

## SIMATIC HMI

### Fail-safe operation of the Mobile Panel 277F IWLAN

#### Function Manual



The following supplement is part of this documentation:

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## Legal information

### Warning notice system

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

#### DANGER

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

#### WARNING

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

#### CAUTION

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

#### CAUTION

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

#### NOTICE

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

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### 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:

#### 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 function manual

This function manual provides all information required for operation of the Mobile Panel 277F IWLAN in fail-safe systems.

Readership of this function manual:

- Plant designers
- Project engineers
- Commissioning engineers
- Users
- Service technicians
- Maintenance technicians

Please pay particular attention to the "Safety instructions, standards and notes" chapter.

## Basic knowledge required

General knowledge in the field of automation technology, safety technology, and process communication is a prerequisite for comprehension of this function manual.

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

## Valid scope of the function manual

The function manual covers the Mobile Panel 277F IWLAN HMI device in combination with the software packages STEP 7 V5.4 SP2 or higher, S7 Distributed Safety V5.4 SP3 and WinCC flexible 2007 with HSP Mobile Panel 277 Wireless.

## Position in the information landscape

This function manual is part of the SIMATIC HMI documentation. The section below provides an overview of the documentation which is relevant to applications with Mobile Panel 277F IWLAN.

## Additional documentation for Mobile Panel 277F IWLAN

- Operating instructions for Mobile Panel 277F IWLAN
- Mobile Panel IWLAN Getting Started

## Documentation for fail-safe systems

- System description "Safety technology in SIMATIC S7"
  - Provides general information on the use, structure, and mode of operation of the fail-safe automation systems S7 Distributed Safety and S7 F/FH Systems
  - Contains detailed technical information which can be represented for the fail-safe technology both in S7-300 and S7-400.
  - Contains information about the calculation of monitoring and reaction times of the fail-safe systems S7 Distributed Safety and of S7 F/FH Systems.
- "S7 Distributed Safety, Configuring and Programming" Manual / Online Help  
Describes the configuration of the F-CPU and of the fail-safe I/O and the programming of the F-CPU in F-FBD or F-LAD
- "Automation System S7-400, CPU Data" Reference Manual  
Describes the standard functions of CPU 416F-3 PN/DP, CPU 414-3 PN/DP and CPU 416-3 PN/DP
- "Automation System S7-300, CPU Data" Reference Manual  
Describes the standard functions of CPU 315F-2 PN/DP, CPU 317F-2 PN/DP, CPU 315-2 PN/DP and CPU 317-2 PN/DP

## User manuals

- WinCC flexible Compact/ Standard/ Advanced  
Describes basic principles of configuration using the WinCC flexible Compact Engineering System/WinCC flexible Standard/WinCC flexible Advanced.
- WinCC flexible Runtime  
Describes how to commission and operate your runtime project on a PC.
- Communication
  - Communication Part 1 describes the connection of the HMI device to SIMATIC PLCs.
  - Communication Part 2 describes the connection of the HMI device to third-party PLCs.

## Getting started

- WinCC flexible for first time users  
Based on an example project, this is a step-by-step introduction to the basics of configuring screens, alarms, recipes and screen navigation.
- WinCC flexible for power users  
Based on an example project, this is a step-by-step introduction to the basics of configuring logs, project reports, scripts, user management, multilingual projects and integration in STEP 7.
- WinCC flexible options  
Based on an example project, this is a step-by-step introduction to the basics of configuring the WinCC flexible Sm@rtServices, Sm@rtAccess and OPC server options.

## Online availability

The link below guides you to the multilingual technical documentation offered for the SIMATIC products and systems.

["http://www.automation.siemens.com/simatic/portal/html\\_76/techdoku.htm"](http://www.automation.siemens.com/simatic/portal/html_76/techdoku.htm)

## Screens

The HMI device is sometimes represented in the form of photographs in this function manual. The photographs of the HMI device may differ slightly from the factory state of the HMI device.

## Conventions

Configuration and runtime software differ with regard to their names as follows:

- "WinCC flexible 2007" for example, refers to the configuration software.  
The term "WinCC flexible" is used in a general context. The full name, for example "WinCC flexible 2007", is always used when it is necessary to differentiate between different versions of the configuration software.
- "WinCC flexible Runtime" refers to the runtime software that can run on HMI devices.

The following text notation facilitates the reading of this function manual:

Notation	Scope
"Add screen"	<ul style="list-style-type: none"><li>• Terminology that appears in the user interface, for example dialog names, tabs, buttons, menu commands</li><li>• Inputs required, for example limit values, tag values</li><li>• Path information</li></ul>
"File > Edit"	Operational sequences, for example menu commands, shortcut 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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- HMI®
- SIMATIC®
- SIMATIC HMI®
- SIMATIC ProTool®
- SIMATIC WinCC®

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

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Using the support request form on the web at:

<http://www.siemens.com/automation/support-request>

Further information about our technical support is available on the Internet at  
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- 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 more

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# Overview and definition of terms

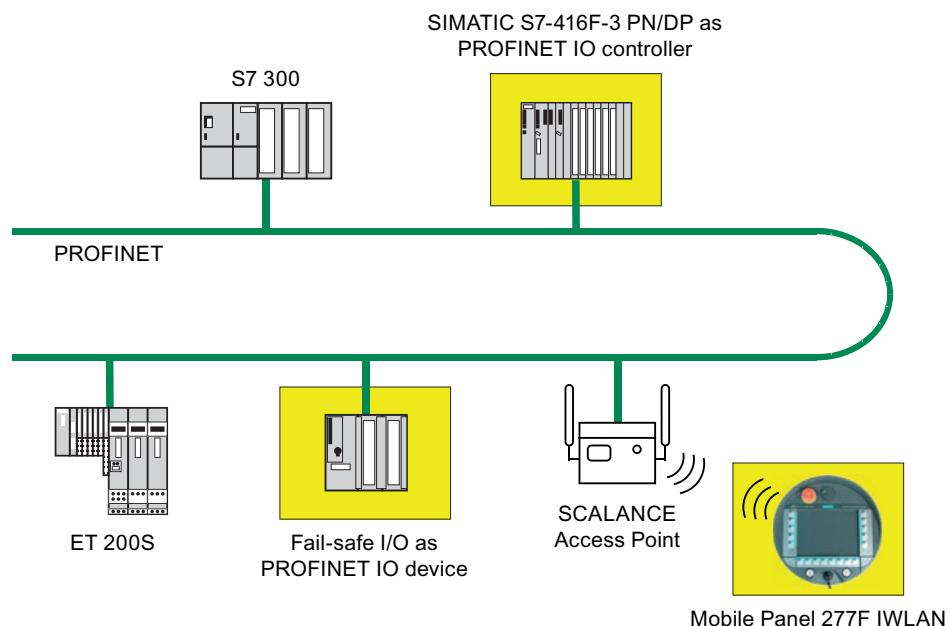
## 1.1 Using the Mobile Panel 277F IWLAN

### Use

The Mobile Panel 277F IWLAN offers the possibility of having the mobile safety functions of emergency stop and enable available at any point of a machine or plant. An effective range limit has been implemented for the Mobile Panel 277F IWLAN. Depending on his location, the operator obtains a safe, electronically monitored operator control enable.

The HMI device communicates with an access point via WLAN. Thus the operator can operate the various machines or process cells without bothersome cable. The HMI device is connected via the access point with a PROFINET network in which it communicates with an F-CPU via the PROFIsafe protocol.

### Sample installation - F-system with Mobile Panel 277F IWLAN



In the depicted configuration, each PROFINET IO device communicates with a single PROFINET IO controller. In this example the Mobile Panel 277F IWLAN communicates exclusively with the F-CPU as F-PROFINET IO controller.

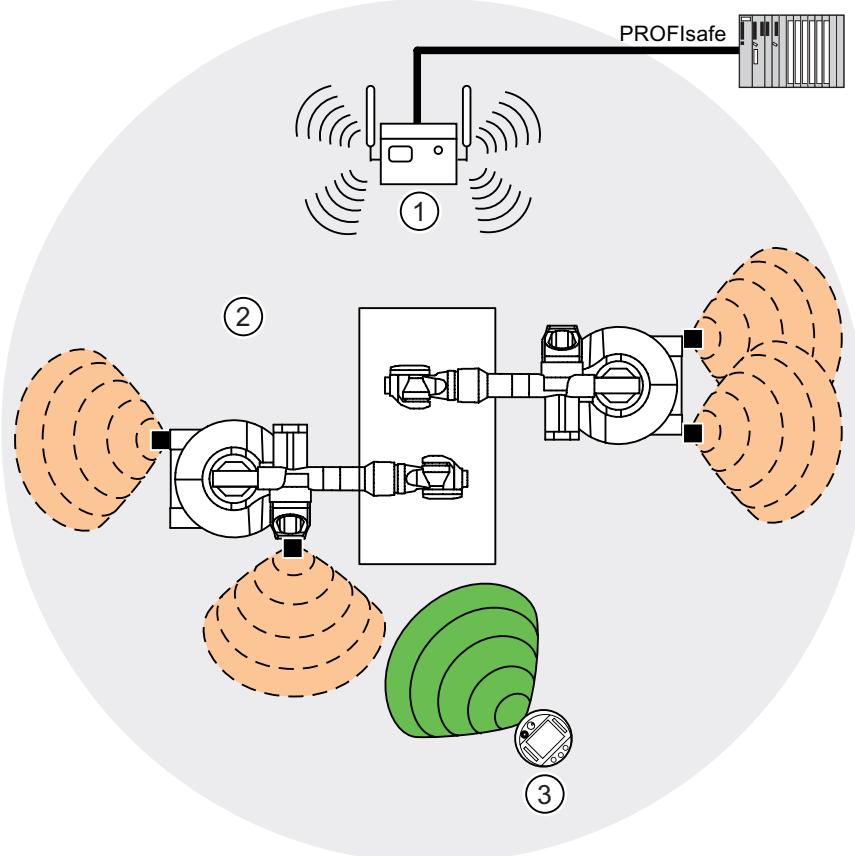
### Basic terms

In the following chapters several basic terms are explained that you must learn before you use the HMI device.

## 1.2 Areas in the plant

### WLAN area

The WLAN area is the area in the plant where the HMI device communicates with other communication nodes over a wireless local area network.



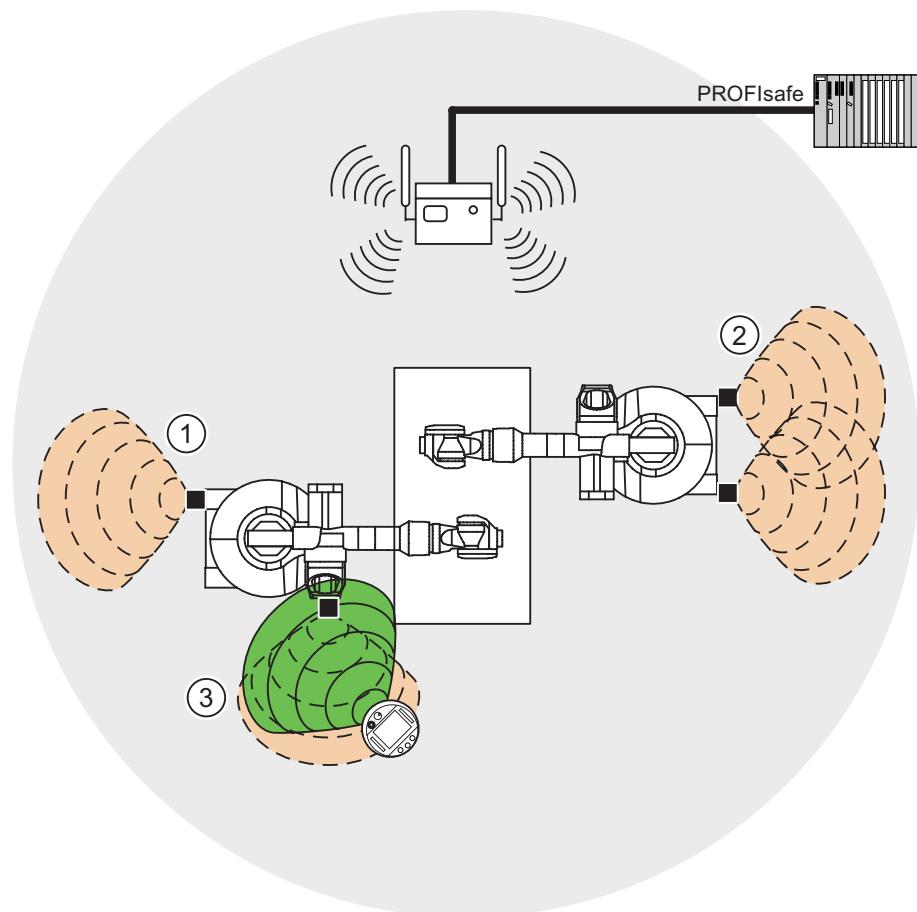
- ① Access point is the network transition from WLAN to LAN
- ② WLAN area in which communication with the access point is possible
- ③ Mobile panel in the WLAN area; the emergency stop button is active, the enabling buttons are without function.

When the PROFI safe communication between the controller and operator panel is established in the WLAN area, the emergency stop button on the HMI device becomes active.

Safe operation of the plant with the enabling buttons only becomes possible when the HMI device is logged on in an effective range within the WLAN area.

## Effective range

An effective range is the range in which sections of the plant, e.g. a machine can be operated with the enabling buttons of the HMI device. An effective range is formed physically with transponders that are mounted in the vicinity of the machine. Each transponder has a unique ID. The transponder emits this ID in a lobe-shaped area. The ID is received by the HMI device, which enables the HMI device to determine its distance from the transponder. Additional information about the transponders is provided in the chapter Planning effective ranges (Page 46) and in the operating instructions for the HMI device.



- ① Effective range 1, formed by a transponder
- ② Effective range 2, formed by two transponders
- ③ The mobile panel is located in effective range 3. The emergency stop button is active. The enabling buttons are active after logon in the effective range.

When the HMI device detects that it is within an effective range the operator can log the HMI device on at the effective range. Safe operation of the plant unit delimited by the effective range is only possible after successful connection.

Effective ranges should not overlap.

All effective ranges available in the plant are stored in the project. The effective ranges are verified in the acceptance procedure for the plant.

---

**Note**

In addition to the effective ranges you can define zones in your project. The zones are not relevant for fail-safe operation. They are used merely to control the project depending on the location of the operator. For example a picture change can be configured for zone entry or zone exit.

Zones and effective range are independent of each other.

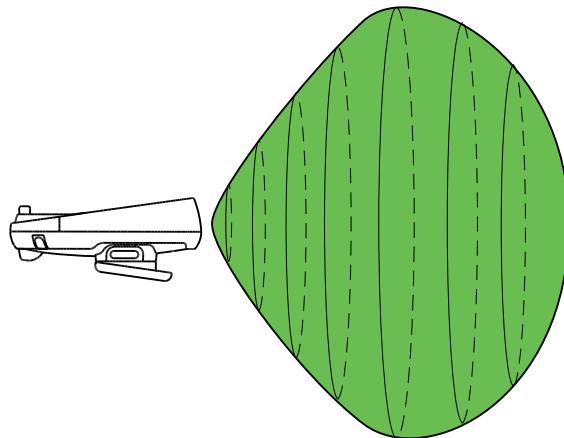
Additional information on zones is provided in the Operating instructions for the HMI device.

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### **Distance measurement between HMI device and transponder**

The transmitting range of the transponder and the receiving range of the HMI device have the approximate shape of a lobe with a range of approximately 8 m.

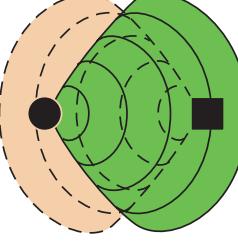
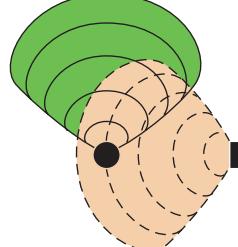
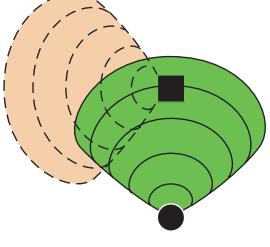
The detailed representation of the radiation characteristics of HMI device and transponder is provided in the appendix of the Operating instructions.



A distance measurement between HMI device and transponder is only possible if both devices are in range of each other. The following table shows when a distance measurement is successful.

In the figures the HMI device and transponder are represented as follows:

- The HMI device as circle
- The transponder as square

			
HMI device in the transmitting range of the transponder	Yes	Yes	No
Transponder in the receiving range of the HMI device	Yes	No	Yes
<b>Result</b>	<b>Successful distance measurement</b>	<b>Distance measurement not possible</b>	<b>Distance measurement not possible</b>

The distance measurement is executed in the following manner:

- The HMI device emits signals in the current project.
- The transponder reacts to the signal from the HMI device and transmits its ID to the HMI device.
- The HMI device evaluates the ID and only measures the distance to the configured transponders.

## See also

[Integration and segregation \(Page 18\)](#)

[Planning effective ranges \(Page 46\)](#)

## 1.3      **Switch-off behavior**

### **Introduction**

Different switch-off behavior is possible depending on the situation in the plant:

- Emergency stop
- Shutdown
- Local rampdown.
- Global rampdown

Plant switch-off differs in its triggers and effects.



#### **No switch off triggering**

In the plant the described switch-off behavior is only triggered if the F-CPU has been programmed accordingly.

### **Emergency stop**

The operator triggers the emergency stop by pressing the emergency stop button.

Emergency stop is a procedure in response to an emergency that is intended to stop a process or movement that could result in danger (from EN 60204-1 Appendix D).

The emergency stop immediately stops all machines that are assigned to the F-CPU via the safety program.

The emergency stop depends on the effective ranges.

The emergency stop button is always active if there is PROFIsafe communication between HMI device and F-CPU, i.e. if the HMI device is integrated in the PROFIsafe communication.

### **Shutdown**

Shutdown is triggered if the F-CPU detects a communication error on an HMI device which is logged on in the effective range.

Shutdown is the immediate stopping of the machines which belong to the effective range.

The shutdown is always specific to the effective range.

### **Local rampdown.**

Local rampdown is triggered if the HMI device is logged on at the effective range and if it is removed from the effective range for longer than 30 seconds.

Local rampdown is the defined shutdown of the machines belonging to the effective range within a defined time period.

Local rampdown is always specific to the effective range.

## Global rampdown

Global rampdown is triggered if the F-CPU detects a communication error on an HMI device which is integrated in the PROFIsafe communication.

Global rampdown is the defined shutdown of the machines assigned in the safety program within a defined time period.

Global rampdown is independent of the effective ranges.

In the safety program of the F-CPU, ensure that global rampdown is available in the event that a communication error occurs on an HMI device which is integrated in the PROFIsafe communication.

## Trigger

The switch off can have the following triggers:

- The operator presses the emergency stop button.
- A communication error occurs.
- Timeout: The HMI device is logged on at the effective range and the operator leaves the effective range with his HMI device for longer than 30 seconds.

## Triggering the switch off

The following table shows the effect of the different triggers depending on the operating situation:

Operating situation			Trigger		
			Emergency stop pressed	Communication error	Timeout
HMI not integrated			---	---	---
HMI integrated	HMI device logged on at the effective range	HMI device is in the effective range	Emergency stop	Shutdown	---
		HMI device is outside of the effective range for less than 30 seconds	Emergency stop	Shutdown	---
		HMI device is outside of the effective range for longer than 30 seconds	Emergency stop	Shutdown	Local rampdown.
	HMI device is logged off from the effective range		Emergency stop	Global rampdown	---

## **1.4      Integration and segregation**

### **Introduction**

In fail-safe operation a safety program runs in the F-CPU. This safety program communicates with the HMI device. The F-CPU monitors this communication for errors and analyzes the signals. The terms "integrate" and "segregate" refer to the integration and segregation of the HMI device in/from the safety program of the F-CPU.

### **Integrate**

If the HMI device is configured for the safety program then when the HMI device starts it is automatically integrated in the safety program. The integration process is concluded as soon as the LED "SAFE" is illuminated.

The emergency stop button is active as soon as the HMI device is integrated.

### **Segregation**

Segregation means the desired segregation of the HMI device from the safety program.

The operator has the following alternatives for segregating the HMI device:

- The operator terminates the project.
- The operator presses the ON/OFF button for longer than 4 seconds. After the segregation process the HMI device switches off.

When the operator segregates the HMI device there are no side effects, e.g. a global rampdown. When the segregation process is terminated the LED "SAFE" and the emergency stop button are no longer active.

### **See also**

Safety functions of the emergency stop button (Page 37)

## **1.5 Log on and log off at the effective range**

### **Introduction**

An effective range is the range within which plant units, e.g. a machine, can be operated with the enabling buttons of the HMI device. The prerequisite for this is that the operator must log the HMI device on at the effective range.

### **Logging on at the effective range**

If the operator enters an effective range with the HMI device the system shows that he can log the HMI device on at the effective range via the "Effective range name" object.

To log on he touches the "Effective range name" object. Then he reads the effective range ID in the plant and enters this ID in the ""Effective range logon" dialog box.

If the entered effective range ID agrees with the configured ID then the HMI device is logged on.

When the HMI device is logged on the enabling buttons are active.

The system alerts the operator that the HMI device is logged on at the effective range in the following manner:

- The LED "RNG" is illuminated.
- The "Effective range name" object is displayed in green.
- In the process cell the indicator for the effective range is active, e.g. a lamp.

When the HMI device is logged on at the effective range the following rules apply:

- The operator should not leave the effective range without logging off. Local rampdown occurs if the operator leaves the effective range for longer than 30 seconds without logging off.
- No other HMI device can log on at this effective range.

### **Log off at the effective range**

Before the operator exits the effective range at which the HMI device is logged on, he must log off from the effective range. To log off he touches the "Effective range name" object and edits the dialog box ""Effective range logoff".

When the HMI device is logged off the enabling buttons are no longer active. The LED "RNG" is not illuminated.

### **See also**

[Log on and log off at the effective range \(Page 91\)](#)

## **1.6 Safety-oriented operator controls**

### **Introduction**

The Mobile Panel 277F IWLAN has the following elements for safe operation of a process cell:

- Emergency stop button
- Enabling button

### **1.6.1 Emergency stop button**

#### **Introduction**

The emergency stop button is designed with 2-channels and enables an emergency stop of the configured system.

The emergency stop button satisfies the requirements specified in DIN IEC 60947-5-5;1997 Annex K.

For additional safety instructions please refer to the chapter, Safety instructions, standards and notes.

When using the emergency stop button the following F-FBs must be linked in the safety program of the F-CPU:

- F\_FB\_MP
- F\_FB\_RNG\_n



- ① Fall protection
- ② Emergency stop button

Due to its position, the emergency stop button is equally accessible for both left-handed and right-handed individuals.

Due to its profiled design, the emergency stop button is easily accessible. A collared enclosure is used to protect the operator controls against damage. This applies in particular to the emergency stop button. The emergency stop button may still trigger if the HMI device falls and hits the floor.

## **Operation**

The operator triggers the emergency stop by pressing the emergency stop button. The emergency stop button engages in the emergency stop position.

### **Releasing the emergency stop button**



#### **WARNING**

If you have activated the emergency stop button and thereby brought the configured system to a standstill, the emergency stop button should only be released under the following conditions:

- The reasons for the emergency stop have been eliminated.
- A safe restart is possible.
- The restart should not be executed by releasing the emergency stop button.  
The operator must strictly ensure that he executes a separate operator action to commence the restart. The safety program must ensure that release of the emergency stop button alone does not trigger an automatic restart of the system.

In order to release the emergency stop button, turn it in a clockwise direction. The emergency stop button then returns on its own to the initial position.

## **See also**

Safety functions of the emergency stop button (Page 37)

S7 Distributed Safety (Page 58)

## **1.6.2 Enabling button**

### **Introduction**

The enabling device consists of the two enabling buttons mounted on both sides of the Mobile Panel 277F IWLAN. The switch setting of the two enabling buttons is determined by electrical momentary contact switches.

#### **Note**

The HMI device analyzes the switch settings of the two enabling buttons in the form of an OR gate.



