Configuring Messages and Alarms in WinCC (TIA Portal) – Extension with S7-1200/S7-1500

WinCC V14 SP1

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1 Introduction

1.1 Overview

Motivation

This documentation describes the configuration of messages and alarms in WinCC (TIA Portal) in conjunction with the S7-1200/S7-1500 controller families.

Application-specific implementation

The application-specific implementation is based on the documentation “Configuration of Messages and Alarms in WinCC (TIA Portal)” in conjunction with the S7-300/S7-400 controller families of this application example.
The basics and selected chapters explicitly refer to this documentation as the content and the configuration scope are identical.

The application example is a supplement to the manual and TIA Portal’s Online Help.

Required knowledge

Basic knowledge of WinCC (TIA Portal).

Note

The SITRAIN courses “SIMATIC WinCC on the machine level in the TIA Portal” and “SIMATIC WinCC SCADA in the TIA Portal” teach the basics of WinCC.

- SIMATIC WinCC maschinennah im TIA Portal (de)
- SIMATIC WinCC on the machine level in the TIA Portal (en)

- SIMATIC WinCC SCADA im TIA Portal (de)
- SIMATIC WinCC SCADA in the TIA Portal (en)

The SITRAIN courses “SIMATIC programming 1 in the TIA Portal” and “SIMATIC S7-1200 basic course” teach the basics of STEP 7.

- SIMATIC Programmieren 1 im TIA Portal (de)
- SIMATIC programming 1 in the TIA Portal (en)

- SIMATIC S7-1200 Basiskurs (de)
- SIMATIC S7-1200 basic course (en)

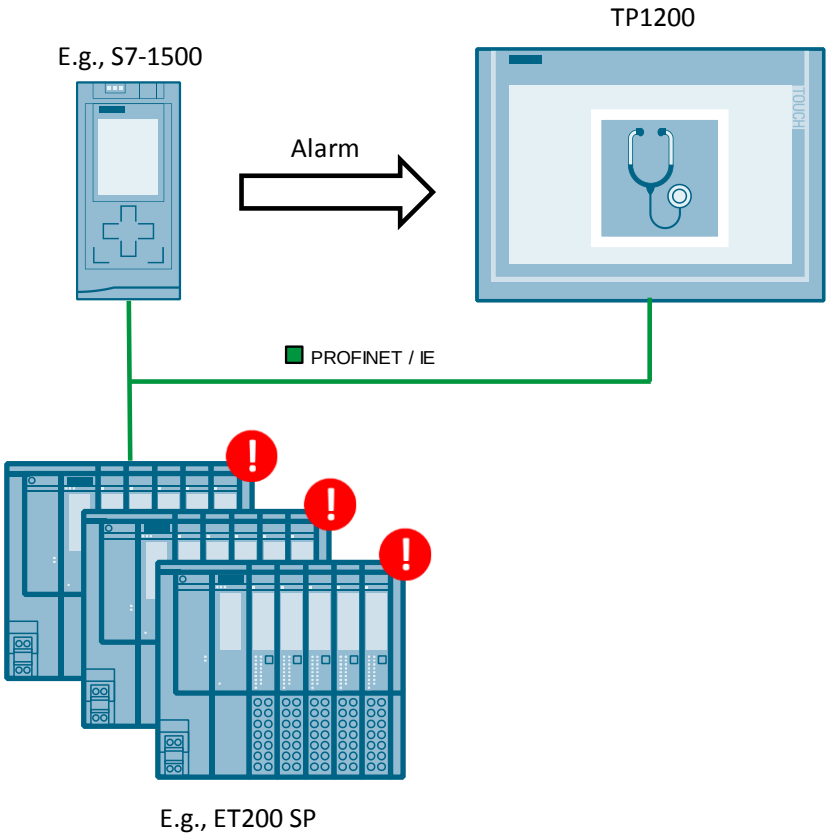
1.2 How the application works

During operation of a plant, it is essential to visually output information about operating states, faults and individual processes on an HMI operator panel. In conjunction with the SIMATIC S7-1200/S7-1500 controllers, WinCC (TIA Portal) alarm logging offers an appropriate alarm procedure for each of these pieces of information.

This application provides you with:

- An overview of the different alarm procedures in WinCC
- Support in selecting the right alarm procedure for your use case and hardware (S7-1200/S7-1500)
- Detailed configuration instructions for the different types of alarms in WinCC and STEP 7 (TIA Portal)

Figure 1-1



1.3 Scope

This application example explains messages and alarms in WinCC (TIA Portal) in conjunction with the S7-1200/S7-1500 controller families.

For more information about the alarm procedures with the S7-300/S7-400 controllers, refer to the second PDF document for this application example.

1.4 Components used

The application was created with the following components:

Hardware components

Table 1-1

Component	No.	Article number	Note
SIMATIC CPU 1513-1 PN	1	6ES7513-1AL01-0AB0	Alternatively, any other CPU from the S7-1500 family can be used; the only requirement is to change the device in the configuration.
Memory card, 24 Mbytes	1	6ES7954-8LF02-0AA0	
SIMATIC HMI TP1200 Comfort	1	6AV2124-0MC01-0AX0	Alternatively, any other Comfort Panel can be used (device change required).

Note When using a CPU from the S7-1200 family, the scope of possible alarm types is significantly restricted compared to a CPU from the S7-1500 family.

Software components

Table 1-2

Component	No.	Article number
STEP 7 Professional V14 SP1 (TIA Portal)	1	6ES7822-1..04-..
WinCC Professional V14 SP1 (TIA Portal)	1	6AV210.-….4-0
WinCC Runtime Professional V14 SP1 (TIA Portal)	1	6AV2105-….4-0

2 Configuring Alarms in WinCC Basic/Comfort/Advanced

As a supplement to the manual ("Working with alarms" chapter), this section describes the configuration of system-defined alarms and controller alarms. This includes the configuration of user-defined alarms.

Required software components

- WinCC Basic/Comfort/Advanced V14 SP1 (TIA Portal)
- STEP 7 Professional V14 SP1 (TIA Portal)

Requirement

A WinCC (TIA Portal) project exists with a created connection between the operator panel and the controller.

2.1 Configuring user-defined alarms

In WinCC Basic/Comfort/Advanced, the configuration of user-defined alarms (discrete alarms and analog alarms) is independent of the controller used. For a detailed description of configuring user-defined alarms, refer to the following application example:
"Configuration of Messages and Alarms in WinCC" In addition, you will find a detailed description in the "Configuring discrete alarms" and "Configuring analog alarms" chapters of the WinCC Advanced V14 system manual.

2.2 Configuring system-defined alarms

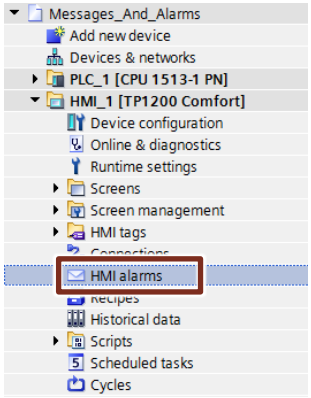
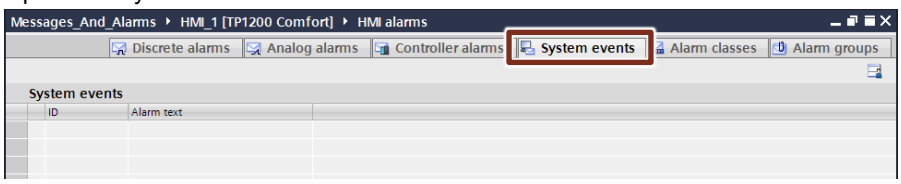
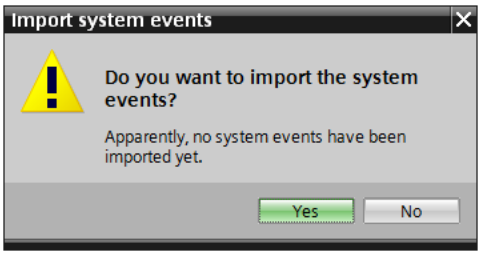
2.2.1 Configuring system events (S7-1200, S7-1500)

By default, system events are stored in the HMI for different languages. If you want to translate system events into other languages, you must first import the texts into the project.

Importing system events

Importing system events is only necessary for projects that were newly created or when the system events have not yet been imported.

Table 2-1

No.	Action
1.	In the project tree, go to the folder of the operator panel you created and open the “HMI alarms”. 
2.	Open the “System events” tab. 
3.	Confirm the next dialog to import the “system events”. 
4.	Importing the system events is now complete.

Display of system events on the operator panel in Runtime

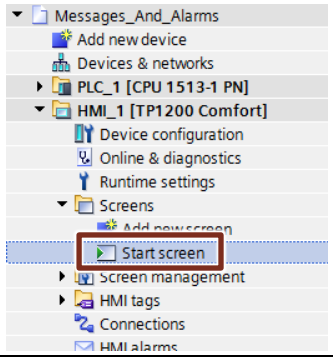
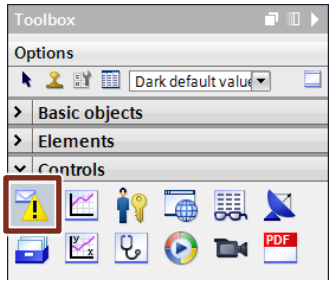
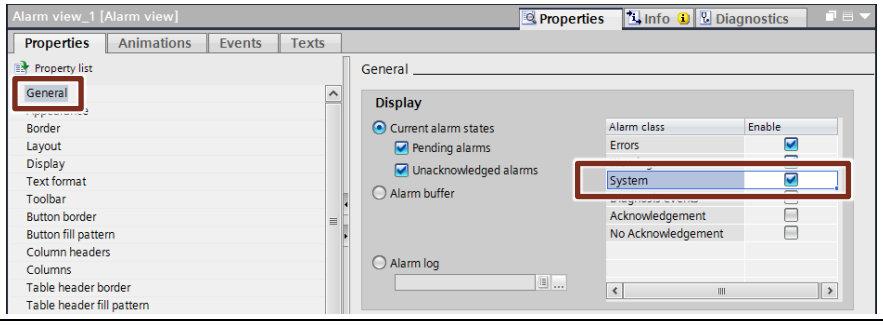
The following table provides the instructions for configuring an alarm view. This is a static element (always visible) that you permanently configure into a screen.

Note

Aside from a static alarm view, you have the option to dynamically output alarms using an alarm window. It is configured in the "global screen" of the HMI and appears only when an alarm occurs.

For more information, refer to the WinCC manual, chapter "Configuring an alarm window".

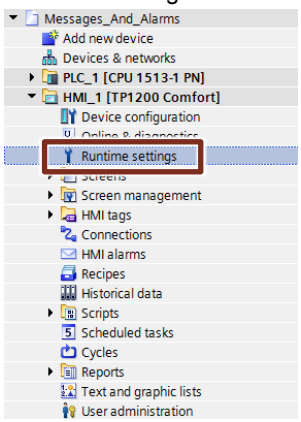
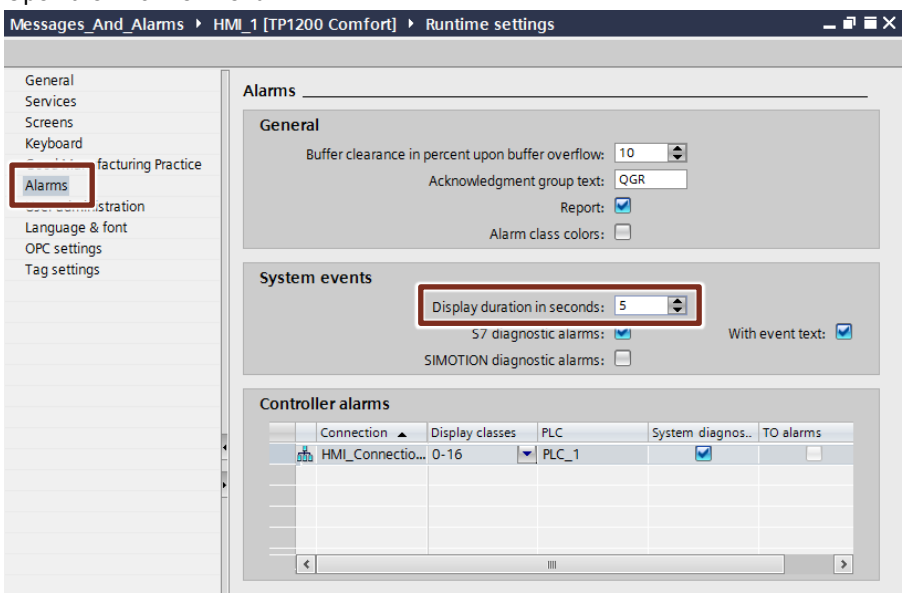
Table 2-2

No.	Action
1.	Open the start screen of your operator panel. 
2.	In the "Toolbox" task card, go to "Controls" and select the "Alarm view". 
3.	Use drag and drop to move the "Alarm view" to your start screen and resize it as required.
4.	In the "Alarm view" properties, check "System" to display system events on the operator panel. 

For more information about configuring an alarm view, refer to the WinCC Basic/Comfort/Advanced system manual, "Configuring an alarm view".

Defining the display duration for system events

Table 2-3

No.	Action
1.	In the project tree, go to the folder of the operator panel you created and open the “Runtime settings”. 
2.	Open the “Alarms” menu.  In “System events > Display duration in seconds”, enter the display duration for system events on the operator panel. **Note** If you want the system events to be permanently pending, set the display duration to “0” seconds.
3.	The display duration settings for system events are now complete.

Changing alarm texts for system events

The alarm texts of system events can be changed or customized if necessary. The associated alarm numbers cannot be changed.

