SIEMENS

FUNCTION MANUAL

SIMATIC / SINAMICS

S7-1500, S7-1200 / SINAMICS

Using the trace and logic analyzer function

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Using the trace and logic analyzer function

Function Manual

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

Introduction

<div style="text-align: right; font-size: large;">**1**</div>

Purpose of the documentation

The diagnostics options available with the trace and logic analyzer function are described in this documentation. Depending on the device used, the recording options can vary.

Required basic knowledge

In order to understand this documentation, the following knowledge is required:
- General knowledge in the field of automation
- Knowledge about the use of Windows-based computers
- S7-1200/1500 CPUs, ET 200SP, ET 200Pro
  - Knowledge of the SIMATIC industrial automation system
  - Knowledge of working with STEP 7
- SINAMICS Drives
  - Knowledge of working with the drive
- SIRIUS SIMOCODE pro, SIRIUS Soft Starter 3RW
  - Proficiency in using these systems

Validity of the documentation

This documentation applies to all products of the product series S7-1200, S7-1500, S7-1500 Software Controller, S7-1500 Drive Controller, ET 200SP, ET 200SP Open Controller, CPU 1513(F)pro-2 PN, CPU 1516(F)pro-2 PN, SINAMICS drives, SIRIUS SIMOCODE pro and SIRIUS Soft Starter 3RW as of TIA Portal V16.

Conventions

This documentation contains pictures of the devices described. The pictures may differ slightly from the devices supplied.

Please also observe notes marked as follows:

NOTE

A note contains important information on the product described in the documentation, on the handling of the product and on the section of the documentation to which particular attention should be paid.

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With "mySupport", your personal working area, you make the most of your Industry Online Support.

In "mySupport" you can store filters, favorites and tags, request CAx data and put together your personal library in the Documentation area. Furthermore, your data is automatically filled into support requests and you always have an overview of your current requests.

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You can find "mySupport" on the Internet (https://support.industry.siemens.com/My/ww/en/).

"mySupport" - Documentation

In the Documentation area of "mySupport", you have the possibility to combine complete manuals or parts of them to make your own manual.

You can export the manual in PDF format or in an editable format.

You can find "mySupport" - Documentation on the Internet (http://support.industry.siemens.com/My/ww/en/documentation).

Further support

- The range of technical documentation for the individual SIMATIC products and automation systems can be found on the Internet (http://www.siemens.com/simatic-tech-doku-portal).
- The online catalog and the online ordering system is available on the Internet (https://mall.industry.siemens.com).

1.1 Function Manuals documentation guide

1.1.1 Information classes Function Manuals

The documentation for the SIMATIC S7-1500 automation system, for the 1513/1516pro-2 PN, SIMATIC Drive Controller CPUs based on SIMATIC S7-1500 and the SIMATIC ET 200MP, ET 200SP, ET 200AL and ET 200eco PN distributed I/O systems is arranged into three areas.

This arrangement enables you to access the specific content you require.
You can download the documentation free of charge from the Internet (https://support.industry.siemens.com/cs/ww/en/view/109742705).

Basic information

The system manuals and Getting Started describe in detail the configuration, installation, wiring and commissioning of the SIMATIC S7-1500, SIMATIC Drive Controller, ET 200MP, ET 200SP, ET 200AL and ET 200eco PN systems. Use the corresponding operating instructions for 1513/1516pro-2 PN CPUs.

The STEP 7 online help supports you in the configuration and programming.

Examples:

- Getting Started S7-1500
- System manuals
- Operating instructions ET 200pro and 1516pro-2 PN CPU
- Online help TIA Portal

Device information

Equipment manuals contain a compact description of the module-specific information, such as properties, wiring diagrams, characteristics and technical specifications.

Examples:

- Equipment manuals for CPUs
- Equipment manuals for interface modules
- Equipment manuals for digital modules
- Equipment manuals for analog modules
- Equipment manuals for communication modules
- Equipment manuals for technology modules
- Equipment manuals for power supply modules
- Equipment manuals for BaseUnits

General information

The function manuals contain detailed descriptions on general topics relating to the SIMATIC Drive Controller and the S7-1500 automation system.

Examples:

- Function Manual Diagnostics
- Function Manual Communication
- Function Manuals Motion Control
- Function Manual Web Server
- Function Manual Cycle and Response Times
- PROFINET Function Manual
- PROFIBUS Function Manual

Product Information

Changes and supplements to the manuals are documented in a Product Information. The Product Information takes precedence over the device and system manuals.

You will find the latest Product Information on the Internet:

- S7-1500/ET 200MP (https://support.industry.siemens.com/cs/de/en/view/68052815)
- SIMATIC Drive Controller (https://support.industry.siemens.com/cs/de/en/view/109772684/en)
- Motion Control (https://support.industry.siemens.com/cs/de/en/view/109794046/en)
- ET 200SP (https://support.industry.siemens.com/cs/de/en/view/73021864)
- ET 200eco PN (https://support.industry.siemens.com/cs/ww/en/view/109765611)

Manual Collections

The Manual Collections contain the complete documentation of the systems put together in one file.

You will find the Manual Collections on the Internet:

- S7-1500/ET 200MP/SIMATIC Drive Controller (https://support.industry.siemens.com/cs/ww/en/view/86140384)
- ET 200SP (https://support.industry.siemens.com/cs/ww/en/view/84133942)
- ET 200AL (https://support.industry.siemens.com/cs/ww/en/view/95242965)
- ET 200eco PN (https://support.industry.siemens.com/cs/ww/en/view/109781058)

1.1.2   Basic tools

Tools

The tools described below support you in all steps: from planning, over commissioning, all the way to analysis of your system.

TIA Selection Tool

The TIA Selection Tool tool supports you in the selection, configuration, and ordering of devices for Totally Integrated Automation (TIA).

As successor of the SIMATIC Selection Tools , the TIA Selection Tool assembles the already known configurators for automation technology into a single tool.

With the TIA Selection Tool , you can generate a complete order list from your product selection or product configuration.
You can find the TIA Selection Tool on the Internet.
(https://support.industry.siemens.com/cs/ww/en/view/109767888)

SIMATIC Automation Tool

You can use the SIMATIC Automation Tool to perform commissioning and maintenance activities on various SIMATIC S7 stations as bulk operations independent of TIA Portal.
The SIMATIC Automation Tool offers a wide range of functions:

- Scanning of a PROFINET/Ethernet system network and identification of all connected CPUs
- Assignment of addresses (IP, subnet, Gateway) and device name (PROFINET device) to a CPU
- Transfer of the date and the programming device/PC time converted to UTC time to the module
- Program download to CPU
- RUN/STOP mode switchover
- CPU localization through LED flashing
- Reading out of CPU error information
- Reading the CPU diagnostic buffer
- Reset to factory settings
- Firmware update of the CPU and connected modules

You can find the SIMATIC Automation Tool on the Internet.
(https://support.industry.siemens.com/cs/ww/en/view/98161300)

PRONETA

SIEMENS PRONETA (PROFINET network analysis) is a commissioning and diagnostic tool for PROFINET networks. PRONETA Basic has two core functions:

- In the network analysis, you get an overview of the PROFINET topology. Compare a real configuration with a reference installation or make simple parameter changes, e.g. to the names and IP addresses of the devices.
- The "IO test" is a simple and rapid test of the wiring and the module configuration of a plant, including documentation of the test results.

You can find SIEMENS PRONETA Basic on the Internet: (https://support.industry.siemens.com/cs/ww/en/view/67460624)

SIEMENS PRONETA Professional is a licensed product that offers you additional functions. It offers you simple asset management in PROFINET networks and supports operators of automation systems in automatic data collection/acquisition of the components used through various functions:

- The user interface (API) offers an access point to the automation cell to automate the scan functions using MQTT or a command line.
- With PROFIenergy diagnostics, you can quickly detect the current pause mode or the readiness for operation of devices that support PROFIenergy and change these as needed.
- The data record wizard supports PROFINET developers in reading and writing acyclic PROFINET data records quickly and easily without PLC and engineering.

You can find SIEMENS PRONETA Professional on the Internet. (https://www.siemens.com/proneta-professional)

SINETPLAN

SINETPLAN, the Siemens Network Planner, supports you in planning automation systems and networks based on PROFINET. The tool facilitates professional and predictive dimensioning of your PROFINET installation as early as in the planning stage. In addition, SINETPLAN supports you during network optimization and helps you to exploit network resources optimally and to plan reserves. This helps to prevent problems in commissioning or failures during productive operation even in advance of a planned operation. This increases the availability of the production plant and helps improve operational safety.

The advantages at a glance

- Network optimization thanks to port-specific calculation of the network load
- Increased production availability thanks to online scan and verification of existing systems
- Transparency before commissioning through importing and simulation of existing STEP 7 projects
- Efficiency through securing existing investments in the long term and the optimal use of resources

You can find SINETPLAN on the Internet (https://new.siemens.com/global/en/products/automation/industrial-communication/profinet/sinetplan.html).

1.1.3 SIMATIC Technical Documentation

Additional SIMATIC documents will complete your information. You can find these documents and their use at the following links and QR codes.

The Industry Online Support gives you the option to get information on all topics. Application examples support you in solving your automation tasks.

Overview of the SIMATIC Technical Documentation

Here you will find an overview of the SIMATIC documentation available in Siemens Industry Online Support:

Industry Online Support International (https://support.industry.siemens.com/cs/ww/en/view/109742705)

Watch this short video to find out where you can find the overview directly in Siemens Industry Online Support and how to use Siemens Industry Online Support on your mobile device:

Quick introduction to the technical documentation of automation products per video (https://support.industry.siemens.com/cs/us/en/view/109780491)

YouTube video: Siemens Automation Products - Technical Documentation at a Glance (https://youtu.be/TwLSxxRQQsA)

Retention of the documentation

Retain the documentation for later use.

For documentation provided in digital form:

1. Download the associated documentation after receiving your product and before initial installation/commissioning. Use the following download options:
   - Industry Online Support International: (https://support.industry.siemens.com)
     The article number is used to assign the documentation to the product. The article number is specified on the product and on the packaging label. Products with new, non-compatible functions are provided with a new article number and documentation.
   - ID link:
     Your product may have an ID link. The ID link is a QR code with a frame and a black frame corner at the bottom right. The ID link takes you to the digital nameplate of your product. Scan the QR code on the product or on the packaging label with a smartphone camera, barcode scanner, or reader app. Call up the ID link.
2. Retain this version of the documentation.

Updating the documentation

The documentation of the product is updated in digital form. In particular in the case of function extensions, the new performance features are provided in an updated version.

1. Download the current version as described above via the Industry Online Support or the ID link.
2. Also retain this version of the documentation.

mySupport

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Registration	You must register once to use the full functionality of "mySupport". After registration, you can create filters, favorites and tabs in your personal workspace.
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Documentation	In the Documentation area you can build your personal library.
Favorites	You can use the "Add to mySupport favorites" to flag especially interesting or frequently needed content. Under "Favorites", you will find a list of your flagged entries.
Recently viewed articles	The most recently viewed pages in mySupport are available under "Recently viewed articles".
CAx data	The CAx data area gives you access to the latest product data for your CAx or CAe system. You configure your own download package with a few clicks: • Product images, 2D dimension drawings, 3D models, internal circuit diagrams, EPLAN macro files • Manuals, characteristics, operating manuals, certificates • Product master data

You can find "mySupport" on the Internet. (https://support.industry.siemens.com/My/ww/en)

Application examples

The application examples support you with various tools and examples for solving your automation tasks. Solutions are shown in interplay with multiple components in the system - separated from the focus on individual products.
You can find the application examples on the Internet.
(https://support.industry.siemens.com/cs/ww/en/ps/ae)

Safety instructions

2

2.1 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines, and networks.

In order to protect plants, systems, machines, and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For more information on protective industrial cybersecurity measures for implementation, please visit (https://www.siemens.com/global/en/products/automation/topic-areas/industrial-cybersecurity.html).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customers' exposure to cyber threats.

To stay informed about product updates at all times, subscribe to the Siemens Industrial Cybersecurity RSS Feed under (https://new.siemens.com/global/en/products/services/cert.html).

Description

<div align="right">

3

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3.1 Supported hardware

If a device supports the trace and logic analyzer function, ⬚ "Traces" is offered for selection in the project tree below the device.

The following devices support the trace and logic analyzer function:

- SIMATIC S7-1200 CPUs (as of firmware version V4.0)
- SIMATIC S7-1500, ET 200SP, CPU 1513pro-2 PN and CPU 1516pro-2 PN CPUs
- SIMATIC S7-1500 Software Controller
- SIMATIC Drive Controller
- ET 200SP Open Controller
- SINAMICS drives that are supported in Startdrive
- SINAMICS V90 (with HSP 0185)
- SIRIUS SIMOCODE pro (with Simocode ES)
- SIRIUS Soft Starter 3RW (with Soft Starter ES)

3.2 Recording of measured values with the trace function

Introduction

The trace and logic analyzer function can be called in the project tree (Page 28) by double-clicking an entry in the "Traces" system folder. The measurements on the memory card can also be read and displayed via the diagnostic interface of the Web server.

You record device tags and evaluate the recordings with the trace and logic analyzer function. Tags are, for example, drive parameters or system and user tags of a CPU. The number of installed traces is hardware-dependent. You can use the project trace to record tags from multiple devices across devices.

The recordings are saved on the device and, when required, can be read out with the engineering system (ES) and saved permanently. The trace and logic analyzer function is therefore suitable for monitoring highly dynamic processes. The recorded values are overwritten when the recording is activated again.
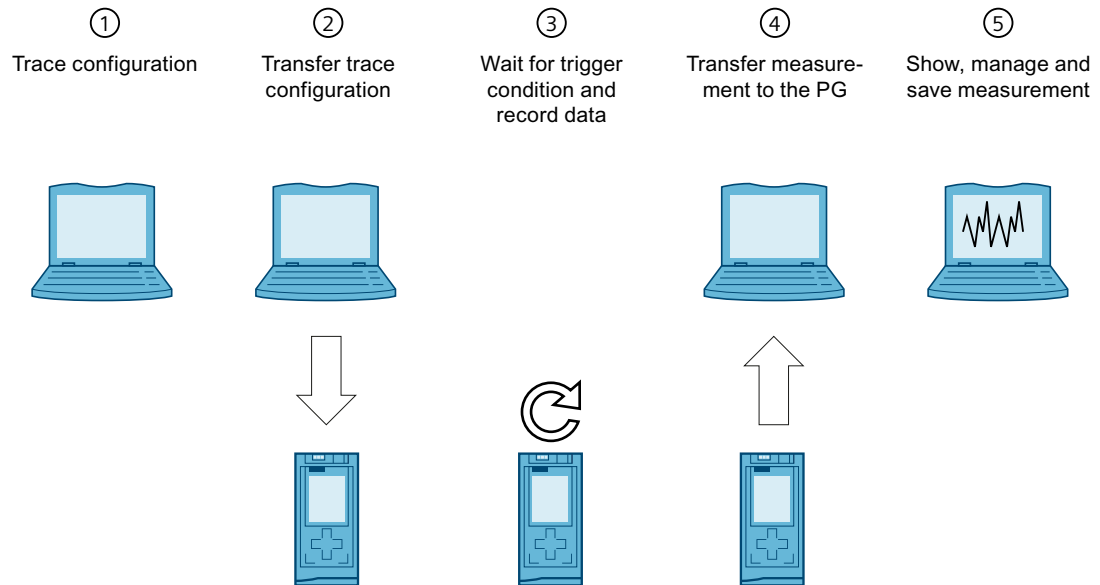
The trace and logic analyzer functions are also used in the commissioning editors of technology objects (for example, axle control panels). Active recordings from the axis control panel are displayed in the "Traces" system folder as installed traces. Recordings can be added to the measurements in the curve diagram of the axis control panel or the PID via a shortcut menu command.