① Enabling button

### **Operation**

#### **WARNING**

##### **Unintentional enabling**

Press the enabling button only until the operation you wish to enable is completed.

Enabling is a conscious operator action. It is not permissible to continuously press the enabling button or to fix it in any way.

The following happens if you leave the effective range for a period of up to 30 seconds with the enabling button pressed: Enabling is revoked 5 seconds after leaving the effective range.

If you reenter the effective range within 30 seconds, you must release the enabling button and press it again for enabling to take effect again.

The enabling button has three switch settings:

- Neutral position: The enabling button is not pressed.
- Enable: The enabling button is pressed to a mid position. This switch setting is used to allow another command, for example an input with the membrane keyboard.

- **Panic:** The "Panic" switch setting is reached as soon as one of the two enabling buttons is fully pressed. The switch setting of the other enabling button is unimportant in this case. The "Panic" switch setting has the same effect as releasing the enabling button, namely, it revokes the enable.

You only have to activate one enabling button. The PLC gets the same signal regardless as to whether one or two enabling buttons of the Mobile Panel 277F IWLAN have been pressed.

#### Note

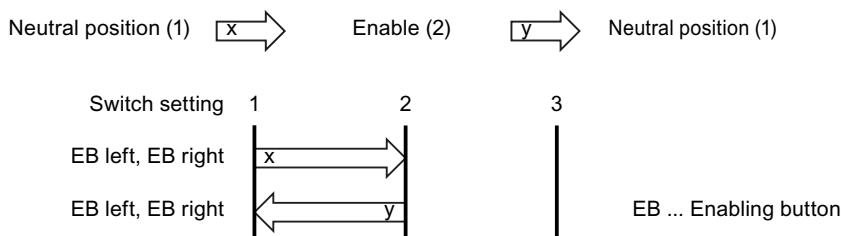
The enabling button and the membrane keyboard can be operated at the same time.

When using the enabling button the following F FBs must be linked in the safety program of the F CPU:

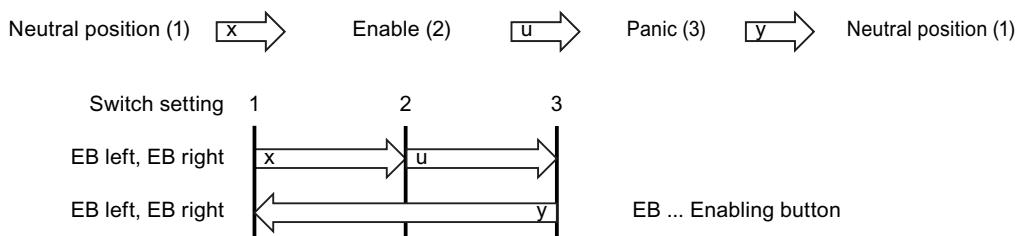
- F\_FB\_MP
- F\_FB\_RNG\_n

#### Switch settings

The following figure shows the switching sequence for enable.



The following figure shows the switching sequence during panic usage.



If the operator has pressed the enabling button through to the "Panic" setting, the "Enable" setting will not be evaluated when leaving the panic setting. A new enable can only be triggered by releasing the enabling button.

#### See also

Safety functions of the enabling button (Page 39)

S7 Distributed Safety (Page 58)

## **1.7      "Override" mode**

### **Introduction**

The effective range functionality of the HMI device can be extended through the "override" mode.

### **Applications**

"Override" mode can be used in the following cases:

- Use of existing protective measures instead of the effective range functionality

If protective measures, such as protective fences are already available in your plant, then you can integrate them in your safety concept with the "override" mode. Thus you achieve a consistent concept for safe plant operation.

- If plant units, which do not allow themselves transponder coverage, (such as inside a robot cell), will be operated with the enabling buttons.

In this case you must secure the plant area with additional protective measures, such as a protective fence.

### **Requirements**

Only use "override" mode in delimited plant units that are secured by additional protective measures.

Entering and leaving the protected area must be monitored by the F-CPU.

The operator must be able to fully see the area for which "override" mode applies. The danger location must be visible from every point of the override area.

When using the "override" mode you must install a switch within an effective range that is independent of the HMI device. The operator activates "override" mode with this switch.



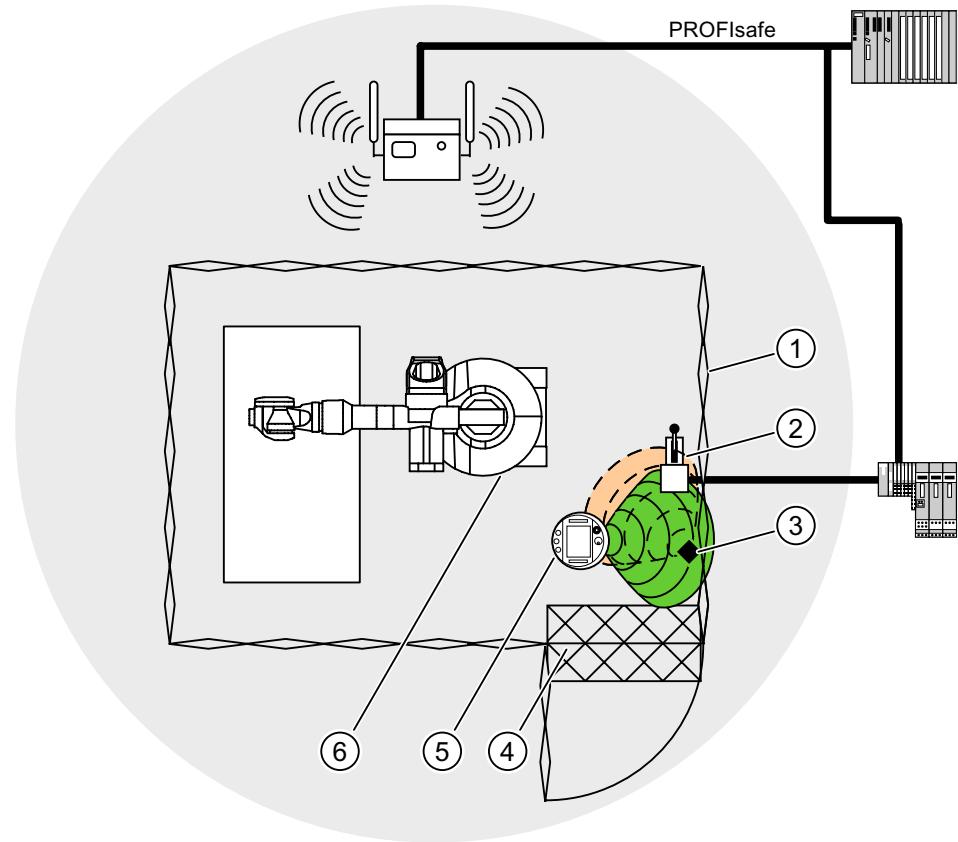
#### **WARNING**

##### **Inadmissible activation of the "override" mode**

The operator has to activate "override" mode through a conscious operator action, e.g. by activating a switch. The "override" mode should not be automatically activated, e.g. when the safety area is entered.

The application program in conjunction with F-FB must ensure that the "override" mode is revoked when the area is left.

## Sample configuration



- ① Protective fence
- ② Switch for activating "override" mode
- ③ Transponder for logging on at the effective range
- ④ Foot grating for access monitoring
- ⑤ HMI device
- ⑥ Machine that will be operated

## Activation of the "override" mode

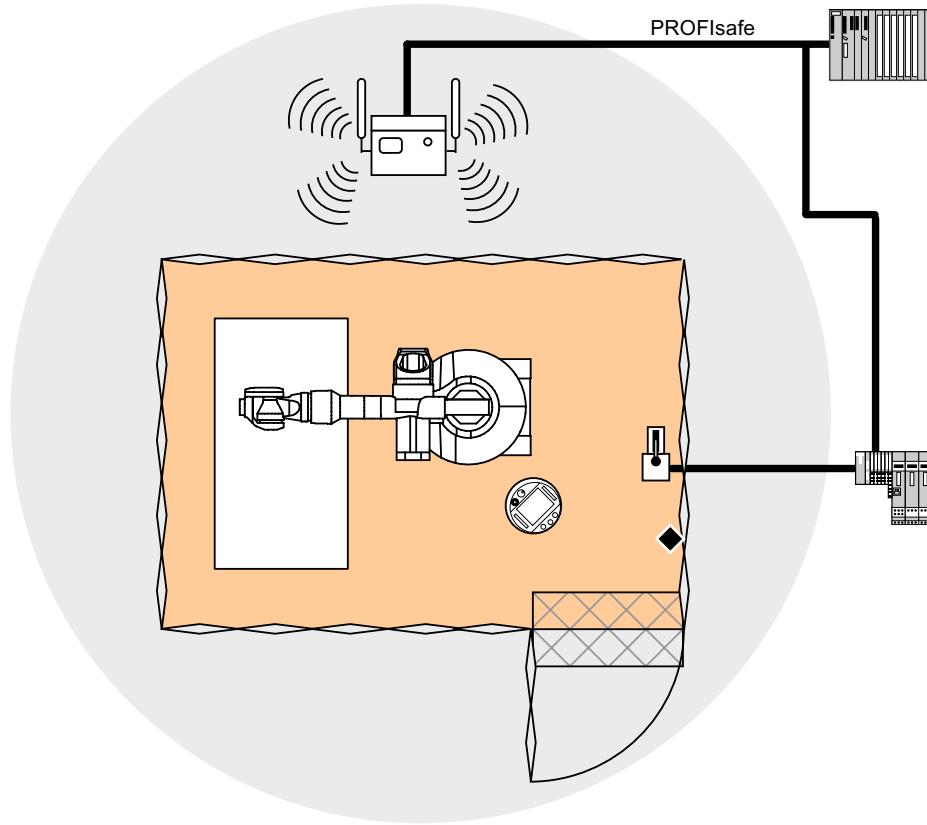
The operator activates "Override" mode in the following manner:

1. The operator enters the protected area through a light barrier or across a foot grating.  
The protective device is activated.
2. The operator logs on at the effective range in which the override switch is located.
3. The operator activates the override switch.

"Override" mode is now active until either the operator deactivates "Override" mode with the override switch or until he leaves the protected area.

### **Operating principle**

In the following figure you see the plant area for which "override" mode is active.



If "override" mode is activated the operator can safely operate the associated plant area with the enabling buttons. The HMI device is considered to be permanently logged on in the effective range, without analyzing the transponder signals.

### **Deactivation of "override" mode**

The operator deactivates "override" mode in the following manner:

1. The operator activates the override switch.

"Override" mode is deactivated by the safety program.

2. The operator logs off from the effective range.

Subsequent logon at this effective range is only possible if the operator has terminated "override" mode with the override switch.

3. The operator leaves the protected area.

If the operator leaves the protected area without deactivating "override" mode, "override" mode is deactivated by the safety program.

### **See also**

For the "Override" mode: Planning the protective devices (Page 49)

Configuration and operation (Page 113)

# Safety instructions, standards and notes

## 2.1 Safety instructions

### Safety regulations



#### **WARNING**

#### **Injury or material damage**

Strictly observe all instructions in this document at all times. Otherwise, hazardous situations can arise or the safety functions integrated in the HMI device can be rendered ineffective.

Observe the safety and accident prevention instructions applicable to your application in addition to the safety instructions given in this manual.

### Configuration requirements



#### **WARNING**

#### **Injury or material damage**

The configuration engineer for a machine or system PLC must take precautions to ensure that an interrupted program can be restarted normally after communication errors, voltage dips, or power failures.

Dangerous operating modes must not occur, not even temporarily, from the entire sequence of the user program up to troubleshooting.

### Proper use



#### **WARNING**

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

### Fault-free operation



#### **WARNING**

#### **Interference with other systems**

When using the HMI device in accordance with DIN EN 13557 you must ensure that the HMI device does not interfere with other systems at the site, or that other systems do not interface with the HMI device.

*2.1 Safety instructions*

**Safety measures during operation**



**WARNING**

**Non-functional emergency stop button**

The emergency stop button must be checked annually for proper function.



**WARNING**

**HMI device failure**

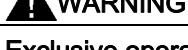
After a hard impact to the HMI device, check the safety-relevant features for functional capability, for example in the event that the HMI device is dropped.



**WARNING**

**Danger of injury**

Manual movements controlled with the HMI should only be executed in conjunction with the enabling buttons and at reduced velocity.



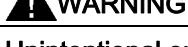
**WARNING**

**Exclusive operating right**

When operating the plant with the HMI device it is not permitted to operate the plant concurrently from a different HMI device.

Prevent concurrent operation through appropriate configuration.

**High frequency radiation**



**WARNING**

**Unintentional operating situations**

High-frequency radiation, for example from cellular phones, can lead to undesirable operating situations.

**Information for handling the battery:**

**⚠ CAUTION**

**Charging and discharging the battery**

In the following cases, there is a risk of fire and, in extreme cases, explosion!

- Incorrect charging and discharging of the battery
- Reverse polarity
- Short-circuit

Only charge the bridging battery in the HMI device.

Only charge the main battery in the HMI device or in the charging compartment of the charging station.

**⚠ CAUTION**

The battery is a lithium ion battery. The following safety notes apply to these rechargeable batteries:

- Do not crush
- Do not expose to heat and do not burn
- Do not short-circuit
- Do not take apart
- Do not immerse in liquid – the battery might crack or burst
- Store unused batteries away from the following items, which can cause the contacts to be bridged
  - Paper clips
  - Coins
  - Keys
  - Nails
  - Screws or other small metal objects

**⚠ CAUTION**

**Danger of injury**

If used incorrectly, fluid can leak from the battery. Avoid contact with the battery fluid. If fluid comes into contact with the skin, rinse with water.

If fluid comes into contact with the eyes, rinse with water and seek medical advice.

## Instructions for battery replacement in Mobile Panel 277F IWLAN

### **CAUTION**

#### **Local rampdown of logged on HMI device**

If the HMI device which is logged on at the effective range no longer recognizes the transponder and, therefore, the effective range, it triggers a local rampdown.

To change the battery, rest the HMI device on its front. Align the HMI device so that it is still possible to measure the distance between the HMI device and the transponder.

If possible, log the HMI device off from the effective range.

### **NOTICE**

Pay attention to cleanliness. Foreign bodies or liquids must not come into contact with the printed circuit board or penetrate the inside of the HMI device.

Place the HMI device with the front side facing down on a flat, clean surface to protect against damage.

### **CAUTION**

#### **Malfunctions**

If the HMI device is resting on its front, the following can be activated:

- The emergency stop button  
This can bring the system to a standstill unintentionally.
- The key-operated switch or an illuminated pushbutton  
This can result in malfunctions.

#### **Components and modules endangered by electrostatic discharge (ESD)**

When working in the open housing, ensure that current-carrying conductors do not come into contact with electrical circuits.

Note the ESD instructions.

## 2.2 Guidelines, standards, certificates and approvals

### Certifications

#### **CAUTION**

The following overview shows possible approvals.

The only valid approvals for the HMI device, the charging station, the power supply module, and the transponder are those shown on the label on the rear panel.

## CE approval



The HMI device, charging station, power supply unit, and transponder satisfy the requirements and protection objectives of the EC Directives below. The HMI device, charging station, power supply unit, and transponder comply with the harmonized European standards (EN) published in the Official Journals of the European Union for programmable controllers:

- 2004/108/EC Electromagnetic Compatibility Directive (EMC Directive)
- 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
- Specific absorption rate in accordance with EN 50392

## EC Declaration of Conformity

The EC Declarations of Conformity are available to the relevant authorities at the following address:

Siemens AG  
Industry Sector  
IIA AS RD ST PLC  
PO Box 1963  
D-92209 Amberg

## UL approval



Underwriters Laboratories Inc., to

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

The approval is only valid in the case of battery operation or when stationary in the charging station.

## Marking for Australia



The HMI device, charging station, power supply unit, and transponder satisfy the requirements of Standard AS/NZS 2064 (Class A).

## Wireless approval

The HMI device wireless approvals for the various countries are located as follows:

- On the rear of the HMI device
- In the product information supplied together with the HMI device

## *Safety instructions, standards and notes*

### *2.2 Guidelines, standards, certificates and approvals*

#### TÜV

The TÜV confirms that the HMI device satisfies the requirements of the standards below with regard to its safety functions.

- SIL3 to IEC 61508-1 to 4
- Category 4 in accordance with EN 954-1.
- Pl e and Cat. 4 in accordance with EN ISO 13849-1
- EN 60204-1
- ISO 13850
- IEC 62061

#### Requesting certificates

Copies of the certificates and associated reports can be requested from the following address:

Siemens AG  
Industry Sector  
IIA AS RD ST  
PO Box 1963  
D-92209 Amberg

## 2.3 Operating safety

### Standards

The HMI device complies with the following standards:

- EN 954-1  
Safety of machinery
- EN 60204-1  
Safety of machinery – Electrical equipment of machines
- EN 62061  
Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems
- EN ISO 13849-1  
Development, testing and certification of safety-related machine controls
- ISO 13850  
Safety of machinery – Emergency stop – Principles for design
- IEC 61508  
Functional safety of electrical/electronic/programmable electronic-related systems
- EN 61131-1 and EN 61131-2  
Programmable Controllers
- The HMI device was tested for EMC in accordance with the following standards:
  - EN 61000-6-4, Generic standard – emitted interference
  - EN 61000-6-2, Generic standard, Immunity, industrial environments
  - EN 61131-2, Programmable Controllers
- EN 300 328 V1.6.1, EN 300 440-1 V1.3.1, EN 301 893, EN 301 489-1, EN 301 489-17, FCC Part 15.245, 15.247, 15.407  
Wireless approval
- EN 50 360, IEEE 1528-X, EN 50371, EN 50 392  
Radiation protection requirements (SAR/EMF)

If the HMI device is used in a system, the following standards are fulfilled:

- prEN 1921, Industrial automation systems – safety of integrated manufacturing systems
- EN 12417:2001, Machine tools – safety – machining centers
- UL 508, Industrial Control Equipment
- CSA C22.2 No.14, Industrial Control Equipment

## 2.4 Power supply

### Safety specifications

#### **CAUTION**

##### **Damage to the HMI device**

Only operate the HMI device with approved components:

- Batteries
- Charging station
- For office environments only: Tabletop power supply unit

Order information of the components is available on the Internet at  
["http://mall.automation.siemens.com"](http://mall.automation.siemens.com).

#### **⚠ WARNING**

##### **Injury or material damage**

You may operate the HMI device in the plant only with the battery or in the charging station.  
Operation with the desktop power supply module is not permitted.

#### **⚠ WARNING**

##### **Effectiveness of the emergency stop button**

The emergency stop button only has an effect if the HMI device is integrated into the safety program.

### Charging station

#### **⚠ WARNING**

##### **Injury or material damage**

The charging station complies with the following standards:

- EN 50335-2-29
- DIN EN 60204-1
- Protection class III in accordance with EN 61131-2 or EN 50178.

The 24 VDC power supply must be ensured by safely isolating the low voltage from hazardous voltages, e.g. by using a safety transformer or equivalent equipment.

Allowance should be made for the loss of voltage on the connection cable during dimensional analysis of the supply!

**⚠ WARNING**

**Injury or material damage**

Configure the 24 VDC supply for the charging station correctly, otherwise components of your automation system can be damaged and persons may be injured.

Use only voltage generated as protective extra-low voltage (PELV) for the 24 VDC supply of the charging station.

**CAUTION**

**Safe electrical separation**

Use only power supply units with safety isolation complying with IEC 60364-4-41 or HD 384.04.41 (VDE 0100, Part 410), for example according to the PELV standard, for the charging station's 24 VDC supply.

The supply voltage must be within the specified voltage range. Malfunctions in the charging station may otherwise result.

Applies to non-isolated system design:

Connect the connection for GND 24 V from the 24 V power supply output to equipotential bonding for uniform reference potential.

The following table shows the technical data of the supply voltage for the charging station:

Nominal voltage	+24 VDC
Range, permissible	19.2 V to 28.8 V (-20 %, +20 %)
Transients, maximum permissible	35 V (500 ms)
Time between two transients, minimum	50 sec
Current consumption with Mobile Panel <ul style="list-style-type: none"> <li>• Typical</li> <li>• Constant current, maximum</li> <li>• Power on current surge <math>I^2t</math></li> </ul>	<ul style="list-style-type: none"> <li>• Approximately 1.5 A</li> <li>• Approx. 1.8 A</li> <li>• Approx. 1.7 A<sup>2</sup>s</li> </ul>
Current consumption with Mobile Panel and batteries in charging compartment <ul style="list-style-type: none"> <li>• Typical</li> <li>• Constant current, maximum</li> <li>• Power on current surge <math>I^2t</math></li> </ul>	<ul style="list-style-type: none"> <li>• Approximately 2.8 A</li> <li>• Approximately 3.4 A</li> <li>• Approximately 1.7 A<sup>2</sup>s</li> </ul>
Fuse, internal	Electronic

**Connection to the supply voltage**

Wire the supply voltage to the cable terminal box included with the charging station using a 3-wire flexible cable (0.75 mm<sup>2</sup>). For additional information, refer to the operating instructions of the HMI device.

### Tabletop power supply unit

#### **CAUTION**

Please note that the mains connector must be removed for a complete disconnection from the mains.

Do not operate the HMI device in the plant with the table power supply unit.

The tabletop power supply unit is only suitable for an office environment.

The device is designed for operation on grounded power supply networks (TN systems to VDE 0100, Part 300, or IEC 364-3).

Operation is not authorized on ungrounded or impedance-grounded power networks (IT networks).

## **2.5 Notes about usage**

### Using the HMI device

A list indicating the country or geographical region of a country in which the HMI device is certified is included in the product information supplied with the HMI device.

### Use in industry

The HMI device is designed for industrial use. For this reason, the following standards are met:

- Interference emission requirements, paragraph 7.3, DIN EN 60947-1, Environment A
- Interference immunity requirements DIN EN 61326

### Residential use

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#### **Note**

The HMI device is not suitable for use in residential areas: If you use the HMI device in residential areas, the radio/TV reception may be impeded.

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.

A suitable measure for achieving the required RF interference level for Limit Class B includes for example:

- Use of filters in electrical supply lines

Individual acceptance is required.

## **Use of cable-free control equipment**



### **WARNING**

When using cable-free control equipment you must ensure that it does not interfere with other systems at the site, or that other systems do not interfere with it.

## **2.6 Risk analysis**

### **Carrying out a risk analysis**

The following standards must be used to perform the risk analysis:

- EN ISO 12100-1 and EN ISO 12100-2, General design guidelines for machines
- EN 1050 Risk Assessment for Machinery
- EN 954-1 Safety of Machinery

These considerations result in a safety category (B, 1, 2, 3, 4) in accordance with EN 954-1 that ultimately dictates how the safety-related aspects of the system that will be configured must be furnished.

With the safety-related parts of the Mobile Panel 277F IWLAN the following requirements are satisfied:

- Category 4 in accordance with EN 954-1.
- SIL 3 in accordance with IEC 61508
- Pl e and Cat. 4 in accordance with EN ISO 13849-1

The risk assessment must take into account that the overall concept of the plant must be configured accordingly. More detailed instructions on risk assessment and risk reduction are provided in the system manual "Safety Integrated".

## **2.7 Safety functions of the emergency stop button**

### **Safety instructions**

There is an emergency stop button on the Mobile Panel 277F IWLAN.

The emergency stop button on the Mobile Panel 277F IWLAN brings about a safety-related stop of the configured machine in accordance with EN 60204-1:1997, Section 9.2.5.3. You have the option of implementing a Category 0, 1, or 2 Stop function in accordance with EN 60204-1: 1997, Section 9.2.2. The stop function category must be selected on the basis of a risk assessment.

**⚠ WARNING**

**Emergency stop button not available**

The emergency stop button on the HMI device must not be used as a replacement for a permanently-wired emergency stop/emergency off on the machine.

Install stationary emergency stop buttons that are available at all times on the configured system.

