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
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

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

Qualified Personnel
The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products
Note the following:

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

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

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

1  Present sample project ........................................................................................................................................................................ 4
2  HMI configuration ..................................................................................................................................................................................... 5
   2.1  Overview ............................................................................................................................................................................................... 5
   2.2  SIMATIC HMI Comfort Panels ......................................................................................................................................................... 6
   2.3  HMI screens ......................................................................................................................................................................................... 7
   2.4  Additional control elements ............................................................................................................................................................... 8
   2.5  Recipes ............................................................................................................................................................................................... 9
   2.6  Archives .......................................................................................................................................................................................... 10
   2.7  User-defined functions ...................................................................................................................................................................... 11
   2.8  User Management ........................................................................................................................................................................... 13
   2.9  Multilingualism ................................................................................................................................................................................. 14
   2.10 Reports .......................................................................................................................................................................................... 16
3  Insert HMI device from libraries ....................................................................................................................................................... 18
   3.1  Storing an object in a library ......................................................................................................................................................... 18
4  Configuring HMI connection ................................................................................................................................................................. 19
   4.1  Communication between devices ..................................................................................................................................................... 19
   4.2  Configuring HMI connection .......................................................................................................................................................... 20
   4.3  Connecting HMI tags ......................................................................................................................................................................... 22
5  Configuring system diagnostics ............................................................................................................................................................... 24
   5.1  System diagnostics basics ................................................................................................................................................................. 24
   5.2  System diagnostics views ............................................................................................................................................................... 25
   5.3  Configuring the system diagnostic view ........................................................................................................................................ 28
6  Simulating an HMI device ........................................................................................................................................................................ 30
   6.1  Simulation basics .............................................................................................................................................................................. 30
   6.2  Operating the panel in simulation .................................................................................................................................................... 31
Present sample project

Sample project for the application

To configure the color mixing system with the TIA Portal, create the sample project "Color_Filling_Station". The following project components already exist for the sample project: The program blocks and tag tables of the CPU user program and a configured Comfort Panel with the necessary HMI screens, HMI tags and scripts.

In this section, we will explain the relationships between the individual project components of the sample project. You will carry out the necessary configuration steps yourself at a later point in time.
HMI configuration

2.1 Overview

Introduction of HMI configuration
The supplied project includes the programmed CPU and the preconfigured HMI device in the "global library".

HMI configuration
In this section, we will introduce the HMI device and HMI configuration.

Additional information
For detailed instructions on HMI configuration see:
Getting Started WinCC V13 Comfort Panels, Runtime Advanced
2.2 SIMATIC HMI Comfort Panels

SIMATIC HMI Comfort Panels

The TP1200 Comfort HMI device from the Comfort Panel series is used to operate the color mixing system.

Comfort Panels are particularly suitable for challenging HMI tasks in PROFINET and PROFIBUS environments and are characterized by the following features:

- High-quality housing and numerous interfaces
- Industrial widescreen displays with large visualization area, optimum viewing angle stability and maximum brightness
- Installation either in horizontal or vertical format
- Exact diagnostics with system diagnostics viewer
2.3 HMI screens

HMI screens

You use the screens loaded onto the respective HMI device to operate and monitor machines and plants in runtime.

You manage the screens in WinCC under "Screens" in the project navigation.

The start screen of the HMI device is used to visualize the color mixing system as well as the most important status information and key figures.

The color mixing system includes the following elements:

- A color reservoir for each print color with fill level display
- Mixer
- Feeder pipes to the mixer
- Conveyor belt with emergency stop switch
2.4 Additional control elements

Additional control elements

The process steps "Mixing color" and "Filling color" are to be displayed as animations with dynamic visualization objects.

The start screen of the example project includes additional control objects:

- Buttons for screen changes
- Buttons to reset the fill levels
- Buttons for operating and monitoring the system: Fill recipe, start mixing process, fill color mixture
2.5 Recipes

A recipe contains related production parameters, such as mixing ratios.

The required mixing ratio can be transferred from the HMI device to the color mixing system in a single step, for example, to switch production from dark orange to signal yellow.

The color mixing system can produce the mixed colors "Orange", "Amber", "Green" and "Red".

A recipe data record is created for each color. The recipe data record includes the percentage of basic colors which result in the respective mixed color.

The recipe consists of relevant parameters and the recipe data records in which the mixing ratios for the individual shades of color are stored.
2.6 Archives

To record operational events of a system, the alarms and process values generated during production are saved to logs.

You can then evaluate the alarms and process data logs.

The fill levels of the color reservoirs are to be documented for the color mixing system.

You have configured the alarm log "Tank_Level" for this purpose.