Depending on the device used, the recording options can vary.

A quick start (Page 87) for working with the trace and logic analyzer function can be found in the Operation section.

The following figure shows the mode of operation of the trace:

① Trace configuration ② Transfer trace configuration ③ Wait for trigger condition and record data ④ Transfer measurement to the PG ⑤ Show, manage and save measurement

Trace configuration on the programming device (PG) in the TIA Portal①

You can specify the signals to be recorded, the duration of the recording and the trigger condition in the trace configuration. The trace configuration depends on the device and is described at the respective device.

Transferring the trace configuration from the PG to the device②

You can transfer the complete trace configuration to the device when an online connection is established.

Waiting for the recording③

If the installed trace configuration is activated (Page 103), then the recording is performed independently of the PG. The recording is started as soon as the trigger condition is satisfied.

Transferring the measurement from the device to the PG④

The saving of the measurement in the project (Page 104) stores the measurement in the opened project of the TIA Portal. The measurement can be saved at any time after completing the recording, irrespective of the time of the measurement.

Evaluating, managing and saving the measurement⑤

Numerous options are available for the evaluation of the measurement in the curve diagram and in the signal table. Various display types are possible, for example, a bit representation for binary signals.

Signal waves from different measurements can be put together as an combined measurement and compared with each other.

Measurements can also be exported and imported as a file.

With the saving of the project (Page 104) in the TIA Portal, the measurements transferred to the project are also saved.

3.3 Trace configuration, recording, installed trace and measurement

This section explains the meaning and relationships of the terms: trace configuration, recording, installed trace and measurement.

Trace configuration

Implement the following settings in the ▨ trace configuration:

- Signals to be recorded with display options
- Recording conditions
  - Sampling
  - Trigger
  - Measurements on device (memory card)

Trace configurations can be copied to the "Traces" folder by drag-and-drop operation or by means of the clipboard. The application of a configuration depends on the device type. The following sources are possible:

- Trace configuration
- Measurement
- Measurements on device (memory card)
- Combined measurement (selection of a measurement contained in it)

Recording

A recording is performed in the device. There is only one recording for each installed trace configuration. When a new recording is started, the old recording is overwritten.
An installed recording is not retentive (it is lost when the device is switched off/on) but can be saved permanently in the project as a measurement.

Installed trace

An installed trace ▨ consists of a trace configuration and optionally a recording. The maximum number of installed traces depends on the device.
The trace configuration is stored retentively on the device. The retentivity of the trace configuration may also be configurable depending on the device, e.g. with the S120.
The configuration data is displayed write-protected.

Measurement

A measurement ▨ consists of a trace configuration and a recording, provided that recorded data is present. Each installed trace can be saved as a measurement in the project.
The recording of a measurement can be viewed offline.
The configuration data is displayed write-protected.

Measurements on device (memory card)

The ▨ "Measurements on device (memory card)" folder contains measurements that are saved on the device (for example, on the memory card). These measurements are retentive and can only be deleted by the user.

The installed measurements can be transferred to the "Measurements" folder using drag & drop and are then saved as measurements in the project.

Trace configuration with an installed trace of the same name

Usually, there is a trace configuration in the project with the same name for an installed trace. When there is an online connection, this trace is displayed with the ▨ icon in the project tree.

See also User interface - "Traces" project tree folder (Page 29).

Combined measurement

The combined measurement ▨ allows a comparison and analysis of signals from different measurements with each other.

Measurements can be synchronized with each other and displayed overlaid.

Changes to the settings for measurements within the combined measurement have no impact on the original measurements. The original measurements remain unchanged.

3.4   Data storage

The trace toolbar and the curve diagram also enable the transfer of the trace configuration and the viewing of the recording.

The following figure is a schematic diagram of the data storage:
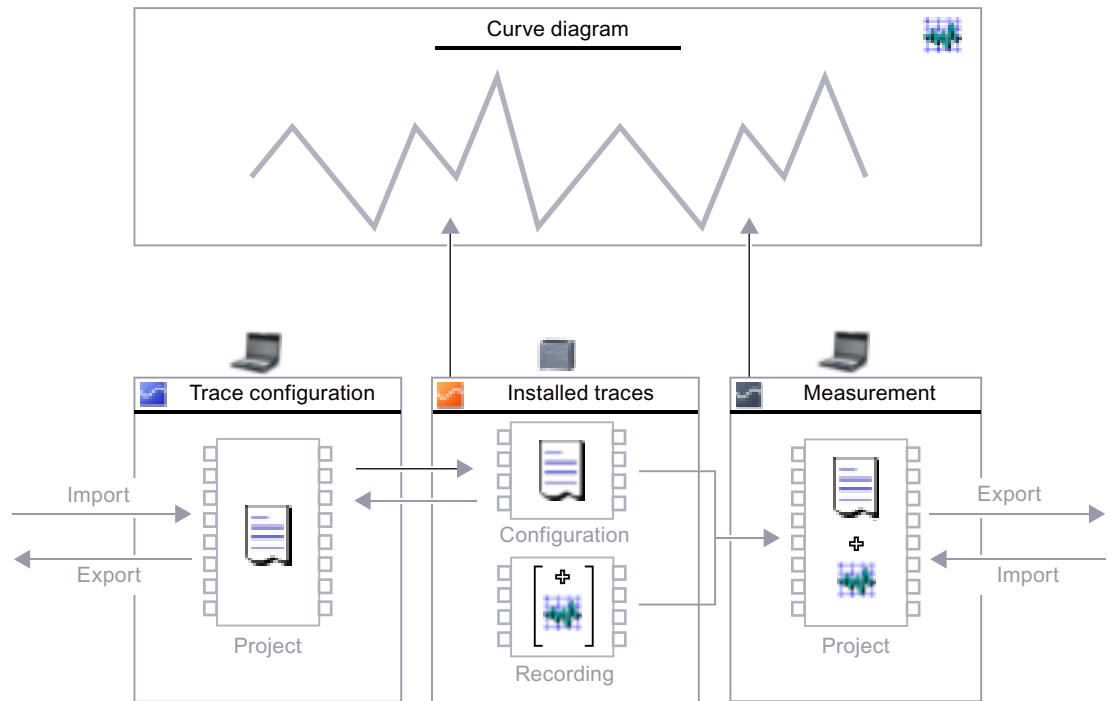
NOTE

Saving the trace configuration and measurement

You save the trace configuration and measurement with the project in the TIA Portal.

If you close the project without saving, the trace configurations and the measurements transferred to the project are discarded. The trace editor can be closed and reopened without loss of data until the project is closed.

3.5 Long-term trace

A long-term trace records signals.

In contrast to trace, long-term trace has the following special features:

- In the long-term trace configuration, you define a target path in the PG. The long-term trace recording is saved as a .csv file and as an .lttcd file in the configured target path on the PG.
- You cannot configure a recording duration or a trigger.
- No support of measurements in the device (memory card)
- No support for FFT/Bode formulas or FFT diagrams/Bode diagram

A description of which devices support the long-term trace is provided at the respective devices.

Long-term trace workflow

A Quick Start for working with long-term traces can be found in the Operation section.

The following figure shows how the long-term trace works:
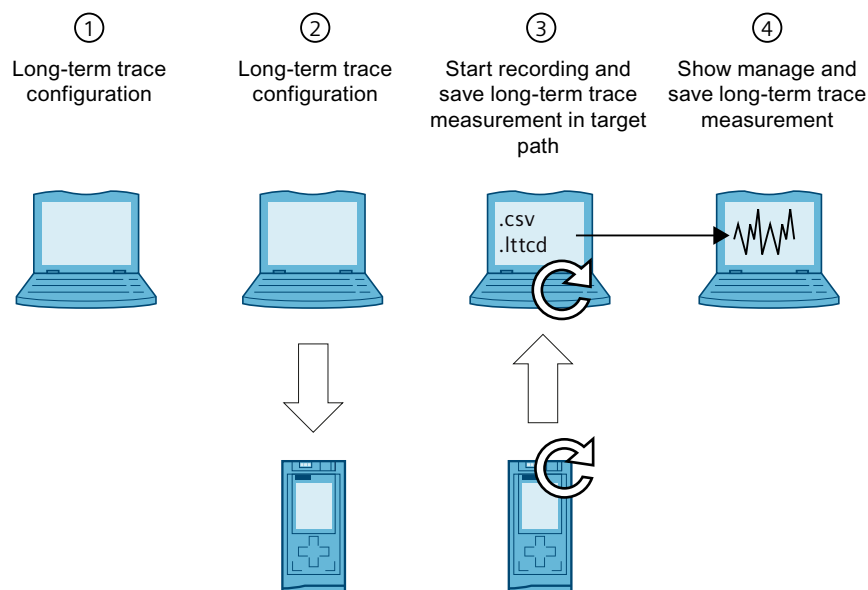
Long-term trace configuration on the programming device (PG) in the TIA Portal①

You can define the signals to be recorded and the target path for the long-term trace measurements in the long-term trace configuration. The long-term trace configuration depends on the device and is described for the respective devices.

Transferring the long-term trace configuration from the PG to the device②

You can transfer the complete long-term trace configuration to the device when an online connection is established.

Starting the long-term trace recording and saving the long-term trace measurement in the target path③

You start the long-term trace recording by activating the trace configuration. The long-term trace recording is displayed in the time diagram.

The long-term trace measurement is saved as a .csv file and as an .lttcd file in the configured target path on the PG.

You can find additional information about long-term trace recording as a csv file in the section Long-term trace recording (Page 119).

NOTE

Note that problems with online access between the PG and the CPU can result in errors or even failure of the recording.

If possible, connect the PG directly to the CPU.

Displaying, managing, and evaluating the long-term trace measurement④

For evaluation, you can add the long-term trace measurement to the system folder "Measurements".

Numerous options are available for the evaluation of the measurement in the curve diagram and in the signal table. Various display types are possible, for example, a bit representation for binary signals.

In the "Combined measurements" folder, you can compare and analyze signals from different long-term trace measurements. The combined long-term trace measurements can be synchronized with each other and displayed in combination. Changes to the settings of long-term trace measurements within the combined long-term trace measurement do not affect the original long-term trace measurements. The original long-term trace measurements remain unchanged.

See also

Saving measurements in the project (Page 104)

3.6 Project trace

3.6.1 General

A project trace includes trace configurations of multiple devices and records the signals across devices.

Each device can trigger the recording on all participating devices. After receiving the global trigger, the devices with valid project trace configuration start the recording.

Each of the respective devices describes whether the project trace function is supported.

Requirements

The following requirements must be fulfilled for recording with project trace:

- PROFINET RT or IRT communication
- All devices are located in a PROFINET subnet (no routing)
- An online connection from the TIA Portal to all devices to transfer the project trace to the devices.
- The "Record immediately" trigger mode may be configured for a maximum of one device.
- A trigger must be configured for at least one device.

3.6.2 Time synchronization

The accuracy of the time synchronization depends on how the trace sample event is determined. Isochronous communication provides the highest accuracy because the IRT cycle is used. In all other cases, the respective time of the device where the signals are recorded is used.

A project trace can contain devices with RT and IRT communication.

For a synchronous display of the signals, the X axis must be set in "Time (relative)" mode. In this representation, the measurements are arranged in time so that their trigger events are at 0 ms.

To facilitate the evaluation with absolute time, synchronize the clock times of the devices.

Information on the trace sample event can be found in the device-specific descriptions, e.g. for S7-1200/1500 CPU under "Recording levels".

Trigger time for RT communication

Devices which receive the trigger from another device, have a time-delayed trigger event. For RT communication, the time of a trigger event is derived from the transfer time and the recording time. The trigger event is first detected at the end of the recording OB and uses this time as the trigger time. The time delay between the original trigger time and the evaluation in the OB cannot be determined for RT communication. This means the signal trends of devices which receive the trigger from another device appear moved forward. After saving the measurements, you can manually correct these signals with a time offset.

Example of a recording with project trace

The figure below shows a recording with project trace and the correction of the representation with an offset.
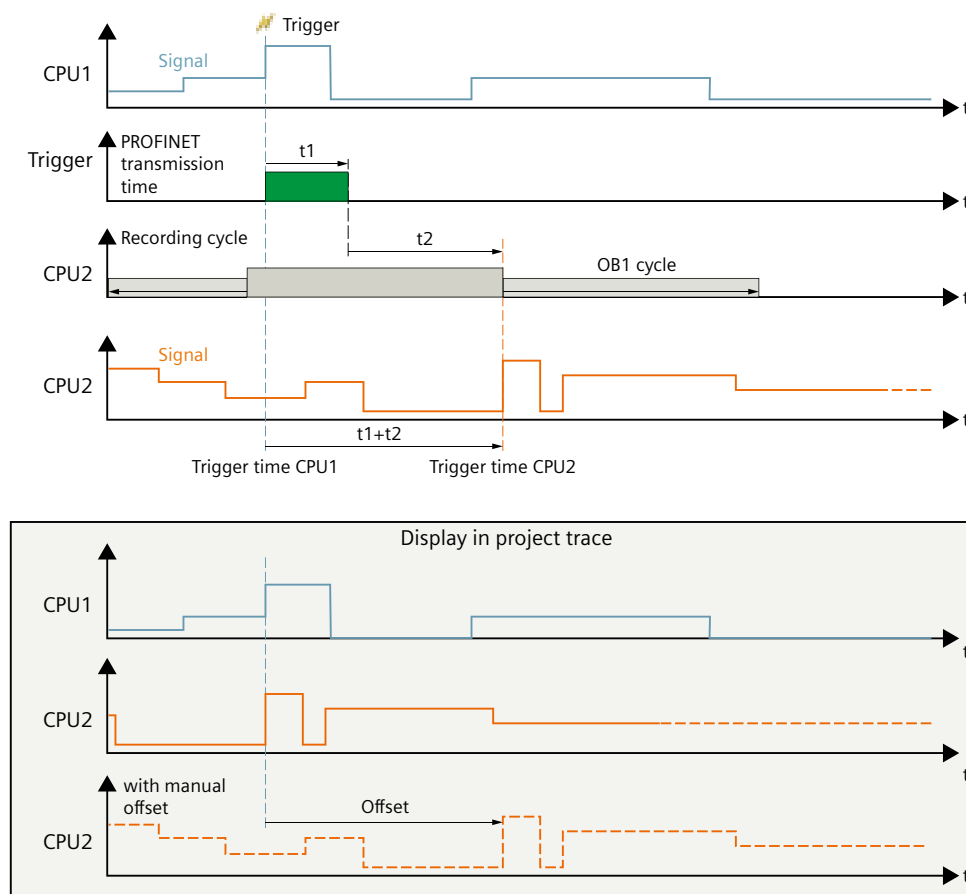
3.7 Long-term project trace

A long-term project trace contains trace configurations of multiple devices and records the signals across devices. In STEP 7, you activate the recording of the long-term project trace in all devices at the same time. All recorded signals are displayed together in a synchronous diagram. The number of long-term project trace configurations is not limited.
In contrast to project trace, there are the following special features of long-term project trace:

- In the long-term project trace configuration, you define a target path in the PG. The long-term project trace recording is saved as a .csv file and as an .lttcd file in the configured target path on the PG.