**⚠ WARNING**

**Effectivity of the emergency stop button**

The following requirements must be met in order to render the emergency stop button effective:

- The HMI device must be operated in the charging station or operated with the battery.
- The project must be running on the Mobile Panel 277F IWLAN.
- The HMI device must be integrated in the safety program of the F-CPU.

If these prerequisites are satisfied the following applies:

- The SAFE LED on the HMI device is illuminated.
- The emergency stop button of the Mobile Panel 277F IWLAN is effective.

**Category 0 or 1 Stop**

If a Category 0 or 1 Stop circuit is implemented, the stop function must be in effect regardless of the operating mode. A Category 0 Stop must have precedence. Release of the emergency stop button should not cause a hazardous situation (see also EN 60204:1997 chapter 9.2.5.3).

The stop function is not to be used as a replacement for safety equipment.

**NOTICE**

**The emergency stop button can be triggered unintentionally**

The emergency stop button is evaluated under the following conditions:

- The Mobile Panel 277F IWLAN is integrated in the safety program of the F CPU.

In the following cases, the emergency stop button can be triggered unintentionally, bringing the configured system to a standstill:

- If the HMI device falls down
- When opening one of the coverings on the rear of the HMI device

**⚠ WARNING**

**Emergency stop button disabled**

If a global rampdown has been triggered by a communication error, the emergency stop will no longer be available on the Mobile Panel in question.

You have the option of configuring the "Global rampdown" signal to trigger an emergency stop.

## Storing the HMI device



### **WARNING**

#### **Non-functional emergency stop button**

If the HMI device is not integrated, the emergency stop button does not function.

To avoid confusion between effective and non-effective emergency stop buttons, only one integrated HMI device should be freely accessible.

If the HMI device is not in use, it must be stored in an secure place.

## See also

[Emergency stop button \(Page 20\)](#)

## 2.8 Safety functions of the enabling button

### Introduction

The enabling mechanism is comprised of two enabling buttons mounted on both sides of the HMI device.

Numerically controlled machines and systems are equipped with the operating modes "Automatic mode" and "Special mode".

Safety is ensured in automatic mode by means of closed, isolating protective devices and/or with functional non-isolating protective devices that block access.

In special mode, safety has to be ensured in a different manner than in automatic mode. In special mode, the danger zones of the machine or system are entered, where controlled movements have to be possible.

### Special mode

A reduced speed on the machine or in the system has to be specified for special mode based on the risk assessment. Movement of the machine should only be possible when the enabling device is activated. The operator must have the necessary qualifications and be acquainted with the details of the intended application.

### Safety instructions

The safety-related aspects of the velocity reduction control and those for the enabling device are designed in such a way that they satisfy the EN 954-1 safety category determined by the risk analysis.

The operating principles of enabling devices are described in EN 60204. Through the findings from accident investigations and the existence of technical solutions, the 3-stage enabling button became state of the art. Positions 1 and 3 of the enabling button are Off functions. Only the middle position allows the enabling function. EN 60204-1:1997 is identical to IEC 60204-1, whereby the 3-stage enabling button is gaining international importance.

The Stop category of the enabling device must be selected on the basis of a risk assessment and correspond to a Category 0 or 1 Stop.



### **WARNING**

#### **Injury or material damage**

Enabling buttons should only be used when the following applies for the person activating the enabling button:

- The person can see the danger zone.
- The person is capable of recognizing personal injury hazards in good time.
- The person is capable of taking immediate measures to avoid danger.

The only person allowed to remain in the danger zone is the person who is activating the enabling button.

Commands for unsafe conditions are not permitted to be issued with one enabling button alone. For this purpose, a secondary, intentional start command by means of a button on the Mobile Panel 277F WLAN is required.

The following happens if you leave the effective range for a period of up to 30 seconds with the enabling button pressed: Enabling is revoked 5 seconds after leaving the effective range.

If you reenter the effective range within 30 seconds, you must release the enabling button and press it again for enabling to take effect again.

### **NOTICE**

#### **Enabling button not effective**

The enabling button is only effective if the HMI device is logged on in the effective range and the "RNG" LED on the HMI device lights up.

If the operator leaves the effective range, the enabling button is deactivated after 5 seconds. The "Exit effective range without logoff" dialog opens after 30 seconds. The "RNG" LED only goes off when the operator confirms this dialog.

## **Risk from improper use**

To avoid the danger of unauthorized use of the enabling button due to impermissible hold-down, on each project start the enabling button must be pressed all the way down, and then released.

## **See also**

Enabling button (Page 22)

# 3

## Application Planning

### 3.1 Check list: Planning the application

#### Application planning

For application planning of the HMI device go through the following steps.

#### Check list for application planning

Step	Information	Check
Check the application conditions and environmental conditions	Application and ambient conditions (Page 42)	
Plant planning for application of the HMI device	Check list: Planning the system (Page 45)	
Planning the effective ranges	Planning effective ranges (Page 46)	
Only for the "override" mode: Planning the protective devices	For the "Override" mode: Planning the protective devices (Page 49)	
Planning measures to increase data safety	Check list: Data security (Page 50)	

## **3.2 Application and ambient conditions**

### **Mechanical and climatic conditions of use**

The HMI device is designed for use in a location protected from the effects of the weather. The conditions of use are compliant with requirements to DIN IEC 60721-3-3:

- Class 3M3 (mechanical requirements)

The table applies to the HMI device, charging station, and transponder.

<b>Tested for</b>	<b>Test standard</b>	<b>Comments</b>
Sinusoidal vibration, stationary	DIN IEC 60721-3-3	Frequency range: <b>2 ≤ f ≤ 200 Hz</b> Deflection: 1.5 mm/5 m/s <sup>2</sup>
Shocks, non-stationary, Total shock response spectrum	DIN IEC 60721-3-3	Shock amplitude: 70 m/s <sup>2</sup> Shock duration: 22 ms

- Class 3K3 (climatic requirements)

The table applies to the HMI device, charging station, and transponder.

<b>Ambient conditions</b>	<b>Permitted range</b>	<b>Comments</b>
Air temperature	5 to 40 °C	
Relative humidity	5 to 85 %, no condensation	Corresponds to relative humidity, load degree 2 in accordance with IEC 61131, part 2
Absolute humidity	1 to 25 g/m <sup>3</sup>	
Atmospheric pressure	70 to 106 kPa	Corresponds to an elevation of up to 3,000 m

### **Use with additional measures**

In the following cases the use of the HMI device requires additional measures:

- In locations with a high degree of ionizing radiation
- In locations with difficult operating conditions, for example due to:
  - Corrosive vapors, gases, oils or chemicals
  - Electrical or magnetic fields of high intensity
- In systems that require special monitoring, for example:
  - Elevators
  - Systems in especially hazardous rooms

## Testing for mechanical environmental conditions

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

Tested for	Test standard	Comments
Vibrations	IEC 60068, part 2-6 (sinusoidal)	Type of vibration: 20 frequency cycles with a tuning rate of 1 octave/minute.  Frequency range: <b>10 ≤ f ≤ 150 Hz, ± 1 Hz</b> Deflection: 0.35 mm / 5 g ± 15% at the control point
Shock	IEC 60068, part 2-27	Shock form: Half-sinus Shock amplitude: 30 g Shock duration: 11 ms Number of shocks: 3 per axis
Continuous shocks	IEC 60068, part 2-29	Shock form: Half-sine Shock amplitude: 10 g Shock duration: 16 ms Shock cycle: (1-3)/s Number of shocks: 1000 ± 10
Impact	IEC 60068, part 2-75	One-time impact stress of 1 Nm with an impact test device similar to DIN VDE 0740, Part 1, Section 19.2 at room temperature.
Falling	Drop testing in accordance with EN 60068-2-32	1.2 m  Applies to the HMI device with and without battery:

## Reducing vibrations

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 charging station of the HMI device to vibration-absorbent material (on metal shock absorbers, for example).

## Climatic ambient conditions for the HMI device

The following table shows the permitted climatic ambient conditions for use of the HMI device:

Ambient conditions	Permitted range	Comments
Temperature	<ul style="list-style-type: none"> <li>• Operation 0 to 40 °C</li> <li>• Storage/transport -20 to 60 °C</li> </ul>	
Relative humidity	5 to 85 %, no condensation	Corresponds to relative humidity, load degree 2 in accordance with IEC 61131, part 2
Atmospheric pressure	1060 to 700 hPa	Corresponds to an elevation of –1,000 to 2,000 m

### *3.2 Application and ambient conditions*

Ambient conditions	Permitted range	Comments
Pollutant concentration	SO <sub>2</sub> : < 0.5 vpm; Relative humidity < 60 %, no condensation	Check: 10 cm <sup>3</sup> /m <sup>3</sup> ; 10 days
	H <sub>2</sub> S: < 0.1 vpm; Relative humidity < 60 %, no condensation	Check: 1 cm <sup>3</sup> /m <sup>3</sup> ; 10 days

### **Climatic ambient conditions for the charging station**

The following table shows the permitted climatic ambient conditions for use of the charging station.

Ambient conditions	Permitted range	Comments
Temperature • Operation • Storage/transport	• From 0 to 40 °C • From -20 to 60 °C	
	5 to 85 %, no condensation	Corresponds to relative humidity, load degree 2 in accordance with IEC 61131, part 2
Atmospheric pressure	1060 to 700 hPa	Corresponds to an elevation of -1,000 to 2,000 m
	SO <sub>2</sub> : < 0.5 vpm; Relative humidity < 60 %, no condensation	Check: 10 cm <sup>3</sup> /m <sup>3</sup> ; 10 days
	H <sub>2</sub> S: < 0.1 vpm; Relative humidity < 60 %, no condensation	Check: 1 cm <sup>3</sup> /m <sup>3</sup> ; 10 days

### **Ambient climatic conditions for the transponder**

The following table shows the permitted climatic ambient conditions for use of the transponder:

Ambient conditions	Permitted range	Comments
Temperature • Operation • Storage/transport	• 0 to 50 °C • -20 to 60 °C	
	5 to 85 %, no condensation	Corresponds to relative humidity, load degree 2 in accordance with IEC 61131, part 2
Atmospheric pressure	1060 to 700 hPa	Corresponds to an elevation of -1,000 to 2,000 m
	SO <sub>2</sub> : < 0.5 vpm; Relative humidity < 60 %, no condensation	Check: 10 cm <sup>3</sup> /m <sup>3</sup> ; 10 days
	H <sub>2</sub> S: < 0.1 vpm; Relative humidity < 60 %, no condensation	Check: 1 cm <sup>3</sup> /m <sup>3</sup> ; 10 days

## 3.3 Check list: Planning the system

### Introduction

For fail-safe systems careful system planning is necessary so that the system can be subsequently accepted and commissioned successfully.

### Check list

Use the following check list when planning fail-safe systems:

Step	Further information	Check
Obtain an current plan of the plant for which an effective range concept should be created.		
Based on the system plan specify the operator's access paths to the machine.  Specify the location from which the operator will operate the machine. Here you need WLAN coverage.		
Plan the WLAN areas.  Specify the mounting locations of the access points in such a manner that good WLAN coverage is ensured.  Special tools such as Sinema E are available on the market for planning WLAN coverage.	System description "///Setting up an industrial wireless LAN", on the Internet at the following address: <a href="http://support.automation.siemens.com/WW/view/en/22681042">"http://support.automation.siemens.com/WW/view/en/22681042"</a>  Information about Sinema E is available on the Internet at the following address: <a href="http://www.siemens.com/sinema">"http://www.siemens.com/sinema"</a>	
Specify the effective ranges in which the operator will operate the machine with the enabling buttons.  Specify the mounting locations for the transponders.	Planning effective ranges (Page 46)	
When using "override" mode: Plan additional protective measures.	For the "Override" mode: Planning the protective devices (Page 49)	
Planing the installation of the PROFINET and PROFIsafe communication.  Particularly specify the PROFIsafe addresses for the HMI devices.	System manual: "SIMATIC Communication"  Programming and operating manual "SIMATIC S7 Distributed Safety Configuring and Programming".	

## 3.4 Planning effective ranges

### Effective range and transponder

An effective range is physically formed by transponders mounted in the vicinity of the machine. Each transponder sends a unique ID. The ID is received by the HMI device and enables it to determine its distance from the transponder. If the HMI device is within the effective range, safe operation is possible once it logs on in the effective range.

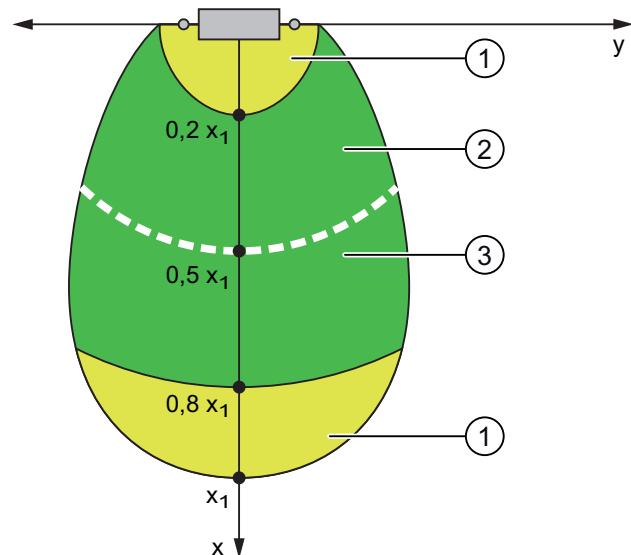
### Rules for effective ranges

The following rules apply when defining effective ranges:

Rule	Explanation
The maximum distance from the transponder to the HMI device can be 8 meters.  No minimum distance to the transponder can be configured, but this is always a percent of the configured maximum range. The following section provides a detailed description.	System limits
The effective range must be scaled so that the danger point can be seen from every angle of the effective range.	Too great a distance or a cluttered effective range prevents visual control on the part of the operator.
The distance between the machine to be operated and the operator needs to be scaled according to the machine.	Insufficient distance from the machine increases the injury hazard for the user.  Too great a distance from the machine prevents visual control on the part of the operator.
Machine, transponder and operator position need to be adapted to one another.	The HMI device needs to be able to measure the distance to the transponder during operation. This requires the HMI device to be aligned with the transponder. The operator needs visual contact to the machine at the same time.
Effective ranges should not overlap. Consequently you should only assign each transponder to a single effective range.  Transponders in <b>different</b> effective ranges must be far enough away from each other that their transmission ranges do not overlap.	Assignment of effective range to the machine that will be operated must be unique.
You can set up a maximum of 127 effective ranges in a project.	System limits
A maximum of 127 transponders can be assigned to one effective range.	System limits

### Distance measurement between HMI device and transponder

The transponder transmits its ID in lobe-shaped area with a maximum range of approx. 8 meters. The following example shows the varying quality of the effective range based on a configuration in which a maximum range of  $x_1 = 8$  m has been specified.



- ① Zone with poor quality effective range
- ② Zone with good quality effective range
- ③ The effective range quality along the line is 100%.

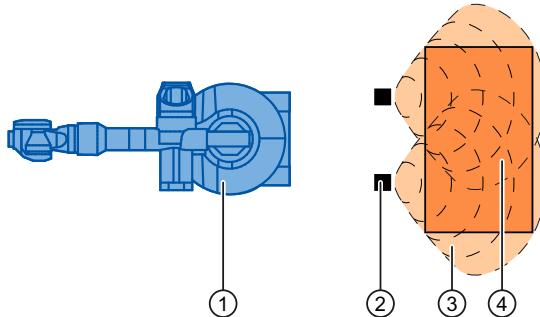
The effective range quality is best in the middle of the lobe-shaped area: the effective range quality along the white line is 100%. The effective range quality decreases along the lobe's center line in the direction of each edge.

There is a zone of poor quality effective range (marked yellow) both directly at the transponder as well as at the other end of the lobe. At the long side of the lobe there is a direct transition of the effective range quality from "good" to "no effective range detected".

You can find an exact description of the radiant characteristics of the HMI device and transponder in specifications section of the operating instructions.

Transponders must be mounted in the system in such a manner that the planned effective range is covered by the transmitting range of the transponders assigned to it.

Example:



- ① Machine that will be operated from within the effective range
- ② Transponder with transmitting range in the form of a lobe
- ③ Planned effective range; safe operation of the machine is possible from here
- ④ Actual effective range; safe operation of the machine is still possible from here

## Procedure

1. On the system plan specify which parts of the system will be operated with the enabling buttons. You require effective ranges for these areas of the system.
2. Specify the spatial expansion of the individual effective ranges. The operator must be located within the limits of the respective effective range in order to operate the corresponding plant unit with the enabling buttons.  
Comply with the rules for the definition of effective ranges.
3. Plan the transponders in the effective range in such a manner that the effective range is covered by the radiated emission of the transponders. Ensure that the effective range is not too large to be seen or another danger arises.
4. Specify the following:
  - A name and an ID unique throughout the plant for each effective range from the value range 1 to 127
  - A name and an ID unique throughout the plant for each transponder from the value range 1 to 65534
  - For each effective range the maximum distance that the HMI device can have to the transponders of this effective range. The distance must be the same for all transponders of an effective range.
  - The mounting location for an indicator.

### **WARNING**

#### **An indicator in the effective range is an absolute necessity**

A indicator supplies the operator the feedback that he has logged onto the correct effective range.

Install an indicator in every situation, for example a light that shows that an HMI device is logged on in the effective range.

5. On the system plan, note the names and the IDs that you use during commissioning.  
Prior to commissioning you must affix the IDs of the effective ranges in the plant so that they are easily legible.

## 3.5 For the "Override" mode: Planning the protective devices

### Introduction

Use "override" mode to extend the effective range concept.

### Requirements

Only use "override" mode in delimited plant areas that are secured by additional protective measures.

The operator must be able to fully see the area for which "override" mode applies. The danger location must be visible from every point of the override area.

When using the "override" mode you must install a switch within an effective range that is independent of the HMI device.

The operator logs his HMI device on at the effective range and activates "override" mode with this switch.

### Suitable additional protective measures

When using "override mode you must provide additional protective measures in your plant which prevent unauthorized use or incorrect operation of the HMI device. The additional protective measures must have a safety category that is commensurate with the plant requirements.

For example the following measures are suitable:

- Grate with protective door
- Light barrier
- Foot grating / safety shutdown mat
- Additional plant-typical safety measures

If you use a grating with a protective door, you have to protect against access to the override area using a further protective measure, e.g a light barrier or a foot grating. This enables you to leave the protective door open as an escape route during operation of the plant in "override" mode.

### Safety program

The "override" mode may only be activated as long as the safety measure is active.

If the operator leaves the protected area, the "override" mode must be automatically ended.

### Example of an application

A detailed example of an application can be found in the section Application example: Safety Functions (Page 113).

## **3.6      Check list: Data security**

### **Introduction**

Data security, security in automation technology serves particularly to ensure the availability and trouble-free operation of industrial plants.

In order to ensure secure transmission of signals via a WLAN for the Mobile Panel 277F IWLAN, you must particularly safeguard the system from unauthorized access.

You can count on the following types of unauthorized accesses:

- Outside accesses

To protect against unauthorized accesses from outside you must protect the WLAN in the same way you would protect a WLAN for office communication, namely with a firewall.

- Accesses from inside

Investigations have shown that the majority of attacks on data security are executed from inside the plant. To ensure data security you must take special measures inside the plant.

### **Possible attack objectives**

The HMI device communicates with the fail-safe controller via PROFIsafe. Here the following possible attack objectives are present:

- Parameter assignment and configuration

Possible objectives of an attack are assignment of parameters to a device and configuration.

- Productive operation data

The productive data can be manipulated by sending a series of false PROFIsafe telegrams, which prevent the machine from being switched off.

Data transfer between HMI device and access point is protected by the AES encryption mechanism. Manipulation of productive data is prevented in this manner.

### **Organizational measures to ensure data security**

The organizational measures to ensure data security are described in the following documents:

- PROFIsafe – Profile for Safety Technology on PROFIBUS DP and PROFINET IO (IEC 61784-3-3)
- PROFIsafe - Environmental Requirements

Note the regulations in these documents.

### **Check list**

The following check list shows the organizational measures required to achieve the highest possible level of data security when transmitting via WLAN.

Specify the organizational measures you must implement in accordance with your plant's requirements. Take all phases into account:

- The configuration phase

- Project transfer to the HMI device
- The process management phase in which the HMI device is used to operate and monitor the plant.

Check the interplay of the specified measures.

The measures listed in the table are marked as follows:

- To achieve PROFIsafe conformity, you must take all the measures which are marked with an asterisk \* and highlighted in bold in the table.
- Additional voluntary measures are not marked.

Measure	Further information	Check
<b>* Comply with the regulations in the document "PROFIsafe - Environmental Requirements".</b>	Document PROFIsafe - Environmental Requirements	
<b>Access points</b>		
Select the installation site and antenna characteristics of the access points in such a manner that only the desired area is with supplied wireless capacity. In this regard note that wireless waves spread out horizontally as well as vertically.	Access point operating instructions	
<b>* Install access points where there is secure access, e.g. in intermediate ceilings. In this manner you prevent manipulations directly at the access point or at the Ethernet connection to the LAN.</b>		
<b>* Only use wire conducted connections to access the parameter assignments of the access point.</b>		
Change the default administration password.	Access point Operating instructions	
<b>* Hidden SSID: Configure the access point in such a manner that the SSID of the wireless cell is not visible.</b>	Access point Operating instructions	
<b>* Change the pre-set SSID.</b>	Access point Operating instructions	
<b>Network</b>		
Examine the use environment with a spectrum analyzer and via WLAN measurement programs for possible interference to the WLAN on the wireless level.  If you have detected interference sources specify the appropriate remedial measures. Log the results.		
Only operate the network in the infrastructure mode.	System manual "Fundamentals of Industrial Wireless LAN", chapter "Network architecture"	
<b>* Completely disconnect the automation networks from other networks. Use firewalls, or VPNs at points where connections to these networks must exist. Limit the communication between the networks to the absolute minimum required.</b>	System manual "Fundamentals of Industrial Wireless LAN", chapter "VPN (Virtual Private Network)"	

## 3.6 Check list: Data security

Measure	Further information	Check
<p><b>* Use authentication mechanisms to prevent unauthorized participation in wireless traffic.</b></p> <p>Shared key as well as certificates are allowed as authentication methods.</p> <p>The pass phrase must be at least 20 characters long. The passphrase should contain alphanumeric characters and special characters.</p>		
<b>HMI device</b>		
<p><b>* Protect the HMI device and the toolbar of the HMI device against unauthorized access with a password.</b></p>	HMI device operating instructions, chapter "Change password protection".	
<p><b>* Only release the data channel via which the project will be transmitted to the HMI device, during transmission of the project.</b></p>	HMI device operating instructions, chapter "Data channel parameter assignment".	
<b>F-CPU and safety program</b>		
<p><b>* Protect the access to the F-CPU and to the safety program with passwords.</b></p>	Programming and operating manual "S7 Distributed Safety Configuring and Programming", chapter "Access protection"	
<b>WinCC flexible ES</b>		
<p>Protect WinCC flexible Es with general IT technologies.</p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Protect the PC where the ES is installed on the operating system level with a password.</li> <li>• To encrypt files, folders, and partitions use an appropriate encryption program. Programs with this functionality are available as shareware.</li> <li>• Assign access rights to specific drives so that only a certain person subgroup can use the data.</li> <li>• Encrypt the data with mechanisms that Windows makes available.</li> </ul>		
Protect the "Effective range name" object with a password.	WinCC flexible Information System	

## Further information

Addition information on the data security is available in the following publications:

- System manual "Fundamentals - Industrial Wireless LAN", chapter "Data security of wireless communication in accordance with IEEE 802.11".
- Brochure published by the German Federal Office for Information Security (Bundesamt für Sicherheit in der Informationstechnik): "Wireless communication systems and their security aspects".

# 4

## Configuration

### 4.1 Check list: Configuration

#### Configuration

Go through the following steps for configuration.