This log stores alarms for fill levels that were too low and fill levels that were too high during a shift.
2.7 User-defined functions

Scripts

You use the user-defined functions to program additional functionality for the HMI device. WinCC offers a VBS programming interface to create user-defined functions.

The example project uses two user-defined functions to display the mixed print color on the monitor in different screens.

- "Recipescreen" displays a rectangle in the selected color in the "Recipes" screen.

```
Sub Recipescreen()
    'This script calls the screen "Recipes" and therein the item "RECIPE_DISPLAY".
    For displaying the recipe color, the SmartTags for color RGB are called.
    Dim RecipeC
    Set RecipeC = HmiFunctie.Screen("Recipes").ScreenItem("RECIPE_DISPLAY")
    RecipeC.DrawColor = RGB(SmartTags("HMI_Recipe_RGB_Convert_0"),
                            SmartTags("HMI_Recipe_RGB_Convert_1"))
End Sub
```
"Startscreen" displays the label of the filled cans in the currently mixed color in the system overview of the start screen.
2.8 User Management

User Management

WinCC gives you the option to restrict safety-related operations to special user groups and thus protect data and functions from unauthorized access in Runtime.

The "User view" object offers management of users and passwords on the HMI device.

Users with user management authorization have access to the full range of functions in the user view.

They can create and delete users and change their own password or that of other users.
2.9 Multilingualism

WinCC supports multilingual user interfaces.

The color mixing system is operated in a new subsidiary in Russia.

A Russian user interface is required for maintenance and service technicians.

The example project has been expanded by another language for this purpose.

The texts are imported again after they have been exported and translated into Russian.
The Russian texts are displayed in Runtime in case of a language selection.
2.10 Reports

Reports are used to record events in a production process as a basis for product testing and quality control. Alarms and recipe data are output at regular intervals in the form of shift reports for this purpose.

A report has been created in WinCC for the "Tank_Level" log with alarms for the fill level.
A report for recipes has also been created in this project.

The reports should be output on a daily basis to a printer which is connected to the HMI device.

The cyclical output was created with the help of the Scheduler.
3.1 Storing an object in a library

Introduction

The global library includes a preconfigured HMI device.

Procedure

1. Open the global library.
2. Drag-and-drop the HMI device "Color_Mixing_HMI" into the "Devices & Networks" editor.
3. The mouse pointer changes into a crosshair with an object symbol attached.

Result

The preconfigured HMI device is created and can be connected to the CPU.
4 Configuring HMI connection

4.1 Communication between devices

Communication

The data exchange between devices is referred to as communication. The devices can be interconnected directly or via a network. The interconnected devices in communication are referred to as communication partners.

Data transferred between the communication partners may serve different purposes:

- Display processes
- Operate processes
- Output alarms
- Archive process values and alarms
- Document process values and alarms
- Administer process parameters and machine parameters

Basic information for all communication

The basis for all types of communication is a network configuration. In a network configuration, you specify the connection that exists between the configured devices. With the network configuration, you also ensure the necessary prerequisites for communication, in other words:

- Every device in a network is assigned a unique address.
- The devices carry out communication with consistent transmission characteristics.
4.2 Configuring HMI connection

Introduction

You configure an HMI connection between the Comfort Panel TP1200 and the CPU via PROFINET in the "Devices & Networks" editor.

The available communication partners in the project are displayed graphically in the network view.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication via Ethernet</strong></td>
</tr>
<tr>
<td>In Ethernet-based communication, the end user is responsible for the security of his data network.</td>
</tr>
<tr>
<td>Targeted attacks can overload the device and interfere with proper functioning.</td>
</tr>
</tbody>
</table>

Requirements

The following communication partners are created in the "Devices & Networks" editor:

- HMI device: SIMATIC Comfort Panel
- CPU: SIMATIC S7-1500
Configuring HMI connection

4.3 Connecting HMI tags

Procedure

1. Click the "Connections" button and select "HMI connection" for the connection type. The devices available for connection are highlighted in color.

2. Click the PROFINET interface of the CPU and drag-and-drop a connection to the PROFINET interface of the HMI device.

3. Click the communication partners in the "Network view" and change the PROFINET parameters in the Inspector window according to the requirements of your project.

Note

The created HMI connection is also shown in the tabular area of the editor in the "Connections" tab. You check the connection parameters in the table. You can change the local name for the connection only in the table.

Result

You have created a connection between an HMI device and the CPU.
4.3 Connecting HMI tags

Introduction

Once you have created the connection of CPU and HMI device, connect the tags of the two devices.

Procedure

1. Open the HMI tag editor.

![HMI tag editor screenshot]

2. Select the HMI connection you have just configured in the "Connections" column.
3. Repeat this procedure for all entries highlighted in red.