- You cannot configure a recording duration, a trigger and a sample count.

Each of the respective devices describes whether the long-term project trace function is supported.

NOTE

The number of devices that can be in the respective long-term trace configuration is limited to 5.

Long-term project trace workflow

A Quick Start (Page 99) for working with long-term project traces can be found in the Operation section.

The following figure shows how the long-term project trace works:
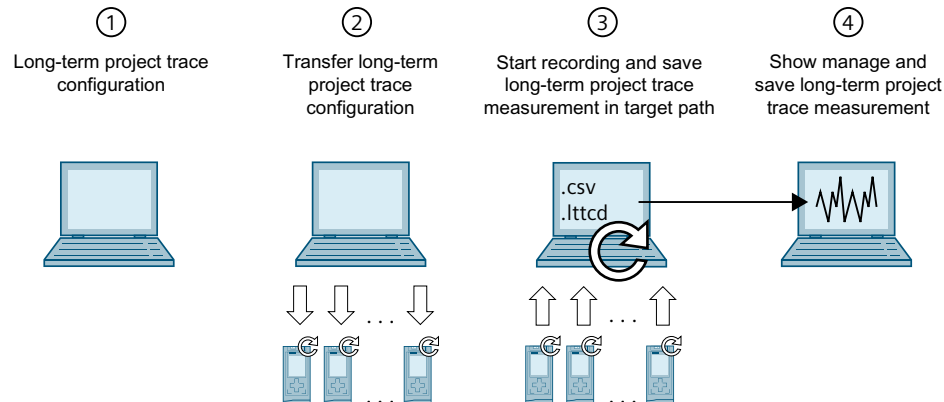
Long-term project trace configuration on the programming device (PG) in the TIA Portal①

In the long-term project trace configuration, you define the signals to be recorded and the target path for the long-term project trace recordings.

Transferring the long-term project trace configuration from the PG to the device②

You can transfer the complete long-term project trace configuration to the device when an online connection is established.

Start long-term project trace recording and save in target path.③

Start the recording by activating the trace configuration. The long-term project trace recording is displayed in the time diagram.

The long-term project trace measurement is saved as a .csv and as a .lttcd file in the configured target path.

You can find additional information about long-term project trace recording as a csv file in the section Long-term project trace recording (Page 121).

NOTE

Note, if there are problems in the online access between PG and the CPU, the recording may be disturbed or even fail.

Connect the PG directly to the CPU if possible.

Displaying, managing, and evaluating the long-term project trace measurement④

For evaluation, you can add the long-term project trace measurement to the system folder "Measurements".

Numerous options are available for the evaluation of the measurement in the curve diagram and in the signal table. Various display types are possible, for example, a bit representation for binary signals.

Requirements

The following requirements must be fulfilled for recording with long-term project trace:
- S7-1500 CPU
- PROFINET RT or IRT communication
- All devices are located in a PROFINET subnet (no routing)
- An online connection from the TIA Portal to all devices to transfer the project trace to the devices.

See also

Saving measurements in the project (Page 104)

3.7.1 Time synchronization

The accuracy of the time synchronization depends on how the trace sample event is determined. Isochronous communication provides the highest accuracy because the IRT cycle is used. In all other cases, the clock time of the device is used.

A long-term project trace can contain devices with RT and IRT communication.

For a synchronous display of the signals, the X axis must be set in "Time (relative)" mode. In this representation, the measurements are arranged in time so that the start of recording is always at the time 0 ms.

To facilitate the evaluation with absolute time, synchronize the clock times of the devices.

You can find information on the trace sample event in the device-specific descriptions, e.g. for S7-1200/1500 CPU under "Recording level".

Trace software user interface

4

The user interface of the trace and logic analyzer function consists of several areas. The layout of the user interface in the TIA Portal is described here.

The figure below shows an example of the distribution of the surface:
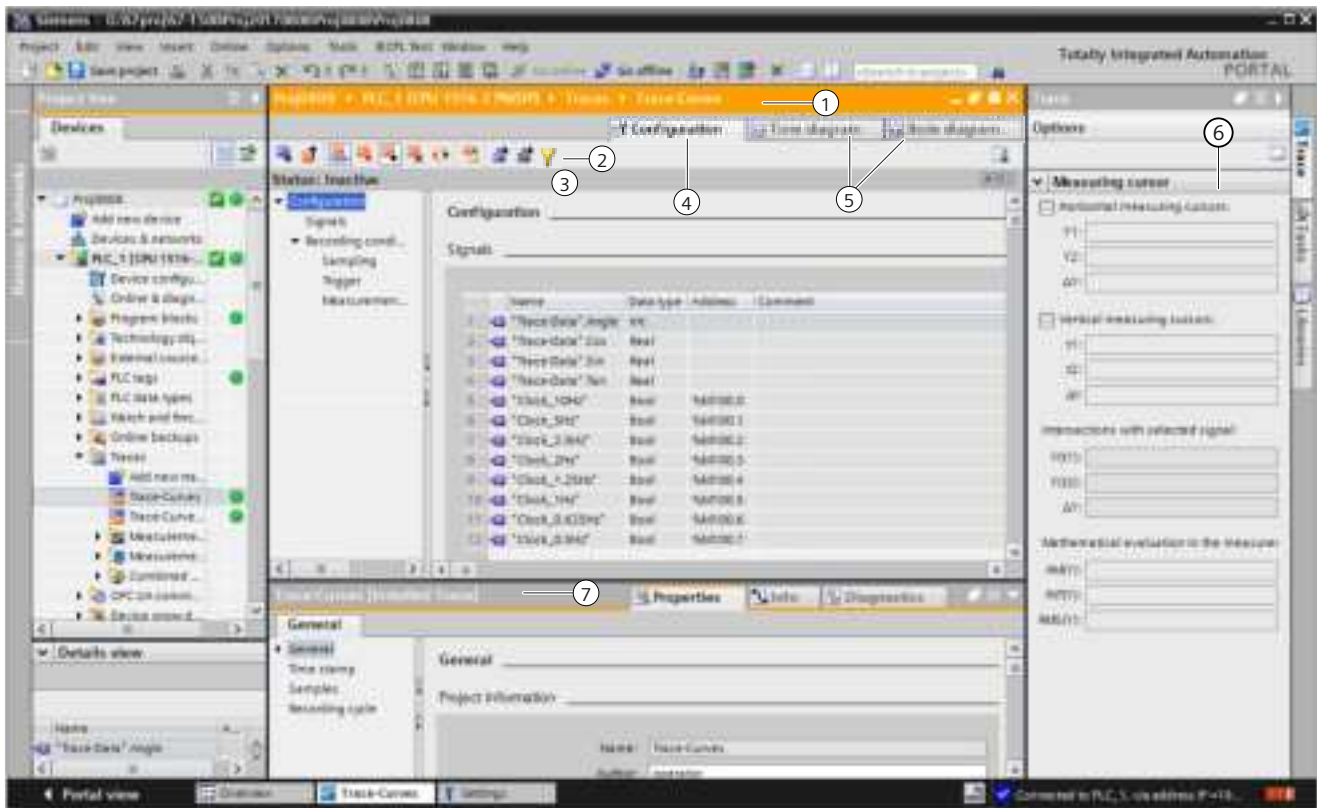
Project tree	
Management and creation of the trace and measurements directly in the project tree and via context menu commands.	
Working area	
	① Title bar of the working area Shows the device to which the current display belongs.
	② Trace toolbar Buttons for managing the trace in the project and device: • Activation/deactivation of installed traces • Deletion of installed traces • Transfer of trace configurations and measurements between the device and the project • Export of trace configurations and measurements • Switchover between offline and online display
	③ Status display of the trace Display of the current status of the recording.

④ Configuration tab Device-specific configuration of the recording duration, trigger condition and signal selection. Configuring the devices for project trace. See Device-specific descriptions.
⑤ Time diagram / FFT diagram / Bode diagram tab Display of the recorded values as a curve diagram, FFT diagram or Bode diagram, and the signals from the displayed measurement. Specification of the display options.
Signal selection tab Display of all signals that are contained in the combined measurements.
"Trace" task card Display of the measurement cursor data with mathematical evaluation ⑥ and snapshots.
Inspector window⑦ Display of general information about the trace configuration

4.1 Project tree

4.1.1 User interface - "Traces" project tree folder

Trace configurations and installed traces are displayed in the 🖼 "Traces" folder.

More information about the "Traces" sub-folder is provided in the following sections.

Double-click a trace to open the corresponding "Configuration" or "Time diagram" tab in the working area.

Icons in the "Traces" folder

The following table explains the icons in the 🖼 "Traces" folder:

Icon	Description
🖼	Add trace configuration Double-click the icon to add a new trace configuration.
🖼	Trace configuration (offline) Double-click the icon to open the "Configuration" tab.
🖼	Installed trace (online) The icon is only displayed when there is no offline trace configuration of the same name for the installed trace. Double-click the icon to open the "Time diagram" tab.
🖼	Trace configuration with an installed trace of the same name If the 🖼 button is deactivated, the trace configuration from the project is displayed. The trace corresponds to a trace configuration. If the 🖼 button is activated, the trace configuration from the device is displayed. The trace corresponds to an installed trace. Double-click on the symbol to open the "Time diagram" tab of the installed trace.

Status

When there is an online connection, the status is displayed in the right-hand column of the project tree. The status is also displayed as tooltip above the respective icon.
The following table shows the meaning of the icons:

Icon	Description
🟢	Online and offline configuration are identical
🔵	Online and offline configuration are different
🟠	Configuration only exists online

Shortcut menu commands

The following table shows the shortcut menu commands for the 🖼 "Traces" system folder:

Shortcut menu command	Description
"Add new group"	Inserts a new folder.
"Add new trace"	Inserts a new trace configuration and opens the configuration tab.
"Import trace configuration"	Imports a trace configuration from a file.

The following table shows the shortcut menu commands for trace configurations 🖼 and installed traces 🖼 / 🖼:

Shortcut menu command	Trace configuration	Installed trace	Description
"Copy"	x	-	Copies the trace configuration or trace to the clipboard.
"Paste"	x	-	Inserts a trace configuration or measurement from the clipboard.
"Delete"	x	x	Deletes the selected objects from the project tree or from the device.
"Rename"	x	-	Switches the selected object to the editing mode.
"Export trace configuration"	x	-	Export a trace configuration as a file with the file extension "* .ttcfgx" or a trace in the device with the file extension "* .ttrecx". For reasons of compatibility with TIA Portal V12, the "* .ttcfg" and "* .ttrec" file extensions are supported, although they do not contain any information about the device family.

The trace configuration can also be copied across devices within the same device family.

4.1.2   User interface - "Measurements" project tree folder

The "Measurements" folder shows the saved measurements.

Icons in the "Measurements" folder

The following table explains the icons in the "Measurements" folder:

Icon	Description
	Measurement (offline) Double-click the icon to open the "Time diagram" tab. The configuration for a measurement can be transferred to the "Traces" folder using drag & drop.

Shortcut menu commands

The following table shows the shortcut menu commands for the "Measurements" system folder:

Shortcut menu command	Description
"Add new group"	Inserts a new folder.
"Import measurement"	Imports a measurement from a file with the "*.ttrecx" file extension. The import is device-independent. For reasons of compatibility, the "*.ttrec" file extension is supported in V12, although it does not contain any information about the device family.

The following table shows the shortcut menu commands for measurements :

Shortcut menu command	Description
"Copy"	Copies the trace configuration of the selected objects to the clipboard.
"Paste"	Inserts a measurement from the clipboard.
"Delete"	Deletes the selected objects from the project tree or from the device.
"Rename"	Switches the selected object to the editing mode.
"Generate new overlay measurement"	Generates a new overlay measurement with the selected measurements.
"Export measurement"	Exports a measurement with the last saved standard view The measurement is saved with the extension "*.ttrecx" or "*.csv". For reasons of compatibility, the "*.ttrec" file extension is supported in V12, although it does not contain any information about the device family.

The measurements can also be copied independent of the device family.

4.1.3   User interface - "Installed measurements (memory card)" project tree folder

The ▣ "Measurements on device (memory card)" folder shows all measurements present on the memory card. The folder is only displayed when there is an online connection to the device.

Drag folders or measurements contained here to the "Measurements" system folder using drag & drop. This transfers the measurements to the project.

NOTE

Transferring numerous and large trace measurements from the device (memory card)

Transferring trace measurements from the device to the project increases the memory requirement.

Avoid copying a large number of measurements with large amounts of data at the same time because this can lead to high memory consumption and extended periods needed for copying.

Icons in the "Traces" folder

The following table explains the icons in the system folder ▣:

Icon	Description
▣	Folders generated automatically with information on the recording activation time: The name of the folder cannot be changed.
▨	Installed measurement Double-click the icon to open the "Time diagram" tab. The time stamp in the name shows the occurrence of the trigger event.

Shortcut menu commands

The following table shows the shortcut menu commands for the group folder ▣:

Shortcut menu command	Description
"Copy"	Copies the selected objects to the clipboard.
"Delete"	Deletes the selected objects from the project tree and from the device.