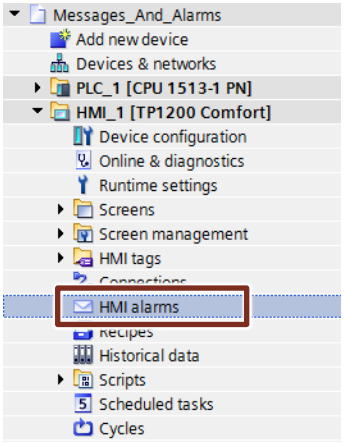
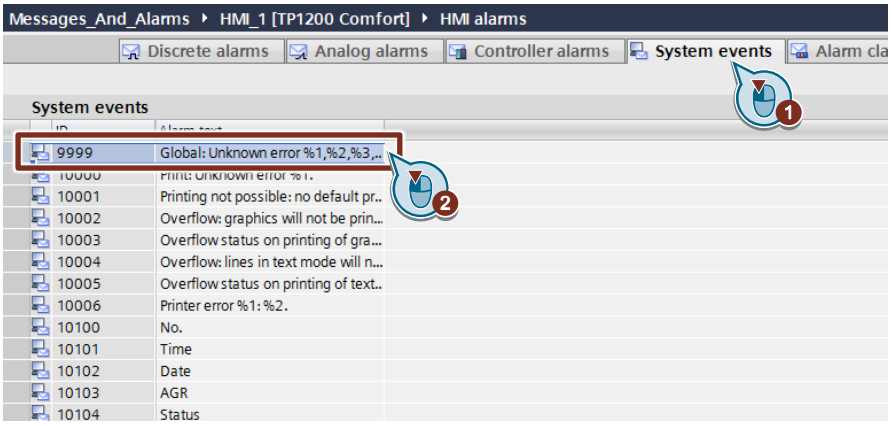
Note

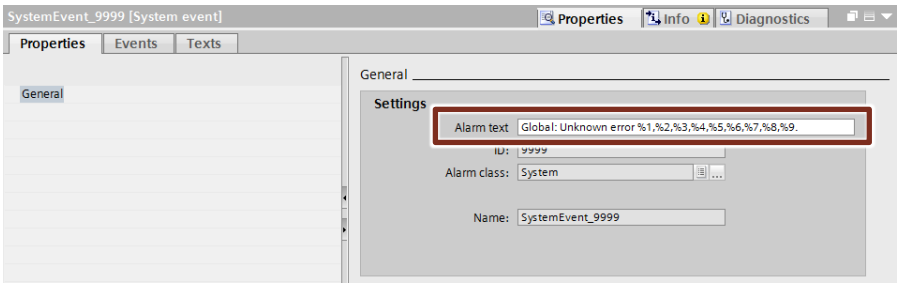
Changing system events changes clearly defined alarms, which may result in misinterpretations.

The imported alarms are part of the manual / online help.

When a change is made, the changed alarms no longer match the documentation.

Table 2-4

No.	Action
1.	In the project tree, go to the folder of the operator panel you created and open the “HMI alarms”. 
2.	Open the “System events” tab.  Select the system event whose alarm text you want to change.

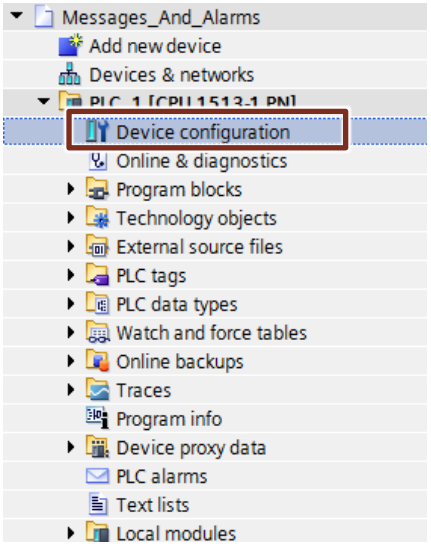
No.	Action
3.	In the Inspector window, open the “Properties > Properties > General” tab.  In “Alarm text”, change the alarm text of the system event. **Note** When changing an alarm text, the number of wildcards must not be modified. Example of a wildcard: %1
4.	Changing the alarm text for the system event is now complete.

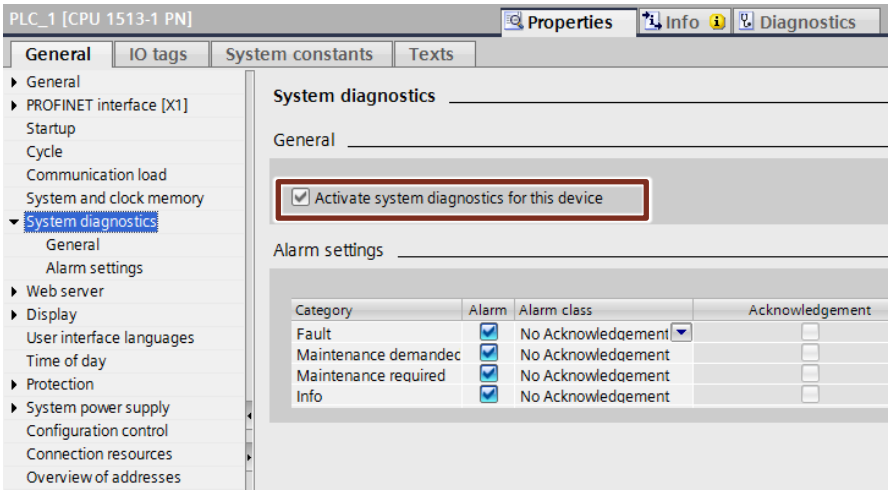
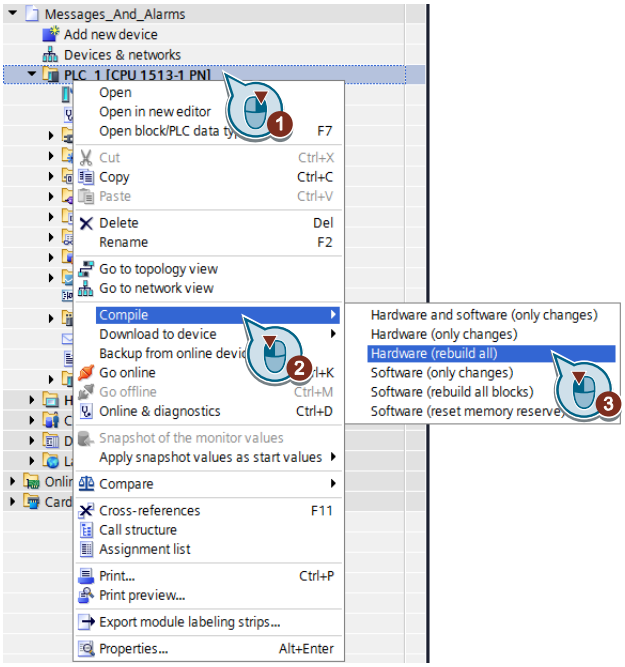
2.2.2 Configuring CPU system diagnostic alarms (S7-1500)

The following section describes the configuration of the display of system diagnostic alarms of an S7-1500 CPU on an operator panel.

Settings in STEP 7

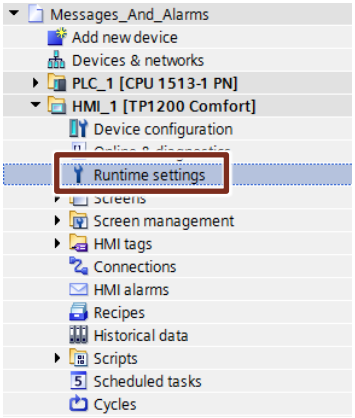
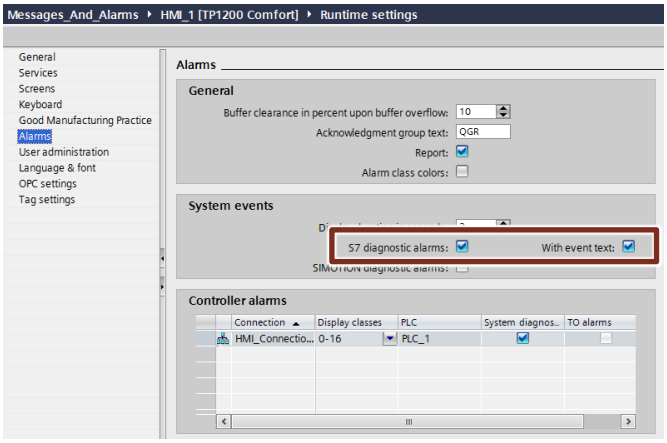
Table 2-5

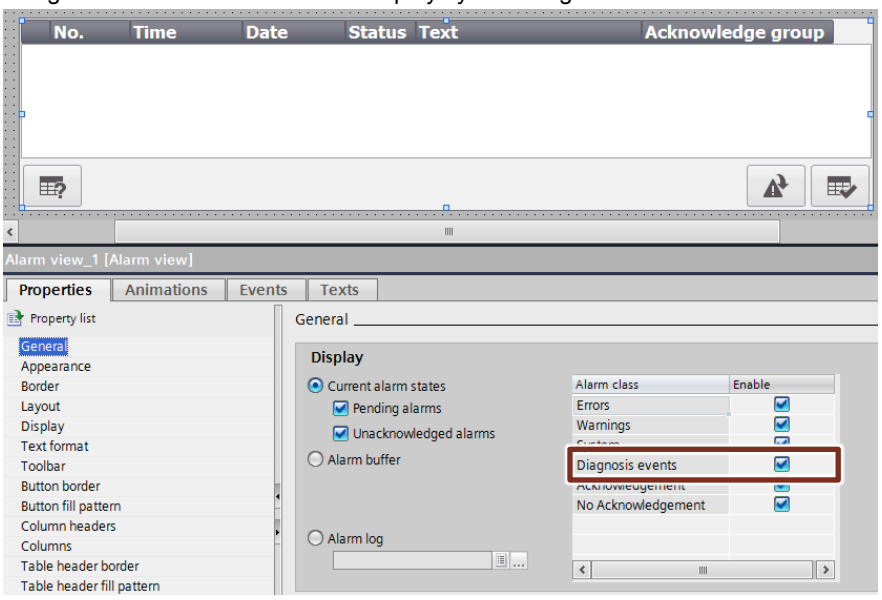
No.	Action
1.	In the project tree, open the “Device configuration” of your CPU. 
2.	In the device view, select the CPU on the rack.

No.	Action
3.	In the Inspector window, open the “Properties > General > System diagnostics” tab. The “Activate system diagnostics for this device” check box is checked by default and cannot be unchecked.  **Optional:** Depending on your requirements, “Alarm settings” in the bottom part of the Inspector window allows you to customize the alarms and alarm classes of the respective categories.
4.	In the project tree, right-click the CPU. From the context menu, select “Compile > Hardware (rebuild all)”. 
5.	The settings in STEP 7 are now complete.

Settings in WinCC Basic/Comfort/Advanced

Table 2-6

No.	Action
1.	In the project tree, open the “Runtime settings” of your operator panel. 
2.	In “Alarms > System events”, check the “S7 diagnostic alarms” check box.  If you want to display the associated alarm text in addition to the alarm number, check the “With event text” check box as well.
3.	In the next step, create an “alarm view” in a screen of your operator panel.

No.	Action
4.	In the “Alarm view” properties, go to “Properties > General” and check the “Diagnosis events” alarm class to display system diagnostic alarms in WinCC.  **Note** Depending on the CPU’s alarm class (e.g., in step 3 of Table 2-5), it may be additionally necessary to check the “Acknowledgement” or “No Acknowledgement” alarm classes.
5.	Transfer the project to the operator panel. The settings in WinCC are now complete.

For more information about configuring an alarm view, refer to the WinCC Basic/Comfort/Advanced system manual, “Configuring an alarm view”.

Note For information about system diagnostics and system diagnostics options, refer to the following application example:
“System Diagnostics with S7-1500 and TIA Portal”

2.3 Configuring controller alarms

2.3.1 Configuring Program_Alarm (S7-1500)

The “Program_Alarm: Generate program alarm with associated values” instruction monitors a signal and generates an incoming program alarm when the signal at the SIG parameter changes from 0 to 1. When the signal changes from 1 to 0, it generates an outgoing program alarm. Whether or not the alarm requires acknowledgment depends on the configured alarm class. By default, it is not necessary to acknowledge the block.

You can append up to ten associated values to the program alarm. Each alarm, both incoming and outgoing, is provided with a time stamp.

Parameters of the Program_Alarm alarm block

Table 2-7

Parameter	Declaration	Data type	Memory area	Description
SIG	Input	BOOL	I, Q, M, D, L, T, C or constant	The signal to be monitored. • Positive signal edge: An incoming program alarm is generated • Negative signal edge: An outgoing program alarm is generated
TIMESTAMP	Input	LDT	M, D, L or constant	This parameter is used to provide an alarm with a time stamp, for example, from an input signal with a distributed stamp. The time value must always be specified in system time (i.e. UTC), as this is the time used for time synchronization throughout the plant. • "Not assigned" means that the system time of the CPU will be used as the interrupt time stamp when a signal change occurs (default). • Any system time input will be used as the interrupt time stamp when a signal change occurs. Note: If you want an interrupt to be time-stamped with local time, a conversion block must be connected in series to convert local time to system time. This is the only way to make sure that the time stamp is shown correctly in the interrupt display.
SD_i	Input	VARIANT	I, Q, M, D, L	i-th associated value ($1 \leq i \leq 10$) You can use binary numbers, integers, floating-point numbers or strings as associated values.
Error	Output	BOOL	I, Q, M, D, L	Error status parameter Error = TRUE indicates that an error has occurred during processing. The Status parameter displays the possible error cause.
Status	Output	WORD	I, Q, M, D, L	Status status parameter Displays the error information (see "Error and Status parameters").