Result

An HMI connection had already been created for tags already configured in the CPU and HMI device.

You have restored this HMI connection.
Configuring system diagnostics

5.1 System diagnostics basics

Introduction
You use system diagnostics to detect problems and errors in any part of your plant. WinCC has two display and operating elements for quick error localization.

System diagnostics view
The alarm view shows the status of a CPU while the system diagnostics view gives you an overview of all devices available in your system: You navigate directly to the cause of the error and to the relevant device. You have access to all devices supporting diagnostics you have configured in the "Devices & networks" editor.

System diagnostics window
The system diagnostics window is an operating and display element that you can only use in the global screen.
The functions of the system diagnostics window are no different than those of the system diagnostics view. Because the system diagnostics window is configured in the global screen, you can, for example, also specify if the object is closable in Runtime.
5.2 System diagnostics views

Introduction

There are four different views available in the system diagnostics display and the system diagnostics window.

- Device view
- Diagnostic buffer view
- Detail view
- Matrix view (for master systems, PROFIBUS, PROFINET only)

Device view

The device view shows all the available devices of a layer in a table. Double-clicking on a device opens either the child devices or the detail view. Symbols in the first column provide information about the current status of the device.
5.2 System diagnostics views

**Diagnostic buffer view**

The current data from the diagnostic buffer are shown in the diagnostic buffer view.

![Diagnostic buffer view](image)

**Detail view**

The detail view gives detailed information about the selected device and any pending errors. Check whether the data is correct in the detail view. You cannot sort error texts in the detail view.

![Detail view](image)
Matrix view

The matrix view is only available for master systems. The matrix view shows the status of the subdevices of the master system.

- In PROFIBUS, the numbers assigned by Profibus are used as identification (DP station number).
- The IO devices are numbered consecutively from 1 in PROFINET.

<table>
<thead>
<tr>
<th>Button</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Right Arrow]</td>
<td>Opens the child devices or the detail view if there are no child devices.</td>
</tr>
<tr>
<td>![Left Arrow]</td>
<td>Opens the parent device or the device view if there is no parent device.</td>
</tr>
<tr>
<td>![Home]</td>
<td>Opens the device view.</td>
</tr>
<tr>
<td>![Diagnostic Buffer]</td>
<td>Opens the diagnostic buffer view. Only visible in the device view.</td>
</tr>
<tr>
<td>![Refresh]</td>
<td>Refreshes the view. Configured softkey, for example F2</td>
</tr>
</tbody>
</table>
5.3 Configuring the system diagnostic view

Introduction

You add a system diagnostics view to your project to get an overview of all devices available in your plant.

Requirements

- CPU has been created.
- The Inspector window is open.

Procedure

1. Double-click the "Diagnostics" HMI screen.
2. Double-click the "System diagnostics view" object in the "Tools" task card. The object is added to the screen.


4. Enable the columns that you require in the device view for Runtime, for example, State, Name, Slot.

5. Enable the columns that you require in the detail view for Runtime, for example, State, Name, Higher level designation.

6. Enable the columns that you require in the diagnostics buffer view, for example: State, Name, Rack.

7. If necessary, adapt the headers to the columns.

8. Enable "Properties > Properties > Layout > Column settings > Columns moveable" to move the columns in Runtime.

9. You can change the column headers under "Properties > Properties > Column headers", if necessary.

**Result**

The system diagnostics view has been added to the "Diagnostics" screen.

Error messages for the entire plant are now displayed in the system diagnostics view in Runtime.
6.1 Simulation basics

Introduction

You can use the simulator to test the performance of your configuration on the configuration PC. This allows you to quickly locate any logical configuration errors before productive operation.

You can start the simulator as follows:

- In the shortcut menu of the HMI device or in a screen: "Start simulation"
- Menu command "Online > Simulation > [Start] With tag simulator [With script debugger]"
- Under "Visualization > Simulate device" in the portal view.

Requirement

The simulation/runtime component is installed on the configuration PC.

Field of application

You can use the simulator to test the following functions of the HMI system, for example:

- Checking limit levels and alarm outputs
- Consistency of interrupts
- Configured interrupt simulation
- Configured warnings
- Configured error messages
- Check of status displays
6.2 Operating the panel in simulation

Introduction

You simulate the HMI project on your computer.

Procedure

1. Start the simulation of the HMI device.

A connection to the CPU is established and the color mixing system is displayed in the simulation.

2. Open the "Recipes" screen and select a color.
3. Specify the number of cans and view the selected color.
4. Go back to the start screen and start production.
5. You can query the current CPU status in the "Diagnostics" screen.