The following table shows the shortcut menu commands for measurements ▨:

Shortcut menu command	Description
"Open"	Opens the measurement in the "Time diagram" tab.
"Copy"	Copies the selected objects to the clipboard.
"Delete"	Deletes the selected objects from the project tree and from the device.
"Export measurement"	Exports a measurement as a file with the extension "*.ttrecx" or "*.csv". For reasons of compatibility, the "*.ttrec" file extension is supported in V12, although it does not contain any information about the device family.
"Properties"	Displays the general properties of the measurement (Page 68).

4.1.4   User interface - "Combined measurements" project tree folder

The system folder 🗂 "Combined measurements" shows the configured combined measurements.

Icons in the "Combined measurements" folder

The following table explains the icons in the system folder 🗂 "Combined measurements":

Icon	Description
🖼	Add new combined measurements Double-click the icon to add a new combined measurement and open the "Time diagram" tab.
🖼	Combined measurement Double-click the icon to open the "Time diagram" tab.

Shortcut menu commands

The following table shows the shortcut menu commands for the system folder 🗂 "Combined measurements" or for a group folder contained within this 🗂:

Shortcut menu command	Description
"Add new group"	Inserts a new folder.
"Add new combined measurement"	Inserts a new combined measurement and opens the "Time diagram" tab.
"Import combined measurement"	Imports an combined measurement from a file with the file extension "*.ttcbmx"

The following table shows the shortcut menu commands for combined measurements 🖼:

Shortcut menu command	Description
"Open"	Opens the selected combined measurements in the working area.
"Import measurement"	Imports a measurement from a file with the file extension "*.ttrecx" For reasons of compatibility with V12, the "*.ttrec" file extension is supported, although it does not contain any information about the device family.
"Export combined measurement"	Exports an combined measurement The combined measurement is saved with the extension "*.ttcbmx" or "*.csv". The "*.ttcbmx" format can also be imported again.
"Copy"	Copies the selected objects to the clipboard.
"Paste"	Pastes measurements, measurements from traces in the device or from an combined measurement from the clipboard. Multiple objects can be inserted from the clipboard if they are all of the same type.
"Delete"	Deletes the selected objects from the project tree or from the device.
"Rename"	Switches the selected object to the editing mode.
"Properties"	Displays the general properties for the combined measurements.

The combined measurements can also be copied device-wide.

4.1.5 User interface - "Long-term traces" project tree folder

Long-term trace configurations and installed long-term traces are displayed in the "Long-term traces" 🖼 folder.

Double-click a long-term trace to open the corresponding "Configuration" or "Time diagram" tab in the workspace.

Icons in the "Long-term traces" folder

The following table explains the icons in the 🖼 "Long-term traces" folder:

Icon	Description
	Add new long-term trace Double-click the icon to add a new long-term trace configuration.
	Long-term trace configuration (offline) Double-click the icon to open the "Configuration" tab.
	Installed long-term trace (online) The icon is only displayed when there is no offline long-term trace configuration of the same name for the installed trace. Double-click the icon to open the "Time diagram" tab.
	Long-term trace configuration with installed long-term trace of the same name If the 🖼 button is deactivated, the trace configuration from the project is displayed. The trace corresponds to a trace configuration. If the 🖼 button is activated, the trace configuration from the device is displayed. The trace corresponds to an installed trace. Double-click on the icon to open the "Time diagram" tab of the installed trace.
	"Measurements" folder The "Measurements" folder displays long-term trace measurements 🖼. The "Measurements" folder in the "Long-term traces" folder behaves like the "Measurements" folder in the "Traces" folder. User interface - "Measurements" project tree folder (Page 31)
	"Combined measurements" folder The "Combined measurements" folder displays combined long-term trace measurements 🖼. Double-click the 🖼 icon to add a new combined long-term trace measurement. The "Combined measurements" folder in the "Long-term traces" folder behaves like the "Combined measurements" folder in the "Traces" folder.

Status

When there is an online connection, the status is displayed in the right-hand column of the project tree. The status is also displayed as tooltip above the respective icon.

The following table shows the meaning of the icons:

Icon	Description
	Online and offline configuration are identical
	Online and offline configuration are different
	Configuration only exists online

Shortcut menu commands

The following table shows the shortcut menu commands for the "Long-term traces" 🖼 folder:

Shortcut menu command	Description
"Add new group"	Adds a new folder.
"Add new long-term trace"	Adds a new long-term trace configuration and opens the Configuration tab.

The following table shows the shortcut menu commands for long-term trace configurations 🖼 and installed long-term traces 🖼 / 🖼:

Shortcut menu command	Long-term trace configuration	Installed long-term trace	Description
"Copy"	x	-	Copies the long-term trace configuration or installed long-term trace to the clipboard.
"Paste"	x	-	Inserts a long-term trace configuration or measurement from the clipboard.
"Delete"	x	x	Deletes the selected objects from the project tree or from the device.
"Rename"	x	-	Switches the selected object to the editing mode.

The long-term trace configuration can also be copied across devices within the same device family.

4.2 Working area

4.2.1 User interface - trace toolbar

Tools are available for handling the trace via buttons.
The following table shows the functions of the buttons:

Icon	Description
🔷	Transfer the selected trace configuration to the device The selected trace configuration is transferred to the device.
🔶	Transfer the selected trace configuration from the device The selected configuration is applied as new trace configuration to the 🖼 "Traces" system folder. The current display options are included in the new trace configuration. A trace configuration of the same name is overwritten in the system folder.
🔶	Observe on/off Change of the display between online and offline. Monitoring is not possible in the Bode diagram. **Note** Once monitor and automatic scaling are activated at the same time, no more actions can be undone using the "Undo" button. **Note** When an installed trace is first started the display in the curve diagram is set to automatic scaling by default. Make sure when the recording is restarted that any

Icon	Description
	changes to the scaling settings are retained. Reactivate automatic scaling manually if necessary in order to monitor the recording.
	Activate recording If the recording of an installed trace is repeated, then the settings relevant for the display (curve diagram and signal table) are also retained for the new recording. **Note** When a recording is restarted, the previously recorded values are lost. To save the recorded values, save the measurement in the project (Page 104) before you activate the recording again.
	Deactivate recording
	Delete installed trace Deletes the selected trace from the device.
	Automatically repeat recording After a recording, the recording is automatically activated again. The display of the curve diagram is refreshed when the recording is completed. This type of refresh is particularly suitable for monitoring fast signals (Page 105).
	Transfer the selected measurement from the device to the project The measurement is added to the "Measurements" system folder. **Note** Only the data loaded from the device is saved. This data is displayed in the curve diagram. If necessary, wait until the display is updated.
	With long-term trace measurements The measurement is added to the "Long-term trace measurements" system folder. **Note** Only the data loaded from the device is saved. The data is only displayed in the time diagram after recording has stopped.
	Export trace configuration Exports a trace configuration as a file with the file extension "*.ttcfgx". For reasons of compatibility with V12, the "*.ttcfg" file extension is supported, although it does not contain any information about the device family.
	Generate a trace configuration Generates a new trace configuration from the measurement.
	Export measurement with the settings from the current view Exports a measurement as a file with the file extension "*.ttrecx" or "*.csv". For reasons of compatibility with V12, the "*.ttrec" file extension is supported, although it does not contain any information about the device family.
	Signal filter Filters the signal table by the signals matching the diagram type. If you are in the Bode diagramtab, for example, only calculated Bode signals are displayed in the signal table when the signal filter is set. **Note** The signal filter does not hide a signal when an invalid value is listed in the "Formula" column of the signal table.
	Import measurement (only with combined measurements) Imports a measurement from a file with the file extension "*.ttrecx". For reasons of compatibility with V12, the "*.ttrec" file extension is supported, although it does not contain any information about the device family.

Icon	Description
	Export combined measurement (only with combined measurements) The combined measurement is saved with the extension "*.ttcbmx" or "*.csv". The "*.ttcbmx" format can be imported via the shortcut menu in the project tree.
	Select a measurement (only with combined measurements) The drop down list box contains the imported measurements. Select the desired measurement to display the configuration.

4.2.2 User interface - Configuration tab

4.2.2.1 User interface - Configuration

The trace configuration depends on the device and is described at the respective device.

4.2.3 User interface - Time diagram tab

4.2.3.1 User interface - curve diagram

The curve diagram displays the selected signals of a recording. Analog signals are displayed in the upper curve diagram. Binary signals are displayed as bit track in the lower diagram. You can adjust the display of the signals in the signal table (Page 45) and with the toolbar of the curve diagram.

With project trace, the curve diagram displays a finished or canceled recording. Under the device you can monitor any recording.

Setting options and displays in the curve diagram

The following figure shows an example of the display:
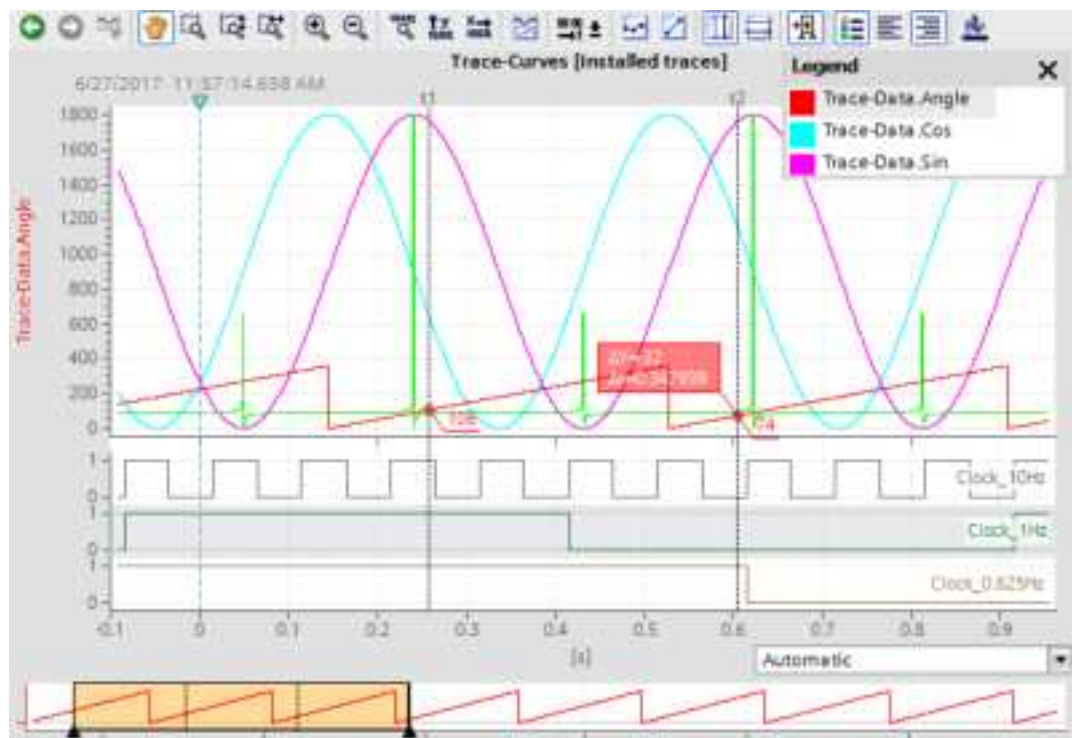
The scale in the diagram applies to the selected (highlighted in gray) signal in the legend. The legend can be moved and its size can be adjusted with the mouse.

The ▽ icon shows the device trigger time with a vertical line.

A drop-down list for selecting the unit is available below the curve for the "Time (relative)" setting for the time axis. The "Automatic" setting automatically adjusts the unit based on the displayed time range.

NOTE

Non-interpretable data types

Some data types require a defined format, e.g. the S7 data type `LTime_of_Day`. If this format is not available, the data type is interpreted as INT.

Functions using the mouse wheel

The following table shows which functions are possible in the curve diagram using the mouse wheel:

Function of the mouse wheel	Description
Move the curve diagram vertically	Turning the mouse wheel moves the display in the upper curve diagram up or down. If the signals are arranged in traces, the display of the group is shifted below the cursor. The mouse pointer must be positioned above the curve diagram with the analog signals.
Move the curve diagram horizontally	Turning the mouse wheel with the <Shift> button pressed down moves the display in the curve diagram to the left or the right. The cursor must be positioned above the curve diagram.
Zoom in and zoom out	Turning the mouse wheel with the <Ctrl> button pressed down zooms in or out of the display in the curve diagram. The cursor position is the starting point for zooming in or out. The value axis of the lower curve diagram (bit tracks) is not affected. The cursor must be positioned above the curve diagram.

Functions using the keyboard

The following table shows which keyboard commands are possible with a focus on the curve diagram:

| Shortcut key	Description
Selecting a measurement cursor	
<Ctrl+Shift+1>	The vertical measurement cursor t1 is selected or deselected.
<Ctrl+Shift+2>	The vertical measurement cursor t2 is selected or deselected.
<Ctrl+Shift+3>	The horizontal measurement cursor Y1 is selected or deselected.
<Ctrl+Shift+4>	The horizontal measurement cursor Y2 is selected or deselected.
<Tab>	The next measurement cursor is selected.
Positioning a vertical measurement cursor	

Shortcut key	Description
<Left>, <Right>	With the unit "Samples", the selected measurement cursor is moved by one sample by the signal in the foreground. With the unit "Time (relative)", the measurement cursor is moved by one pixel.
<Shift+Left>, <Shift+Right>	With the unit "Samples", the selected measurement cursor is moved by 10 samples by the signal in the foreground. With the unit "Time (relative)", the measurement cursor is moved by 10 pixels.
Positioning a horizontal measurement cursor	
<Up>, <Down>	The selected measurement cursor is moved by one pixel along the value axis.
<Shift+Up>, <Shift+Down>	The selected measurement cursor is moved by 10 pixels along the value axis.
Display of vertical measurement cursors	
<Ctrl+Space>	The vertical measurement cursors are shown or hidden.
<Ctrl+Shift+Space>	The vertical measurement cursors are shown and centered for the current view.
Changing the view	
<Space>	Move view
<Ctrl+0>	Set 100% view in open editor
<Ctrl++>	Apply zoom in with 10%
<Ctrl+->	Apply zoom out with 10%

Toolbar of the curve diagram

Tools are available for adapting the display via buttons.

The following table shows the functions of the buttons:

Icon	Function	Description
	Undo	Undoes the display adjustments last made. If several display adjustments have been made, they can be undone step-by-step. Applicable to the following display adjustments: • Show all • Display entire time range • Automatic scaling of the value axis • Move view • Zoom selection • Vertical zoom selection • Horizontal zoom selection • Zoom in • Zoom out
	Redo	Redoes the last undone display adjustment. If several display adjustments have been undone, they can be redone step-by-step.