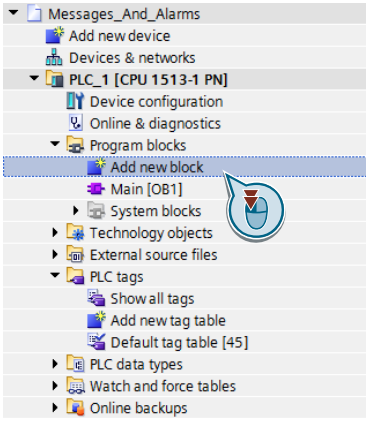
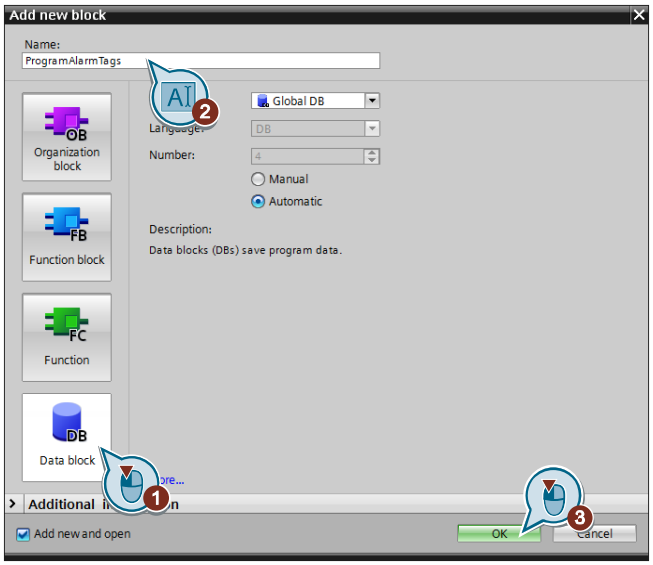
For more information about the “Program_Alarm” block, refer to the STEP 7 system manual, “Program_Alarm: Generate program alarm with associated values” or the following application example:
“Diagnostics in User Program with S7-1500”

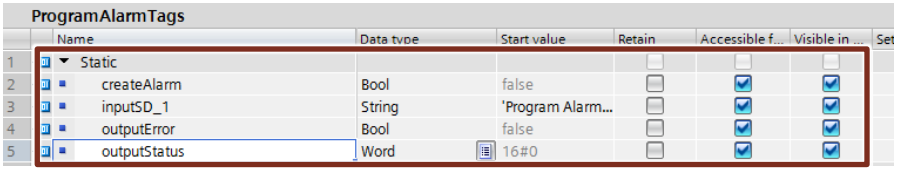
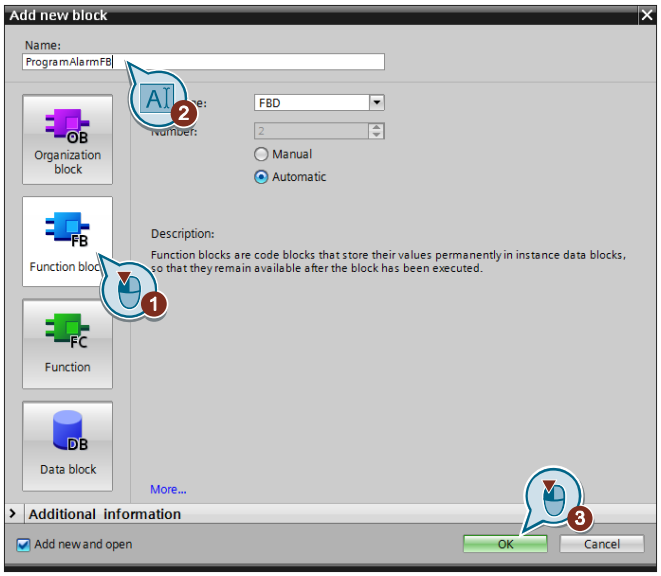
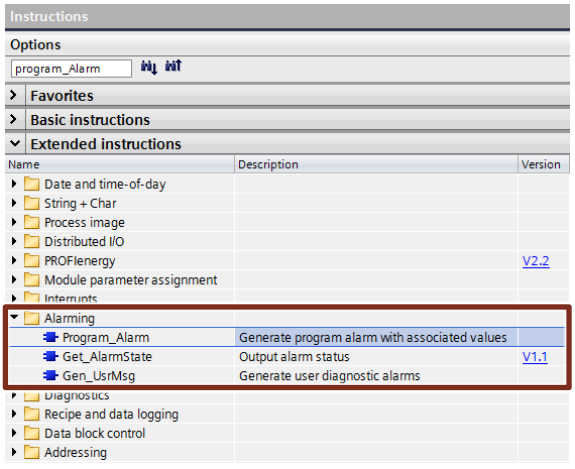
Settings in STEP 7

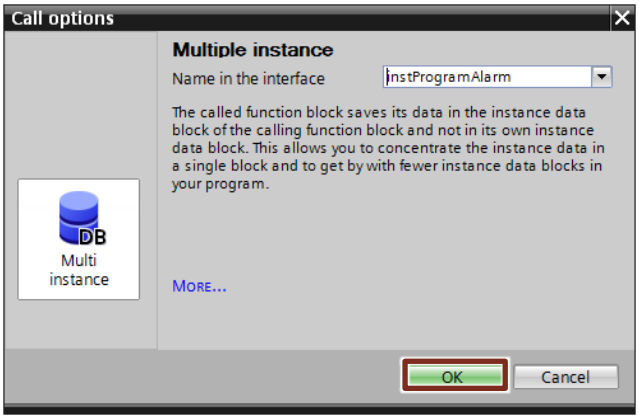
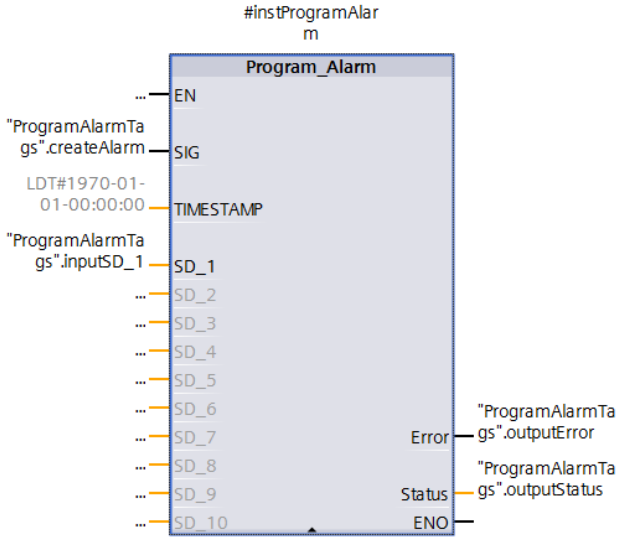
The following table shows the configuration steps necessary to create a program alarm in STEP 7.

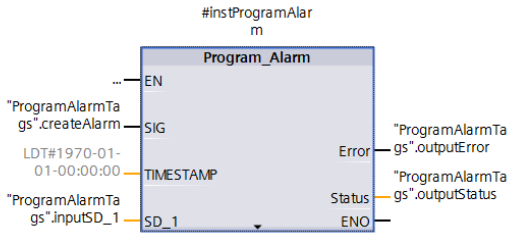
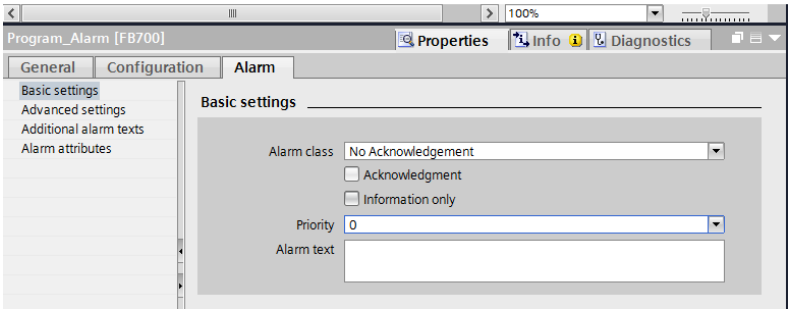
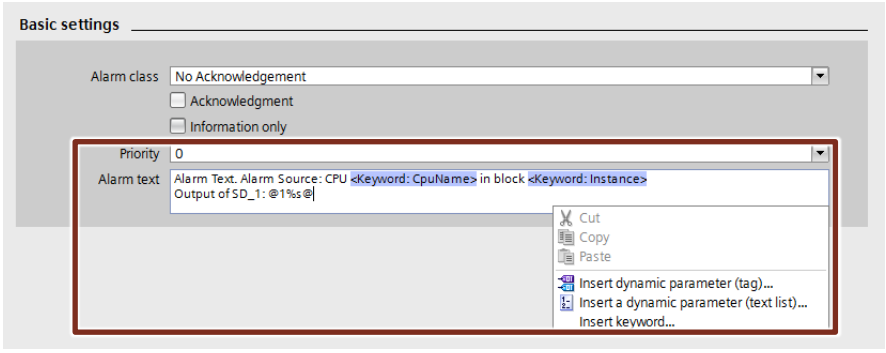
Note The STEP 7 configuration steps for the “Program_Alarm” alarm block apply to both the WinCC Basic/Comfort/Advanced visualization versions and WinCC Professional.

Table 2-8

No.	Action
1.	First, create a global data block for storing and monitoring the values: Go to the created CPU and double-click “Program blocks > Add new block”. 
2.	From the dialog, select “Data block” and change the block’s name, if necessary. Confirm with “OK”. 

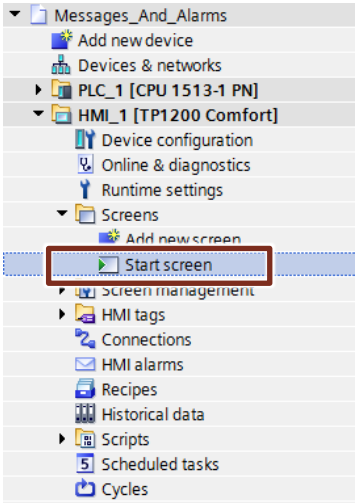
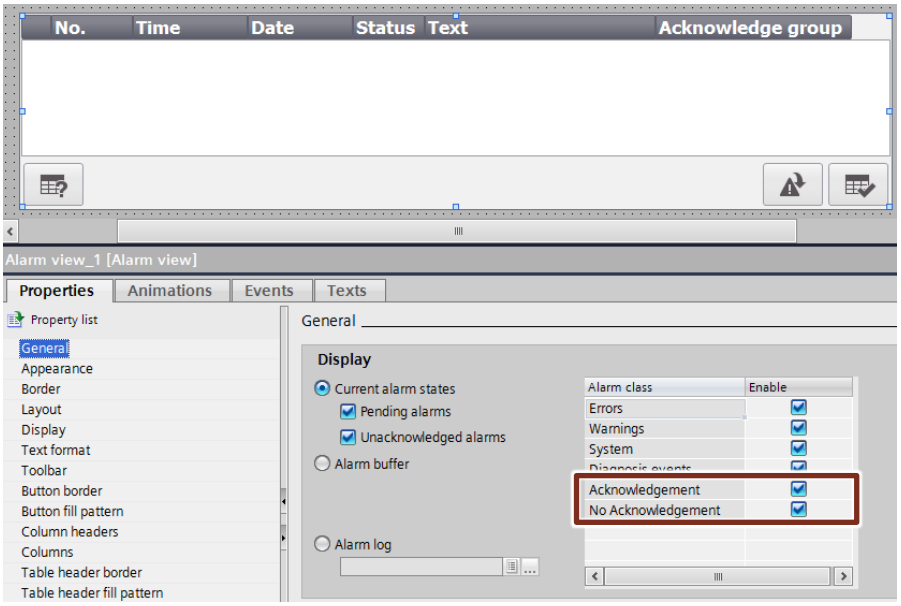
No.	Action
3.	Insert four tags with the appropriate data types into the created data block to be able to interconnect the “Program_Alarm” instruction. 
4.	Proceed similarly to the first two steps to create a function block to be able to call the “Program_Alarm” instruction. 
5.	Go to the “Instructions > Extended Instructions” task card and open the “Alarming” folder. 

No.	Action
6.	Use drag and drop to move the “Program_Alarm” alarm block to an empty network of the function block. Click “OK” to confirm the “call options”. 
7.	Interconnect the inserted “Program_Alarm” block with the tags from the data block. 

No.	Action
8.	To edit the alarms, go to the “Properties” tab and click Alarm. Here you can: • Edit the alarm class, priority and alarm text (Basic settings) • Select the display class, group ID and logging (Advanced settings) and • define additional alarm texts.  
9.	In the alarm text input window, right-click and select different options from the context window to specify the alarm texts in greater detail.  **Note** Due to the “@1%s@” string, the value of the SD_1 parameter is read out and output as a string.

Settings in WinCC Basic/Comfort/Advanced

Table 2-9

No.	Action
1.	In the project tree, open the start screen of your operator panel. 
2.	Create an alarm view.
3.	In the “Alarm view” properties, go to “Properties > General” and check the “Acknowledgement ” and “No Acknowledgement” alarm classes to display system program alarms in WinCC. 
4.	Transfer the project to your operator panel. The settings in WinCC are now complete.

For more information about configuring an alarm view, refer to the WinCC Basic/Comfort/Advanced system manual, “Configuring an alarm view”.

2.3.2 Configuring Get_AlarmState (S7-1500)

The “Get_AlarmState” instruction outputs the alarm state of a program alarm.

