEC 61784-1:2002 Ed1 CP 3/1 and the PROFIsafe bus profile. A device database file (\*.GSD file) is used to configure fail-safe DP standard slaves.

### Failsafe function block (F-FB)

F block refers to all fail-safe blocks:

- Those created by the user in the programming languages F-FBD/F-LAD, F-CALL and F-DB (S7 Distributed Safety)
- Those selected from a library by the user
- Those automatically completed in the safety program

### 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.

### 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.

### PLC

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

**PROFIsafe**

Fail-safe bus profile of PROFIBUS DP/PA 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 level in accordance with IEC 61508 and prEN 50129. The higher the safety integrity level, 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 fail-safe communication can be performed via safety frames.

**Standard mode**

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

**STEP 7**

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

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