Icon	Function	Description
	Standard view	Uses the current view as standard for this recording. If the trace recording is shown again later, the standard view is restored.
	Move view	Moves the display with the mouse button pressed.
	Zoom selection	Selection of an arbitrary range with the mouse button pressed. The display is scaled to the range selection.
	Vertical zoom selection	Selection of a vertical range with the mouse button pressed. The display is scaled to the range selection.
	Horizontal zoom selection	Selection of a horizontal range with the mouse button pressed. The display is scaled to the range selection.
	Zoom in	Enlargement of the display. The ranges of the time axis and value axis are reduced every time the button is clicked. The curves are displayed larger.
	Zoom out	Reduction of the display. The ranges of the time axis and value axis are increased every time the button is clicked. The curves are displayed smaller.
	Display all	Scales the display of the available data so that the entire time range and all values are displayed.
	Automatic scaling of the value axis	Scaling of the display so that all values are displayed for the currently displayed time range. The relative scaling ratio between the signals may change. **Note** The automatic scaling of the value axis is stopped when the zoom function is activated for the value axis. This button reactivates the automatic adjustments to the minimum/maximum values.
	Show the overall time range	Scaling of the display so that the values in the value range currently displayed are displayed for the overall time range. The value range displayed only then changes if "Display all values" ⬛ is activated. **Note** The automatic scaling of the time axis is stopped when a zoom function is activated for the time axis. This button reactivates the automatic adjustments for the time range.
	Arrange in tracks	Activate or deactivate the trace arrangement. When the trace arrangement is activated the signals are arranged among themselves with the relevant value axes. Scaling groups are displayed in the same trace. This setting does not affect the display for the bit traces.
	Unit changeover of the time axis	Switching the unit of the time axis The following units are adjustable: • "Samples" • "Time (relative)" Relative time related to the trigger time • "Time stamp of the samples"
	Display samples	The samples are displayed as small circles on the curves.

Icon	Function	Description
	Interpolated representation	Linear interpolation between two consecutive samples for floating point numbers If linear interpolation is not enabled (default), the connection between the measuring points is drawn in steps.
	Display vertical measurement cursors	Display of the vertical measurement cursors. The vertical position of the two measurement cursors can be moved with the mouse. The associated measured values and the difference of the measurement cursors corresponding to the position are shown in the signal table. Display the "Measurement cursor" pane (Page 69) in the Trace task card in order to display more information. Also use the cursor keys. The following actions are possible for vertical measurement cursors with the cursor keys: • Select • Positioning • Show or hide measurement cursor • Center measurement cursors
	Display horizontal measurement cursors	Display of the horizontal measurement cursors. The horizontal position of the two measurement cursors can be moved with the mouse. Display the "Measurement cursor" pane (Page 45) in the Trace task card in order to display the values or to reposition the measurement cursor through entering the position. Also use the cursor keys. The following actions are possible for horizontal measurement cursors with the cursor keys: • Select • Positioning
	Show/hide time range display	Show or hide the time range display below the curve diagram The time range display shows the area in the curve diagram in yellow based on a selected signal. The yellow area can be moved with the mouse and the borders can be changed horizontally.
	Show/hide chart legend	Showing or hiding of the legend in the curve diagram and the bit track labels.
	Align the chart legend to the left	Display of the legend and the bit track labels on the left side of the curve diagram.
	Align the chart legend to the right	Display of the legend and the bit track labels on the right side of the curve diagram.
	Change background color	Changeover between various background colors.

Shortcut menu commands

The following table shows the shortcut menu commands in the curve diagram:

Shortcut menu command	Description
"Undo"	Undoes the display adjustments last made. If several display adjustments have been made, they can be undone step-by-step. Applicable to the following display adjustments: • Show all • Display entire time range • Automatic scaling of the value axis • Move view • Zoom selection • Vertical zoom selection • Horizontal zoom selection • Zoom in • Zoom out
"Redo"	Redoes the last undone display adjustment. If several display adjustments have been undone, they can be redone step-by-step.
"Zoom in"	Zoom in to the display. The ranges of the time axis and value axis are reduced every time the button is clicked. The curves are displayed larger.
"Zoom out"	Zoom out of the display. The ranges of the time axis and value axis are increased every time the button is clicked. The curves are displayed smaller.
"Display all"	Scales the display of the available data so that the entire time range and all values are displayed.
"Automatic scaling of the value axis"	Scaling of the display so that all values are displayed for the currently displayed time range. The relative scaling ratio between the signals may change. **Note** The automatic scaling of the value axis is stopped when the zoom function is activated for the value axis. This button reactivates the automatic adjustments to the minimum/maximum values.
"Display entire time range"	Scaling of the display so that the values in the value range currently shown are displayed for the overall time range. The value range displayed only then changes if "Display all values" is activated. **Note** The automatic scaling of the time axis is stopped when a zoom function is activated for the time axis. This button reactivates the automatic adjustments for the time range.
"Arrange in tracks"	Activate or deactivate the trace arrangement. When the trace arrangement is activated the signals are arranged among themselves with the relevant value axes. Signal groups are displayed in the same trace. This setting does not affect the display for the bit traces.
"Measurement cursor"	You can find the following options in this submenu:

Shortcut menu command	Description	
"Measurement cursor"	"Show vertical measurement cursors"	Display of vertical measurement cursor. The vertical position of the two measurement cursors can be moved with the mouse. The associated measured values and the difference of the measurement cursors corresponding to the position are shown in the signal table. Display the "Measurement cursor" pane (Page 69) in the Trace task card in order to display further information. Also use the cursor keys. The following actions are possible for vertical measurement cursors with the cursor keys: • Select • Positioning • Show or hide measurement cursor • Center measurement cursors
	"Show horizontal measurement cursors"	Display of the horizontal measurement cursors. The horizontal position of the two measurement cursors can be moved with the mouse. Display the "Measurement cursor" pane (Page 69) in the Trace task card in order to display the values or to reposition the measurement cursor through entering the position. Also use the cursor keys. The following actions are possible for horizontal measurement cursors with the cursor keys: • Select • Positioning
	"Center measurement cursors"	Positions the activated measurement cursors at a central point in the current display.
"Save diagram as image"	Exports the current display in graphic format, e.g. as a bitmap.	
"Copy image to clipboard"	Copies the current display to the clipboard.	
"Add to measurements" (only axis control panel and PID)	Adds the displayed recording to the "Measurements" system folder.	
"Automatic bit track height"	Automatically adjusts the height of the bit tracks and thereby determines the size of the lower curve diagram. The setting is automatically deactivated once you change the space allocation between the curve diagrams manually. **Note** You can change the vertical space allocation between the upper and lower curve diagram. To do this drag the time axis of the upper curve diagram up or down with the mouse.	

4.2.3.2 User interface - signal table

The signal table lists the signals of the selected measurement and provides setting options for some properties.
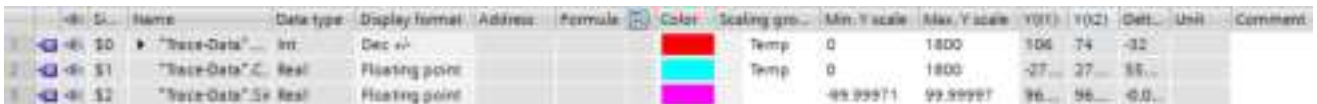
Trace settings can be changed on the device in online mode. The changes of the display options can be applied to the project using the ![button] button. Otherwise the changes are discarded during the switch to offline mode.

If the installed trace is added to the measurements, the current settings of the signal table are saved in the measurement.

The signals can be sorted using drag-and-drop. The bits of a signal can be resorted within a signal.

Setting options and displays in the signal table

The following figure shows an example of the display:

The following table shows the settings and displays of the recorded signals:

Column	Description
"Status" (Only project trace in online mode)	Status display
![icon]	No online connection
![icon]	Configuration only exists offline
![icon]	Online and offline configuration are different
![icon]	No access right
![icon]	Online and offline configuration are identical
Signal or error symbol	
![icon]	Signal
![icon]	Failsafe signal
![icon]	Signal from a data block
![icon]	Signal from a failsafe data block
![icon]	Calculated signal (formula)
![icon]	Error in the formula of the calculated signal
![icon] ![icon]	Selection for display in the curve diagram - a maximum of 16 signals can be selected. The point indicates that at least one bit has been selected for display as bit track for the signal in the bit selection.
"Signal reference" (only trace)	Automatically generated number of the signal The signal are accessed via the signal reference in the formulas.
"Device" (project trace only)	Display of the device name

Column	Description
"Name"	Display of the signal name A click on the name of a displayed signal updates the scale in the curve diagram. You can enter a name for a calculated signal in the last line without a signal symbol. The calculated signal is entered with its name.
"Measurement" (Only combined measurements)	Display of the measurement Shows the name of the measurement to which the signal belongs.
▶	Open bit selection Individual bits can also be selected for the following data types for display as a bit track in the lower curve diagram: • Byte, Word, DWord, LWord • SInt, USInt, Int, UInt, DInt, UDInt, LInt, ULInt Example of an opened bit selection for the DWORD data type: Select or deselect the relevant bit for display by clicking the ◁ icon.
▶ Bode	Automatically generated Bode signals Bode signals are automatically generated for amplitude and phase after entering a Bode formula for a signal. Click on the arrow to display the Bode signals.
"Data type"	Display of the data type
"Display format"	Display format of the signal The display formats supported for the signal are offered for selection. A display format suitable for the data type is set with "Default".
"Address"	Display of the address of the signal The field remains empty with optimized / type correct tags.
"Formula" (only trace)	Display or entry of a formula A formula can contain mathematical functions with numbers and signals. Use the formula editor to conveniently create formulas.
🔲	Call of the formula editor for calculated signals Click on the icon to open the formula editor.
"Color"	Display and setting option for the color of the signal
"Scaling group"	Display or input of the scaling group name for one scaling group The Y-scales are scaled identically for all signals of one scaling group. Enter an identical scaling group name for those signals that are to be scaled identically. Remove signals from the scaling group by deleting the scaling group name. The scaling groups are saved via the function "Use current view as standard" (button 🔲). **Notes** You cannot group binary signal events. In hex display format, group only the signals with a format compatible to the sign for the display. This setting is not available for the Bode diagram.

Column		Description
	Gray field for chain icon	Move the cursor over the gray field or the chain icon (or) to add the signal to a scaling group or delete the signal from the scaling group. Clicking the chain icon adds the signal to a scaling group or creates a new scaling group. Clicking the chain icon removes the signal from the scaling group. For a selected signal with scaling group, the chain icon displays all signals of the same scaling group.
	Input field	The input field displays the scaling group name. As an alternative to the chain icon, you can assign or delete a group name via text input in this field.
"Min. Y-scale"		Display or input of the minimum value for the scaling of the signal
"Max. Y-scale"		Display or input of the maximum value for the scaling of the signal
"Y(t1)"		Display of the value at the position of the first measurement cursor
"Y(t2)"		Display of the value at the position of the second measurement cursor
"ΔY"		Display of the value difference between the first and the second measurement cursor
		Selection of the automatic scaling of the value axis for the signal When the check box is selected, the minimum and maximum values for scaling the signal are adjusted so that all values are displayed for the currently displayed time range. The button on the toolbar of the curve diagram activates automatic scaling for all scalable signals.
"Unit"		Display of the unit For example, for unit-based values from technology objects
"Comment"		Display and input option for a comment about the signal

Shortcut menu commands

The following table shows the shortcut menu commands of the signal table:

Shortcut menu command	Description
"Insert calculated signal"	Inserts a re-calculated signal at the top in the table
"Edit formula"	Opens the formula editor for the calculated signal
"Cut"	Cannot be selected
"Copy"	Copies the contents of the selected lines to the clipboard.
"Paste"	Cannot be selected
"Delete"	Cannot be selected
"Rename"	Cannot be selected
"Display format"	Allows you to switch the display format The display formats supported for the signal are offered for selection.
"Display signal(s)"	Displays the selected signals in the curve diagram.
"Hide signal(s)"	Hides the selected signals in the curve diagram.

See also

4.2.3.3 Interface - Formula editor

The formula editor provides various mathematical functions for analyzing signals. Open the editor in the signal table by clicking 🔳.

Configuration options and displays in the formula editor

The following figure shows an example of the display:
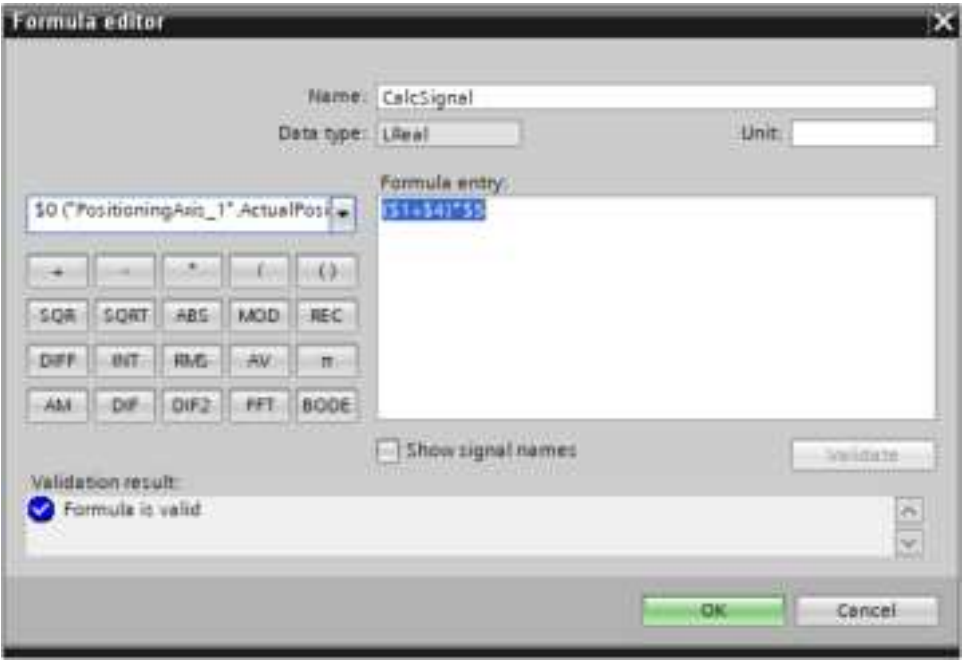
Figure 4-1 Formula editor

The following table shows the configuration options and displays of the formula editor:

Field/Button	Description
"Name"	Display and input of the name for the created formula The name must be unique and only contain characters that are allowed in Windows file names.
"Data type"	Display of formula data type The data type is pre-assigned with a floating-point number of LREAL type and cannot be changed.
"Unit"	Display and input of a unit Freely specified user-defined unit.
Drop-down list with signals	Selection of the signals The drop-down list contains the signals from the signal table and inserts a selected signal into the formula.