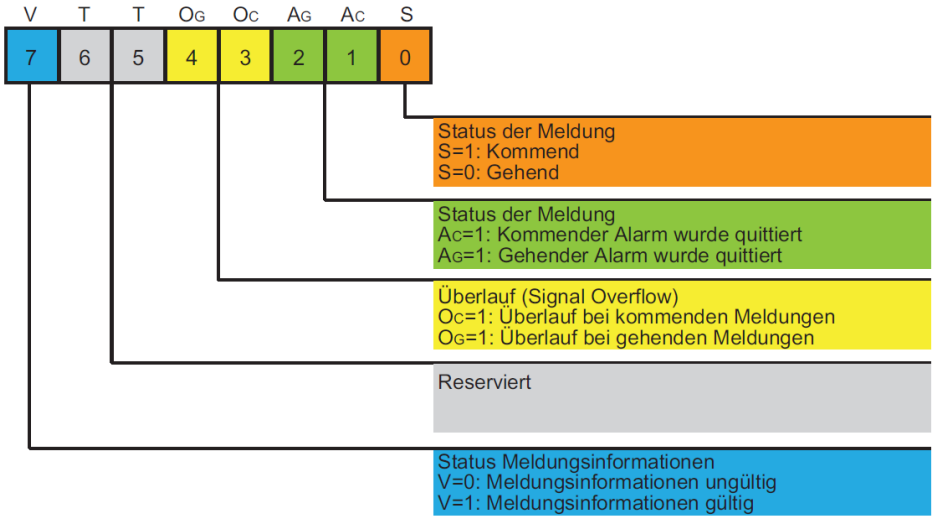
Note Each output alarm state refers to a program alarm that was created using the “Program_Alarm” instruction.

The “Alarm” input parameter defines which program alarm is output: Specify the instance DB of the “Program_Alarm” instruction whose alarm state you want to output.

The “AlarmState” output parameter outputs the alarm state in a byte.

Meaning of the individual bits of the “AlarmState” output parameter:

Figure 2-1



For more information about the “Get_AlarmState” instruction, refer to the STEP 7 system manual, “Get_AlarmState: Output alarm status”.

Parameters of the Get_AlarmState block

Table 2-10

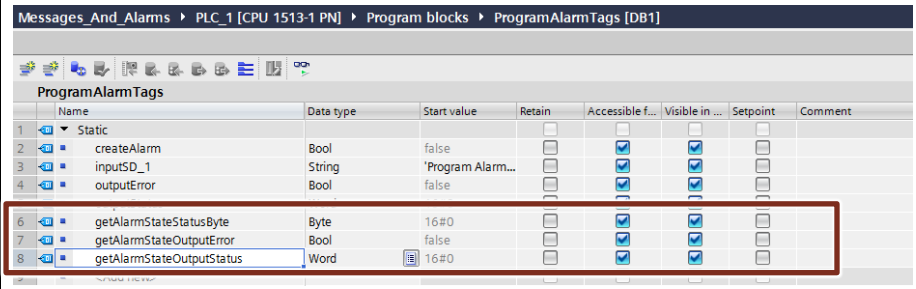
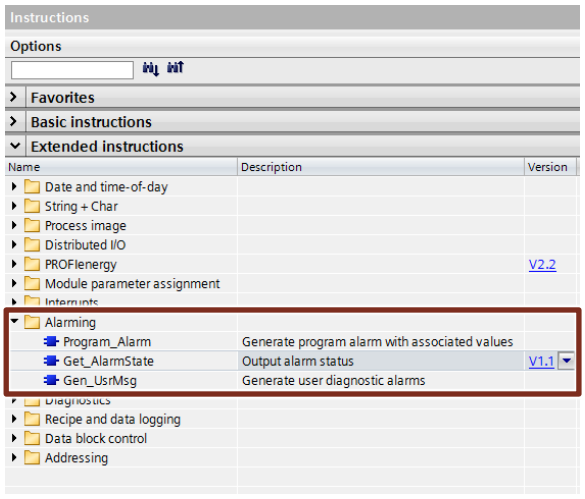
Parameter	Declaration	Data type	Memory area	Description
Alarm	Input	ALARM_BASE	D	Instance of the “Generate program alarm with associated values” instruction. • Alarm.Messagetype = Alarm_AP, then the signal state of the Ac bit is either 0 or 1 and the signal state of the Ag bit is 1 - not active: 0x86 (1000 0110) - active/not acknowledged: 0x85 (1000 0101) - active/acknowledged: 0x87 (1000 0111) - outgoing/not acknowledged: 0x84 (10000100) • Alarm.Messagetype = Notify_AP, then the signal state of the Ac bit is either 0 or 1 and the signal state of the Ag bit is 1 - not active: 0x86 (1000 0110) - active: 0x85 (10000101) • Alarm.Messagetype= Inforeport_AP, then the signal state of both bits, Ac and Ag, is 1 - Static: 0x86 (10000110) If the alarm is not active or an info report, the signal state of the S bit is 0.
AlarmState	Output	BYTE	I, Q, M, D, L	Alarm state as a bit field
Error	Output	BOOL	I, Q, M, D, L	Status parameter • 0: No error • 1: An error occurred while executing the instruction. Detailed information is output via the STATUS parameter.
STATUS	Output	WORD	I, Q, M, D, L	Status parameter The parameter is only set for the duration of one call. To display the status, you should therefore copy STATUS to a free data area.

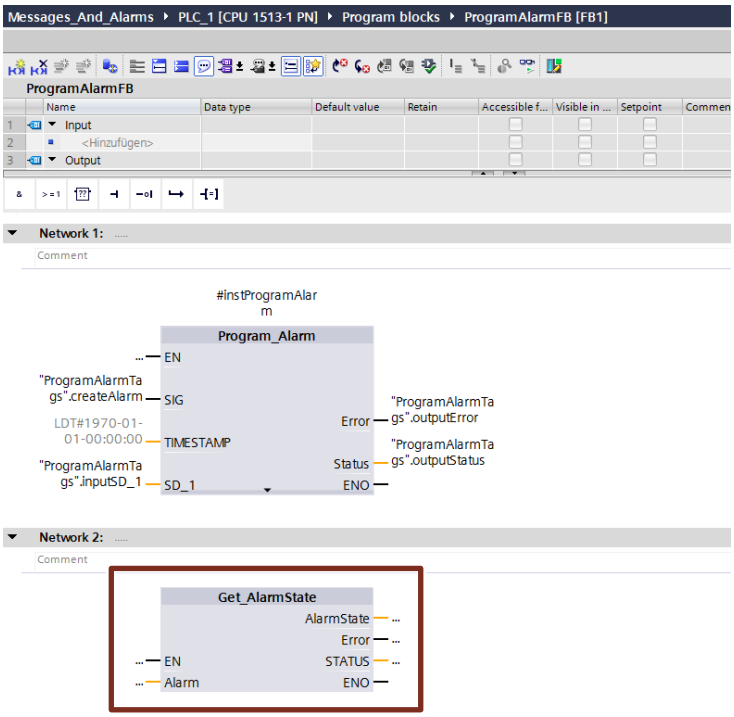
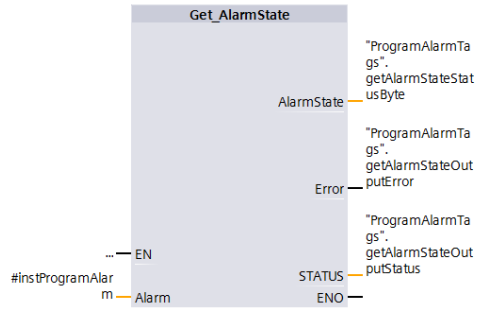
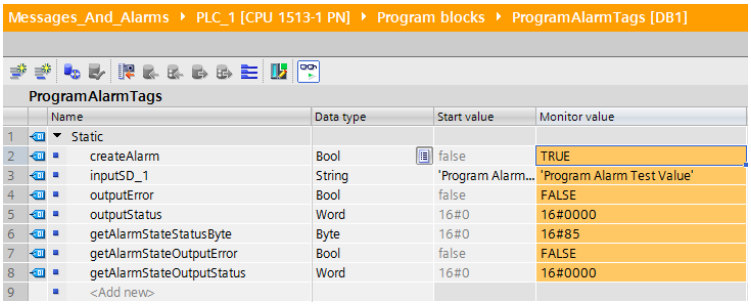
Configuring in STEP 7

The following table shows you how to output the alarm state of a program alarm. In order to configure it, a program alarm must already have been created (as described in chapter 2.3.1).

Note The configuration steps for the “Get_AlarmState” instruction apply to both the WinCC Basic/Comfort/Advanced visualization versions and WinCC Professional.

Table 2-11

No.	Action
1.	Open the “ProgramAlarmTags” data block (see Table 2-8) and insert three tags with the associated data types. 
2.	Go to the “Instructions > Extended Instructions” task card and open the “Alarming” folder. 

No.	Action
3.	Use drag and drop to move the “Get_AlarmState” block to an empty network of the function block where the block for the Program_Alarm is called. 
4.	Interconnect the “Alarm” input parameter with the instance of the “Program_Alarm” instruction. Then interconnect the block’s output parameters with the three created tags of the data block. 
5.	Download the configuration to your CPU.
6.	The program alarm is output as soon as the “Program_Alarm” instruction receives a “True” signal state at the SIG input parameter. Then the “AlarmState” output of the “Get_AlarmState” instruction displays the alarm based on the alarm class. 

2.3.3 Configuring Gen_UsrMsg (S7-1200, S7-1500)

The “Gen_UsrMsg” instruction generates an alarm that is entered in the diagnostic buffer. The Mode parameter allows you to select whether an incoming or outgoing alarm will be generated:

- Mode = 1: generate incoming alarm
- Mode = 2: generate outgoing alarm

Use text lists and the appropriate text list entries to define the alarm contents. The “TextListID” and “TextID” parameters allow you to select the entry you want to write to the diagnostic buffer. In the text lists, you can also define associated values you want to be displayed in the diagnostic buffer.

For more information about the “Gen_UsrMsg” instruction, refer to the STEP 7 system manual, “Gen_UsrMsg: Generate user diagnostic alarms”.

Note The “Generate user diagnostic alarms” instruction (GEN_UsrMsg) is only available for STEP 7 V13 SP1 or higher.

Parameters of the Get_AlarmState block

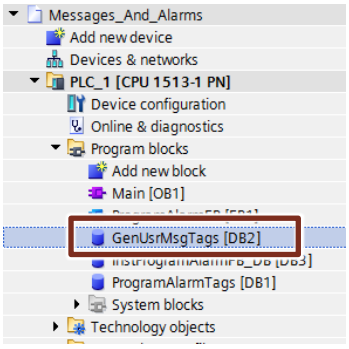
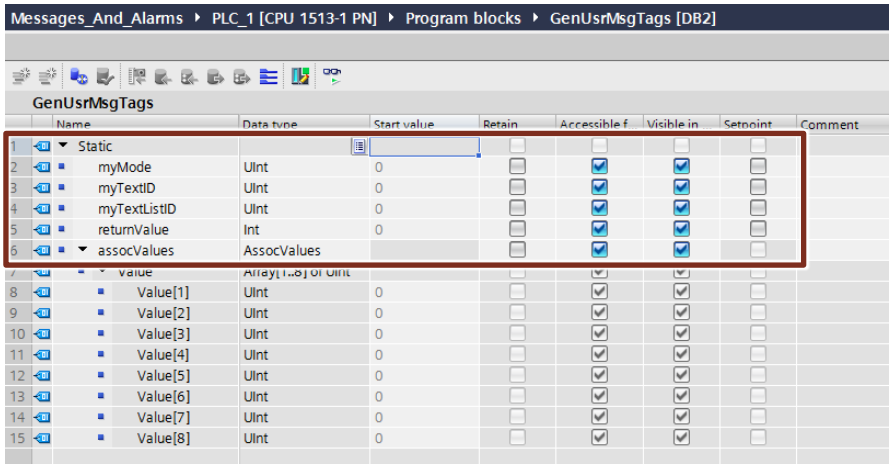
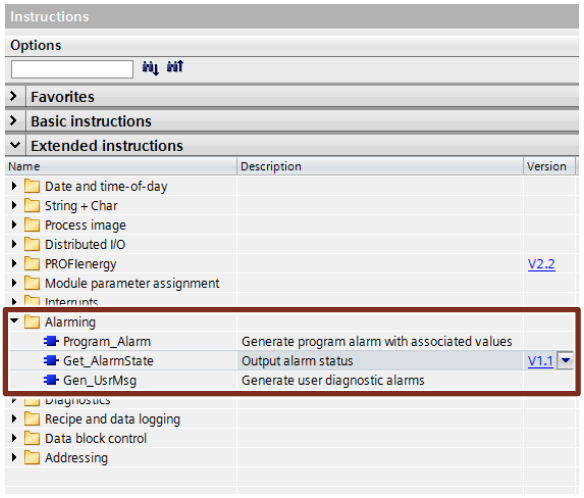
Table 2-12

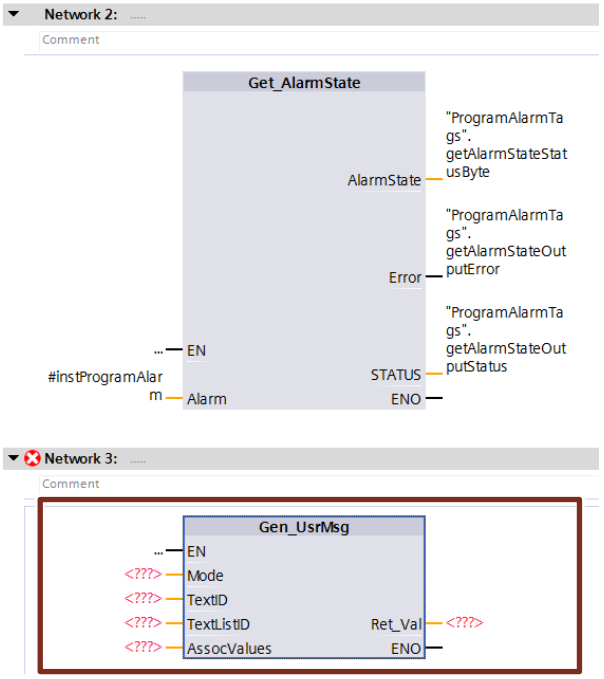
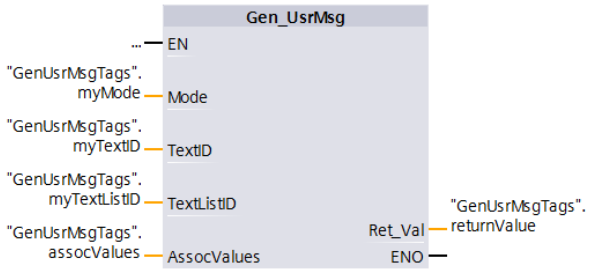
Parameter	Declaration	Data type	Memory area	Description
Mode	Input	UInt	I, Q, M, D, L or constant	Parameter for selecting the state of the alarm • 1: incoming alarm • 2: outgoing alarm
TextID	Input	UInt	I, Q, M, D, L or constant	ID of the text list entry to be used for the alarm text.
TextListID	Input	UInt	I, Q, M, D, L or constant	ID of the text list that contains the text list entries.
Ret_Val	Return	Int	I, Q, M, D, L	Error code of the instruction.
AssocValues	InOut	Variant	D, L	Pointer to the AssocValues system data type you use to define the associated values.