#### Checklist for configuration

Step	Information	Check
STEP 7, HW Config: Integrating the HMI device in the plant configuration Setting the PROFIsafe parameters	Assigning parameters for communication between the HMI device and the controller (Page 55)	
S7 Distributed Safety: Call the F-FBs in the safety program that are necessary for the HMI device	Using F-FBs (Page 60)	
WinCC flexible: Configure a unique project ID, the effective ranges, and the desired objects	Configuration overview (Page 72)	
Setting the HMI device parameters	HMI device operating instructions, Appendix	

### 4.2 Procedure for configuration

#### Tools

For the use of a Mobile Panel 277F IWLAN you have to use various tools, which you can call centrally on the configuration computer via the SIMATIC Manager:

- The STEP 7 hardware configuration "HW Config"
- The S7 Distributed Safety option pack
- WinCC flexible 2007 ES

## Basic procedure

Always use the following procedure for configuration:

1. Create a STEP 7 project in the SIMATIC Manager.
2. Configure the required F-CPU and a PROFINET connection in the hardware configuration "HW Config".
3. Insert a Mobile Panel 277F IWLAN in the configuration from the hardware catalog of the HW Config by dragging it to the PROFINET connection in the station window via Drag&Drop.
4. Call the object properties of the Mobile Panel 277F IWLAN using the context menu (right mouse button) and configure the communication between the HMI device and the PLC, see *Assigning parameters for communication between the HMI device and the controller* (Page 55).
5. Configure other components in accordance with your plant.
6. Create a safety program for the F-CPU in STEP 7 with S7 Distributed Safety. Insert the F-FBs required for the HMI device in the safety program and wire them according to instructions. Do this according to the checklist *Checklist: Creation of the safety program* (Page 59).
7. Start WinCC flexible ES and create a project for the HMI using the Wizard.
8. Set "Ethernet/Wireless" in the project view under "Communication".
9. Set the PROFIsafe address of the HMI device in the project view under "Device settings" > "Device settings".
10. Configure the effective ranges planned for your plant under "Device settings" > "Effective ranges", see *Effective ranges editor* (Page 73).
11. Configure the figures for operating and monitoring the plant. Insert the objects required for working with effective ranges in these figures, see *Objects for the Mobile Panel 277F IWLAN* (Page 73).

## Further information

You have central access to SIMATIC documentation under SIMATIC in the Start menu on the configuration computer.

More detailed information can be found under the following references:

Tool	Task	Documentation
STEP 7, HW Config	Creation of the project for the automation system	SIMATIC > Documentation > desired language
S7 Distributed Safety	Creation of the safety program	SIMATIC > Documentation > desired language
WinCC flexible	Creation of the project for the HMI device	SIMATIC > WinCC flexible 2007 > WinCC flexible help system

## 4.3 STEP 7: HW Config

### Procedure in STEP 7 HW Config

When you have created a STEP 7 project in the SIMATIC Manager, configure the desired F-CPU and a PROFINET connection in the hardware configuration "HW Config".

Then insert a Mobile Panel 277F IWLAN in the configuration from the hardware catalog of the HW Config by dragging it to the PROFINET connection in the station window via Drag&Drop.

Configure the communication between the HMI device and the F-CPU in the properties of the HMI device.

### 4.3.1 Integrating the GSD file in STEP 7

If the HMI device is not listed in the hardware catalog of HW Config, you need to integrate the valid GSD 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>"

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#### Note

At installation of WinCC flexible, the GSD files supplied with WinCC flexible are automatically integrated in STEP 7.

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### 4.3.2 Assigning parameters for communication between the HMI device and the controller

#### Introduction

If you select the HMI device in the HW Config, the following modules are displayed:

- mobile277fiwlan
- Mobile277Standard\_IO
- Mobile277Failsafe\_IO

#### Object properties of the module "Mobile277Failsafe\_IO"

The parameters for fail-safe operation are configured in the object properties of the Mobile277Failsafe\_IO module. You can only change this parameter after you have entered a password for the safety program.

You can find additional information about access protection in the manual "S7 Distributed Safety Configuring and Programming".

- "Addresses" tab

The address area for the process image is configured in this tab. The process image is a memory area in the controller which the HMI device and controller access together. At the beginning of the cyclic control program the signal states of the inputs of the HMI device are transferred to the controller via the process input images, PII. At the end of the cyclic program the process image of the outputs, PIQ is transferred as a signal state to the HMI device.

Parameter	Meaning
Input > Address > Start of Address Area	Start address of the inputs in the process image. The safety-relevant user data of the HMI device is shown. The default depends on the controller used.
Input > process image	Process image to which the address range of the inputs belongs, PII. This parameter cannot be set with controllers of the SIMATIC CPU 300 type.
Output > Address > Start of Address Area	Start address of the outputs in the process image. The safety-relevant user data of the HMI device is shown. The default depends on the controller used.
Output > process image	Process image to which the address range of the outputs belongs, PIQ. This parameter cannot be set with controllers of the SIMATIC CPU 300 type.

- Tab "PROFIsafe"

Here you must set the parameters "F\_Dest\_Add" and "F\_WD\_Time".

Parameter	Meaning
F_SIL	Safety class of the Mobile Panel 277F WLAN The value of the parameter is set to "SIL 3". This parameter cannot be modified.
F_CRC_Length	Length of the CRC for the consistency check. The value of the parameter is set to "3 byte CRC". This parameter cannot be modified.
F_Block_ID	This parameter must be set to the value "0", as there is no checksum of the individual device parameters.
F_Par_Version	Implemented PROFIsafe version. The value of the parameter is set to "1". This means that PROFIsafe V2 is used. This parameter cannot be modified.
F_Source_Add	PROFIsafe address used to uniquely identify the source throughout the network and station. The address is assigned automatically. The "F_Source_Add" parameter can have a value between 1 and 65534. This parameter cannot be modified.

Parameter	Meaning
F_Dest_Add	<p>PROFIsafe address used to uniquely identify the destination throughout the network and station.</p> <p>The address is assigned automatically. The "F_Dest_Add" parameter can have a value between 1 and 65534.</p> <p>You can change the value for "F_Dest_Add".</p>
F_WD_Time (ms)	<p>Monitoring time in the fail-safe IO device.</p> <p>A valid current safety frame must reach the F-CPU and be returned to the HMI device within the monitoring time period. This ensures that failures and errors are detected and appropriate responses, which keep the fail-safe system in a safe state or transfer it to a safe state, are triggered.</p> <p>The monitoring time selected must be long enough that message frame delays will be tolerated by the communication system, but short enough that the fault reaction function responds quickly enough in the event of a fault (e.g. interruption in the communication connection).</p> <p>The "F_WD_Time" parameter can be set in 1 ms increments. The default monitoring time is 500 ms.</p> <p>Calculate the minimum monitoring time with the Excel table "s7fcotia.xls".</p> <p>This table is part of the option package S7 Distributed Safety. You can find the current version of this table on the Internet at the following address:</p> <p><a href="http://www.siemens.de/automation/support">"http://www.siemens.de/automation/support"</a>, document ID 21627074.</p> <p>You can find the parameters needed to calculate the monitoring time under "General specifications".</p>

**NOTICE**

If an error occurs, the monitoring time is included in the maximum response time. The selected monitoring time must be short enough that the error tolerance time of the process is not exceeded.

**Additional information on configuring F-I/O in STEP 7**

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

**Additional information on working in HW Config**

You can find additional information on working in HW Config in the manual "Configuring hardware and communication connections with STEP 7" and in the HW Config online help.

## **4.4      S7 Distributed Safety**

### **Introduction**

The Mobile Panel 277F IWLAN is used as a peripheral in fail-safe automation systems. Fail-safe automation system, also referred to as F systems in the following, are used in plants requiring high levels of safety.

During fail-safe operation, a safety program runs in the F CPU. The HMI device must be integrated into this safety program.

The HMI device and F CPU communicate via PROFINET IO. They use the safety-related PROFIsafe protocol as of V 2.0 for fail-safe communication.

### **Safety-related functions of the HMI device**

The fail-safe HMI device performs the following:

- Detects the signal states of the emergency stop button and enabling button
- Sends these signal states to the F CPU in the form of safety message frames

### **Safety program and F FBs**

To operate the HMI device, you need to configure a safety program in STEP 7 with the "SIMATIC S7 Distributed Safety" add-on package as of V5.4 SP3.

To guarantee availability of the safety functions, you need to use particular fail-safe function blocks (F FBs) in the safety program.

If you do not use the fail-safe function blocks, the HMI device cannot be integrated in the safety program of the F CPU. The project on the HMI device cannot be started.

The F FBs are supplied on a CD together with the HMI device.

You can also obtain the F FBs in the Internet at the following address:

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

### **Additional information**

You can find additional information about working with S7 Distributed Safety in the programmer and operator manual "SIMATIC S7 Distributed Safety - Configuration and Programming" as well as the online help for S7 Distributed Safety.

#### 4.4.1 Checklist: Creation of the safety program

##### Checklist for configuring a safety program for emergency stop applications

Information on S7 Distributed Safety can be found in the programming and operating manual "S7 Distributed Safety - configuring and programming".

Please observe all additional instructions described in the programming and operating manual "S7 Distributed Safety - configuring and programming".

Go through the following steps for configuration.

Step	Information	Check
Configuration of the hardware	S7 Distributed Safety, chapter "Overview of configuration"	
Configuration of the F-CPU <ul style="list-style-type: none"> <li>• Level of protection "CPU contains safety program"</li> <li>• Password</li> <li>• Define/set F-specific parameters:</li> <li>• Define the call time for the F-run-time group in which the safety program is to be executed.</li> </ul>	S7 Distributed Safety, chapter "Configuring the F-CPU"	
Save, compile and load the hardware configuration The following blocks are generated: <ul style="list-style-type: none"> <li>• F-shared DB</li> <li>• F-I/O DB for the HMI device</li> <li>• System data</li> </ul>		
Insert the following fail-safe blocks: <ul style="list-style-type: none"> <li>• FB 161: F_FB_MP</li> <li>• FB 162: F_FB_RNG_4 or FB 163: F_FB_RNG_16</li> <li>• FC 176: F_BO_W</li> <li>• FC 177: F_W_BO</li> <li>• FB 215: F_ESTOP1</li> <li>• F_DB_STATES or a comparable data area in an existing F-DB</li> </ul>	<ul style="list-style-type: none"> <li>• Using F-FBs (Page 60)</li> <li>• FB161: Mobile Panel Status (F_FB_MP) (Page 63)</li> <li>• FB162: Effective range for 4 Mobile Panel (F_FB_RNG_4) / FB 163 Effective range for 16 Mobile Panel (F_FB_RNG_16) (Page 67)</li> </ul>	
Call and wire the F-FBs as described in the application example Creating the additional safety program	<ul style="list-style-type: none"> <li>• Online help for the F-FBs</li> <li>• Application example: Safety Functions (Page 113)</li> </ul>	
Creating the fail-safe run-time group <ul style="list-style-type: none"> <li>• Create F-CALL</li> <li>• Assign F-FB/F-FC to F-CALL</li> <li>• Set maximum cycle time for the F-run-time group in accordance with requirements</li> </ul>	S7 Distributed Safety, chapter "Defining F-run-time groups"	
Calling the safety program e.g. OB 35	S7 Distributed Safety, chapter "Defining F-run-time groups"	
Compiling the safety program	S7 Distributed Safety, chapter "Compiling the safety program"	

Step	Information	Check
Checking the safety program	<ul style="list-style-type: none"> <li>Online help for the F-FBs</li> <li>FB161: Mobile Panel Status (F_FB_MP) (Page 63)</li> <li>FB162: Effective range for 4 Mobile Panel (F_FB_RNG_4) / FB 163 Effective range for 16 Mobile Panel (F_FB_RNG_16) (Page 67)</li> </ul>	
Loading the safety program in the F-CPU		
Testing and acceptance testing of the safety program	S7 Distributed Safety, chapter "Safety program acceptance test"	

#### 4.4.2 Using F-FBs

##### Required F FBs

You must integrate the following fail-safe blocks in your safety program:

- For each HMI device: An F\_FB\_MP  
The assigned HMI device is monitored by this F FB.
- For each effective range: An F\_FB\_RNG\_4 or alternatively an F\_FB\_RNG\_16  
The assigned effective range is managed by this F FB.  
The number of HMI devices that should get permission to log onto the effective range determines the F FB that is called, F\_FB\_RNG\_4 or F\_FB\_RNG\_16:
  - F\_FB\_RNG\_4 For a maximum of 4 HMI devices
  - F\_FB\_RNG\_16 For a maximum of 16 HMI devices
- An F\_DB\_STATES with a WORD data type or a comparable address area in an available F DB  
Using this F DB, data is exchanged between the F\_FB\_MP of the HMI deice and F\_FB\_RNG\_n of the effective range.
- FB 215: F\_ESTOP1; with this block, you can ensure that the operator must first provide confirmation after an emergency stop before the plant can be restarted. You can find this block in the Distributed Safety F library in the F Application Blocks block container.
- FC 176: F\_BO\_W and FC 177: F\_W\_BO

Insert the FC 176: F\_BO\_W and FC 177: F\_W\_BO blocks into your safety program since these blocks are used as calls. You can find these blocks in the Distributed Safety F library in the F Application Blocks block container.



##### WARNING

###### Defective fail-safe application blocks

Do not change the numbers of F application blocks!

Ensure the following matches when changing the names of F application blocks:

- The symbolic name in the symbol table
- The name in the object properties of the block (header)

## Rules for the safety program

### **WARNING**

#### **Emergency stop button not evaluated**

The emergency stop button can only be evaluated if you call an F\_FB\_RNG\_n in your safety program.

Always call an F\_FB\_RNG\_n in your safety program, even if you do not use effective ranges in your plant.

### **WARNING**

#### **Prohibited restart of the plant**

Once the emergency stop button has been triggered, the plant can only be restarted for operation only after the operator provides acknowledgment. Use the FB 215 F\_ESTOP1 in your safety program to ensure acknowledgment by the operator.

### **WARNING**

#### **Emergency stop button evaluation delayed**

If the cycle time for OB 35 is set too high, message frame may be lost and the evaluation of the "E-STOP" of F\_FB\_RNG\_n may be delayed.

Set the cycle time for OB 35 lower than that for the PROFINET IO time.

### **CAUTION**

#### **Safety states not evaluated**

The safety states, such as a global rampdown, can only be evaluated if you call an F\_FB\_RNG\_n in your safety program.

Always call an F\_FB\_RNG\_n in your safety program, even if you do not use effective ranges in your plant.

### **WARNING**

#### **Emergency stop button enabled**

If a global rampdown has been triggered by a communication error, the emergency stop will no longer be available on the Mobile Panel in question.

You have the option of configuring the "Global rampdown" signal to trigger an emergency stop.

The F FBs used are called cyclically and in a specific order in the safety program. You need to call the F FBs in the following order in your safety program:

1. All F\_FB\_MP
2. All F\_FB\_RNG\_n

The operator must always acknowledge errors, such as communication errors. You cannot use any automatic acknowledgment in your safety program, therefore.

**⚠ WARNING**

**Unwanted restart of the plant after acknowledgment of a communication error**

The plant cannot be automatically restarted after a communication error on the HMI device is acknowledged.

Therefore, ensure that your safety program requires an additional user action before the plant can be restarted.

### Interconnection of the F FBs

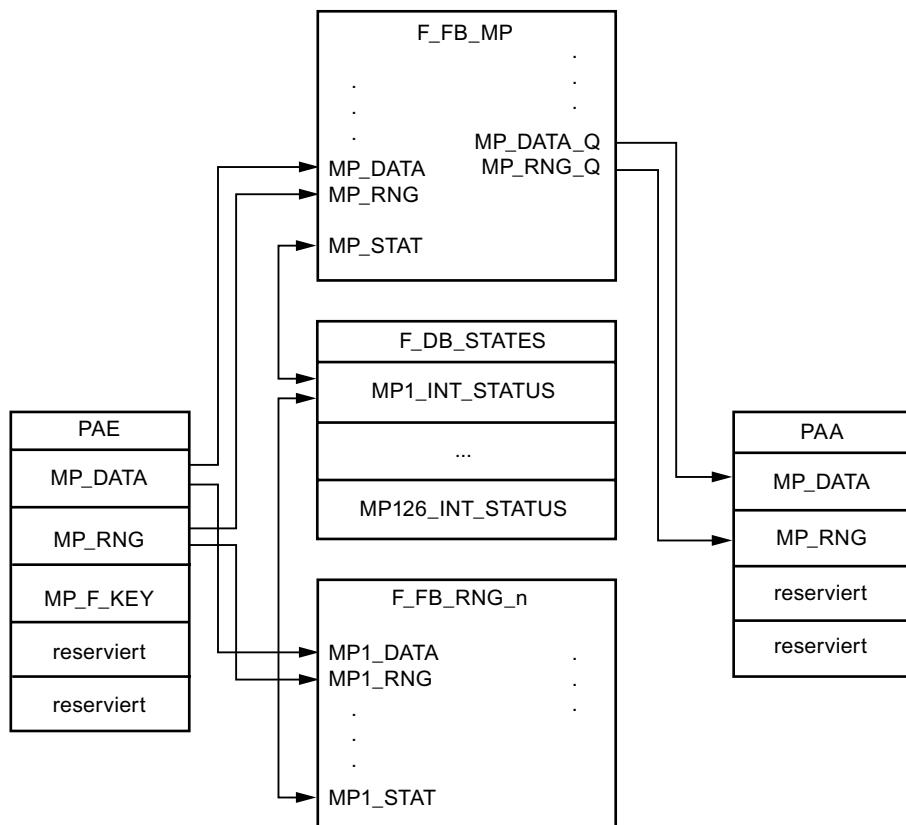
The blocks are interconnected with one another and with the process image of the Mobile Panel 277F IWLAN.

For every Mobile Panel 277F IWLAN, there is a memory area in the PLC that is commonly access by the HMI device and the PLC, the so-called process image. The signal states of the HMI device's inputs is sent to the PLC at the start of the cyclic control program through the process image of the inputs, PII. The process image of the outputs, PIQ, is sent to the HMI device as the signal state at the end of the cyclic program.

The following figure is a schematic representation of the interconnection of F FBs to one another and to the PII and PIQ.

**⚠ WARNING**

You cannot directly evaluate the PII and PIQ in your program.



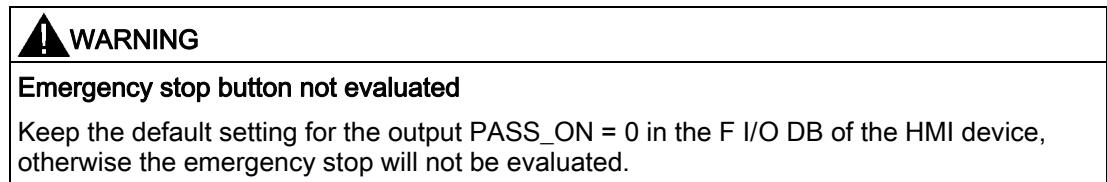
## Example application

Read Application example: Safety Functions (Page 113) if you use F\_FB\_RNG\_n.

You can find another detailed example application in the Internet under "<http://support.automation.siemens.com>", contribution number 25702331.

## F I/O DB

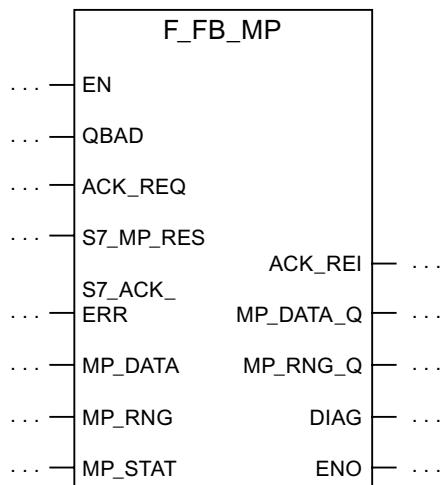
An F I/O DB is automatically generated in HW Config for every F I/O.



The access to the F I/O and working with the F I/O DB is described in detail in the manual "SIMATIC S7 Distributed Safety Configuration and Programming", "F I/O Access" section.

### 4.4.3 FB161: Mobile Panel Status (F\_FB\_MP)

#### Structure



## Configuration

### 4.4 S7 Distributed Safety

#### Inputs

Parameters	Data type	Description	Interconnection
QBAD	Bool	QBAD indicates if the F-I/O has been passivated.	F-I/O DB: DBx2.1 = QBAD
ACK_REQ	Bool	Acknowledgement required  After a communication error, the fail-safe system sets QBAD = 1 and ACK_REQ = 0. ACK_REQ = 1 indicates that the PROFIsafe message frames are being exchanged again.	F-I/O DB: DBx2.2 = ACK_REQ
S7_MP_RES	Bool	This input is set so that the F-CPU resets the status of F_FB_MP to its "original state", i.e.: <ul style="list-style-type: none"><li>• The HMI device has the status "removed"</li><li>• If a rampdown or shutdown was set, it is reset.</li><li>• If the HMI device was logged on to an effective range, it is enabled again.</li></ul> The input is only evaluated if Q_BAD = 1.  Setting the input S7_MP_RES is necessary if the HMI device cannot return itself to a defined state, for example when a system error occurs or the battery is dead.	Must be specifically interconnected for plant.  The security program must ensure that after S7_MP_RES is set, automatic restart of the plant is not possible. The operator must strictly ensure that he executes a separate operator action to commence the restart.
S7_ACK_ERR	Bool	Communication errors may not be acknowledged automatically.  This input is set to have the F-CPU to acknowledge a communication error during ongoing PROFIsafe communication.  F_FB_MP only reacts to a rising edge.	Must be specifically interconnected for plant.
MP_DATA	Word	User data of the fail-safe process image's inputs	PII: Word 1 = MP_DATA
MP RNG	Word	ID of the effective range in which the HMI is included.	PII: Word 2 = MP RNG
MP_STAT	Word	Data are exchanged through F_DB_STATES to F_FB_RNG_n via this input/output.	F_DB_STATES

#### Outputs

Parameter	Data type	Description	Interconnection
ACK_REI	Bool	Acknowledgement for reintegration  The automatic reintegration is regulated via the F-I/O DB through this output.	F-I/O DB: DBx0.2 = ACK_REI
MP DATA_Q	Word	User data of the fail-safe process image's inputs:	PIO: Word 1 = MP DATA
MP RNG_Q	Word	The effective range ID is transmitted to the HMI device through this output.	PIO: Word 2 = MP RNG

Parameter	Data type	Description	Interconnection
DIAG	Word	<p>Information about any occurring errors is provided through this output for servicing purposes.</p> <p>Bit 0: HMI removed Bit 1: HMI integrated Bit 2: Communication error on the HMI device Bit 3: Communication error must be acknowledged. Bits 4 to 15: Reserved</p>	You can evaluate the DIAG output in your program.

## Enable inputs EN and ENO

When you call a fail-safe block, the enable input EN and enable output ENO automatically appear.

Note the following:

- Do not connect these I/Os
- Do not supply these I/Os with "0"
- Do not evaluate these I/Os

## Validity

This description applies to version 1.0 of F\_FB\_MP.

---

### Note

Insert the FC 176: F\_BO\_W and FC 177: F\_W\_BO blocks into your safety program because they are called by F\_FB\_MP. You can find these blocks in the Distributed Safety F-Library in the F-Application Blocks block container.

---

## Wiring

You have to wire the inputs and outputs of the F-FB manually. They are not automatically wired.

## Purpose

The assigned Mobile Panel 277F IWLAN HMI device is monitored by F\_FB\_MP.

You need to use a separate F\_FB\_MP for each Mobile Panel 277F IWLAN.

F\_FB\_MP performs the following tasks:

- The block integrates the HMI device in the safety program of the F-CPU after startup.
- The block removes the HMI device from the safety program after a communication error. As soon as the communication error has been corrected and the operator has acknowledged this, the block integrates the HMI device back into the safety program.

- The block passes the states of the HMI device through F\_DB\_STATES to F\_FB\_RNG\_n.

The following HMI device states are possible:

- "Integrated"
- "Removed"
- "Communication error"
- "Acknowledgement required"

QBAD monitors the output of the F-I/O for integrating and removing the HMI device.

- QBAD = 0: PROFIsafe communication is taking place between the HMI device and the F-CPU.
- QBAD = 1: No PROFIsafe communication is taking place between the HMI device and the F-CPU.