[1] The constant

Field/Button		Description
"Formula entry"		Text field to display and enter the formula Create a formula by typing into this text box or by using the buttons for the mathematical functions. Signals can be referenced in the text box using the signal reference with a prefixed $ character or the name in double quotes in the formula. Mixed input is possible. Restrictions: • Bits from a bit selection (e.g. below the INT data type) are not allowed in the formula. • Do not use any signal references to a tag in the formula that start with "$", for example, `$0("$0")`.
Mathematical functions		
	+	Addition
	-	Subtraction
	*	Multiplication
	/	Division
	()	Brackets Grouping expressions
	SQR	Square
	SQRT	Square root
	ABS	Absolute value Calculates the size of a number. **Examples** `ABS(5)` → 5 `ABS(-3)` → 3 `ABS(-3.14)` → 3.14
	MOD	Modulo Calculates the residual value of a division **Examples** `MOD(5,3)` → 2 `MOD(3.14,3)` → 0.14
	REC	Reciprocal value (1/x)
	DIFF [1]	Numerical differentiation **Examples** Formula: `DIFF($0,SAMPLETIME)`
	INT [1]	Numerical integration **Examples** Formula: `INT($0,SAMPLETIME)`
	RMS [1]	Quadratic mean The squares of all measured values are totaled and then divided by the number of measured values. The quadratic mean is the square root of this value. **Examples** Formula: `RMS($0,SAMPLETIME)`
	AV	Mean value filter from 1st to 5th order If the specification of an order is missing, the mean filter of the 1st order is used. **Examples** `AV($0,1)` → Mean filter 1st order `AV($0,5)` → Mean filter 5th order

[1] The constant

Field/Button		Description
	π	Mathematical constant Pi
	AM	Arithmetic mean The arithmetic mean is a moving average over five samples.
	DIF	Simple subtraction with mean filter from 1st to 5th order If the specification of an order is missing, simple subtraction is performed with a 1st order filter. **Examples** `DIF($0,1)` → Single subtraction with 1st order filter `DIF($0,5)` → Single subtraction with 5th order filter `DIF($0)` → Single subtraction with 1st order filter **Example: Calculate an acceleration curve from a velocity signal** `$0`: Velocity signal in meters per second Cycle time of the constant cycle velocity recording: 1 ms Formula: `DIF($0,1)/0.001` Unit: `m/s`^{2}
	DIF2	Double subtraction with mean filter from 1st to 5th order If the specification of an order is missing, then double subtraction is executed with a 1st order filter. **Examples** `DIF2($0,1)` → Double subtraction with 1st order filter `DIF2($0,5)` → Double subtraction with 5th order filter `DIF2($0)` → Double subtraction with 1st order filter **Example: Calculate an acceleration curve from a position sequence** `$0`: Position sequence in meters Cycle time of the constant cycle position recording: 1 ms Formula: `DIF2($0,1)/SQR(0.001)` Unit: `m/s`^{2}

	FFT	Fast Fourier transform
		A calculated signal as input parameter or calculations for the parameters are not permitted.
		Additional calculations with the FFT function are not permitted.
		Mandatory parameters
		An analog signal must be specified for the input parameter.
		Permitted data types:
		SINT, INT, DINT, LINT, USINT, UINT, UDINT, ULINT, REAL, LREAL, BYTE, WORD, DWORD, LWORD
		Optional parameters
		The following parameters can be optionally specified:
		• RemoveDirectCurrent
		  Remove direct current component
		  Data type Bool
		  If the parameter is not set, "true" is assumed as the default (Remove direct current component).
		• RangeStart
		  Index of the first sample to be displayed.
		  The index of the samples is displayed on the X axis in the FFT diagram.
		  If the parameter is not set, the first sample of the measurement is assumed as the default.
		• RangeEnd (RangeStart required)
		  Index of the last sample to be displayed.
		  The index of the samples is displayed on the X axis in the FFT diagram.
		  If the parameter is not set, the last sample of the measurement is assumed as the default.
		Valid examples

| Field/Button		Description

		$0=Input signal
		`FFT($0,true)`
		`FFT($0,0,1000)`
		`FFT($0,false,0,1000)`
		Invalid examples
		`FFT($0,20)`
		`FFT($0,0)`
		`FFT($0,1000,0)`
		`FFT($0)+10`
		`FFT($0)+SQRT($5)`

	BODE	Bode diagramwith amplitude and phase
		Calculated signals as parameter or calculations for the parameters are not permitted.
		Additional calculations with the Bode function are not permitted.
		Mandatory parameters
		Analog signals must be specified for the parameters of the input and output signal.
		Permitted data types for the parameters:
		SINT, INT, DINT, LINT, USINT, UINT, UDINT, ULINT, REAL, LREAL, BYTE, WORD, DWORD, LWORD
		Optional parameters
		The following parameters can be optionally specified:
		• RangeStart
		  Index of the first sample to be displayed.
		  The index of the samples is displayed on the X axis in the Bode diagram.
		  If the parameter is not set, the first sample of the measurement is assumed as the default.
		• RangeEnd (RangeStart required)
		  Index of the last sample to be displayed.
		  The index of the samples is displayed on the X axis in the Bode diagram.
		  If the parameter is not set, the last sample of the measurement is assumed as the default.
		Valid examples
		$0=input signal, $1=output signal
		`BODE($0,$1)`
		`BODE($0,$1,0,1000)`
		Invalid examples
		`BODE($0,20)`
		`BODE($0,$1,0)`
		`BODE($0,$1,1000)`
		`BODE($0+1,0)`
		`BODE($0,$1)+10`
		`BODE($0,$1)+SQRT($5)`

"Show signal name"		Display of the signal names If the check box is selected, the signal names in the formula are displayed instead of the signal references.
"Validate"		Check the validity of the formula
"Result of validation"		Result of validation Displays the result of the validation and indicates errors and error locations.
"OK"		Transfer the entries in the formula editor
"Cancel"		Discard the entries in the formula editor

[1] The constant

NOTE

The functions DIF, DIF2, DIFF, AM, RMS, AV and INT can only process one recorded signal as argument. Not all invalid formulas are marked as errors.

4.2.3.4 User interface - Measurements (Combined measurements)

The Measurements tab displays the individual measurements and among other things provides the setting options for synchronization.

Setting options and displays in the Measurements tab

The following figure shows an example of the display:
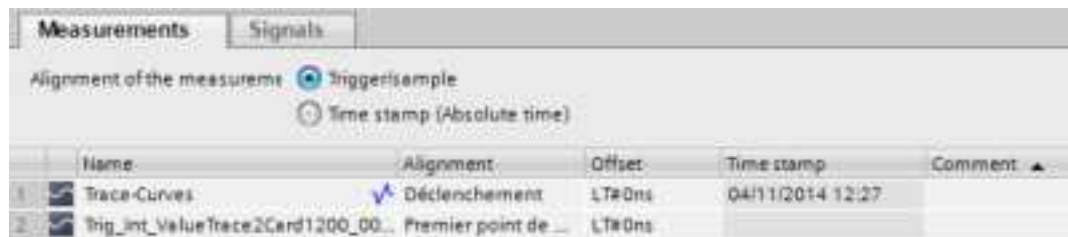
The following table shows the settings and displays for the measurements:

Column	Description
Alignment of the measurements (not available for the Bode diagram)	
"Trigger/measurement point"	Alignment of the measurements in accordance with the trigger or measurement point The individual zero point for the measurement is predefined in the table under the "Alignment" column.
"Time stamp (absolute time)"	Alignment of the measurements in accordance with their time stamp The signals are aligned in accordance with the time from the absolute time stamp.
Table columns	
	Static display of the measurement icon
"Name"	Display and change options for the measurement name The name must be a unique one and can be changed.
"Alignment"	Alignment of the measurement (only adjustable with the "Trigger/measurement point" check box activated) Determines the individual zero point for a measurement. All signals for the measurement are displayed in relation to this zero point. The following settings are possible: • Trigger • First sample after the trigger event • First sample • Last measurement point This setting is not available for the Bode diagram.

Column		Description
	"Offset"	Offset related to the time axis Moves the measurement left or right by the offset stated on the time axis. The offset can also be transferred via the clipboard to the cell from the ΔX value of the measurement cursor. See Aligning measurements with measurement cursor (Page 112). This setting is not available for the Bode diagram.
	"Time stamp"	Display of the trigger time
	"Comment"	Display and input option for a comment about the signal

Shortcut menu commands

The following table shows the shortcut menu commands of the signal table:

Shortcut menu command	Description
"Cut"	Cannot be selected
"Copy"	Copies the contents of the selected lines to the clipboard.
"Paste"	Cannot be selected
"Delete"	Cannot be selected
"Rename"	Switches the selected cell to the editing mode.
"Import measurement"	Imports a measurement from a file, e.g. with the "*.ttrecx" file extension. The import is device-independent and also suitable, for example, for comparing measurements of a PLC with the measurements of a drive device. For reasons of compatibility, the "*.ttrec" file extension is supported in V12, although it does not contain any information about the device family.
"Export measurement"	Exports a measurement as a file with the extension "*.ttrecx" or "*.csv". For reasons of compatibility, the "*.ttrec" file extension is supported in V12, although it does not contain any information about the device family.

4.2.4 User interface - FFT diagram tab

4.2.4.1 User interface - curve diagram

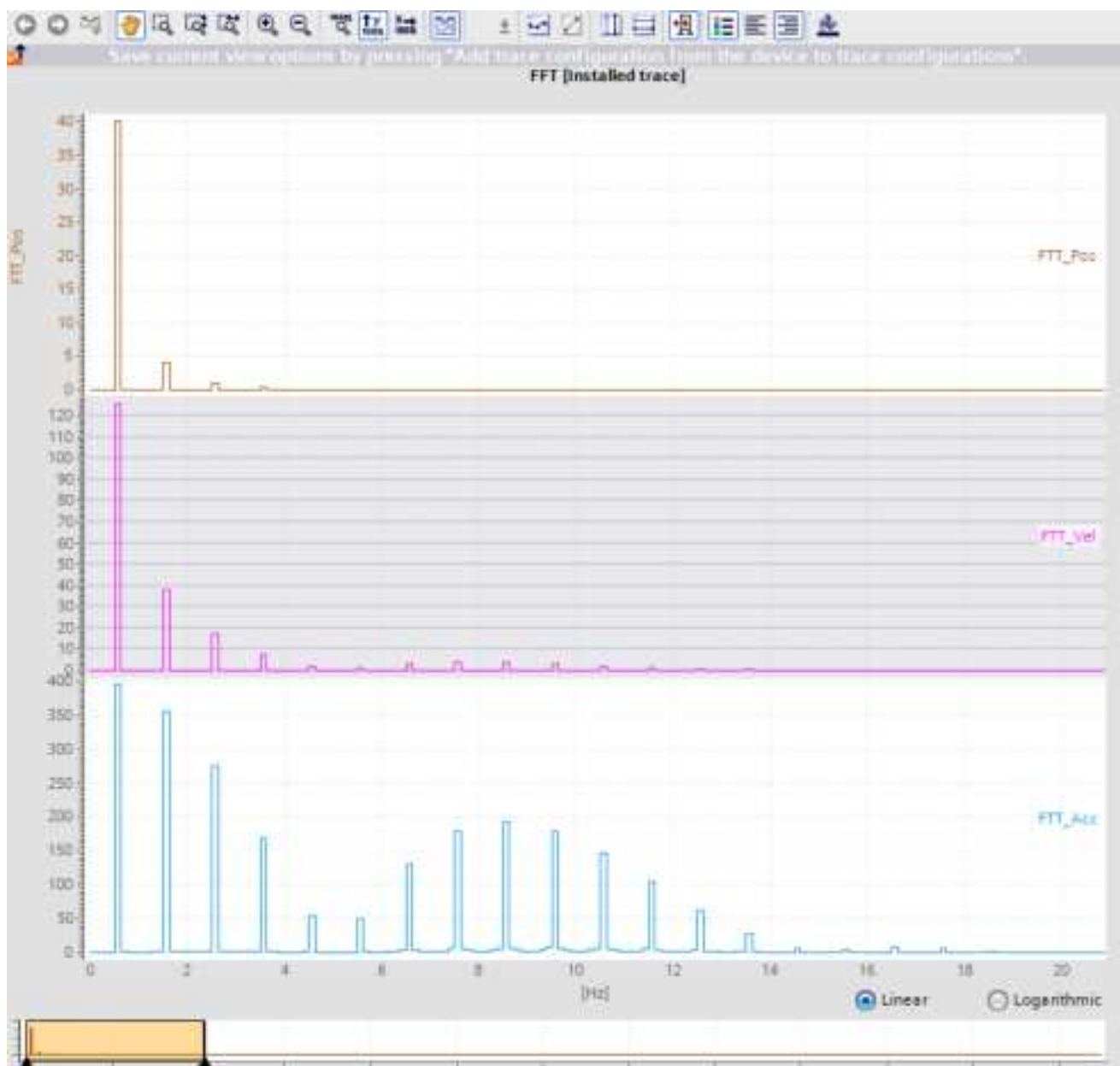The FFT diagram shows the frequency spectra of measured signals calculated with the FFT formula.
The Y axis shows the amplitude. The display of values on the Y axis is linear.
The X axis represents the frequency in Hertz. You can set the display of values on the X axis as linear or logarithmic.

Setting options and displays in the curve diagram

The following figure shows an example of the display:

Below the curve diagram, you can change the partitioning of the X axis with the options "Linear" and "Logarithmic".

Functions using the mouse wheel

The following table shows which functions are possible in the curve diagram using the mouse wheel:

Function of the mouse wheel	Description
Move the curve diagram vertically	Turning the mouse wheel moves the display in the upper curve diagram up or down. If the signals are arranged in traces, the display of the group is shifted below the cursor. The mouse pointer must be positioned above the curve diagram with the analog signals.
Move the curve diagram horizont-ally	Turning the mouse wheel with the <Shift> button pressed down moves the display in the curve diagram to the left or the right. The cursor must be positioned above the curve diagram.
Zoom in and zoom out	Turning the mouse wheel with the <Ctrl> button pressed down zooms in or out of the display in the curve diagram. The cursor position is the starting point for zooming in or out. The value axis of the lower curve diagram (bit tracks) is not affected. The cursor must be positioned above the curve diagram.