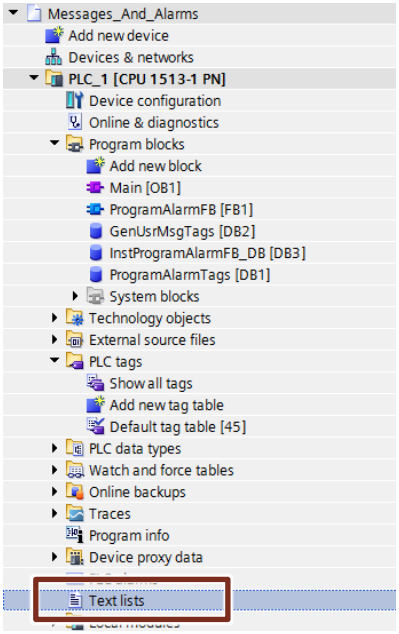
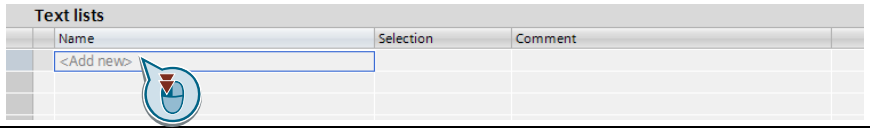
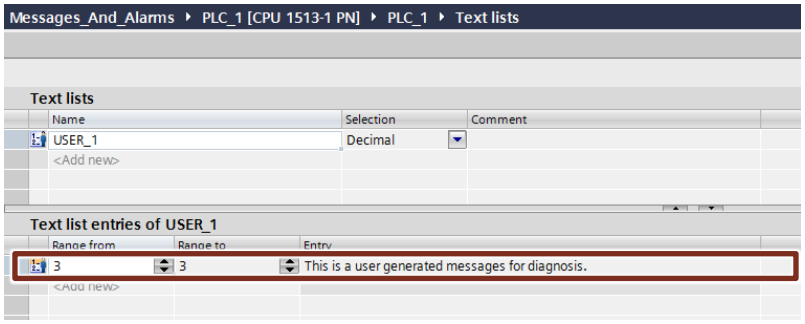
Configuring in STEP 7

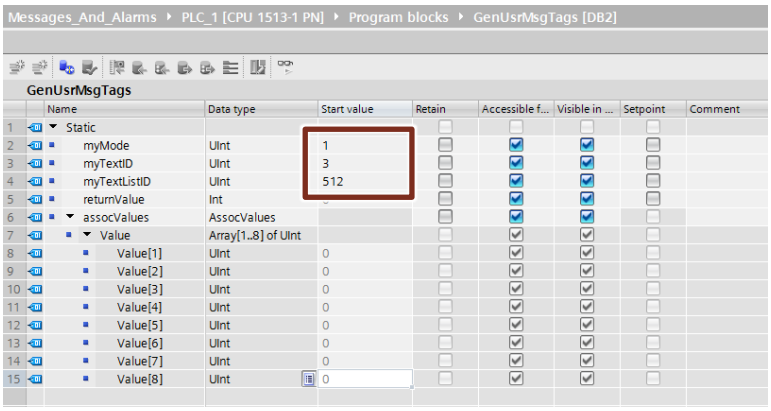
Note The configuration steps for the “Get_AlarmState” instruction apply to both the WinCC Basic/Comfort/Advanced visualization versions and WinCC Professional.

Table 2-13

No.	Action
1.	First, create another global data block for storing and monitoring the values. 
2.	In the “GenUsrMsgTags” data block, create five tags with the associated data types.  **Note** In STEP 7, the “AssocValues” data type is, by default, stored as a system data type. To assign this data type to a tag, enter “AssocValues” in the Data type column and press Enter to confirm.
3.	Go to the “Instructions > Extended Instructions” task card and open the “Alarming” folder. 

No.	Action
4.	Use drag and drop to move the “Gen_UsrMsg” block to an empty network of the function block where the block for the program alarm is called. 
5.	Interconnect the “Alarm” input parameter with the instance of the “Program_Alarm” instruction. Then interconnect the block’s output parameters with the three created tags of the data block. 

No.	Action
6.	In the project tree, go to the folder of the CPU you created and open “Text lists”. 
7.	In the text list's workspace, double-click “Add new” to add a new text list. 
8.	Add a new text list entry to the text list: First, specify the range and then enter the text to be displayed.  **Note** To view the text list ID, right-click the table header and select “Show all columns”.

No.	Action
9.	Add the text ID and text list ID values of the created text list to the data block. 
10.	Download the configuration to your CPU.

You can output the generated user diagnostic alarm in the diagnostic buffer of the created S7-1500 CPU.

Note

You can also output the CPU's diagnostic buffer on a panel using the Web server or the "System diagnostics display" HMI control.

For more information, refer to the following application example "System Diagnostics View using WinCC (TIA Portal) and SIMATIC Comfort Panels" or the following FAQ "How do you display the diagnostics buffer of a SIMATIC CPU with integrated web server on a SIMATIC Panel?".

2.4 Using alarm classes

Alarms of different priorities occur during operation of a plant. Depending on their importance, these alarms are classified into different alarm classes. This enables the plant operator to identify alarms of higher priority and importance that must be prioritized.

Function of the alarm classes

When creating new alarms, each alarm must be assigned to an alarm class.

The alarm class defines:

- The appearance
- The acknowledgment model (single acknowledgment, double acknowledgment, alarm annunciator)
- The archiving of the alarm

Note The scope of functions of the alarm class depends on the configured operator panel.

Types of alarm classes

WinCC (TIA Portal) provides the following types of alarm classes.

- **Predefined alarm classes**

For each operator panel, you will find predefined alarm classes in the project tree, “HMI alarms”, “Alarm classes” tab. These alarm classes cannot be deleted and can only be edited to a limited extent.

- **User-defined alarm classes**

For each operator panel, you can create more alarm classes in the project tree, “HMI alarms”, “Alarm classes” tab. In these alarm classes, the appearance and the acknowledgment model of the associated alarms can be configured individually.

- **Project-wide alarm classes (not for Basic Panels)**

Project-wide alarm classes can be used across operator panels in the project. These alarm classes are displayed in the project tree, “Common Data > Alarm classes”, and this is also where new project-wide alarm classes are configured.

2.5 Using alarm groups

Alarms concerning different processes and areas occur during operation of a plant. In order to structure these alarms (for example, by plant parts) to get a better overview, you can add alarms to alarm groups.

Functional scope of alarm groups in WinCC Basic/Comfort/Advanced

In WinCC Basic/Comfort/Advanced, alarm groups allow you to separately monitor plant parts and acknowledge the associated alarms together, if necessary. Only alarms requiring acknowledgment can be assigned to an alarm group, regardless of the alarm class used.

Example
If multiple alarms requiring acknowledgment are assigned to an alarm group, acknowledging one of these alarms acknowledges all alarms of this alarm group.

Purpose

We recommend using alarm groups for the following alarms:

- Error alarms with the same cause
- Alarms of the same type
- Alarms from a plant part (e.g., Press_1)
- Alarms that are part of a process (e.g., temperature monitoring)

2.6 Acknowledgment model

You define the acknowledgment model for an alarm class. All alarms that are part of this alarm class will then be acknowledged based on this model.

In WinCC Basic/Compact/Advanced, there are the following acknowledgment models:

- Alarm without acknowledgment
- Alarm with single acknowledgment

This chapter explains the acknowledgment models in greater detail.

2.6.1 Alarm without acknowledgment

An alarm without acknowledgment does not necessarily require the operator to respond to the alarm. This alarm comes and goes without having to be acknowledged.

2.6.2 Alarm with single acknowledgment

During operation of a plant, alarms can occur that must be clearly identifiable to the operator. Due to the configuration, the alarm requires acknowledgment. As a result, the alarm remains pending until it is acknowledged by the operator.

Note Alarms concerning critical and dangerous states in the process must require acknowledgment.

General definition

If an alarm requiring acknowledgment is acknowledged by an operator, the operator confirms that he has processed or cleared the event that triggered the alarm.

The alarm acknowledgment can be logged and archived as required.

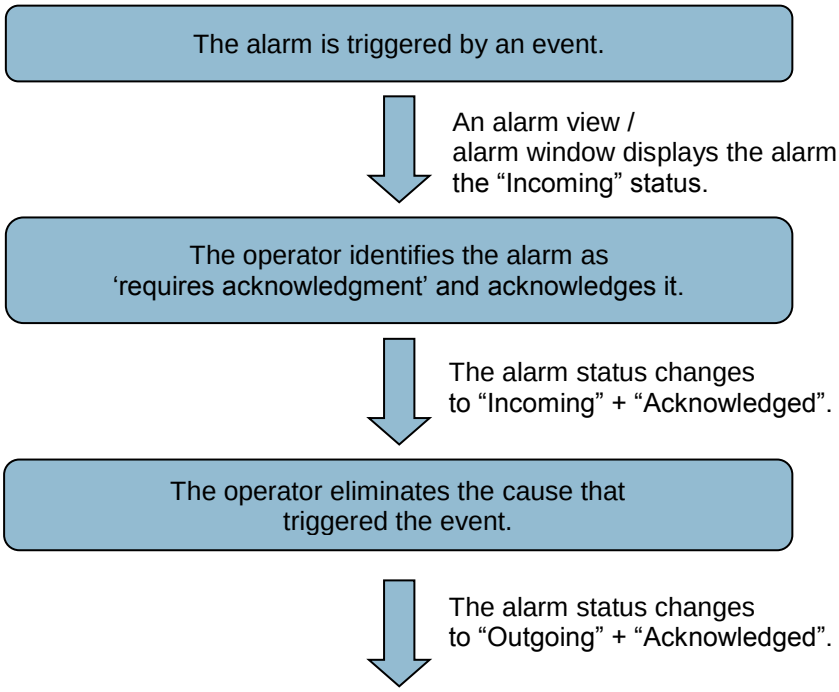
Note The option to log and archive alarms depends on the operator panel.

Acknowledgment options

In Runtime, an alarm can be acknowledged using the following options:

- Manual acknowledgment by an authorized operator on the operator panel
- Automatic acknowledgment by the system without any operator action by:
  - Tags
  - Controller
  - System functions in function lists
  - System functions in scripts

Acknowledgment by the operator on the operator panel



Depending on the configuration, an operator can acknowledge an alarm in Runtime in the following way:

- Using the “Acknowledgment” button of an alarm view

  Note The button must first be enabled in the properties of the “Alarm view -> Toolbar -> Buttons”.

- Using function keys and configured buttons with a configured “AlarmViewAcknowledgeAlarm” function in screens
- Using the <ACK> button on an operator panel with a key front

Note Critical alarms should only be acknowledged by authorized operators. Therefore, provide all control and display objects for acknowledging alarms with an appropriate operator authorization.

Acknowledgment by the controller

Aside from acknowledging alarms on the operator panel, they can also be acknowledged by the control program. The alarms are then acknowledged using the PLC acknowledgment tag that can be configured for each alarm requiring acknowledgment. For more information about configuring the acknowledgment tag, refer to the “Configuring discrete alarms” chapter.

Acknowledging multiple alarms at a time

If you want to acknowledge multiple alarms at a time, these alarms must be assigned to the same alarm group. This means if one alarm from this alarm group is acknowledged, all the other alarms from this alarm group will also be acknowledged. As a result, it is no longer necessary to separately acknowledge each alarm.

For more information about alarm groups, refer to the “Using alarm groups” chapter.

3 Configuring Alarms in WinCC Professional

As a supplement to the manual ("Working with alarms" chapter), this section essentially describes the configuration of system-defined alarms and controller alarms. This includes the configuration of user-defined alarms.

Required software components

- STEP 7 Professional V14 SP1 (TIA Portal)
- WinCC Professional V14 SP1 (TIA Portal)
- WinCC Runtime Professional V14 SP1 (TIA Portal)

Requirement

A WinCC (TIA Portal) project exists with a created HMI connection between Runtime Professional and the controller.

3.1 Configuring user-defined alarms

In WinCC Professional, the configuration of user-defined alarms (discrete alarms, analog alarms and user alarms) is independent of the controller used. For a detailed description of configuring user-defined alarms, refer to the following application example: "Configuration of Messages and Alarms in WinCC"
In addition, you will find a detailed description in the "Configuring discrete alarms" and "Configuring analog alarms" chapters of the WinCC Professional V14 SP1 system manual.