#### **WARNING**

##### **Inadmissible automatic restart of the plant**

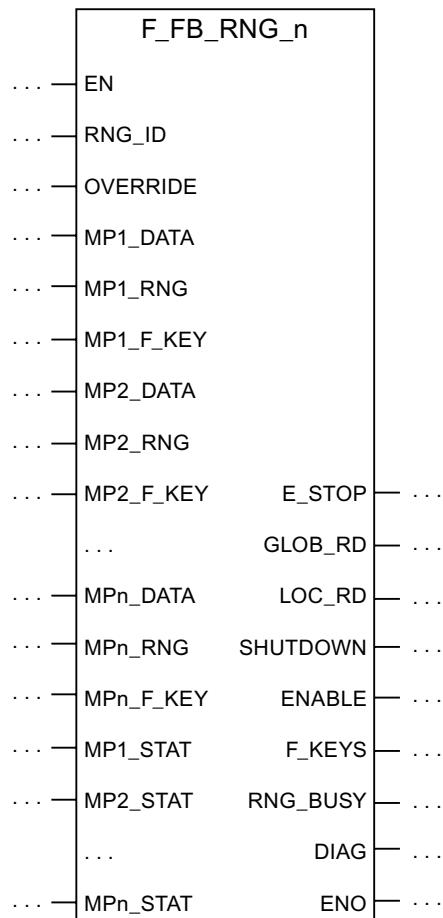
The security program must ensure that after S7\_MP\_RES is set, automatic restart of the plant is not possible. The operator must strictly ensure that he executes a separate operator action to commence the restart.

#### **Addresses of PII and PIQ**

You can find the start addresses of PII and PIQ in the PROFIsafe settings of the HMI device in HW Config.

#### 4.4.4 FB162: Effective range for 4 Mobile Panel (F\_FB\_RNG\_4) / FB 163 Effective range for 16 Mobile Panel (F\_FB\_RNG\_16)

##### Structure



MPn is used as follows:

- With F\_FB\_RNG\_4 for HMI device 1 to HMI device 4
- With F\_FB\_RNG\_16 for HMI device 1 to HMI device 16

## Inputs

Parameters	Data type	Description	Interconnection
RNG_ID	Integer	Click on this input and enter the ID of the effective range to be monitored by F_FB_RNG_n. The RNG_ID must be unique throughout the plant and is set in WinCC flexible.	---
OVERRIDE	Bool	0 = "Override" mode inactive, 1 = "Override" mode active	Result of the link between the override switch and the protection mechanism
MPn_DATA*	Word	User data of the inputs of the fail-safe process image.	PII: Word 1 = MP_DATA
MPn_RNG*	Word	ID of the effective range in which the HMI device is located.	PII: Word 2 = MP_RNG
MPn_F_KEY*	Word	Reserved	
MPn_STAT*	Word	Data is exchanged with F_FB_MP through this input/output via F_DB_STATES.	F_DB_STATES

\*MPn is used as follows:

- With F\_FB\_RNG\_4 for HMI device 1 to HMI device 4
- With F\_FB\_RNG\_16 for HMI device 1 to HMI device 16

## Outputs

Parameters	Data type	Description	Interconnection
E_STOP	Bool	Emergency stop  Evaluation of the emergency stop button of all HMI devices connected to F_FB_RNG_n.  0 = at least one emergency stop pressed, 1 = no emergency stop pressed	You can detect if an emergency stop is pressed with this output.
GLOB_RD	Bool	Global rampdown	You can detect if a global rampdown has been triggered with this output.
LOC_RD	Bool	Local rampdown	You can detect if a local rampdown has been triggered with this output.
SHUTDOWN	Bool	Shutdown	You can detect if a shutdown has been triggered with this output.
ENABLE	Bool	This output passes the state of the enabling button for the HMI device logged on in the effective range.  0 = enabling button not pressed, 1 = enabling button pressed	You can detect if the enabling button has been pressed with this output.

Parameters	Data type	Description	Interconnection
F-KEYS	Word	Reserved	
RNG_BUSY	Bool	This output passes the state of the effective range. 0 = effective range free, 1 = effective range in use	You can detect if the effective range is free or in use with this output. You use this output, for example, to control a light that indicates the allocation of the effective range in the plant.
DIAG	Word	This output indicates which of the HMI devices with permission to log on in the effective range are actually logged on. Bit 0: 1st panel logged on Bit 1: 2nd panel logged on Bit 2: 3rd panel logged on Bit 3: 4th panel logged on With F_FB_RNG_16: Bit 4: 5th panel logged on ... Bit 14: 15th panel logged on Bit 15: 16th panel logged on	You can evaluate the DIAG output in your user program.

## Enable inputs EN and ENO

When you call a fail-safe block, the enable input EN and enable output ENO appear automatically.

Please observe the following:

- Do not connect these I/Os.
- Do not set "0" for these I/Os.
- Do not evaluate these I/Os.

## Validity

This description applies to the following F FB:

- F\_FB\_RNG\_4, version 1.0
- F\_FB\_RNG\_16, version 1.0

When the term "F\_FB\_RNG\_n" is used, the information applies to both F-FB.

---

### Note

Insert the FC 176: F\_BO\_W and FC 177: F\_W\_BO blocks into your safety program since these blocks are called by F\_FB\_RNG\_n. You can find these blocks in the Distributed Safety F library in the F Application Blocks block container.

---

## Wiring

You have to wire the inputs and outputs of the F FB manually. No automatic wiring is performed.

## Usage



### **Emergency stop button not evaluated**

The emergency stop button can only be evaluated if you call an F\_FB\_RNG\_n in your safety program.

Always call an F\_FB\_RNG\_n in your safety program, even if you do not use effective ranges in your plant.

The assigned effective range is managed by this F FB.

You need call one of the following F FB for every effective range when using the Mobile Panel 277F IWLAN:

- F\_FB\_RNG\_4 "Effective range for 4 Mobile Panels"
- F\_FB\_RNG\_16 "Effective range for 16 Mobile Panels"

The FB you need to call depends on how many HMI devices are used in the effective range:

- If you configure a logon for up to 4 HMI devices in this effective range, use F\_FB\_RNG\_4.
- If you configure a logon for up to 16 HMI devices in this effective range, use F\_FB\_RNG\_16.

## How it works

The F FB performs the following depending on the state of the HMI devices assigned to the effective range:

- Connect the outputs of F\_FB\_RNG\_n
- Prepare the output user data

Each HMI device can take one of the following states in the effective range:

- Removed without communication error

The HMI device is successfully removed from the safety program of the F CPU. This ends PROFIsafe communication. The HMI device has no influence on the outputs of F\_FB\_RNG\_n.

- Integrated without communication error

The actual operating state of the HMI device in the effective range

F\_FBG\_RNG\_n reacts as follows:

- The HMI device is supplied with user data, such as the effective range ID and the status of the HMI device in the effective range, if it is located in the effective range.
- If no other HMI device is logged on in the effective range, the operator can log on the HMI device in the effective range.
- The outputs of F\_FBG\_RNG\_n are set according to the state of the enabling button of the logged on HMI device.

The setting for E-STOP output depends on whether or not the HMI device is logged on in the effective range.

- The RNG\_BUSY output of F\_FBG\_RNG\_n is set to "1" if the HMI device is logged on in the effective range.
- The operator can activate the "Override" mode if needed.
- If the operator wants to exit the effective range, he can log the HMI device off from the effective range.

- Removed with communication error

PROFIsafe communication with the HMI device was interrupted without explanation.

The following outputs are set in F\_FBG\_RNG\_n:

- GLOB\_RD, if the HMI device was not logged on in the effective range.
- SHUTDOWN, if the HMI device was logged on in the effective range.

The corresponding signal is reset following acknowledgment of the communication error or the MP status reset is set. The allocated effective range is enabled again by F\_FBG\_RNG\_n for logging on of an HMI device .

- Integrated with communication error

PROFIsafe communication with the HMI device is resumed after a brief interruption, enabling user data to be exchanged again between the HMI device and F CPU. As long as communication error is not acknowledged, F\_FBG\_RNG\_n reacts as follows:

- The HMI device is supplied with user data (effective range ID, status of the HMI device in the effective range), if it is located in the effective range.
- If the emergency stop of the HMI device is pressed, the E\_STOP output of F\_FBG\_RNG\_n is set to "0".

## Override in the safety program

The override switch should only be active as long as the protective mechanism is active.

Connect the following in the safety program to ensure this reaction:

- The switch position of the override switch with the evaluation signals of the protective device
- The result of the first link with the OVERRIDE input of F\_FBG\_RNG\_n

## Addresses of PII and PIQ

You can find the start address of the PII and PIQ AA in HW Config in the PROFIsafe settings for the HMI device.

## **4.5 WinCC flexible**

### **4.5.1 Configuration overview**

For fail-safe operation of the HMI you must configure the following areas of WinCC flexible ES:

- Settings of the HMI device:

Set the PROFIsafe address of the HMI device in the project view under "Device settings" > "Device settings".

- Effective ranges editor

Configure the effective ranges defined when the plant was planned in the project view under "Device settings" > "Effective ranges".

- Figures

- Configure the following in the project view under "Images":

- Display of the project ID

You must assign a unique project ID for each project.

The project ID is used to check which project is currently on the HMI.

You must update the project ID each time the project is changed, e.g. by listing a version or date.

Configure the display of the project ID at a point of the project that can be displayed at any time in the current project, e.g. start screen or in a service display.

- Objects that are specially designed for fail-safe operation of the HMI device

### **Additional information on configuration with WinCC flexible**

Only a brief overview is provided below. A detailed description of the configuration is provided in the WinCC flexible Information System.

## 4.5.2 Effective ranges editor

### Work area

In WinCC flexible ES, open the "Effective Ranges" work area in the project window under "Device Settings" by double-clicking on "Effective Ranges".

The work area provides a tabular view of the effective ranges and their transponders.

### Configuring

The configuration consists of the following tasks:

1. You create the effective ranges by specifying the "Name", "Display name" and "ID".  
The "Display name" and "ID" of an effective range cannot be identical.
2. You configure a transponder by specifying the "Name" and "ID" of the transponder.
3. You assign the transponders to the effective ranges.
4. You set the "limit" for each effective range.

The "Limit" parameter determines the maximum distance between the HMI device and the individual transponders of an effective range. The "Limit" parameter applies to all transponders of the effective range. If the HMI device is located farther from the transponders than the "Limit", it is outside the effective range.

### Commissioning

When commissioning the plant, you need to enter the checksum determined during the verification of the effective ranges in the "Checksum" box in this editor.

## 4.5.3 Objects for the Mobile Panel 277F IWLAN

### Introduction

WinCC flexible ES offers you a variety of objects especially designed for configuring the Mobile Panel 277F IWLAN.

These objects offer the operator the latest information about the effective range and batteries during runtime.

### Effective range name

The "Effective range name" object shows the name and logon status of the effective range in which the HMI device is currently located.

Display during runtime:	Description
	The HMI device is within the effective range shown. The HMI device is not logged on in the effective range. It is possible to log onto the effective range.
	The HMI device is within the effective range shown and is logged on in the effective range. Safe operation in the effective range is possible using the enabling buttons.
	The HMI device is within the effective range shown. Logon to the effective range is rejected because a different HMI device is already logged on. Note: When using the "Override" mode: Although no other HMI device is still logged on in the effective range, logon is rejected because the override switch is still set.
	The HMI device is outside all of the effective ranges.

### Effective range quality

The "Effective range quality" object shows how close the HMI device is to the limits of a effective range.

Display during runtime	Description
	The HMI device is in the middle of the effective range.
	The HMI device is located at the limits of the effective range.
	The HMI device is located outside the effective range.
	"Override" mode is active. The distance of the HMI device to the transponders is not evaluated.

## Battery

The "Battery" object indicates the charging status of the HMI device's main battery.

### CAUTION

The battery must always be sufficiently charged. If the battery becomes empty, a communication error occurs. The F CPU initiates one of the following measures:

- If the HMI device is logged on at the effective range: a shutdown.
- If the HMI device is not logged on at the effective range: a global rampdown.

Symbol	Color	Meaning	Charging status
	Green	The battery is sufficiently charged.	>20%
	Yellow	The battery is weak. The battery must be charged. Alternatively, insert a charged spare battery.	10% to 20%
	Red	Battery is very weak. The battery must be charged. Alternatively, insert a charged spare battery.	<10%

## Additional information

You can find a detailed description of the object configuration in the WinCC flexible Information System.



# System commissioning

## 5.1 Acceptance of the system

### Introduction

All of the relevant application-specific standards and the procedure described in this chapter must be observed in the course of final acceptance of the plant.

### Important information about the final acceptance of a plant with fail-safe systems

---

#### Note

This document only provides detailed information about the additional acceptance procedures required for operation of the Mobile Panel 277F IWLAN HMI device.

In the course of final inspection of the plant, you must strictly observe the detailed description of basic measures to be taken provided in the "S7 Distributed Safety, Configuring and Programming" manual, chapter "Final inspection of the plant."

---

### Requirement

- The hardware configuration was created in HW Config.
- The safety program was created and generated.
- A backup of the STEP 7 project was created.

### Basic procedure

The acceptance of the plant includes the following areas:

- Configuring the F CPU and fail-safe I/O
- Safety program
- Effective ranges and transponders

### Acceptance of the configuration for the F CPU and fail-safe I/O

- Print and archive the hardware configuration data.
- Check the following parameters in the hardware configuration data:
  - Parameters of the F-CPU
  - Safety-relevant parameters of the fail-safe I/O:  
Unique PROFIsafe addresses, additional PROFIsafe parameters
- Backup the hardware configuration data along with your STEP 7 project.

A detailed description is provided in the "S7 Distributed Safety, Configuring and Programming" Manual, chapter "Acceptance of the configuration for the F-CPU and fail-safe I/O."

### **Acceptance of the safety program**

- Print and archive the safety program.
- Check the printed copy of the safety program for existence of the criteria specified in the "S7 Distributed Safety, Configuring and Programming" manual, chapter "Acceptance of a safety program."
- Download the entire safety program to the F-CPU.
- Test all functions of the safety program.

A detailed description is provided in the "S7 Distributed Safety, Configuring and Programming" manual, chapter "Acceptance of the configuration for the F-CPU and fail-safe I/O."

### **Acceptance of the effective ranges and transponders**

- For acceptance of the effective ranges and transponders you must determine a CRC checksum in the plant and enter it in the project. After subsequent project transfer to the HMI device you can operate the plant with the HMI device.
- Generate a printed copy of the project with output format "Complete."
- Archive the project.

A detailed description about the printing and archiving of projects is provided in the WinCC Online Help.

---

#### **Note**

If you change transponders in the plant you must execute another acceptance of the plant.

---

### **See also**

Accepting effective ranges and transponders (Page 79)

## 5.2 Accepting effective ranges and transponders

### Introduction

The operational safety of the plant for the most part depends on a good safety plan and a careful realization of the safety functions.

For safe operation, the project of the HMI device must precisely match the plant.

For this reason when first starting a project in the plant, you must verify all effective ranges with all transponders. The result of the verification is a CRC checksum that you must enter in the project. Then you must transfer the project to the HMI device again.

---

#### Note

Transponders that are exclusively assigned to one zone are not considered in this verification.

---

### Acceptance if there are changes

If you change the configuration of transponders and effective ranges in the system, you need to adapt the configuration. Then you must accept the effective ranges and transponders again.

### Requirement

- In the project:
  - Effective ranges and transponders must be configured in the project.
  - The project has been transferred to the HMI device.
- In the plant:
  - The transponders must be mounted in the plant in such a manner that the effective ranges stored in the project are formed.
  - Batteries must be inserted in the transponders. The ID must be set on the transponders that is stored in the project for these transponders.
  - The IDs of the effective ranges must be marked in the plant.
  - The quality of the WLAN range must be sufficient.
  - An indicator is installed.



#### WARNING

##### An indicator in the effective range is an absolute necessity

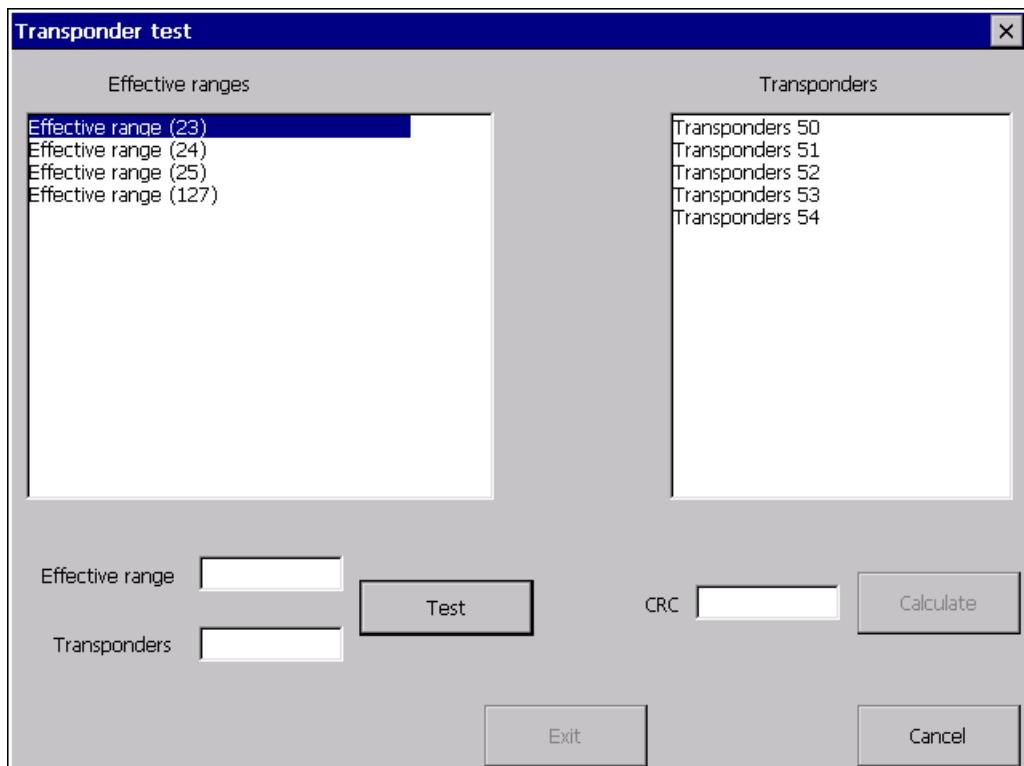
A indicator supplies the operator the feedback that he has logged onto the correct effective range.

Install an indicator in every situation, for example a light that shows that an HMI device is logged on in the effective range.

## Procedure

Proceed as follows:

1. Switch on the HMI device.  
The Windows CE desktop with Loader is displayed.
2. If the project does not start automatically, start the project.  
The "Transponder test" dialog box opens.



To the left you will see the list with the names of all configured effective ranges.

3. In the "Effective ranges" list highlight the first effective range that you want to verify.  
The "Transponder" list on the right shows the IDs of the transponders that are assigned to the effective range in the project.
4. Go to the transponder that you want to verify in the "Transponder" list.
5. In the system, read the ID of the highlighted effective range and enter this ID in the "Effective range" box.
6. Enter the ID of the transponder where you are located in the "Transponder" box.
7. Verify the entered ID with the "Test" button.

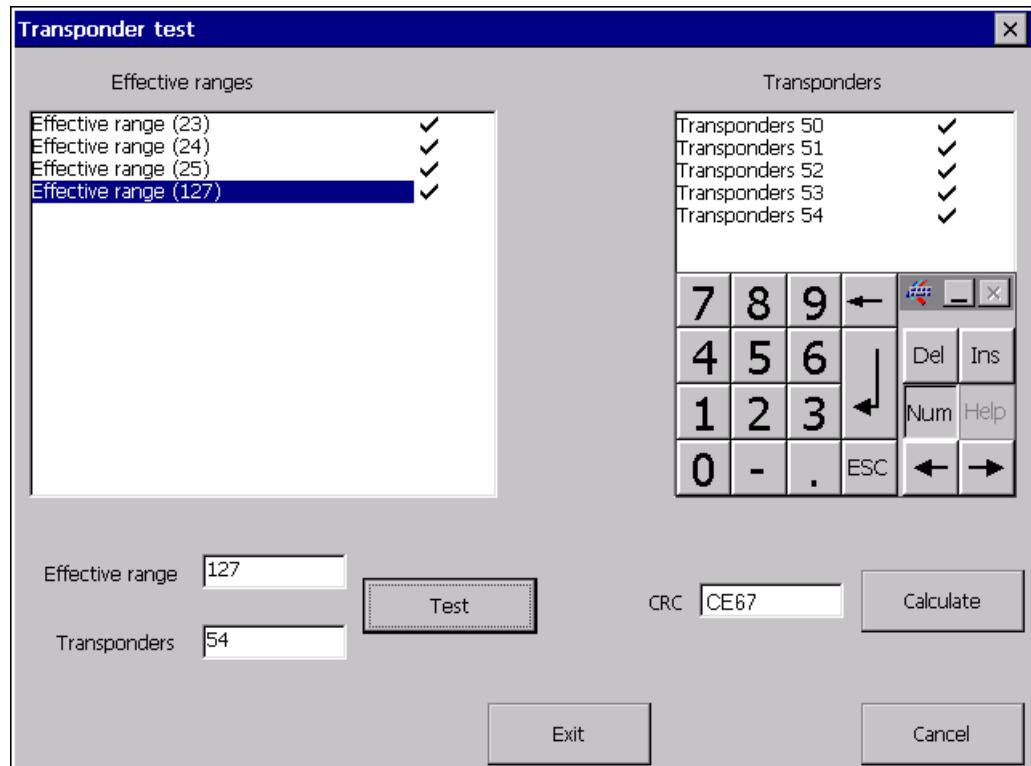
When the HMI device receives the signal of the corresponding transponder, that transponder is considered verified. The transponder will be marked with a check mark in the list.

8. Repeat steps 4 to 7 for all transponders of this effective range.

If you have successfully checked all transponders of an effective range, that effective range will be indicated with a check mark in the list.

9. Select the next effective range in the list.
10. Repeat steps 4 to 7 for all transponders assigned to this effective range.
11. Verify all additional effective ranges in the list to the left.
12. When you have successfully verified all effective ranges, touch the "Calculate" button.

The HMI device calculates the CRC checksum. The CRC checksum is displayed in the "CRC" box.



13. Open the project in WinCC flexible ES.
14. Enter the checksum in the "Effective ranges" editor.
15. Transfer the project to the HMI device again.

## Result

The project can now be used for operating and monitoring the plant.

### **Testing the effective ranges in the plant**

After successful verification of the transponders and effective ranges you must test in the plant whether the expansion of the configured effective ranges corresponds to the planning.

In particular, check the following cases:

- Do the limits of the effective range run as planned?

Pay special attention that no machine operations are permitted from excessive distances or areas that cannot be seen.

- Does the indicator that belongs to the effective range show whether an HMI device is logged on at the effective range?
- Are moving machine parts influencing the reception of the transponders? Check also the extreme positions of moving machine parts.
- Is WLAN coverage ensured everywhere in the effective range?

# 6

## Operation

### 6.1 Organizational measures

The HMI device should only be operated in the system with a battery or in the charging station.

To ensure fail-safe operation of the HMI device the organizational measures described below must be complied with.

#### Storing the HMI device



##### WARNING

###### Non-functional emergency stop button

If the HMI device is not integrated, the emergency stop button does not function.

To avoid confusion between effective and non-effective emergency stop buttons, only one integrated HMI device should be freely accessible.

If the HMI device is not in use, it must be stored in a locked area.

#### Handling the HMI device during operation



##### CAUTION

###### Shutdown or rampdown of the system due to empty battery

An integrated HMI device with flat battery triggers a communication error. This results in the following reaction of the F CPU:

- If the HMI device is logged on at the effective range: Shutdown
- If the HMI device is not logged on at the effective range: Global rampdown

Check the charge status of the battery of the ready-for-operation device via the "BAT" LED.

- Recharge the HMI device in good time.

To charge the batteries, the ambient temperature / battery temperature must not exceed 40 °C. The higher the temperature, the longer it will take for the battery to charge.