Functions using the keyboard

The following table shows which keyboard commands are possible with a focus on the curve diagram:

Shortcut key	Description
Selecting a measurement cursor	
<Ctrl+Shift+1>	The vertical measurement cursor t1 is selected or deselected.
<Ctrl+Shift+2>	The vertical measurement cursor t2 is selected or deselected.
<Ctrl+Shift+3>	The horizontal measurement cursor Y1 is selected or deselected.
<Ctrl+Shift+4>	The horizontal measurement cursor Y2 is selected or deselected.
<Tab>	The next measurement cursor is selected.
Positioning a vertical measurement cursor	
<Left>, <Right>	With the unit "Samples", the selected measurement cursor is moved by one sample by the signal in the foreground.
<Shift+Left>, <Shift+Right>	With the unit "Samples", the selected measurement cursor is moved by 10 samples by the signal in the foreground.
Positioning a horizontal measurement cursor	
<Up>, <Down>	The selected measurement cursor is moved by one pixel along the Y axis.

Shortcut key	Description
<Shift+Up>, <Shift+Down>	The selected measurement cursor is moved by 10 pixels along the value axis.
Display of vertical measurement cursors	
<Ctrl+Space>	The vertical measurement cursors are shown or hidden.
<Ctrl+Shift+Space>	The vertical measurement cursors are shown and centered for the current view.
Changing the view	
<Space>	Move view
<Ctrl+0>	Set 100% view in open editor
<Ctrl++>	Apply zoom in with 10%
<Ctrl+->	Apply zoom out with 10%

Toolbar of the curve diagram

Tools are available for adapting the display via buttons.

The following table shows the functions of the buttons:

Icon	Function	Description	
	Undo	Undoes the display adjustments last made. If several display adjustments have been made, they can be undone step-by-step. Applicable to the following display adjustments: • Show all • Display entire time range • Automatic scaling of the value axis • Move view • Zoom selection • Vertical zoom selection • Horizontal zoom selection • Zoom in • Zoom out	
	Redo	Redoes the last undone display adjustment. If several display adjustments have been undone, they can be redone step-by-step.	
	Standard view	Not used	
	Move view	Moves the display with the mouse button pressed.	
	Zoom selection	Selection of an arbitrary range with the mouse button pressed. The display is scaled to the range selection.	
	Vertical zoom selection	Selection of a vertical range with the mouse button pressed. The display is scaled to the range selection. Depending on the mouse position, the selection influences either the amplitude response or the phase response.	

Icon	Function	Description	
	Horizontal zoom selection	Selection of a horizontal range with the mouse button pressed. The display is scaled to the range selection.	
	Zoom in	Enlargement of the display. The ranges of the time axis and value axis are reduced every time the button is clicked. The curves are displayed larger.	
	Zoom out	Reduction of the display. The ranges of the time axis and value axis are increased every time the button is clicked. The curves are displayed smaller.	
	Display all	Scales the display of the available data so that the entire time range and all values are displayed.	
	Automatic scaling of the value axis	Scaling of the display so that the entire value range is displayed for the set time range.	
	Show the overall time range	Scaling of the display so that the values in the value range currently displayed are displayed for the overall time range. The value range displayed only then changes if "Display all values" is activated. **Note** The automatic scaling of the time axis is stopped when a zoom function is activated for the time axis. This button reactivates the automatic adjustments for the time range.	
	-	Not used	
	Display samples	The samples are displayed as small circles on the curves.	
	-	Not used	
	Display vertical measurement cursors	Display of the vertical measurement cursors. The vertical position of the two measurement cursors can be moved with the mouse. The associated measured values and the difference of the measurement cursors corresponding to the position are shown in the signal table. Display the "Measurement cursor" pane in the Trace task card in order to display more information. Also use the cursor keys. The following actions are possible for vertical measurement cursors with the cursor keys: • Select • Positioning • Show or hide measurement cursor • Center measurement cursors	
	Display horizontal measurement cursors	Display of the horizontal measurement cursors. The horizontal position of the two measurement cursors can be moved with the mouse.	

Icon	Function	Description	
		Display the "Measurement cursor" pane in the Trace task card in order to display the values or to reposition the measurement cursor through entering the position. Also use the cursor keys. The following actions are possible for horizontal measurement cursors with the cursor keys: • Select • Positioning	
	Show/hide time range display	Show or hide the time range display below the curve diagram The time range display shows the area in the curve diagram in yellow based on a selected signal. In the Bode diagram, the time range display has an effect on the frequency. The yellow area can be moved with the mouse and the borders can be changed horizontally.	
	Show/hide chart legend	Showing or hiding of the legend in the curve diagram.	
	Align the chart legend to the left	Display of the legend on the left side of the curve diagram.	
	Align the chart legend to the right	Display of the legend on the right side of the curve diagram.	
	Change background color	Changeover between various background colors.	

Shortcut menu commands

The following table shows the shortcut menu commands in the curve diagram:

Shortcut menu command	Description
"Undo"	Undoes the display adjustments last made. If several display adjustments have been made, they can be undone step-by-step. Applicable to the following display adjustments: • Show all • Display entire time range • Automatic scaling of the value axis • Move view • Zoom selection • Vertical zoom selection • Horizontal zoom selection • Zoom in • Zoom out
"Redo"	Redoes the last undone display adjustment. If several display adjustments have been undone, they can be redone step-by-step.

Shortcut menu command	Description	
"Zoom in"	Zoom in to the display. The ranges of the time axis and value axis are reduced every time the button is clicked. The curves are displayed larger.	
"Zoom out"	Zoom out of the display. The ranges of the time axis and value axis are increased every time the button is clicked. The curves are displayed smaller.	
"Display all"	Scales the display of the available data so that the entire time range and all values are displayed.	
"Automatic scaling of the value axis"	Scaling of the display so that all values are displayed for the currently displayed time range. The relative scaling ratio between the signals may change. **Note** The automatic scaling of the value axis is stopped when the zoom function is activated for the value axis. This button reactivates the automatic adjustments to the minimum/maximum values.	
"Display entire time range"	Scaling of the display so that the values in the value range currently shown are displayed for the overall time range. The value range displayed only then changes if "Display all values" is activated. **Note** The automatic scaling of the time axis is stopped when a zoom function is activated for the time axis. This button reactivates the automatic adjustments for the time range.	
"Arrange in tracks"	Activate or deactivate the trace arrangement. When the trace arrangement is activated the signals are arranged among themselves with the relevant value axes. Signal groups are displayed in the same trace. This setting does not affect the display for the bit traces.	
"Measurement cursor"	You can find the following options in this submenu:	
	"Show vertical measurement cursors"	Display of vertical measurement cursor. The vertical position of the two measurement cursors can be moved with the mouse. The associated measured values and the difference of the measurement cursors corresponding to the position are shown in the signal table. Display the "Measurement cursor" pane in the Trace task card in order to display further information. Also use the cursor keys. The following actions are possible for vertical measurement cursors with the cursor keys: • Select • Positioning • Show or hide measurement cursor • Center measurement cursors

Shortcut menu command	Description	
"Measurement cursor"	"Show horizontal measurement cursors"	Display of the horizontal measurement cursors. The horizontal position of the two measurement cursors can be moved with the mouse. Display the "Measurement cursor" pane in the Trace task card in order to display the values or to reposition the measurement cursor through entering the position. Also use the cursor keys. The following actions are possible for horizontal measurement cursors with the cursor keys: • Select • Positioning
	"Center measurement cursors"	Positions the activated measurement cursors at a central point in the current display.
"Save diagram as image"	Exports the current display in graphic format, e.g. as a bitmap.	
"Copy image to clipboard"	Copies the current display to the clipboard.	
"Add to measurements" (Only axis control panel and PID, and only if FFT feature is enabled)	Adds the displayed recording to the "Measurements" system folder.	

4.2.4.2 User interface - signal table

See User interface - signal table (Page 45) in the section User interface - Time diagram tab.

4.2.4.3 Interface - Formula editor

See Interface - Formula editor (Page 48) in the section User interface - Time diagram tab.

4.2.5 User interface - Bode diagram tab

4.2.5.1 User interface - curve diagram

The Bode diagram shows the amplitude and phase of the transfer function as a function of the frequency. The X axis represents the frequency in Hertz.
The Y axis shows the following values:
• Amplitude response in the top curve diagram, values linear in decibels
• Phase response in the bottom curve diagram, values linear in degrees
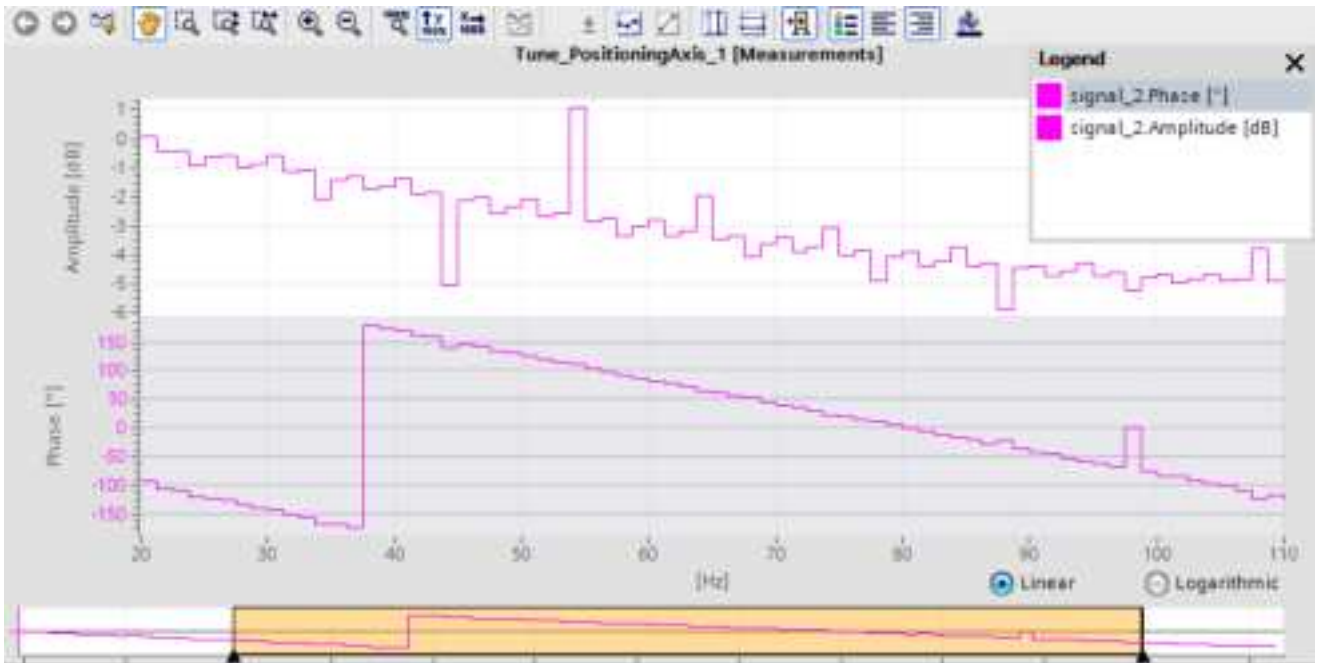
The following requirements must be met for the calculation and display of the Bode diagram:
• The recording cycle must be constant.
• The input signal must contain at least three samples.

The curve diagram is calculated using two measured signals with the Bode formula in the formula editor and displayed.

Setting options and displays in the curve diagram

The following figure shows an example of the display:

Below the curve diagram, you can change the partitioning of the X axis with the options "Linear" and "Logarithmic".

Functions using the mouse wheel

The following table shows which functions are possible in the curve diagram using the mouse wheel:

Function of the mouse wheel	Description
Move the curve diagram vertically	Turning the mouse wheel moves the display in the upper curve diagram up or down. If the signals are arranged in traces, the display of the group is shifted below the cursor. The mouse pointer must be positioned above the curve diagram with the analog signals.
Move the curve diagram horizontally	Turning the mouse wheel with the <Shift> button pressed down moves the display in the curve diagram to the left or the right. The cursor must be positioned above the curve diagram.
Zoom in and zoom out	Turning the mouse wheel with the <Ctrl> button pressed down zooms in or out of the display in the curve diagram. The cursor position is the starting point for zooming in or out. The value axis of the lower curve diagram (bit tracks) is not affected. The cursor must be positioned above the curve diagram.

Functions using the keyboard

The following table shows which keyboard commands are possible with a focus on the curve diagram:

Shortcut key	Description
Selecting a measurement cursor	
<Ctrl+Shift+1>	The vertical measurement cursor t1 is selected or deselected.
<Ctrl+Shift+2>	The vertical measurement cursor t2 is selected or deselected.
<Ctrl+Shift+3>	The horizontal measurement cursor Y1 is selected or deselected.
<Ctrl+Shift+4>	The horizontal measurement cursor Y2 is selected or deselected.
<Tab>	The next measurement cursor is selected.
Positioning a vertical measurement cursor	
<Left>, <Right>	With the unit "Samples", the selected measurement cursor is moved by one sample by the signal in the foreground.
<Shift+Left>, <Shift+Right>	With the unit "Samples", the selected measurement cursor is moved by 10 samples by the signal in the foreground.
Positioning a horizontal measurement cursor	
<Up>, <Down>	The selected measurement cursor is moved by one pixel along the Y axis.
<Shift+Up>, <Shift+Down>	The selected measurement cursor is moved by 10 pixels along the value axis.
Display of vertical measurement cursors	
<Ctrl+Space>	The vertical measurement cursors are shown or hidden.
<Ctrl+Shift+Space>	The vertical measurement cursors are shown and centered for the current view.
Changing the view	
<Space>	Move view
<Ctrl+0>	Set 100% view in open editor
<Ctrl++>	Apply zoom in with 10%
<Ctrl+->	Apply zoom out with 10%

Toolbar of the curve diagram

Tools are available for adapting the display via buttons.
The following table shows the functions of the buttons:

Icon	Function	Description	
	Undo	Undoes the display adjustments last made. If several display adjustments have been made, they can be undone step-by-step.	