3.2 Configuring system-defined alarms

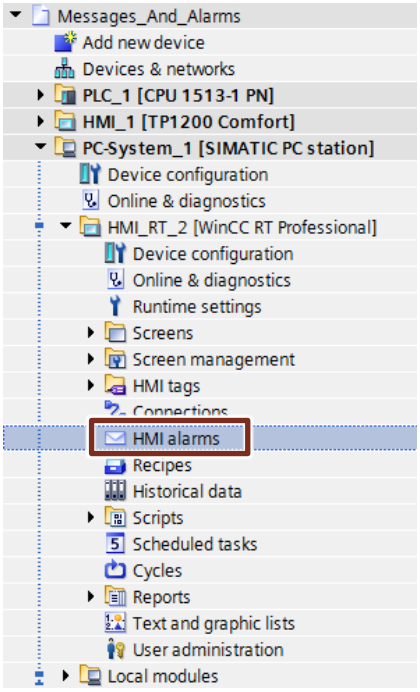
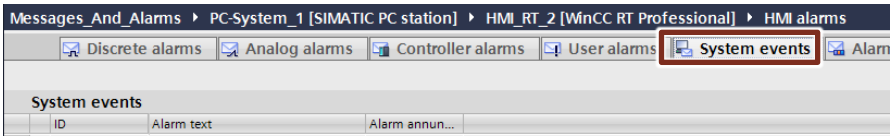
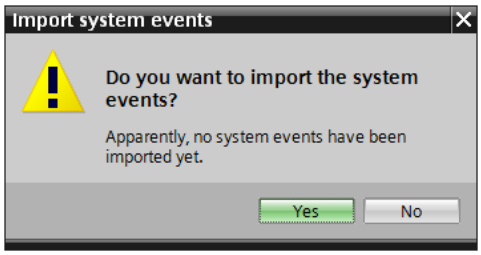
3.2.1 Configuring system events (S7-1200, S7-1500)

By default, system events are stored in the HMI for different languages. If you want to translate system events into other languages, first import the texts into the project.

Importing system events

Importing system events is only necessary for projects that were newly created or when the system events have not yet been imported.

Table 3-1

No.	Action
1.	In the project tree, go to the folder of the operator panel you created and open the “HMI alarms”. 
2.	Open the “System events” tab. 
3.	Confirm the dialog that appears with “OK”. 
4.	Configuring the system events is now complete.

Displaying CPU system diagnostic alarms in Runtime

To display the CPU system diagnostic alarms, an alarm view must have been configured in your project.

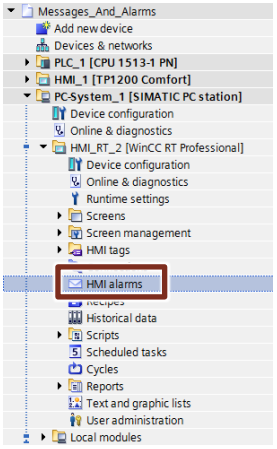
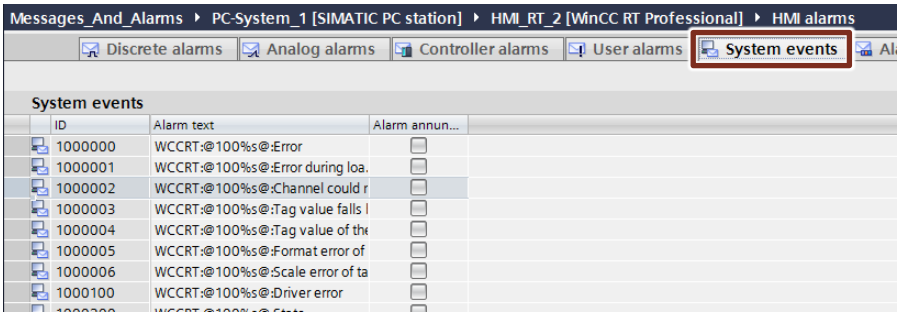
For more information about configuring an alarm view, refer to the WinCC Professional system manual, “Configuring an alarm view”.

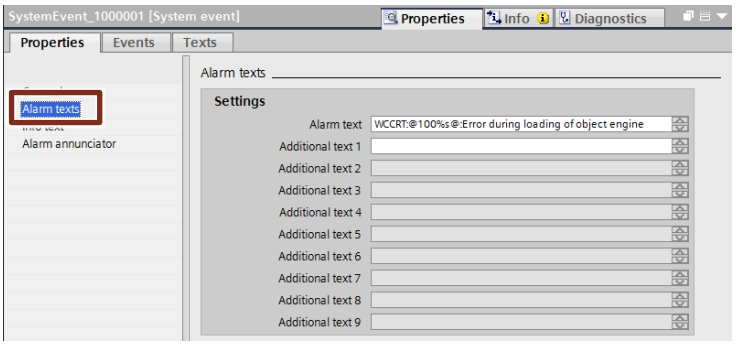
Changing alarm texts of system events

The alarm texts of system events can be changed or customized if necessary. The associated alarm numbers cannot be changed.

Note Changing system events changes clearly defined alarms, which may result in misinterpretations. The imported alarms are part of the manual / online help. When a change is made, the changed alarms no longer match the documentation.

Table 3-2

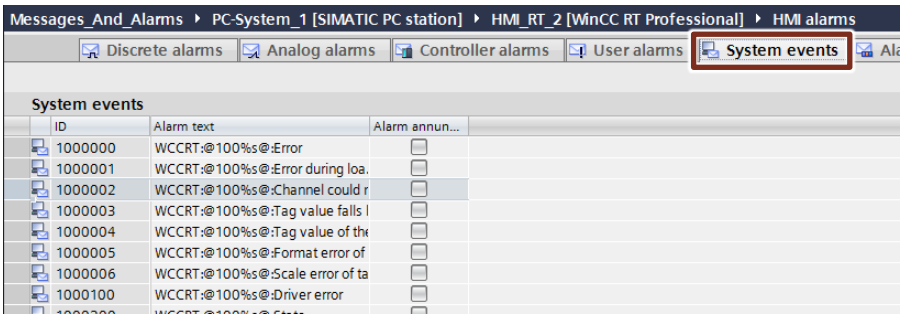
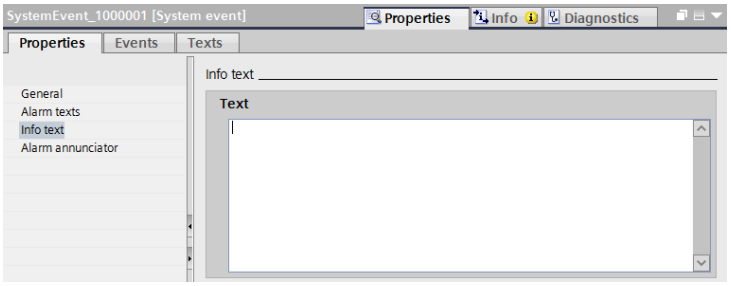
No.	Action
1.	In the project tree, go to the folder of the operator panel you created and open the “HMI alarms”. 
2.	Open the “System events” tab.  Select the system event whose alarm text you want to change.

No.	Action
3.	In the Inspector window, open the “Properties > Properties > Alarm texts” tab.  In “Alarm text”, change the alarm text of the system event. • Optionally, “Additional text” allows you to add more texts concerning the system event. **Note** Do not, under any circumstances, delete the wildcards (for example, @100%s@) in the system events.
4.	Changing the alarm text for the system event is now complete.

Adding info text

Info text allows you to provide the plant operator with additional information and instructions that go beyond the alarm text.

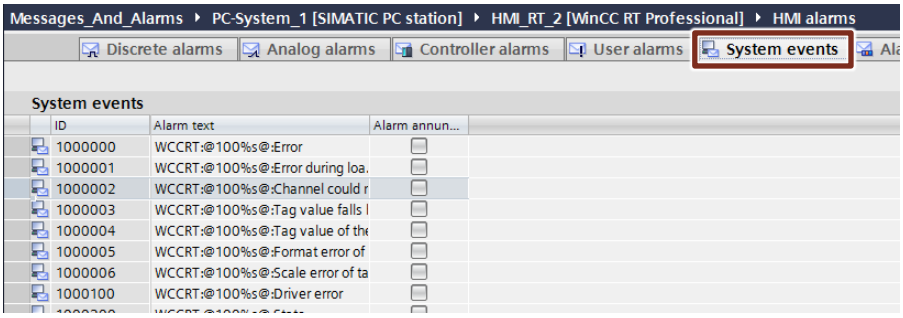
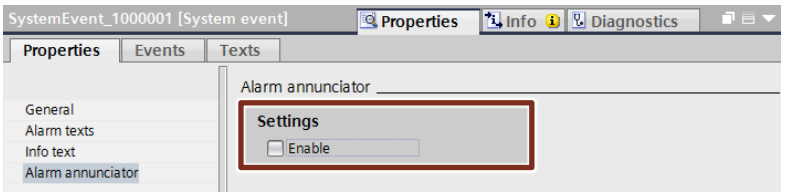
Table 3-3

No.	Action
1.	In the “System events” tab, select the system event. 
2.	In the Inspector window, open the “Properties > Properties > Info text” tab.  In “Text”, enter the text you want to appear as info text for this system event. The appropriate button in the alarm view then allows you to view the info text for this alarm. **Note** The maximum length for the info text is 255 characters.
3.	Configuring the tooltip for the system event is now complete.

Alarm annunciator

By enabling the “alarm annunciator”, an alarm can, in addition to the alarm view, be indicated by a visual or acoustic signal.

Table 3-4

No.	Action
1.	In the “HMI alarms” tab, select the “system event”. 
2.	In the Inspector window, open the “Properties > Properties > Alarm annunciator” tab.  In the “Alarm annunciator” settings, check the check box.
3.	Configuring the alarm annunciator for the system event is now complete.

For more information about the alarm annunciator, refer to chapter 3.6.4.

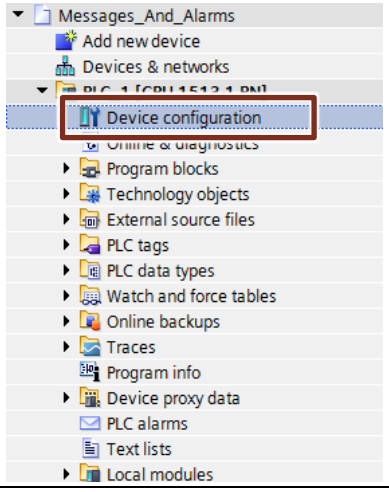
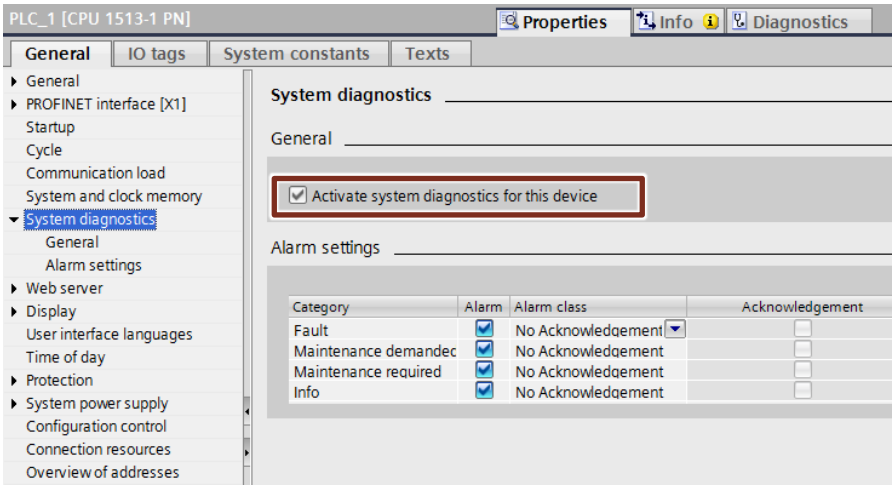
3.2.2 Configuring CPU system diagnostic alarms (S7-1500)

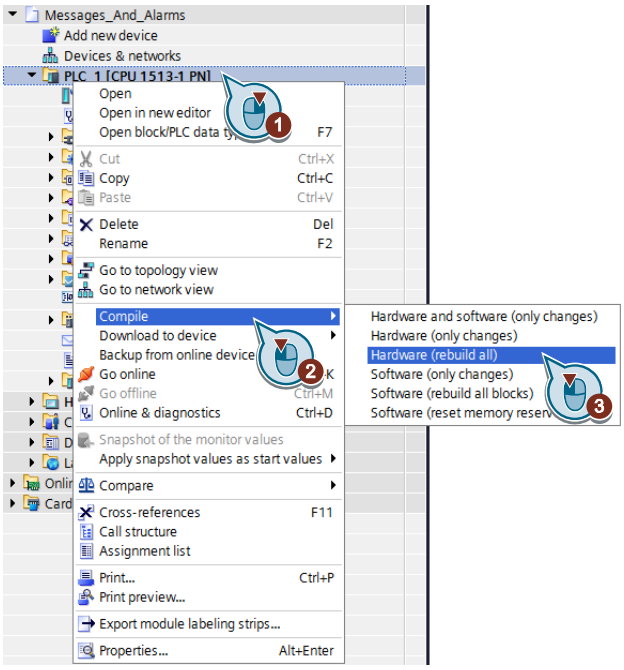
The following section describes the configuration of the display of system diagnostic alarms of a CPU on an operator panel using the following components:

- CPU 1513-1PN
- WinCC Runtime Professional

Settings in STEP 7

Table 3-5

No.	Action
1.	In the project tree, open the “Device configuration” of your CPU. 
2.	In the device view, select the CPU on the rack.
3.	In the Inspector window, open the “Properties > General > System diagnostics” tab. The “Activate system diagnostics for this device” check box is checked by default and cannot be unchecked.  **Optional** Depending on your requirements, “Alarm settings” in the bottom part of the Inspector window allows you to customize the alarms and alarm classes of the respective categories.

No.	Action
4.	In the project tree, right-click the CPU. From the context menu, select “Compile > Hardware (rebuild all)”. 
5.	The settings in STEP 7 are now complete.

Displaying CPU system diagnostic alarms in Runtime

To display the CPU system diagnostic alarm, an alarm view must have been configured in your project.

For more information about configuring an alarm view, refer to the WinCC Professional system manual, “Configuring an alarm view”.

3.3 Configuring controller alarms

3.3.1 Configuring Program_Alarm (S7-1500)

The “Program_Alarm: Generate program alarm with associated values” instruction monitors a signal and generates an incoming program alarm when the signal at the SIG parameter changes from 0 to 1.