Find a place with a cool ambient temperature for the charging station. If necessary, allow the battery to cool first. You can check the battery temperature in the "OP" dialog box, "Battery" tab in the Control Panel.

Alternatively, change the main battery.

The following must be noted when working with the Mobile Panel 277F IWLAN:

- Pay attention to the "SAFE" LED.

If the HMI device is integrated in fail-safe communication, the "SAFE" lights up and the emergency stop button is active.

- Pay attention to the "COM" LED.

If you leave the area with sufficient WLAN coverage, the "COM" LED will flash. Communication between the HMI device and PLC is down. You can no longer operate the system with the HMI device.

- Check the "RNG" LED when the HMI device is logged onto the effective range.

The "RNG" LED indicates when the HMI device is logged onto the effective range. Logging onto the effective range is required for the enabling button to be active.

**CAUTION**

**Unauthorized operation possible**

It is not permitted to leave the effective range without an HMI device while the HMI device is logged on to the effective range.

## 6.2 Typical applications

### 6.2.1 Overview

#### Introduction

Typical applications for the HMI device are described in this chapter.

The assumption for all application cases is that the HMI device will be used in mobile operation with batteries.

#### Structure of the application cases

All application cases are described in the same form:

- Description and identification of the initial situation
- Action of the operator and of the plant
- Result of the action and identification of the new situation

#### Graphic representations

In the application cases the following is presented graphically.

- LED status
- Operability of the emergency stop button and of the enabling buttons

Thus you can detect the action described in the application case at a glance.

The figures used have the following meaning:

### Example of an LED display

Figure	Meaning
	Status of the LEDs that are displayed on the HMI device during the situation described in the application case. In this example all LEDs are on.

### Emergency stop button

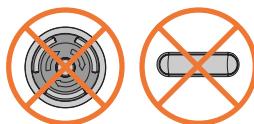
Figure	Meaning
	Pressing the emergency stop button triggers an emergency stop.
	Pressing the emergency stop has no effect.

### Enabling button

Figure	Meaning
	The operator can release movements of the assigned machine with the enabling buttons.
	Pressing the enabling buttons has no effect.

### 6.2.2 Switch on the HMI device.

Starting situation
The HMI device is switched off. The battery must be charged.

Action
The operator switches the HMI device on via the ON/OFF button. Communication via WLAN starts up. While the WLAN connection is being established the "COM" LED flashes.
Result
WLAN communication is established. The HMI device displays the Windows CE Desktop with the Loader.  <input type="checkbox"/> SAFE  PWR  COM <input type="checkbox"/> RNG  BAT

### 6.2.3 Integrating and segregating the HMI device

#### 6.2.3.1 Integrating the HMI device (start project)

Initial situation
The HMI device is switched on. WLAN communication is established. The HMI device displays the Windows CE desktop with the loader.  <input type="checkbox"/> SAFE  PWR  COM <input type="checkbox"/> RNG 
Action
The project is started either automatically or by the operator using the loader, depending on the configuration. PROFIsafe communication is established. While the connection is being established, the "Establishment of safety connection" dialog box is displayed. The HMI device is integrated in the safety program of the F CPU. The "Test enabling switch" dialog box opens. The operator is requested to press both enabling buttons until the "Panic" switch position is reached. The operator presses both enabling buttons until the "Panic" switch position is reached.

Result
<p>Both enabling buttons were tested in the "Enable" and "Panic" switch positions. The project start screen appears.</p>  

If the operator now exits the WLAN area, the F-CPU detects a communication error and initiates a global rampdown. The "COM" LED on the HMI device flashes. The "Establishment of safety connection" dialog with the text "No safe connection available. Reason: Communication error (timeout)" is displayed.

### 6.2.3.2 Communication error for the integrated HMI device

Initial situation
<p>The HMI device is integrated in the safety program of the F CPU. The HMI device is not logged on to an effective range.</p>  

Action	
<p>The operator takes the HMI device out of the WLAN range. The "COM" LED flashes. The F CPU detects a communication error and initiates a global rampdown. The LEDs "SAFE" and "COM" are switched off. The user is informed that no safety functions are available.</p>	
<p><b>Scenario 1:</b> The operator returns to the WLAN range within 60 seconds.</p>	<p><b>Scenario 2:</b> The operator stays outside the WLAN range.</p>

Result scenario 1: return to the WLAN range
<p>The "Acknowledgment of communication error" dialog box opens. In this dialog, the operator acknowledges the communication error. The global rampdown signal is canceled. PROFIsafe communication is possible again. The HMI device has recovered the fully functional state.</p>  

**Result scenario 2: no return to the WLAN range**

The "Confirm removal" dialog box is displayed on expiration of 60 seconds.

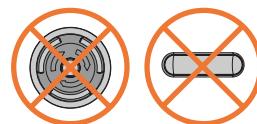
The project is closed immediately if you confirm the Confirm removal dialog within 60 seconds.

The active project is closed automatically if you do not confirm the Confirm removal dialog within 60 seconds.

The HMI device displays the Windows CE desktop with the loader.

Users can react to a fault on the HMI device by resetting the associated F\_FB\_MP to the "original state" using input "S7\_MP\_RES." This action sets the relevant HMI device to the "removed" state and the global rampdown signal is canceled.

SAFE  PWR  COM  RNG  BAT



The WLAN communication is set up again after the operator returns with the HMI device to the WLAN range. The operator must restart the project and acknowledge the communication error in the "Acknowledgment of communication error" dialog. The operator performs the enabling button test in the next step.

The global rampdown signal is canceled.

The HMI device has recovered the fully functional state.

**6.2.3.3 Discrepancy error during enabling**

The enabling switch is connected to two channels. Both contacts must be closed in parallel to reach the enabled state. A discrepancy error is generated if one of the contacts is open while the other is closed. Distinguish between the following fault scenarios:

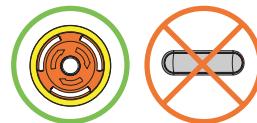
- The enabling switch is jammed
- The enabling switch is damaged

**Enabling switch jammed****Initial situation**

The HMI device is integrated in the safety program of the F CPU. The HMI device may or may not be logged on to an effective range.

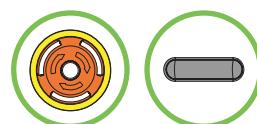
- The HMI device is integrated without being logged on to an effective range:

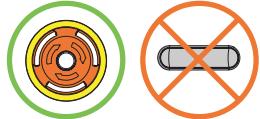
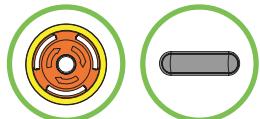
SAFE  PWR  COM  RNG  BAT



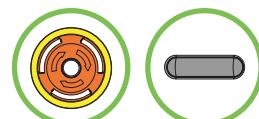
- The HMI device is integrated and logged on to an effective range:

SAFE  PWR  COM  RNG  BAT



Action
The operator presses the enabling switch. Unintentional incorrect operation of the enabling switch. Instead of operating the switch in the center, the operator pressed it at the edge.
<p><b>Result</b></p> <p>The enabled state is deactivated immediately after discrepancy was detected. The "Enabling switch discrepancy error" dialog box opens on expiration of the discrepancy time (see Technical data for fail-safe operation (Page 109)).</p> <p>The dialog stays open until this discrepancy is cleared.</p> <p>The enabling switch must be released completely and pressed again to recover the enabled state. The HMI device has then recovered the fully functional state.</p> <ul style="list-style-type: none"> <li>The HMI device is integrated without being logged on to an effective range:</li> </ul>  <p><b>SAFE</b> PWR COM RNG BAT</p> <ul style="list-style-type: none"> <li>The HMI device is integrated and logged on to an effective range:</li> </ul>  <p><b>SAFE</b> PWR COM RNG BAT</p>

### The enabling switch is damaged

Initial situation
The HMI device is integrated and logged on to an effective range. The enabling switch is damaged and is not pressed. Distinguish between the two scenarios: <ul style="list-style-type: none"> <li>Scenario 1: One channel of the enabling switch is opened permanently.</li> <li>Scenario 2: One channel of the enabling switch is closed permanently. Discrepancy is detected in this situation. The "Enabling switch discrepancy error" dialog is displayed.</li> </ul>  <p><b>SAFE</b> PWR COM RNG BAT</p>
Action
The operator presses the enabling switch.

**Result scenario 1:**

The enabled state is not activated. The "Enabling switch discrepancy error" dialog box opens on expiration of the discrepancy time. The dialog stays open until the button is released to clear the discrepancy. A discrepancy error is displayed again when the operator presses the enabling switch once again.

The device must be repaired. Return the HMI device for repair as described in the section Cleaning, repairs and spare parts (Page 106).

You can use the second, functional enabling switch to remove the HMI device.

**Result scenario 2:**

The "Enabling switch discrepancy error" dialog box is closed and the discrepancy is cleared. The enable signal remains in deactivated state. The "Enabling switch discrepancy error" dialog box opens again after the button was released and the discrepancy time has expired (see Technical data for fail-safe operation (Page 109)).

The device must be repaired. Return the HMI device for repair as described in the section Cleaning, repairs and spare parts (Page 106).

#### 6.2.3.4 Segregate

Removal means the intentional removal of the HMI device from the safety program without side effects, e.g. a global rampdown.

The operator removes the HMI device by alternatively executing one of the following actions:

- Closing the project
- Switching off the HMI device

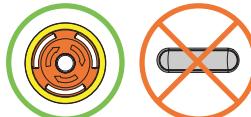
After removal the HMI device must be kept in an enclosed area.

**Starting situation**

The project must be started.

The HMI device must be integrated in the safety program of the F-CPU.

 **SAFE**    PWR    COM    RNG    BAT



#### Project termination alternatives

**Action**

The operator terminates the project with an operator object that has been provided for this purpose.

Following a prompt, the dialog box "Confirm removal" is opened. The operator is requested to confirm the desired removal with the enabling button.

The operator presses within 60 seconds at least one enabling button until the "Enable" setting is reached.

PROFIsafe communication is terminated. The HMI device has been successfully segregated from the safety program of the F-CPU. The project is terminated.

Result
The HMI device shows the Windows CE Desktop with the Loader.
<input type="checkbox"/> SAFE <input checked="" type="checkbox"/> PWR <input checked="" type="checkbox"/> COM <input type="checkbox"/> RNG <input checked="" type="checkbox"/> BAT

### Alternative - switch the HMI device off

Action
The operator presses the ON/OFF button for longer than 4 seconds.
Following a prompt, the "Confirm removal" dialog box is displayed. The operator is requested to confirm the desired removal with the enabling button.
The operator presses within 60 seconds at least one enabling button until the "Enable" setting is reached.
PROFIsafe communication is terminated. The HMI device has been successfully segregated from the safety program of the F-CPU. The project is terminated. The HMI device will be switched off.

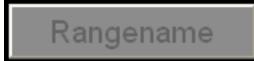
Result
The HMI device is switched off.
<input type="checkbox"/> SAFE <input type="checkbox"/> PWR <input type="checkbox"/> COM <input type="checkbox"/> RNG <input type="checkbox"/> BAT

### 6.2.4 Log on and log off at the effective range

#### 6.2.4.1 Detecting the effective range

Starting situation
The HMI device must be integrated in the safety program of the F-CPU.
<input checked="" type="checkbox"/> SAFE <input checked="" type="checkbox"/> PWR <input checked="" type="checkbox"/> COM <input type="checkbox"/> RNG <input checked="" type="checkbox"/> BAT

Action
With the "Effective range name" object the HMI device shows the name and the status of the effective range in which the HMI device is located.
The operator evaluates the display of the "Effective range name" operator control.

Result		
<p><b>Case 1:</b> The object is displayed in white with lettering. Example:</p>  <p>The HMI device is in the "Rangename" effective range. It is not possible to log on at the effective range</p>	<p><b>Case 2:</b> The object is displayed in gray without lettering. Example:</p>  <p>The HMI device is located outside of the effective range of the plant.</p>	<p><b>Case 3:</b> The object is displayed in gray with lettering. Example:</p>  <p>The HMI device is in the "Rangename" effective range. Log on at the effective range is rejected because a different HMI device is already logged on at the effective range.</p>





#### 6.2.4.2 Log on at the effective range

Starting situation
<p>The "Effective range name" object is displayed in white. It is not possible to log on at the effective range Example:</p>  <p></p>  

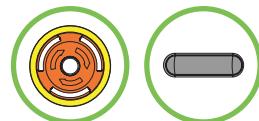
Action
The operator touches the "Effective range name" object.
If the "Effective range name" object is protected with a password, the operator has to enter his user name and password. See also Check list: Data security (Page 50)
The "Effective range logon" dialog box opens.
The operator reads the effective range ID in the plant. He enters the effective range ID and confirms with "OK".
The dialog box closes.

**Result**

The HMI device must be logged on at the effective range.

The "Effective range name" object is displayed in green.

Example:



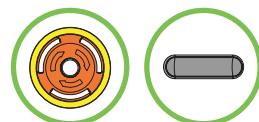
SAFE PWR COM RNG BAT

**6.2.4.3 Log off at the effective range****Starting situation**

The "Effective range name" object is displayed in green.

The HMI device must be logged on at the effective range.

Example:



SAFE PWR COM RNG BAT

**Action**

The operator touches the "Effective range name" object.

If the "Effective range name" object is protected with a password, the operator has to enter his user name and password. See also Check list: Data security (Page 50)

After a query the HMI device is logged off from the effective range.

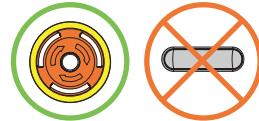
**Result**

The "Effective range name" object is displayed in white.

Example:



The HMI device must be logged off from the effective range.



SAFE PWR COM RNG BAT

**Note****Only for effective ranges which belong to an override switch**

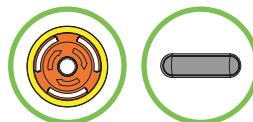
If the operator has logged off from an effective range which belongs to an override switch, the "Effective range name" object is displayed in gray in the following case: The operator has left the effective range without pressing the override switch.

## 6.2.5 Behavior in the effective range

### 6.2.5.1 Exiting the effective range without log off

**Starting situation**

The operator with his HMI device is located at the limit of the effective range.



SAFE   PWR   COM   RNG   BAT

**Action**

The operator exits the WLAN area with the HMI device.



After 5 seconds the following occurs:

- The enabling buttons are deactivated.
- The "Effective range exited without logoff" dialog box opens.
- Depending on the setting of the HMI device, the vibration alarm is triggered.

The operator now has 25 seconds time to enter the effective range again or log off from the effective range via the "Effective range exited without logoff" dialog box.

**Case 1:**

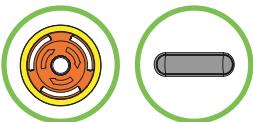
The operator enters the effective range again within 25 seconds.

**Case 2:**

The operator remains outside of the effective range for longer than 25 seconds

**Result case 1: return to the effective range on time**

The HMI device is fully functional again.



SAFE   PWR   COM   RNG   BAT

**Result case 2: does not return to the effective range on time**

The "Effective range exited without logoff" dialog box opens.

The HMI device triggers a local rampdown and log off from the effective range.

As long as the operator does not confirm log off from the effective range, the dialog box is displayed on the HMI device. The operator is not able to interact with the machine. The effective range remains in use.

When the operator has confirmed logoff from the effective range, the HMI device is logged off from the effective range and the effective range is then released for logon for other HMI devices.

SAFE PWR COM RNG BAT



## 6.2.6 "Override" mode

### 6.2.6.1 Activating "override" mode

**Initial situation**

The system has the protective devices specified for "Override" mode.

SAFE PWR COM RNG BAT

**Action**

The operator enters a protected zone.

The operator logs the HMI device on in the effective range in which the override switch is located.

The operator activates the override switch.

**Result**

"Override" mode is active.

The "Effective range quality" object is displayed entirely in green.



The transponders are not evaluated for detection of the effective range.

The operator can operate the machine in the entire override range as if he were in the middle of the effective range.

No other HMI device can log onto the effective range.

SAFE PWR COM RNG BAT



### 6.2.6.2 Terminating "override" mode

#### Introduction

The "Override" mode can be closed by the operator or closed automatically by the safety program of the F CPU.

#### Closed by the operator

The operator closes the "Override" mode with the following actions:

1. The operator activates the override switch.
2. The operator logs the HMI device off from the effective range.

#### Closing automatically

If the operator leaves the override range without activating the override switch, the override mode is automatically closed by the safety program of the F CPU. The transponders are evaluated again for detection of the effective range. "Override" mode can only be activated again if the override switch is reset by the operator.

Initial situation	
<p>"Override" mode is active.</p> 	
 <b>SAFE</b>	 <b>PWR</b>  <b>COM</b>  <b>RNG</b>  <b>BAT</b>
Action	
<b>Scenario 1:</b> The operator activates the override switch.	<b>Scenario 2:</b> The operator leaves a protected zone.
Result of scenario 1:	
<p>"Override" mode is deactivated. The transponders are evaluated again for detection of the effective range. If the operator is outside the effective range when "Override" mode closes, the system reacts as described in the section Exiting the effective range without log off (Page 94).</p>      <b>SAFE</b> <b>PWR</b> <b>COM</b> <b>RNG</b> <b>BAT</b>	

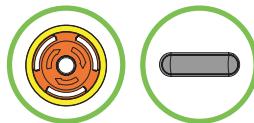
**Result of scenario 2:**

"Override" mode is closed automatically by the safety program of the F CPU.

The transponders are evaluated again for detection of the effective range.

If the operator is outside the effective range when "Override" mode closes, the system reacts as described in the section Exiting the effective range without log off (Page 94).

"Override" mode can only be activated again if the override switch is reset by the operator.



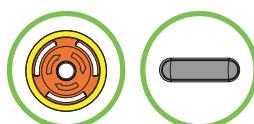
SAFE PWR COM RNG BAT

## 6.2.7 Special operating conditions

### 6.2.7.1 Internal error

**Initial situation**

The HMI device is logged on in the effective range.



SAFE PWR COM RNG BAT

**Action**

An internal error occurs on the HMI device.

**Result**

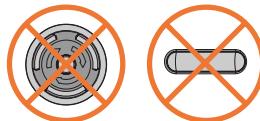
The F CPU performs a shutdown. It stops the section of the system that belongs to the effective range.

The project is closed immediately.

The HMI device shows a red error display.

All LEDs go out.

The effective range remains allocated.



SAFE  PWR  COM  RNG  BAT

### See also

Diagnostics (Page 101)

### 6.2.7.2 Communication error with the HMI device logged on in the effective range

Starting situation
The HMI device must be logged on at the effective range.    <input checked="" type="checkbox"/> SAFE <input type="checkbox"/> PWR <input type="checkbox"/> COM <input type="checkbox"/> RNG <input type="checkbox"/> BAT

Action	
A communication error occurs. The F-CPU executes a shutdown. It stops the plant unit that belongs to the effective range. The LED "SAFE" and the LED "RNG" go out. The operator is alerted that a secure connection is not present.	
<b>Case 1:</b> Communication can be restored within 60 seconds.	<b>Case 2:</b> Communication remains continuously interrupted.

Result case 1: Communication is restored.
The "Acknowledgment of communication error" dialog box opens. The operator acknowledges the communication error in this dialog box. The shutdown signal is revoked and the effective range is released for all HMI devices. PROFIsafe communication is again possible.    <input checked="" type="checkbox"/> SAFE <input type="checkbox"/> PWR <input type="checkbox"/> COM <input type="checkbox"/> RNG <input type="checkbox"/> BAT

Result case 2: Communication remains interrupted for more than 60 seconds
After 60 seconds the project is terminated. The HMI device displays the Windows CE Desktop with the Loader. If the operator enters the WLAN area again with the HMI device and WLAN communication is reestablished, the operator has to acknowledge the communication error in the "Acknowledgment of communication error" dialog box. The shutdown signal is revoked. The HMI device is fully functional again.    <input type="checkbox"/> SAFE <input type="checkbox"/> PWR <input type="checkbox"/> COM <input type="checkbox"/> RNG <input type="checkbox"/> BAT

# Diagnostics

## 7.1 Alarm messages

The following alarms are displayed on the HMI device, depending on the operating situation:

Dialog box	Possible reactions	Situation	Additional information
<b>Establishment of safety connection</b> No safe connection available. Reason: <ul style="list-style-type: none"> <li>• Connection not yet completed</li> <li>• PROFIsafe address error</li> <li>• Internal configuration error</li> <li>• Communication error (timeout)</li> <li>• Communication error (CRC)</li> <li>• CPU in STOP</li> <li>• PROFIsafe CRC configuration error</li> </ul> Should the Panel be switched off?	"Yes" button	The alarm displays one of the stated reasons, depending on the situation. <ul style="list-style-type: none"> <li>• Reason: Connection not yet completed: Setup of the safe connection was not yet completed after the project was started. In this case, wait for the connection to be set up. The dialog is closed on completion.</li> <li>• Other reasons: A communication error has occurred after successful integration of the HMI device. Clear the cause of error defined as "Reason" and restart the HMI device.</li> </ul>	Communication error for the integrated HMI device (Page 87) Communication error with the HMI device logged on in the effective range (Page 98)
<b>Start removal</b> The removal cannot be interrupted once it has started. Do you want to start the removal?	"Yes" button "No" button	The operator has activated an object for closing the project.	Segregate (Page 90)
<b>Confirm removal</b> Please confirm the removal with the enabling switch.	The operator must press at least one of the enabling switches until the "Enable" switch position is reached.	The operator has confirmed the security prompt for logoff.	Segregate (Page 90)
<b>Effective range logon</b> Do you want to logon to the following effective range? Effective range <<EFFECTIVE RANGE NAME>> Please enter the effective range ID:	"Yes" button "No" button	The HMI device is located within the effective range, but it is not logged on. The operator has activated the white "Effective range name" object to log himself on.	Log on at the effective range (Page 92)
<b>Effective range logoff</b> Do you want to log off from the following effective range? Effective range <<EFFECTIVE RANGE NAME>>	"Yes" button "No" button	The HMI device is logged on to the effective range. The operator has activated the "Effective range name" object to log himself off.	Log off at the effective range (Page 93)

## Diagnostics

### 7.1 Alarm messages

Dialog box	Possible reactions	Situation	Additional information
<b>Effective range logoff (shutdown)</b> The Panel cannot be switched off. You have to first logoff from the effective range. Do you want to logoff from the following effective range? Effective range <<EFFECTIVE RANGE NAME>>	"Yes" button "No" button	The HMI device is logged on to the effective range. The operator has attempted to shut down the HMI device.	
<b>Acknowledgment of communication error</b> A safe connection is possible again. Please confirm the communication error.	"OK" button	Communication was recovered after a short communication error. The operator must confirm this state. The short-term communication error was caused by one of the following actions: <ul style="list-style-type: none"> <li>• The operator briefly left the WLAN range and has now returned.</li> <li>• PROFIsafe communication was briefly interrupted.</li> </ul>	Communication error for the integrated HMI device (Page 87) Communication error with the HMI device logged on in the effective range (Page 98)
<b>Effective range exited without logoff(5 seconds)</b> WARNING: You have exited the following effective range without logging off: Effective range <<EFFECTIVE RANGE NAME>> The enabling switch is deactivated. Do you want to log off from the effective range?	"Yes button or return to the effective range within 25 seconds	The operator left the effective range with the logged on HMI device for more than 5 seconds.	Exiting the effective range without log off (Page 94)
<b>Exited effective range without logging off(30 seconds)</b> You have left the effective range without permission. Local switch off was executed! Please confirm logging off from the effective range.	"OK" button	The operator has left the effective range with the logged on HMI device for more than 30 seconds.	Exiting the effective range without log off (Page 94)
<b>Low battery alarm</b> Battery charge is less than 20 percent.	"OK" button	The remaining battery charge is less than 20 %. An additional system alarm is output after the battery charge has dropped to less than 10 %.	Chapter "Inserting, charging and replacing the battery" in the operating instructions
<b>Transponder test</b> This dialog does not contain any correlative text. The user is informed that he is in transponder test mode. The user must test all transponders of all effective ranges.	Diverse	The project started on the HMI device does not contain a current CRC checksum for the effective ranges. The effective ranges and transponders must be checked using the dialog.	Accepting effective ranges and transponders (Page 79)

Dialog box	Possible reactions	Situation	Additional information
<b>Test enabling switch</b> Both enabling switches must be tested to ensure they are operational. Fully press both enabling switches until the panic position is reached.	The operator must press both enabling switches until the "Panic" switch position is reached.	The operator has started the project. The operator must test the functions of the enabling switches.	Integrating the HMI device (start project) (Page 86)
<b>Error during effective range logon</b> Error during effective range logon. The enabling switch remains deactivated.	"OK" button	An error occurred during logon of the HMI device to the effective range. The operator cannot use the enable switches to control the process.	
<b>Enabling switch discrepancy error</b> Please release the enabling switch.	The operator must release both enabling switches.	The HMI device detects a discrepancy at one of the two enabling switches in switch position "Enable".	Discrepancy error during enabling (Page 88)

## 7.2 Diagnostics

### Definition

Use the diagnostics function to determine the following:

- Does signal acquisition function without errors on the HMI device?
- Does the safety module work properly?

### Diagnostics function of the HMI device

HMI device diagnostics conforming to PROFINET IO standard IEC 61784-1:2002 Ed1 CP 3/3 are available for the standard application.

The diagnostics function cannot be parameterized. The diagnostics are always activated and are automatically made available by the HMI device in STEP 7 in the event of an error.

In addition to the safety-relevant part, the diagnostics function returns the following diagnostics data (if still possible):

- Communication error

Communication between the HMI device as I/O device and the F-CPU as I/O controller has been interrupted (for example, due to incorrect PROFIsafe address or missing WLAN connection).

### Reading diagnostics information

Open the module diagnostics in STEP 7 to determine the cause of the error. For detailed information, refer to the STEP 7 Online Help.

You can also read the diagnostics functions by calling SFB 52 or SFB 54 in the standard user program. For detailed information, refer to the "System and standard function" reference manual.

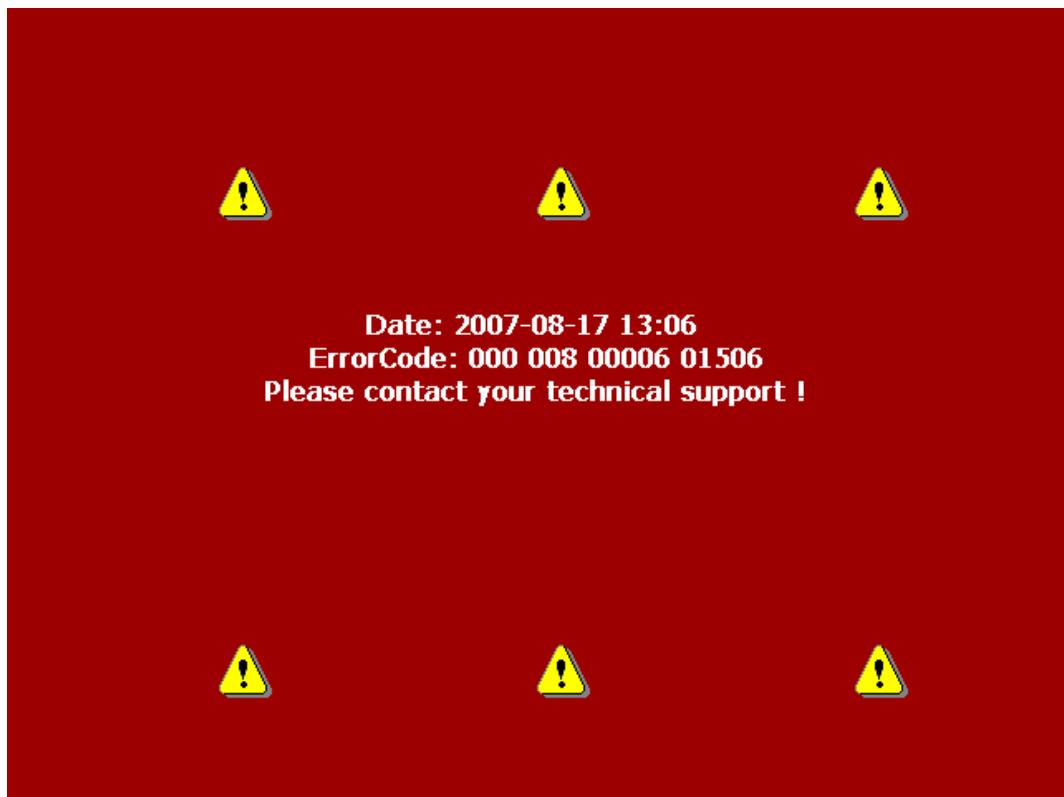
### Diagnostics of internal faults of the HMI device

The HMI device reacts as follows to an internal fault which leads to its failure:

- All LEDs go dark.

The following actions are initiated if a project was started on the HMI device:

- The project is terminated.
- If an "Enable" discrepancy error is detected, the "Discrepancy error enabling switch" dialog opens; see Discrepancy error during enabling (Page 88).
- The red diagnostics (error display) view is output to the screen to notify you of other errors:



1. Note down the error ID.
2. Switch off the HMI device.
3. Restart the HMI device.
4. Contact Technical Support if the error persists.

## ErrorCode

Based on the ErrorCode, Technical Support can come to a conclusion about the type of internal error.

The following table lists the ErrorCodes for discrepancy errors. You might be able to troubleshoot such errors by yourself, depending on the situation. The first six digits of the ErrorCode are decisive for the correct allocation of the error. The terms "left" and "right" enabling switch refer to the your position facing the screen of the HMI device.

Contact Technical Support if the same discrepancy error is generated several times.

Error code	Error type	Remedy
000 008	Discrepancy error at the emergency stop button	Release the emergency stop button by turning the button in clockwise direction. Let the emergency stop button snap back into its initial position.
000 014	Discrepancy error at the right enabling switch, Panic switch position	Make sure that you do not jam the button when pressing it.
000 015	Discrepancy error at the left enabling switch, Panic switch position	



# 8

## Maintenance

### 8.1 Function tests

#### Check list

Execute the tests cited in the following check list, in the specified intervals. If the intervals are not maintained function of the HMI device is not ensured.

#### Requirements

The HMI device must be switched on and integrated in the safety program of the F-CPU.

Test	Test cycle	Check
Press the emergency stop button.	At least once a year	
Fully press both enabling buttons.	At each project start	

### 8.2 Maintenance cycles

#### Check list

Execute the maintenance steps cited in the following check list, in the specified intervals. If the intervals are not maintained function of the HMI device is not ensured.

Component	Maintenance cycle	Check
Transponder battery	Replace every four years	
Bridging battery	Replace every five years	

#### Further information

A detailed description of how to change a battery can be found in the operating instructions of the HMI device in the relevant chapters "Setting transponder IDs and inserting the battery" and "Changing a bridging battery".

## 8.3 Cleaning, repairs and spare parts

### Cleaning

#### CAUTION

##### Inadvertent 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.

#### CAUTION

Do not clean the HMI device with compressed air or steam jet blowers. Never use aggressive solvents or scouring powder.

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

### Repairs

In case of repair, the HMI device must be shipped to the Return Center in Fürth. Repairs may only be carried out at the Return Center in Fürth.

Depending on the work necessary to repair the device, the Center may decide to give you a credit note. In this case, it is your responsibility to order a new device.

The address is:

Siemens AG  
Industry Sector  
Return Center  
Siemensstr. 2  
90766 Fürth, Germany

### Service pack

A service pack can be ordered for servicing purposes.

The service pack includes:

- Cover caps
- Battery compartment cover
- Bridging battery

The service pack can be ordered from your Siemens representative.

### Replacement key set

You can order a replacement key set for the HMI device from your Siemens sales office.

## Replacement batteries

Main batteries and bridge batteries can be ordered from your Siemens sales office.

## Service & Support on the Internet

The online services of Service & Support at "<http://www.siemens.com/automation/support>" provide comprehensive information on SIMATIC products:

- Local service
- Repairs
- Replacement parts and more

## Recycling and disposal

Due to the low levels of pollutants in the HMI device described in this manual, it can be recycled. For environment-friendly recycling and disposal of your old equipment, contact a certified disposal facility for electronic scrap.

*Maintenance*

---

*8.3 Cleaning, repairs and spare parts*

# Technical data

This chapter lists the specifications that are relevant for fail-safe operation.  
 For more information, please read Application and ambient conditions (Page 42).  
 Additional specifications can be found in the operating instructions for the HMI device.

## 9.1 Technical data for fail-safe operation

### Fail-safe operation

<b>WARNING</b>	
The safety characteristics in the specifications apply for a proof-test interval of 10 years and a mean repair time of 8 hours.	

<b>In accordance with IEC 61508</b>	
Hardware architecture	Redundant 1oo2
Hardware error tolerance	1
Safe failure fraction	99,5 %
Diagnostic test interval	10 ms
Request rate	High demand mode
High demand (PFH: probability of a dangerous failure per hour) at 40 °C	8.60E-11 1/h
Maximum achievable safety class (SIL)	3
Useful life	10 years
<b>In accordance with DIN EN ISO 13849-1</b>	
Mean time to failure (MTTF <sub>d</sub> )	1516 years
Meantime to Restoration (MTTR)	8 hours
Diagnostic coverage (DC)	99 %
Performance level (PL)	e
Safety category	4
<b>In accordance with EN 954-1</b>	
Safety category	4

## Technical data

### 9.1 Technical data for fail-safe operation

Other safety-related values	
Acknowledgment time <sup>1)</sup>	40 ms
Maximum reaction time of the HMI device in faultless state <sup>1)</sup>	25 ms
Discrepancy times	<ul style="list-style-type: none"> <li>• Emergency stop</li> <li>• Enabling button position "Enable"</li> <li>• Enabling button position "Panic"</li> </ul>
Runtime of the F-FBs	The runtime of the F-FBs required in the safety program depends on the F-CPU used. The values are provided as FAQs concerning Mobile Panel 277F WLAN at the following Internet address: <a href="http://www.siemens.com/automation/support">"http://www.siemens.com/automation/support"</a>

- 1) The times specified refer to the internal reaction times of the HMI device, e.g. the time expiring between actuation of an emergency stop and the transfer of this signal to PROFINET.

### Quantity structure for the effective range concept

F FBs required in safety program	
F_FB_MP	1x per Mobile Panel 277F WLAN, maximum 126
F_FB_RNG_4	1x per effective range, for which up to 4 HMI devices have logging on authorization
F_FB_RNG_16	1x per effective range, for which up to 16 HMI devices have logging on authorization
DB_STATES	1

Configuring	
Maximum number of transponders used in the project for effective ranges	127
Maximum number of effective ranges in the project	127
Maximum number of transponders per effective range	127
Maximum number of HMI devices with logging on authorization per effective range	<ul style="list-style-type: none"> <li>• When using F_FB_RNG_4: 4 HMI devices</li> <li>• When using F_FB_RNG_16: 16 HMI devices</li> </ul>
Maximum configurable distance between transponder and HMI device	8 m

### Calculating the total reaction time

Use the Excel spreadsheet "s7fcotia" to calculate the total reaction time.

This table is provided with the S7 Distributed Safety options package. The current version of this table is available at the following Internet address:

["http://www.siemens.com/automation/support"](http://www.siemens.com/automation/support), subscription ID 21627074.

### See also

Application and ambient conditions (Page 42)

## 9.2 HMI device

### Weight

Weight without packing	Approximately 2.2 kg
------------------------	----------------------

### Protection class parameters

Protection class to IEC 60417	Description	Symbol
Front panel and rear panel	Protection class III	

### Protection type parameters

Degree of protection in accordance with IEC 60529	Description
Front panel and rear panel	IP65

### Radio system parameters

Frequency	2400 - 2483 MHz
Power	-1.5 dBm (0.7 mW) EIRP -3.65 dBm (0.4 mW) ERP

### WLAN parameters

Frequency	5.180 - 5.835 MHz
Power	maximum 18 dBm

## 9.3      Charging station

### Weight

Weight without packing	Approx. 1.1 kg
------------------------	----------------

### Supply voltage

Nominal voltage	+24 VDC
Range, permissible	19.2 V to 28.8 V (-20%, +20%)
Transients, maximum permissible	35 V (500 ms)
Time between two transients, minimum	50 sec
Current consumption with Mobile Panel	
• Typical	• Approx. 1.5 A
• Constant current, maximum	• Approx. 1.8 A
• Power on current surge $I^2t$	• Approx. 1.7 A <sup>2</sup> s
Current consumption with Mobile Panel and batteries in charging compartment	
• Typical	• Approx. 2.8 A
• Constant current, maximum	• Approx. 3.4 A
• Power on current surge $I^2t$	• Approx. 1.7 A <sup>2</sup> s
Fuse, internal	Electronic

### Connection to the power supply

The charging station is connected to the power supply using the cable box which is included in the scope of supply via a three-conductor flexible cable (0.75 mm<sup>2</sup>). Additional information can be found in the operating instructions for the HMI device.

# Application example: Safety Functions

## A.1 Configuration and operation

### Introduction

The following example shows a possible application of the safety functions of the Mobile Panel 277F IWLAN.

---

#### Note

This example is restricted exclusively to the typical functionality of the Mobile Panel 277F IWLAN, in this case to the "override" mode. Additional security measures, e.g. reducing speeds when opening protective doors, must also be taken into consideration in the safety program, depending on the plant. These measures are, however, not dependent on the functionality of the "override" mode.



#### WARNING

Please also observe the information on S7 Distributed Safety, which you can find in the programming and operating manual "SIMATIC S7 Distributed Safety - configuring and programming" and in the online help for S7 Distributed Safety.

### Sample configuration

The following sample configuration shows a robot cell which is protected by a protective fence with a protective door.

To operate the robot in "override" mode, the following components must also be installed:

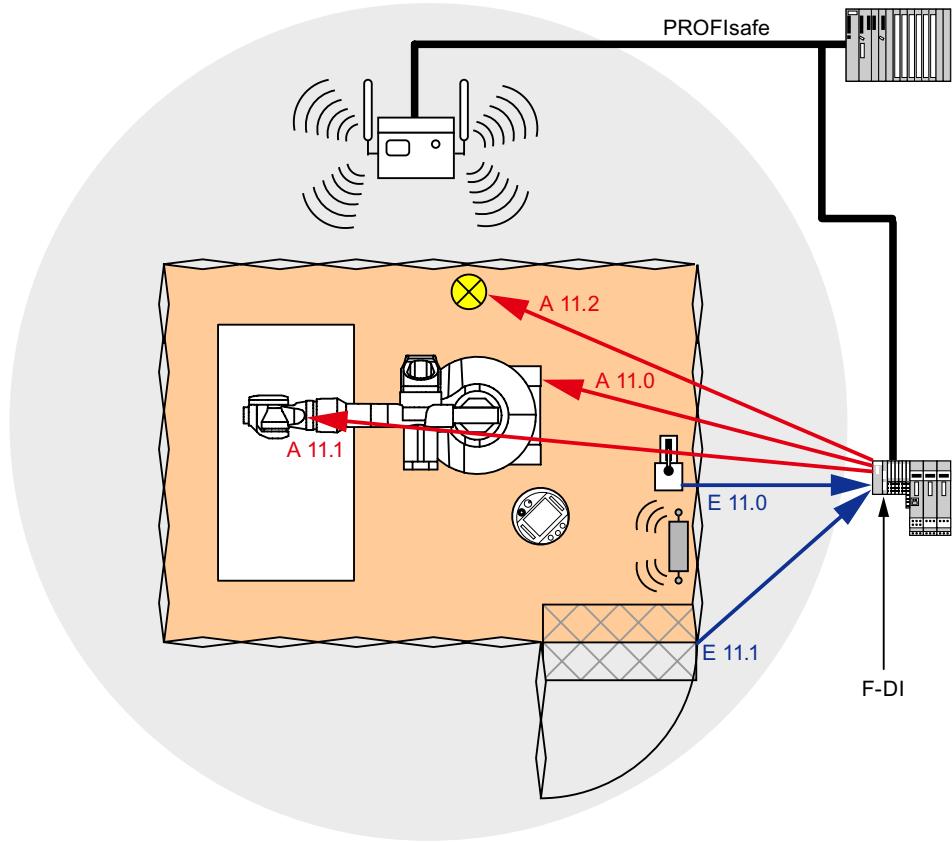
- A transponder for forming an effective range for the "override" switch. By logging on to this effective range, the operator is granted the permission to activate the "override" switch. Without logon to the effective range, activating the "override" switch will have no effect.
- The "override" switch. When the operator activates the "override" switch after logon to the relevant effective range, the "override" mode is activated by the positive edge of the switch.
- A contact mat at the entrance to the protected area. The contact mat enables you to detect whether the operator is leaving the protected area or whether a second person is entering the protected area while the "override" mode is active. In these cases the "override" mode is automatically terminated.

In addition, a lamp is installed, which indicates that the effective range is in use by the logged on HMI device.

If the "override" mode is active, the operator controls the robot by pressing a function key on the device and confirming operation with one of the enabling buttons.

### A.1 Configuration and operation

The following figure shows the configuration used in the example.

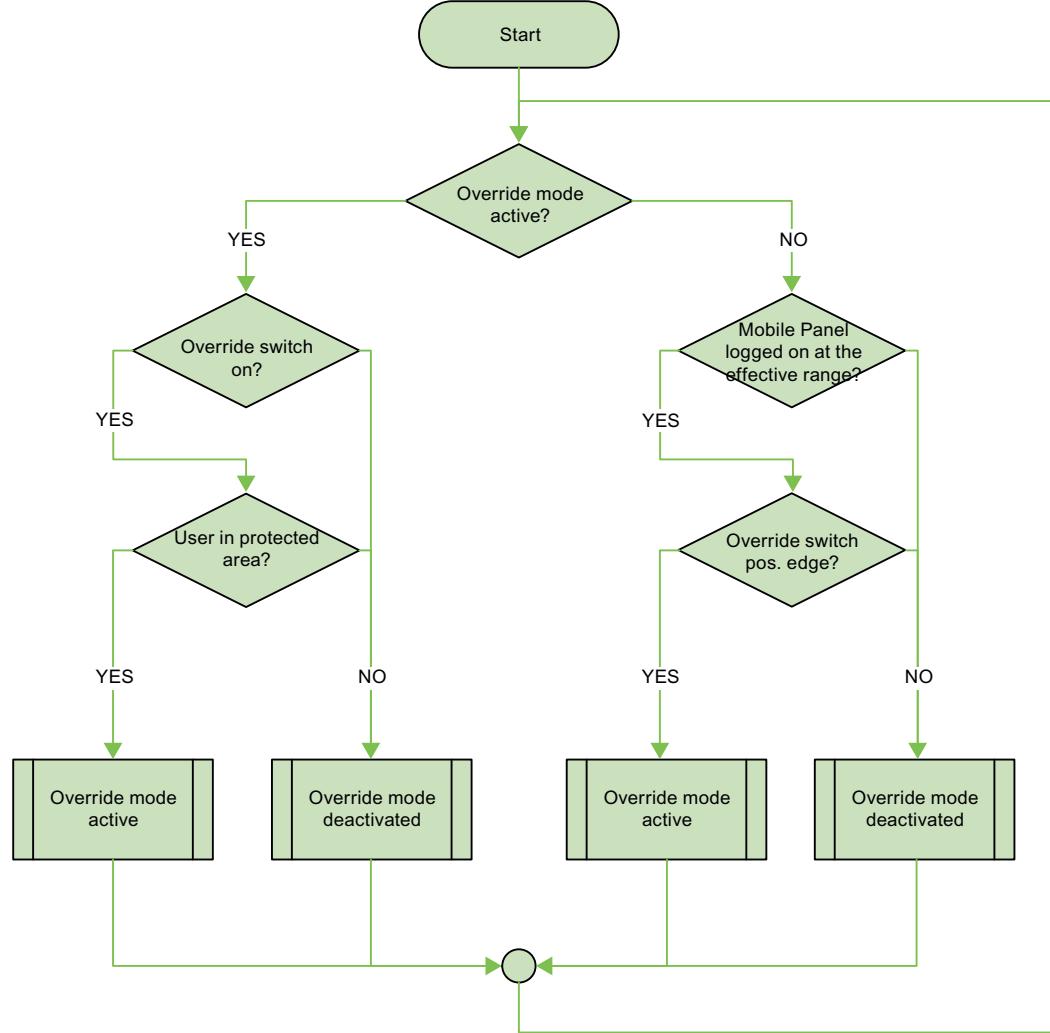


The following signals are used:

Function Symbolic name	Signal	Explanation
"Override" switch "Switch_OVERRIDE"	I11.0	"0": "Override" switch is off "1": "Override" switch is on
Contact mat "Contact_Mats"	I11.1	"0": Step on contact mat "1": Do not step on contact mat
Function key F1 of HMI device "Functionkey_F1"	E0.0	"0": Funktion key not pressed "1": Function key pressed
Enabling button	ENABLE (F_FB_RNG_4)	"0": No enable "1": Enable
POWER ON/OFF robot "E_Stop_Robot"	O11.0	"0": Emergency stop triggered. "1": Normal operation of plant.
Actuator to robot	O11.1	"0": The robot is not operated with F1 and the enabling buttons "1": The robot is operated with F1 and the enabling buttons
Signal lamp	O 11.2	"0": Effective range is not in use; the signal lamp is off "1": Effective range is in use; the signal lamp is on

## Flowchart

The following flowchart shows the operation sequence of the example.



## A.2 Components and settings used

### Necessary components

#### Hardware components

- S7 F-CPU, can be used for safety applications, e.g. CPU-317F-2PN/DP
- HMI device Mobile Panel 277F IWLAN
- Protective door
- Contact mat
- "Override" switch
- Signal lamp

#### Configuration software

- SIMATIC STEP 7 V5.4 as of SP2
- S7 Distributed Safety, V5.4 SP3
- WinCC flexible 2007 with HSP Mobile Panel 277 Wireless

#### Settings for the hardware components in STEP 7

in the following you can see the most important settings you have to make in the HW Config for the F-CPU and the HMI device.

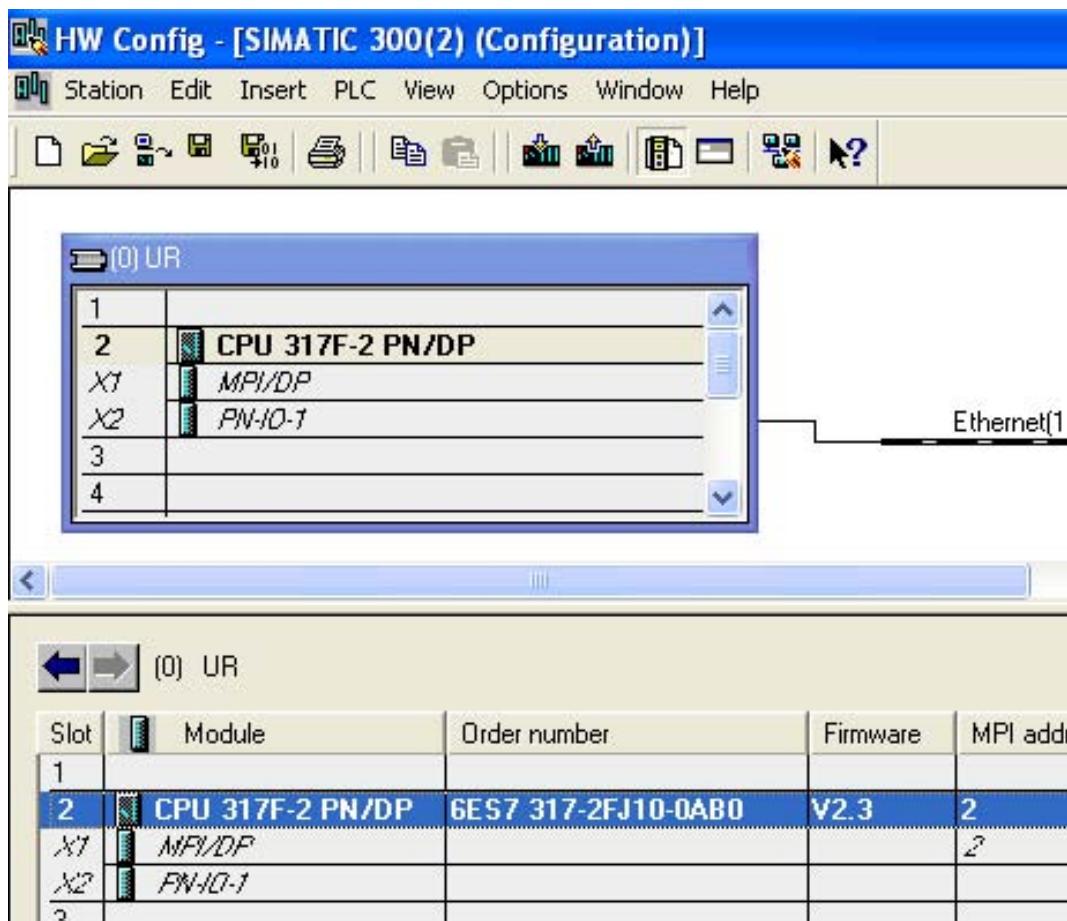


#### Loss of safety function

The settings shown in the following contribute to Cat. 4/ PL and/ SIL 3 being achieved. Any changes to the settings may result in the loss of the safety function.