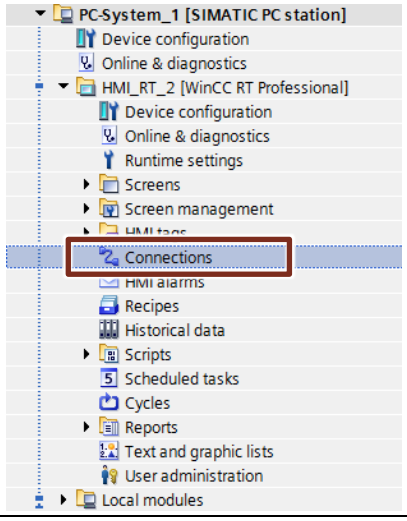
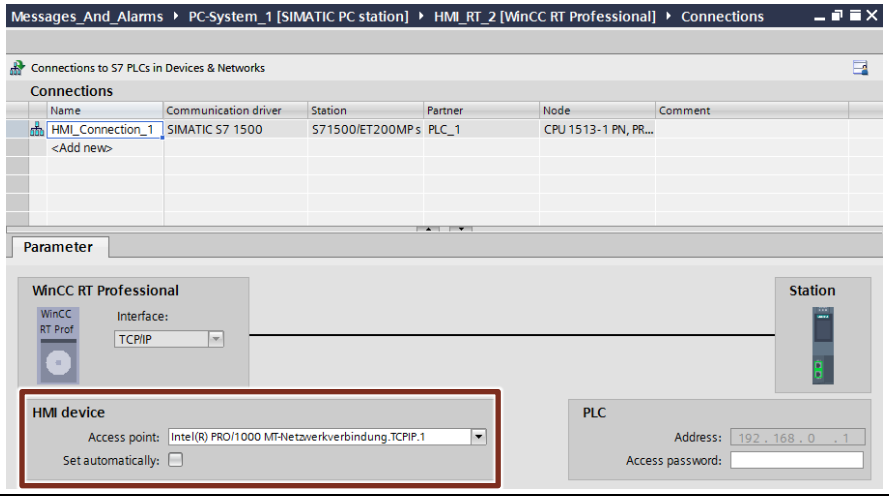
Its principle of operation and the individual parameters of this alarm block have already been described in detail in chapter 2.3.1 of this document.

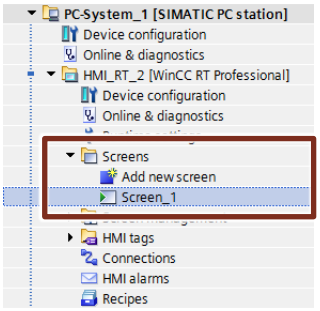
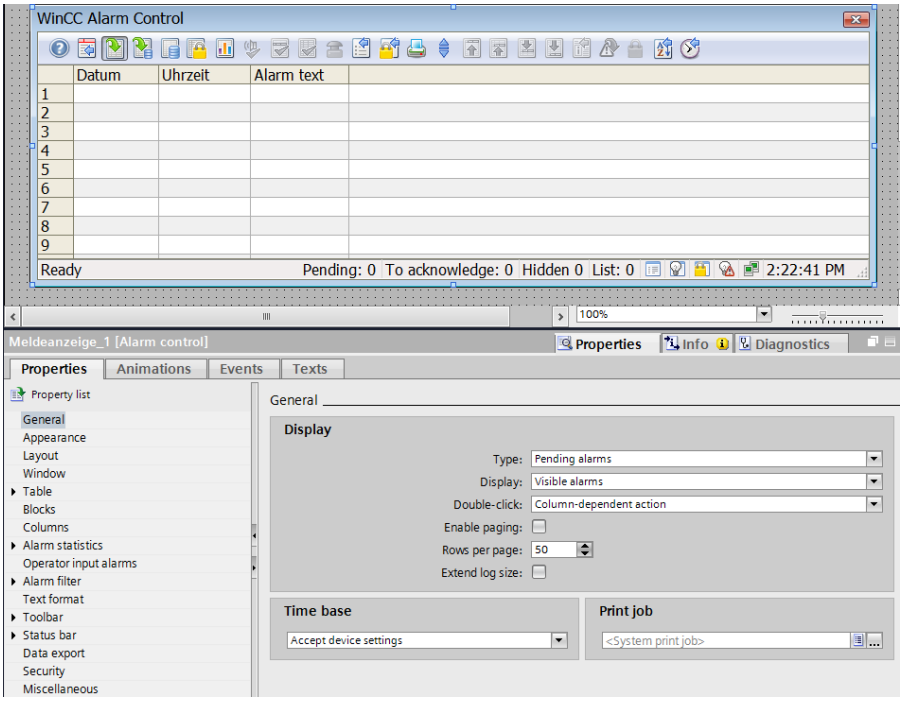
Settings in STEP 7

For the configuration steps that are needed in STEP 7 for the “Program_Alarm” alarm block, refer to chapter 2.3.1 of this document.

Settings in WinCC Professional

Table 3-6

No.	Action
1.	In the project tree, open the folder of the PC station you created and select “Connections”. 
2.	As the access point of the operator panel, select the network card you are using from the drop-down list and uncheck the “Set automatically” check box. 

No.	Action
3.	Go to the PC station you created, open the “Screens” folder and add a new screen. 
4.	In “Screen_1”, create an alarm view.
5.	Start Runtime Professional.
6.	**Optional** The “Properties” tab and the area navigation allow you to customize the alarm view’s appearance and properties. 
7.	Configuring in WinCC Professional is now complete.

For more information about configuring an alarm view, refer to the WinCC Professional system manual, “Configuring an alarm view”.

3.3.2 Configuring Get_AlarmState (S7-1500)

The “Get_AlarmState” instruction outputs the alarm state of a program alarm.

This instruction has already been described in detail in “Configuring Alarms in WinCC Basic/Comfort/Advanced”, subchapter “Configuring Get_AlarmState”. These configuration steps also apply to WinCC Professional.

3.3.3 Configuring Gen_UsrMsg (S7-1200, S7-1500)

The “Gen_UsrMsg” instruction generates an alarm that is entered in the diagnostic buffer.

This instruction, too, was described in the previous chapter, “Configuring Alarms in WinCC Basic/Comfort/Advanced”. For detailed step-by-step instructions for this instruction, refer to the “Configuring Gen_UsrMsg” subchapter.

3.4 Using alarm classes

Alarms of different priorities occur during operation of a plant. Depending on their importance, these alarms are classified into different alarm classes. This enables the plant operator to identify alarms of higher priority and importance that must be prioritized.

Function of the alarm classes

When new alarms are created, each alarm must be assigned to an alarm class.

The alarm class defines:

- The appearance
- The acknowledgment model (single acknowledgment, double acknowledgment, alarm annunciator)
- The archiving of the alarm

Note The scope of functions of the alarm class depends on the configured operator panel.

Types of alarm classes

WinCC (TIA Portal) provides the following types of alarm classes.

- **Predefined alarm classes**

For each operator panel, you will find predefined alarm classes in the project tree, “HMI alarms”, “Alarm classes” tab. These alarm classes cannot be deleted and can only be edited to a limited extent.

- **User-defined alarm classes**

For each operator panel, you can create more alarm classes in the project tree, “HMI alarms”, “Alarm classes” tab. In these alarm classes, the appearance and the acknowledgment model of the associated alarms can be configured individually.

- **Project-wide alarm classes**

Project-wide alarm classes can be used across operator panels in the project. These alarm classes are displayed in the project tree, “Common Data > Alarm classes”, and this is also where new project-wide alarm classes are configured.

3.5 Using alarm groups

Alarms concerning different processes and areas occur during operation of a plant. In order to structure these alarms (for example, by plant parts) to get a better overview, you can add alarms to alarm groups.

Types of alarm groups

WinCC (TIA Portal) provides the following types of alarm groups.

- **User-defined alarm groups**

User-defined alarm groups are created when needed. These alarm groups contain alarms requiring acknowledgment and can contain other subordinate alarm groups. Subordinate alarm groups can be organized hierarchically with up to five subgroups.

- **Alarm groups from alarm classes**

For each predefined alarm class, an alarm group has already been created in WinCC Professional. These alarm groups are called class groups. All alarms of this alarm class are also included in the associated class group.

Scope of functions of alarm groups in WinCC Professional

In WinCC Professional, an alarm group contains multiple tags. These tags address the properties of all alarms assigned to this alarm group. If settings are made in an alarm class, the settings in the associated alarm group are updated.

Purpose

The use of alarm groups is recommended to:

- Combine alarms with the same error cause
- Combine alarms of the same type
- Monitor and sort alarms from a plant part
- Monitor and sort alarms that are part of a process
- Edit multiple alarms from a plant part together (e.g., acknowledge, lock, suppress display)
- Visualize states of plant parts
- Prevent processes of the plant (e.g., by acknowledging alarms)

3.6 Acknowledgment model

You define the acknowledgment model for an alarm class. All alarms that are part of this alarm class will then be acknowledged based on this model.

In WinCC Professional, there are the following acknowledgment models that are divided into more sub-models:

- Alarm without acknowledgment
- Alarm with single acknowledgment
- Alarm with double acknowledgment

This chapter explains these acknowledgment models in greater detail.

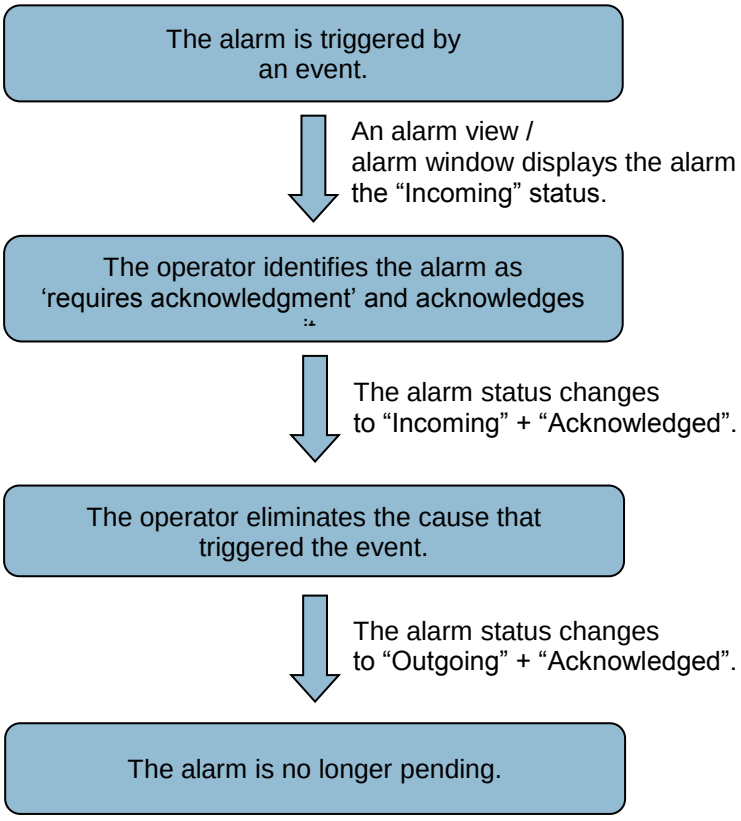
3.6.1 Alarm without acknowledgment

An alarm without acknowledgment does not necessarily require the operator to respond to the alarm. This alarm “comes” and “goes” without having to be acknowledged.

Alarm without “outgoing” status without acknowledgment

As long as the event that triggered the alarm is pending, the alarm remains pending. If the event that triggered the alarm is “outgoing”, the alarm is no longer displayed. The alarm is archived and does not have to be acknowledged.

3.6.2 Alarm with single acknowledgment



An alarm with single acknowledgment requires acknowledgment as soon as the event that triggered the alarm occurs. The alarm is pending until the operator acknowledges the alarm.

Alarm without “outgoing” status with acknowledgment

The alarm is pending as long as the event that triggered the alarm is pending and the alarm has not been acknowledged. When the event is “outgoing” and the alarm has been acknowledged, the alarm is no longer displayed. The alarm is archived.

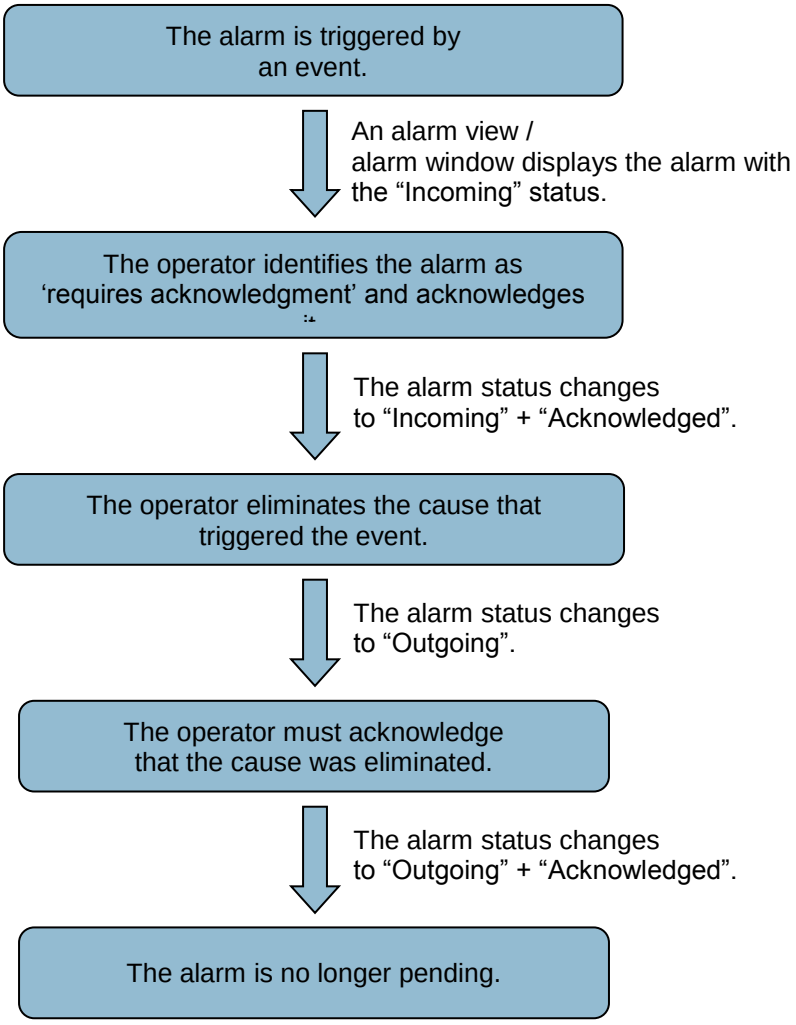
First-up message with flashing and single acknowledgment

A first-up message is an alarm within an alarm class. The alarm whose status changes first after the last acknowledgment is highlighted in the alarm window by flashing. This alarm is then called the first-up message.

New-value message with flashing and single acknowledgment

New-value messages are alarms within an alarm class. Alarms whose statuses have changed since the last acknowledgment are highlighted in the alarm window by flashing.

3.6.3 Alarm with double acknowledgment



An alarm with double acknowledgment requires acknowledgment as soon as the event that triggered the alarm occurs and an additional acknowledgment when the event is no longer pending. The alarm remains pending until the operator has acknowledged the alarm twice.

New-value message with flashing and double acknowledgment

New-value messages are alarms within an alarm class. Alarms whose statuses have changed since the last acknowledgment are highlighted in the alarm window by flashing. These alarms must be acknowledged when they have the “Incoming” and “Outgoing” statuses.

3.6.4 General information about acknowledgment models

Acknowledging multiple alarms at a time

In WinCC Professional, group acknowledgment or an alarm group allows the user to acknowledge multiple alarms at a time.

- **Group acknowledgment using the alarm view**
  The “Group acknowledgment” button of an alarm view allows the user to acknowledge all visible, pending alarms that require acknowledgment at once.

  Note Alarms for which single acknowledgment is enabled cannot be acknowledged using group acknowledgment.

- **Acknowledgment using alarm groups**
  In order to acknowledge multiple alarms requiring acknowledgment at a time, these alarms must be assigned to the same alarm group. This means if one alarm from this alarm group is acknowledged, all other alarms from this alarm group will also be acknowledged. As a result, it is no longer necessary to separately acknowledge each alarm.

For more information about alarm groups, refer to chapter 3.5.

Alarm annunciator

If the alarm annunciator was configured for an alarm requiring acknowledgment, the user has the following options to acknowledge the alarm annunciator:

- The operator acknowledges the alarm annunciator together with the alarm requiring acknowledgment.
- The operator acknowledges the alarm annunciator with the “Acknowledge alarm annunciator” button in an alarm view.
- The alarm annunciator is acknowledged by a tag.

The settings for acknowledging the alarm annunciator are made in the alarm class settings. These settings apply separately to each alarm class requiring acknowledgment.

Emergency acknowledgment

In an emergency, the “Emergency acknowledgment” button of an alarm view allows the user to directly acknowledge alarms requiring acknowledgment with the alarm number.

Note The acknowledgment bit is sent to the controller even if the alarm specified with the respective alarm number is not pending.

Use this emergency acknowledgment only in an emergency.

Note For more information about acknowledging alarms in WinCC Professional, use following link:

http://support.automation.siemens.com/WW/view/en/55622122

4 Valuable Information

4.1 Basics

4.1.1 Overview of the alarm procedures

Introduction

Alarm logging in WinCC (TIA Portal) allows you to display and record operating states and faults that can be present or occur in a plant or on an operator panel.

Overview of alarm logging

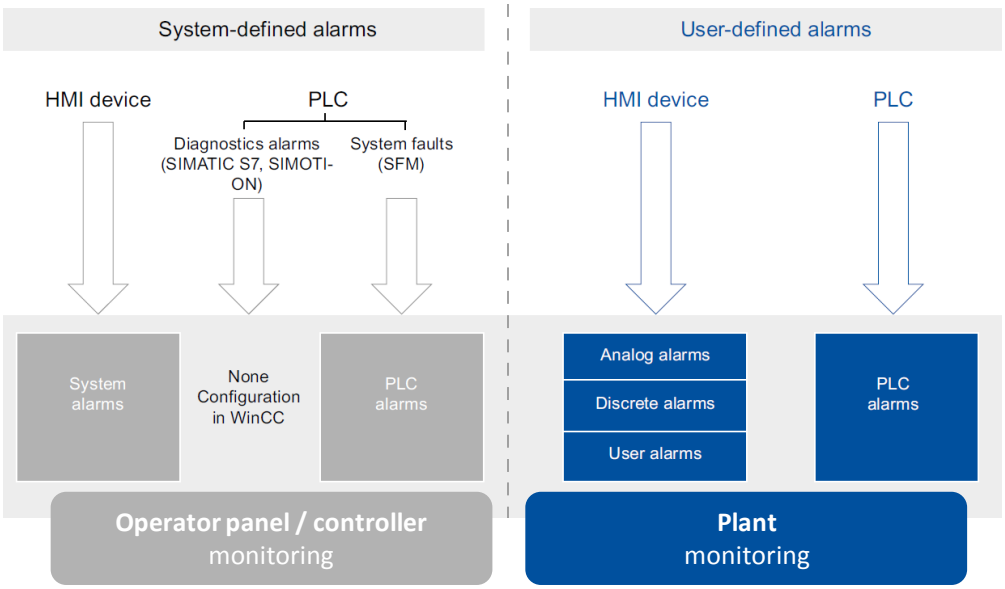
Alarm logging processes various alarm procedures of the operator panel and the controller. The alarm procedures are broken down into system-defined and user-defined alarms:

- System-defined alarms are used for monitoring the operator panel and the controller.
- User-defined alarms are used for monitoring the plant.

The detected alarm events are displayed on the operator panel. Specific access to the alarms and supplementary information about the individual alarms ensure quick fault localization. This reduces or even prevents downtimes.

The following figure shows the structure of the alarm logging system in WinCC (TIA Portal):

Figure 4-1



Note Controller alarms and user alarms must be supported by the operator panel, see Table 4-2 on page 55.

4.1.2 User-defined alarms

User-defined alarm procedures are used for monitoring the plant process. They are named after the type of information required for triggering the alarm.

User-defined alarm procedures consist of the following alarms:

- Analog alarms
- Discrete alarms
- Controller alarms
- User alarms

Analog alarms

An analog alarm indicates limit violations of a tag during operation. An analog alarm is triggered when the tag rises above/falls below a previously defined limit.

Discrete alarms

A discrete alarm indicates status changes during operation. A discrete alarm is triggered when a tag has a certain value (bit).

Controller alarms

Controller alarms indicate status values of the controller during operation.

User alarms

A user alarm monitors operator actions in WinCC Runtime Professional during operation. User alarms are triggered by triggering the alarm number. A user alarm can, for example, contain the following information:

- Type and content of the acknowledged alarm
- Time when the alarm was acknowledged
- Operator
- Date

Note **Device dependency**

Controller alarms and user alarms are not available for all operator panels.

Supported blocks

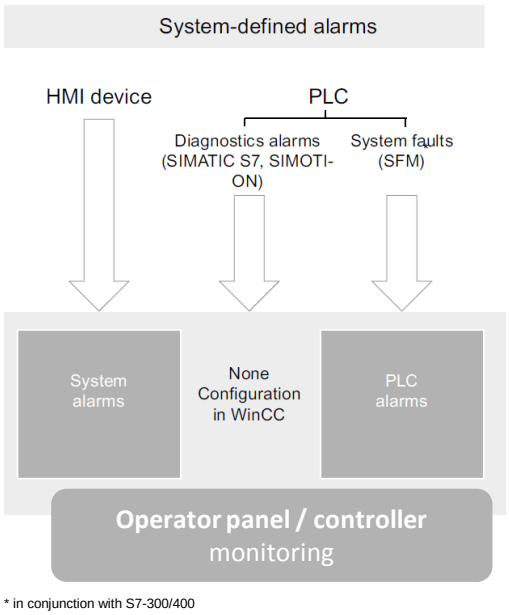
- Program_Alarm (Generate program alarm with associated values, S7-1500 only)
- Get_AlarmState (Output alarm state, S7-1500 only)
- Gen_UsrMsg (Generate user diagnostic alarms, S7-1200 and S7-1500).

4.1.3 System-defined alarms

System-defined alarm procedures are used for monitoring the operator panel or the controller. The alarm procedure consists of the following alarms:

- System-defined controller alarms
- System alarms

Figure 4-2



* in conjunction with S7-300/400

Note Use “Report System Error” (RSE) only in conjunction with an S7-300/400. When using an S7-1200/S7-1500, system errors are reported via the integrated system diagnostics.

System-defined controller alarms

A system-defined controller alarm is used for monitoring states and events of a SIMATIC S7 controller. Diagnostic alarms of a SIMATIC S7-1500 controller can then be displayed on an operator panel.

Note System diagnostics are integrated in the S7-1500 controller family and can be read using the diagnostic buffer or the alarm view on the HMI.

System alarms

A system alarm is output on the operator panel; it is used for monitoring internal states of an operator panel or controller during operation. System alarms inform the operator about the status of the system and indicate, for example, communication errors between an operator panel and a controller.

4.1.4 Availability of alarm procedures

In this chapter, you will find various overviews of the availability of alarm procedures.

Operator panels and supported alarm types for S7-1200 overview

The following table shows the availability of the different alarm types for the S7-1200 controller family depending on the operator panel used.

Table 4-1

Operator panel	Analog alarms	Discrete alarms	Controller alarms	User alarms	Diagnostic alarms	System alarms
Basic Panel	X	X	-	-	-	X
Mobile Panels	X	X	X	-	-	X
Comfort Panels	X	X	X	-	-	X
WinCC RT Advanced	X	X	X	-	-	X
WinCC RT Professional	X	X	X	-	-	X

Operator panels and supported alarm types for S7-1500 overview

The following table shows the availability of the different alarm types for the S7-1500 controller family depending on the operator panel used.

Table 4-2

Operator panel	Analog alarms	Discrete alarms	Controller alarms	User alarms	Diagnostic alarms	System alarms
Basic Panel	X	X	-	-	-	X
Mobile Panels	X	X	X	-	X	X
Comfort Panels	X	X	X	-	X	X
WinCC RT Advanced	X	X	X	-	X	X
WinCC RT Professional	X	X	X	X	X	X

S7-1500 alarm blocks overview

The following table shows the alarm blocks for controller alarms of an S7-1500.

Table 4-3

Alarm block	FB/FC	Acknowledg-ment	Channels – signals to be monitored	Associated values
Program_Alarm	FB700	Depending on the alarm class	1	Up to 10

Note The number of configurable alarm blocks depends on the SIMATIC S7-1500 controller used. For more detailed information, refer to the appropriate SIMATIC controller manual.

5 Appendix

5.1 Service and Support

Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs, application examples and videos – all information is accessible with just a few mouse clicks at:
https://support.industry.siemens.com

Technical Support

The Technical Support of Siemens Industry provides you with fast and competent support regarding all technical queries with numerous tailor-made offers – ranging from basic support to individual support contracts.

You send queries to Technical Support via Web form:
www.siemens.com/industry/supportrequest.

SITRAIN – Training for Industry

With our globally available training courses for our products and solutions, we help you achieve with practical experience, innovative learning methods and a concept that's tailored to the customer's specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to:
www.siemens.com/sitrain

Note

The SITRAIN courses "SIMATIC WinCC on the machine level in the TIA Portal" and "SIMATIC WinCC SCADA in the TIA Portal" teach the basics of WinCC.

- SIMATIC WinCC maschinennah im TIA Portal (de)
- SIMATIC WinCC on the machine level in the TIA Portal (en)

- SIMATIC WinCC SCADA im TIA Portal (de)
- SIMATIC WinCC SCADA in the TIA Portal (en)

The SITRAIN courses "SIMATIC programming 1 in the TIA Portal" and "SIMATIC S7-1200 basic course" teach the basics of STEP 7.

- SIMATIC Programmieren 1 im TIA Portal (de)
- SIMATIC programming 1 in the TIA Portal (en)

- SIMATIC S7-1200 Basiskurs (de)
- SIMATIC S7-1200 basic course (en)

Service offer

Our range of services includes the following:

- Plant data services
- Spare parts services
- Repair services
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contracts

You can find detailed information on our range of services in the service catalog:
https://support.industry.siemens.com/cs/sc

Industry Online Support app

You will receive optimum support wherever you are with the “Siemens Industry Online Support” app. The app is available for Apple iOS, Android and Windows Phone:
https://support.industry.siemens.com/cs/ww/en/sc/2067

5.2 Links and literature

Table 5-1

	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Download page of the entry https://support.industry.siemens.com/cs/ww/en/view/62121503
\3\	STEP 7 Professional V14 SP1 System Manual https://support.industry.siemens.com/cs/ww/en/view/109747136
\4\	WinCC Advanced V14.0 SP1 System Manual https://support.industry.siemens.com/cs/ww/en/view/109747174
\5\	WinCC Professional V14.0 SP1 System Manual https://support.industry.siemens.com/cs/ww/en/view/109747178
\6\	Application Example: System Diagnostics View using WinCC (TIA Portal) and SIMATIC Comfort Panels https://support.industry.siemens.com/cs/ww/en/view/61910954
\7\	Application Example: System Diagnostics with S7-1500 and TIA Portal https://support.industry.siemens.com/cs/ww/en/view/68011497
\8\	FAQ: How do you display the diagnostics buffer of a SIMATIC CPU with integrated web server on a SIMATIC Panel? https://support.industry.siemens.com/cs/ww/en/view/59601288
\9\	FAQ: How do you acknowledge alarm messages in WinCC Runtime Professional V11 onwards? https://support.industry.siemens.com/cs/ww/en/view/55622122

5.3 Change documentation

Table 5-2

Version	Date	Modifications
V1.0	07/2016	First version
V2.0	05/2018	S7-1200 controller family included