**CPU 317F-2PN/DP**

1. Create a STEP 7 project in the SIMATIC Manager.
2. Open the hardware configuration "HW Config" and insert the desired F-CPU and a PROFINET connection as follows:



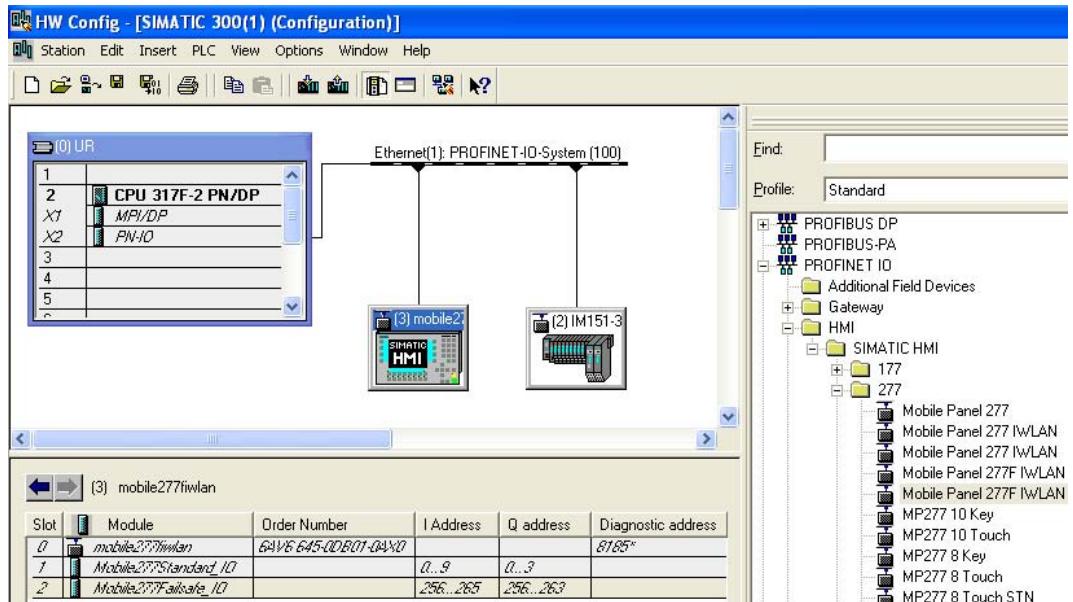
## A.2 Components and settings used

3. Open the settings by double-clicking on the F-CPU in the HW Config. You see the most important settings in the following:

Setting	Explanation																					
<table border="1"> <thead> <tr> <th></th> <th>Priority</th> <th>Execution</th> </tr> </thead> <tbody> <tr> <td>OB30:</td> <td>0</td> <td>5000</td> </tr> <tr> <td>OB31:</td> <td>0</td> <td>2000</td> </tr> <tr> <td>OB32:</td> <td>5</td> <td>1000</td> </tr> <tr> <td>OB33:</td> <td>10</td> <td>500</td> </tr> <tr> <td>OB34:</td> <td>11</td> <td>200</td> </tr> <tr> <td>OB35:</td> <td>12</td> <td>100</td> </tr> </tbody> </table>		Priority	Execution	OB30:	0	5000	OB31:	0	2000	OB32:	5	1000	OB33:	10	500	OB34:	11	200	OB35:	12	100	<p>Cyclic interrupts: This is where you set the cycle time for the OB 35.</p> <p><b>Note:</b> If the cycle time for OB 35 is set too high, message frames may be missing and there may be a delay in evaluating the "E-STOP" output of the F_FB_RNG_n . Set the cycle time for OB 35 slower than the PROFINET IO time.</p>
	Priority	Execution																				
OB30:	0	5000																				
OB31:	0	2000																				
OB32:	5	1000																				
OB33:	10	500																				
OB34:	11	200																				
OB35:	12	100																				
<p>Protection level</p> <ul style="list-style-type: none"> <li><input checked="" type="radio"/> 1: Access protect. for F CPU           <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Can be bypassed with password</li> </ul> </li> <li><input type="radio"/> 2: Write-protection</li> <li><input type="radio"/> 3: Write-/read protection</li> </ul> <p>Password: *****</p> <p>Enter again: *****</p> <p><input checked="" type="checkbox"/> CPU contains safety program</p>	<p>Protection level: Assign a password for the safety program. Set the "CPU contains safety program" check box.</p> <p>All the F-blocks required for the safe operation of the F-modules will only be compiled with this setting on compilation of the HW Config of STEP 7.</p>																					

## Mobile Panel 277F IWLAN

1. Insert the Mobile Panel 277F IWLAN in the HW Config in the following manner:

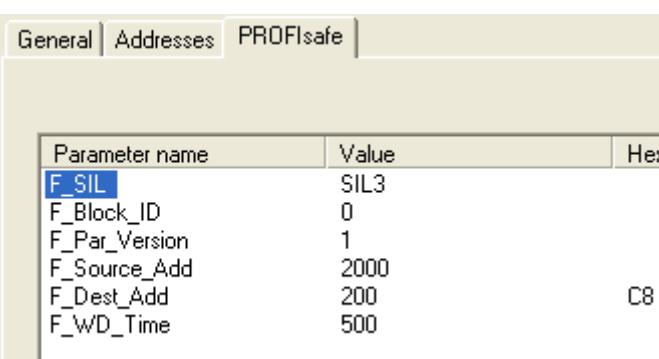


2. To define the device name, open the properties dialog box of the HMI device by double-clicking on the Mobile Panel 277F IWLAN in the HW Config.
3. To define the PROFIsafe parameters, open the properties dialog box of the module "Mobile277Failsafe\_IO", by double-clicking on the module "Mobile277Failsafe\_IO" in the HW Config in the detail view of the selected HMI device and then switch to the "PROFIsafe" tab.

The table below shows the most important settings:

Setting	Explanation
<p>General   IO Cycle  </p> <p>Short description: mobile277iwlan</p> <p>SIMATIC HMI Panel</p> <p>Order no.: 6AV6 645-0DB01-0AX0</p> <p>Family: SIMATIC HMI</p> <p>Device name <b>mobile277iwlan</b></p> <p>GSD file: GSDML-V2.1-Siemens-HMI-20070921.xml</p> <p><a href="#">Change Release Number...</a></p>	<p>Device name: Assign a device name to the HMI device here, which is unique in the Ethernet subnetwork. This name must match the name defined in the Control Panel of the HMI device under "PROFINET" in the text box "Device name: (max. 240 characters)".</p> <p>For detailed information, refer to the operating instructions of your HMI device.</p>

A.2 Components and settings used

Setting	Explanation																					
 <p>The screenshot shows the PROFIsafe configuration interface with two sections: Inputs and Outputs. Both sections have 'Start' and 'End' fields and a 'Process image' dropdown set to 'OB1 PI'. In the Inputs section, Start is 256 and End is 265. In the Outputs section, Start is 256 and End is 263.</p>	<p><b>Inputs:</b> Here, define the starting addresses of the inputs and the process image to which this address area belongs (PII).</p> <p><b>Outputs:</b> Here, define the starting addresses of the outputs and the process image to which this address area belongs (PIQ).</p>																					
 <table border="1" data-bbox="377 871 1017 1102"> <thead> <tr> <th data-bbox="377 871 684 905">Parameter name</th> <th data-bbox="684 871 949 905">Value</th> <th data-bbox="949 871 1017 905">Hex</th> </tr> </thead> <tbody> <tr> <td data-bbox="377 905 684 938">F_SIL</td> <td data-bbox="684 905 949 938">SIL3</td> <td data-bbox="949 905 1017 938"></td> </tr> <tr> <td data-bbox="377 938 684 972">F_Block_ID</td> <td data-bbox="684 938 949 972">0</td> <td data-bbox="949 938 1017 972"></td> </tr> <tr> <td data-bbox="377 972 684 1006">F_Par_Version</td> <td data-bbox="684 972 949 1006">1</td> <td data-bbox="949 972 1017 1006"></td> </tr> <tr> <td data-bbox="377 1006 684 1039">F_Source_Add</td> <td data-bbox="684 1006 949 1039">2000</td> <td data-bbox="949 1006 1017 1039"></td> </tr> <tr> <td data-bbox="377 1039 684 1073">F_Dest_Add</td> <td data-bbox="684 1039 949 1073">200</td> <td data-bbox="949 1039 1017 1073">C8</td> </tr> <tr> <td data-bbox="377 1073 684 1102">F_WD_Time</td> <td data-bbox="684 1073 949 1102">500</td> <td data-bbox="949 1073 1017 1102"></td> </tr> </tbody> </table>	Parameter name	Value	Hex	F_SIL	SIL3		F_Block_ID	0		F_Par_Version	1		F_Source_Add	2000		F_Dest_Add	200	C8	F_WD_Time	500		<p><b>F_Dest_Add:</b> PROFIsafe address of the Mobile Panel 277F WLAN. This address must match the address on the HMI device.</p> <p><b>F_WD_Time (ms):</b> Monitoring time in the fail-safe IO device. A valid current safety message frame must reach the F-CPU and be returned to the HMI device within the monitoring time period. This ensures that failures and errors are detected and appropriate responses, which keep the fail-safe system in a safe state or transfer it to a safe state, are triggered.</p> <p>The monitoring time selected must be long enough that message frame delays will be tolerated by the communication system, but also that the fault reaction function responds quickly enough in the event of a fault (e.g. interruption in the communication connection).</p>
Parameter name	Value	Hex																				
F_SIL	SIL3																					
F_Block_ID	0																					
F_Par_Version	1																					
F_Source_Add	2000																					
F_Dest_Add	200	C8																				
F_WD_Time	500																					

## A.3 Safety program S7 Distributed Safety

### Functionality

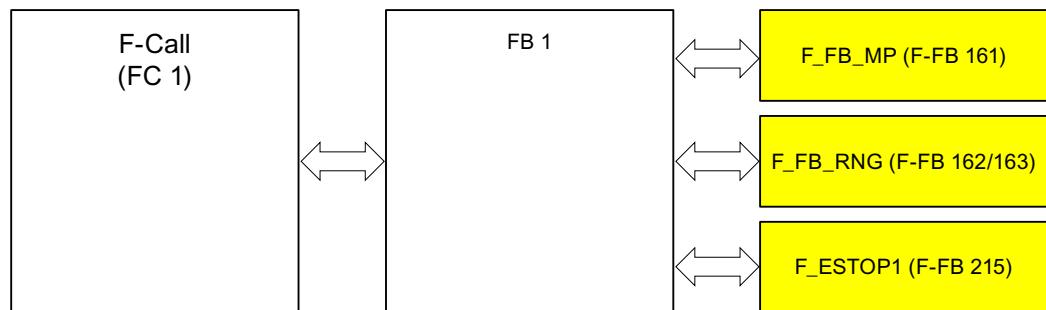
The safety program of the S7-CPU takes care of the following:

- The "override" mode is started when the Mobile Panel 277F IWLAN is logged on at the effective range and there is a positive edge on the override switch.
- When the Mobile Panel 277F IWLAN is logged on at the effective range in which the override switch is located, the signal lamp comes on.
- The "override" mode is terminated if either the override switch is activated again or if the operator leaves the protected area and steps on the contact mat.
- If the "override" mode is active, the operator can control the robot by pressing a function key on the device and at the same time confirming operation with the enabling button.
- After an emergency stop, the plant only restarts when the operator has performed an additional acknowledgment.
- In the event of a rampdown or shutdown, the appropriate plant-specific responses are initiated.

### Program execution of the safety program

#### Structure

The safety program is structured as follows:



#### Symbolic names used

The following symbolic names are used in the networks of the sample programs

Symbolic name	Meaning
F00256_Mobile277Failsafe_IO	Fail-safe I/O DB of HMI device
MP1_FB_S7_MP_RE	Input which is set when a reset of the HMI device is performed from the F-CPU.
MP1_FB_S7_ACK_ERR	Input which is set when a communication error is acknowledged from the F-CPU.
MP1_F_DATA_PII	Word 1 of the PII of the HMI device
MP1_F_RANGE_PII	Word 2 of the PII of the HMI device

Symbolic name	Meaning
MP1_F_DATA_PIQ	Word 1 of the PIQ of the HMI device
MP1_F_RANGE_PIQ	Word 2 of the PIQ of the HMI device
Interface_DB	F-DB for the data transfer of user data
F_DB_States	F-DB for the transfer of data between the F_FB_MP of the HMI device and the F_FB_RNG_n of the effective range

## F-CALL (FC 1)

F-CALL (FC1) is the F-run-time group and is called from the cyclic interrupt OB (OB35).

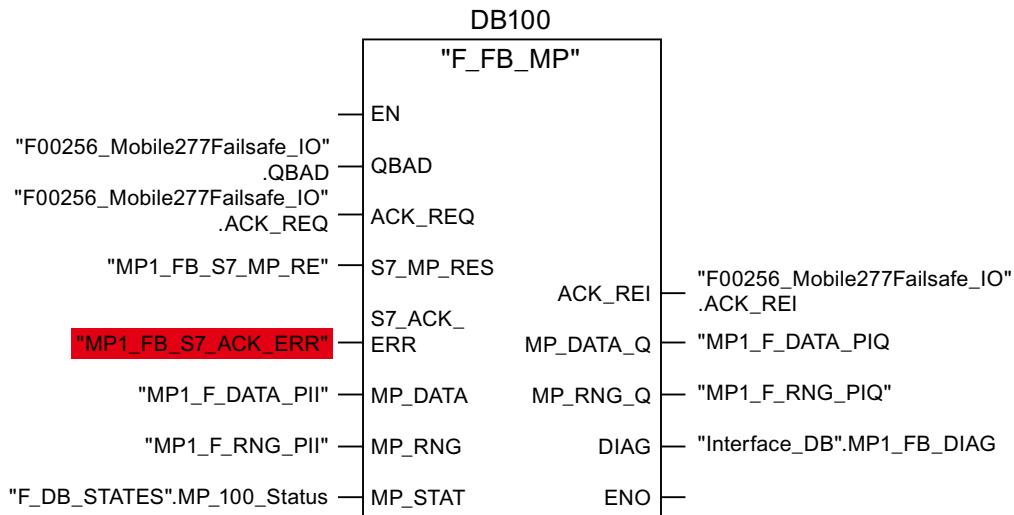
F-CALL (FC1) calls the F-program block (in this case: FB1).

## FB 1

For reasons of program modularity, all other safety-related blocks are called from this FB.

In the FB 1 you have to call the F-FBs in the sequence shown.

## Network1

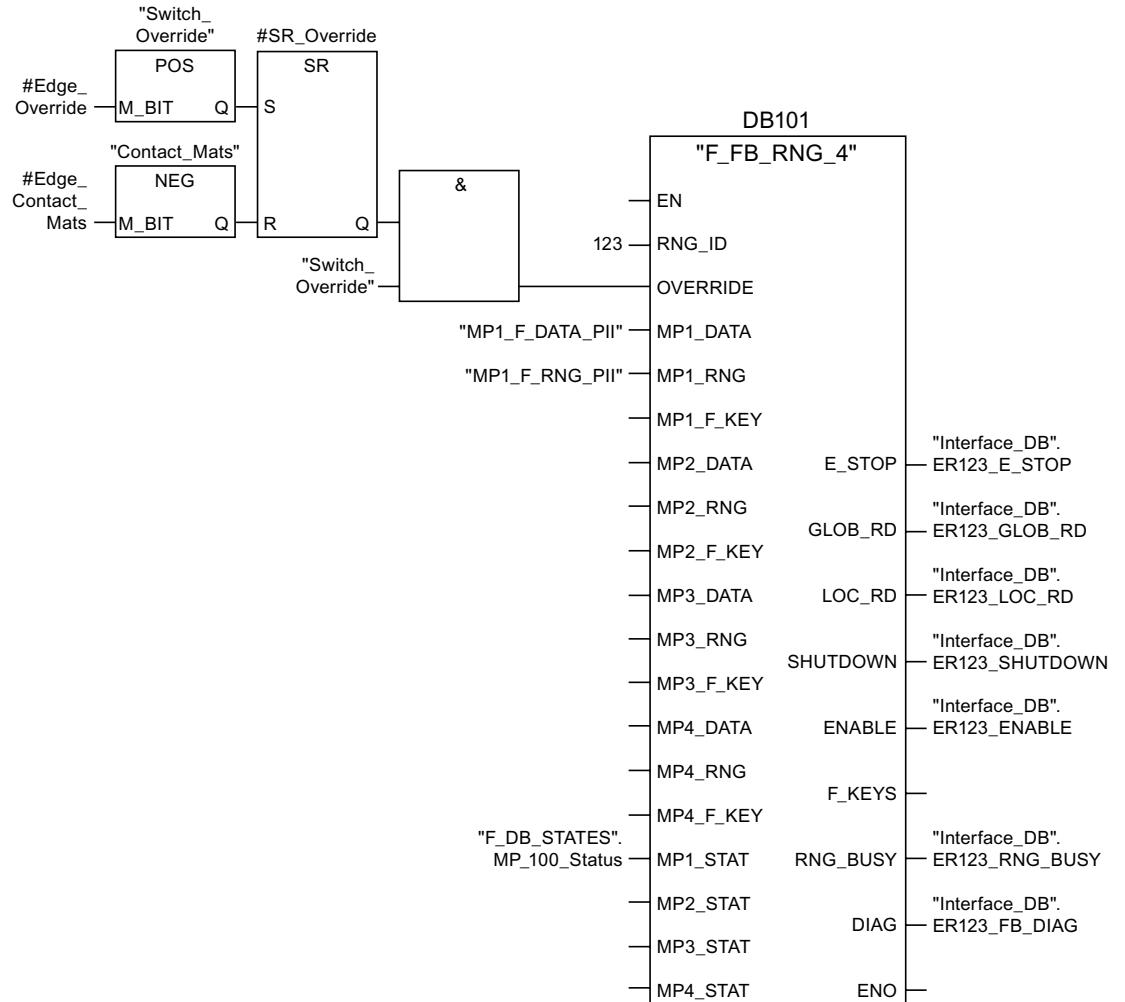


In network 1 the F\_FB\_MP of the HMI device is called. With this block the controller monitors the PROFIsafe communication of the Mobile Panel 277F WLAN. The following diagnostics information is indicated at the "DIAG" output:

- Status of the HMI device: integrated or removed
- A communication error has occurred.
- The communication error must be acknowledged.

For more information, please read FB161: Mobile Panel Status (F\_FB\_MP) (Page 63).

## Network 2

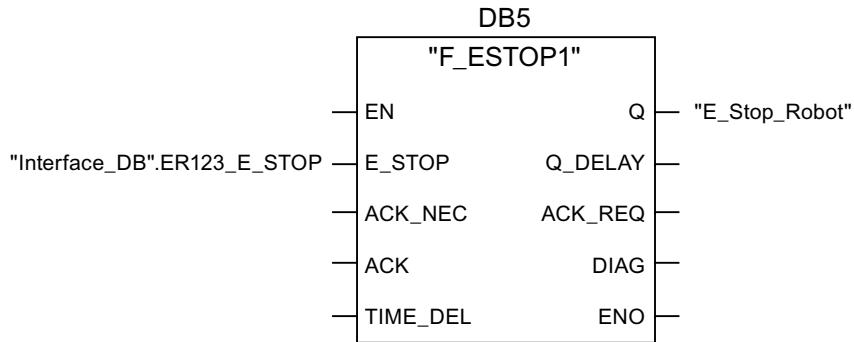


The activation of the "override" mode is controlled in this network.

"SR\_Override" is set if the override switch is switched on, i.e. I11.0 = "1". "SR\_Override" is reset by a negative edge of the contact mat, i.e. I11.1 = "0". This is the case if the operator leaves the override area without terminating the "override" mode. Only when the "SR\_Override" is set and the override switch is set to "on" is the "override" mode activated with the F\_FB\_RNG.

At the same time, the F\_FB\_RNG monitors the signals "emergency stop", "global rampdown", "local rampdown" and "shutdown". They are scanned in networks 3 to 6.

### Network 3

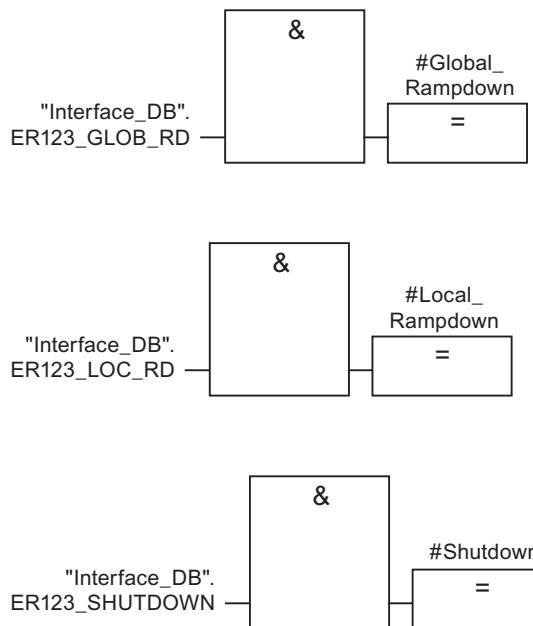


In network 3 the emergency stop signal of the HMI device is monitored via the F\_ESTOP1 from the F-library of S7 Distributed Safety. The F\_ESTOP1 ensures that the plant is only able to restart following an emergency stop after acknowledgment by the operator via the input "ACK".

#### Note

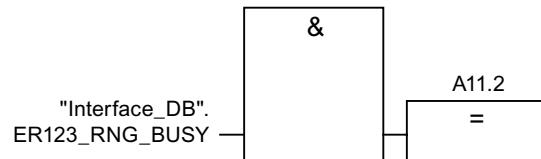
Also note the instructions for the FB 215 in the online help for the F-FBs and in the manual.  
 "SIMATIC S7 Distributed Safety - configuring and programming", Chapter  
 "FB 215 "F\_ESTOP1". Emergency STOP up to Stop Category 1".

### Network 4, network 5 and network 6



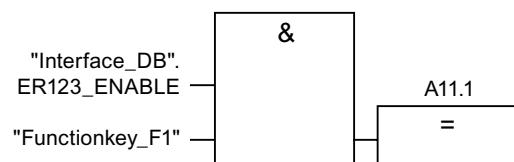
In network 4, 5 and 6 the signals for a global and a local rampdown and shutdown are processed further. As the configuration of the monitored plant determines which responses have to occur following occurrence of a particular safety state, these networks are not explained in detail in this example.

## Network 7



If the "RNG\_BUSY" signal is set in the F\_FB\_RNG, the signal lamp indicating in the plant that the effective range is in use is activated via the output O 11.2.

## Network 8



If the operator simultaneously presses the key F1 and the enabling button, the robot is activated via the output O11.1.



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