Icon	Function	Description	
		Applicable to the following display adjustments: • Show all • Display entire time range • Automatic scaling of the value axis • Move view • Zoom selection • Vertical zoom selection • Horizontal zoom selection • Zoom in • Zoom out	
	Redo	Redoes the last undone display adjustment. If several display adjustments have been undone, they can be redone step-by-step.	
	Standard view	Not used	
	Move view	Moves the display with the mouse button pressed.	
	Zoom selection	Selection of an arbitrary range with the mouse button pressed. The display is scaled to the range selection.	
	Vertical zoom selection	Selection of a vertical range with the mouse button pressed. The display is scaled to the range selection. Depending on the mouse position, the selection influences either the amplitude response or the phase response.	
	Horizontal zoom selection	Selection of a horizontal range with the mouse button pressed. The display is scaled to the range selection.	
	Zoom in	Enlargement of the display. The ranges of the time axis and value axis are reduced every time the button is clicked. The curves are displayed larger.	
	Zoom out	Reduction of the display. The ranges of the time axis and value axis are increased every time the button is clicked. The curves are displayed smaller.	
	Display all	Scales the display of the available data so that the entire time range and all values are displayed.	
	Automatic scaling of the value axis	Scaling of the display so that the entire value range is displayed for the set time range.	
	Show the overall time range	Scaling of the display so that the values in the value range currently displayed are displayed for the overall time range. The value range displayed only then changes if "Display all values" is activated. **Note** The automatic scaling of the time axis is stopped when a zoom function is activated	

Icon	Function	Description	
		for the time axis. This button reactivates the automatic adjustments for the time range.	
	-	Not used	
	Display samples	The samples are displayed as small circles on the curves.	
	-	Not used	
	Display vertical measurement cursors	Display of the vertical measurement cursors. The vertical position of the two measurement cursors can be moved with the mouse. The associated measured values and the difference of the measurement cursors corresponding to the position are shown in the signal table. Display the "Measurement cursor" pane in the Trace task card in order to display more information. Also use the cursor keys. The following actions are possible for vertical measurement cursors with the cursor keys: • Select • Positioning • Show or hide measurement cursor • Center measurement cursors	
	Display horizontal measurement cursors	Display of the horizontal measurement cursors. The horizontal position of the two measurement cursors can be moved with the mouse. Display the "Measurement cursor" pane in the Trace task card in order to display the values or to reposition the measurement cursor through entering the position. Also use the cursor keys. The following actions are possible for horizontal measurement cursors with the cursor keys: • Select • Positioning	
	Show/hide time range display	Show or hide the time range display below the curve diagram The time range display shows the area in the curve diagram in yellow based on a selected signal. In the Bode diagram, the time range display has an effect on the frequency. The yellow area can be moved with the mouse and the borders can be changed horizontally.	
	Show/hide chart legend	Showing or hiding of the legend in the curve diagram.	

Icon	Function	Description	
	Align the chart legend to the left	Display of the legend on the left side of the curve diagram.	
	Align the chart legend to the right	Display of the legend on the right side of the curve diagram.	
	Change background color	Changeover between various background colors.	

Shortcut menu commands

The following table shows the shortcut menu commands in the curve diagram:

Shortcut menu command	Description
"Undo"	Undoes the display adjustments last made. If several display adjustments have been made, they can be undone step-by-step. Applicable to the following display adjustments: • Show all • Display entire time range • Automatic scaling of the value axis • Move view • Zoom selection • Vertical zoom selection • Horizontal zoom selection • Zoom in • Zoom out
"Redo"	Redoes the last undone display adjustment. If several display adjustments have been undone, they can be redone step-by-step.
"Zoom in"	Zoom in to the display. The ranges of the time axis and value axis are reduced every time the button is clicked. The curves are displayed larger.
"Zoom out"	Zoom out of the display. The ranges of the time axis and value axis are increased every time the button is clicked. The curves are displayed smaller.
"Display all"	Scales the display of the available data so that the entire time range and all values are displayed.
"Automatic scaling of the value axis"	Scaling of the display so that all values are displayed for the currently displayed time range. The relative scaling ratio between the signals may change. **Note** The automatic scaling of the value axis is stopped when the zoom function is activated for the value axis. This button reactivates the automatic adjustments to the minimum/maximum values.

Shortcut menu command	Description	
"Display entire time range"	Scaling of the display so that the values in the value range currently shown are displayed for the overall time range. The value range displayed only then changes if "Display all values" is activated. **Note** The automatic scaling of the time axis is stopped when a zoom function is activated for the time axis. This button reactivates the automatic adjustments for the time range.	
"Measurement cursor"	You can find the following options in this submenu:	
	"Show vertical measurement cursors"	Display of vertical measurement cursor. The vertical position of the two measurement cursors can be moved with the mouse. The associated measured values and the difference of the measurement cursors corresponding to the position are shown in the signal table. Display the "Measurement cursor" pane in the Trace task card in order to display further information. Also use the cursor keys. The following actions are possible for vertical measurement cursors with the cursor keys: • Select • Positioning • Show or hide measurement cursor • Center measurement cursors
	"Show horizontal measurement cursors"	Display of the horizontal measurement cursors. The horizontal position of the two measurement cursors can be moved with the mouse. Display the "Measurement cursor" pane in the Trace task card in order to display the values or to reposition the measurement cursor through entering the position. Also use the cursor keys. The following actions are possible for horizontal measurement cursors with the cursor keys: • Select • Positioning
	"Center measurement cursors"	Positions the activated measurement cursors at a central point in the current display.
"Save diagram as image"	Exports the current display in graphic format, e.g. as a bitmap.	
"Copy image to clipboard"	Copies the current display to the clipboard.	
"Add to measurements" (Axis control panel and PID only, and only if Bode feature is enabled)	Adds the displayed recording to the "Measurements" system folder.	

4.2.5.2 User interface - signal table

See User interface - signal table (Page 45) in the section User interface - Time diagram tab.

4.2.5.3 Interface - Formula editor

See Interface - Formula editor (Page 48) in the section User interface - Time diagram tab.

4.2.6 User interface - Signal selection tab (Combined measurements)

4.2.6.1 User interface - Signal selection (Combined measurements)

The Signal selection tab shows the signals for all measurements and allows signals that are presented in the signal table of the diagram to be preselected.

Setting options and displays in the Signal selection tab.

The following figure shows an example of the display:

The following table shows the settings and displays for the table:

Column	Description
▪️🔲	Static display of the signal icon
"Available in the diagram"	Selection for the display in the curve diagram When the selection is activated the signal is transferred to the signal table for the curve diagram.
"Measurement"	Display of the measurement to which the signal belongs
"Name"	Display of the signal name
"Data type "	Display of the data type
"Address"	Display of the address (not for symbolic tags)
"Scaling group"	Display of the scaling group name
"Comment"	Display of a comment on the signal

You will find further information on the specific settings in User interface - signal table (Page 45).

Shortcut menu commands

The following table shows the shortcut menu commands for the signal selection:

Shortcut menu command	Description
"Copy"	Copies the content of the selected lines to the clipboard.
"Display selection in the signal table"	The selected signals are displayed in the signal table and are available in the diagram.
"Remove selection from the signal table"	The removed signals are not available in the diagram.

Several objects can be selected.

4.3 Inspector window

## 4.3.1 Interface - Inspector window

The Inspector window displays general information about the trace.

Additional information is available for measurements:

- Time stamp range
  The availability of the time stamps depends on the configured recording conditions.
- Measuring point range
- Cycle time range
  For equidistant cycle recordings, the time duration between two measurement points is displayed.
  This time, for example, can be used in the formula editor.

Sample time stamp

The following figure shows the time stamps for a measurement:
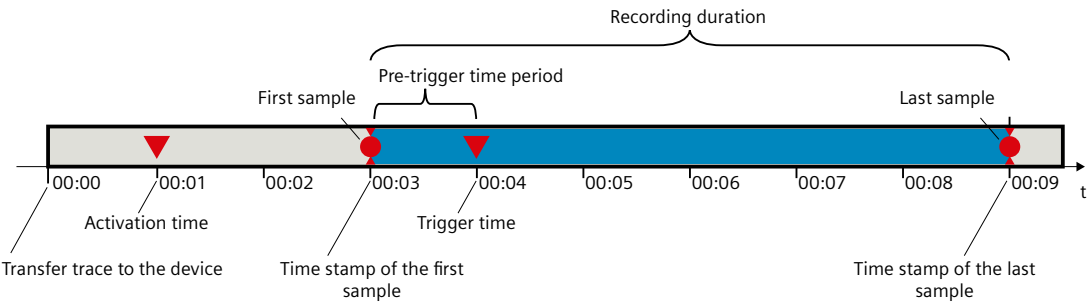
NOTE

Analysis of measurements with sporadically occurring recording condition

When evaluating your measurements, keep in mind that the recording condition between the activation time and the trigger time may not have been fulfilled.

4.4   Trace task card

4.4.1   User interface - Measurement cursor pane

The "Measurement cursor" pane shows the position of the measurement cursor in the curve diagram and the values at the intersection points.

Setting options and displays of the "Measurement cursor" pane

The figure below shows the "Measurement cursor" pane:

The following table describes the settings and displays:

Setting/display		Description
Horizontal measurement cursor		
	Y1	Position of first measurement cursor The value states the position in relation to the scale of the signal currently selected. You also have the option of specifying a new position for the measurement cursor in this entry field for moving with the mouse.
	Y2	Position of the second measurement cursor The value states the position in relation to the scale of the signal currently selected. You also have the option of specifying a new position for the measurement cursor in this entry field for moving with the mouse.
	ΔY	Display of the position difference between the first and the second measurement cursor
Vertical measurement cursor		

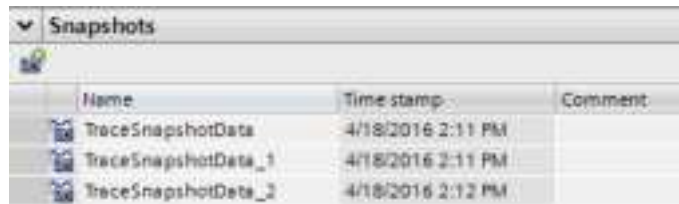| Setting/display		Description
	t1	Position of first measurement cursor You also have the option of specifying a new position for the measurement cursor in this entry field for moving with the mouse.
	t2	Position of the second measurement cursor You also have the option of specifying a new position for the measurement cursor in this entry field for moving with the mouse.
	Δt	Display of the position difference between the first and the second measurement cursor
Intersection points with selected signal		
	Y(t1)	Display of the value at the position of the first measurement cursor
	Y(t2)	Display of the value at the position of the second measurement cursor
	ΔY	Display of the value difference between the first and the second measurement cursor
Mathematical analysis in the range of the measurement cursor·[t1;t2] for the selected signal (not for Bode diagram)		
	AM(Y)	Mean The arithmetic mean is calculated for the range between the vertical measurement cursors.
	INT(Y)	Integral The integral is calculated for the range between the vertical measurement cursors.
	RMS(Y)	RMS value The root-mean square (RMS value) is calculated for the range between the vertical measurement cursors.

See also

4.4.2   User interface - Snapshots pane

The "Snapshots" pane allows the user to save and restore different views for a measurement. A snapshot is taken of the current view in the "Timing diagram" or "Bode diagram" tab. The snapshots are saved in the measurement with the project.

Setting options and displays of the "Snapshots" pane

The figure below shows the "Snapshots" pane:

The following table shows the functions of the buttons:

Icon	Description
	Generate snapshot of the current view Saves the current view as a snapshot in the "Timing diagram" or "Bode diagram" tab.

The following table shows the settings and displays:

Column	Description
	Static display of the snapshot symbol
"Name"	Display and change options for the name
"Time stamp"	Display of the snapshot generation time
"Comment"	Display and input option for a comment

Several rows can be selected and deleted.

Double-clicking on a row opens the measurement with the saved view in the "Time diagram" or "Bode diagram" tab.

Shortcut menu commands

The following table shows the shortcut menu commands of the table:

Shortcut menu command	Description
"Restore snapshot"	Shows the measurement with the saved view in the "Time diagram" or "Bode diagram" tab.
"Delete"	Deletes the snapshot
"Rename"	Switches the cell to the editing mode

Several rows can be selected and deleted.

Project trace software user interface

5

5.1 Structure of the user interface

The user interface of the project trace consists of several combined areas.

The figure below shows an example of the layout of the user interface:
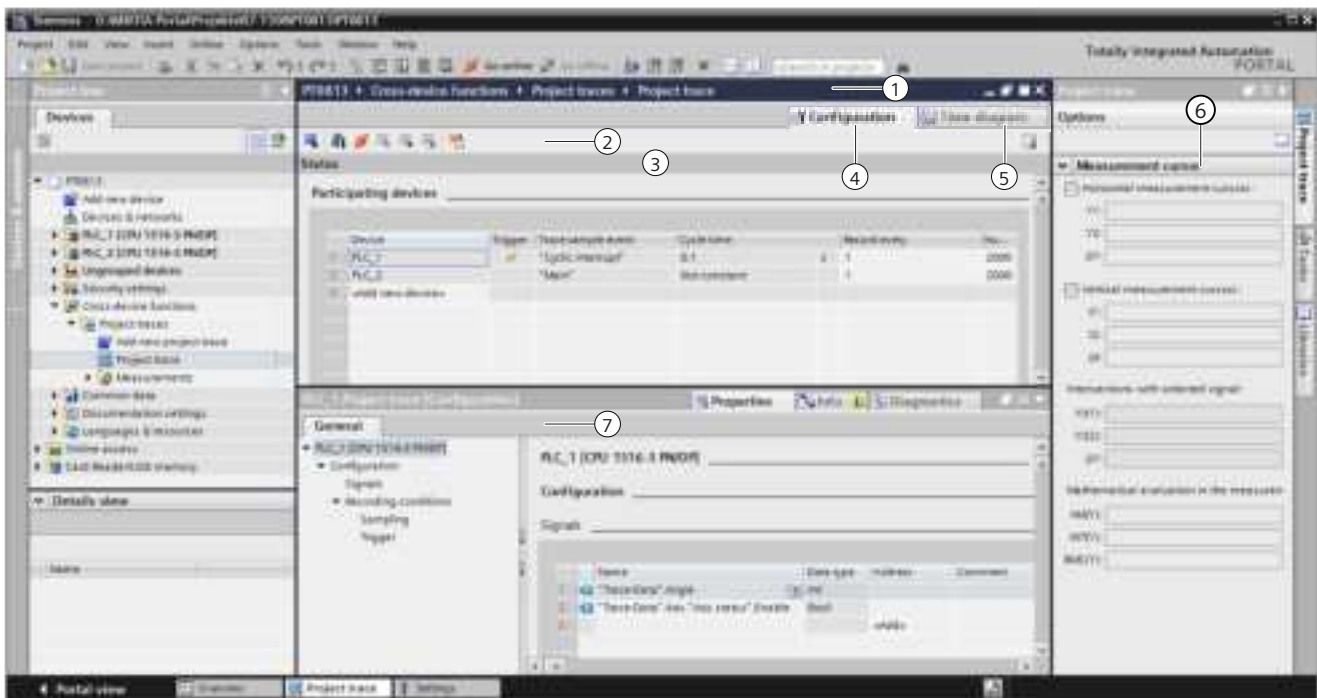
Project tree
Manage and create project traces and measurements directly in the project tree and via shortcut-menu commands.

Working area
① Title bar of the working area Displays the name of the project trace.
② Project trace toolbar Buttons to manage the project traces: • Transfer trace configurations to the devices • Display status overview of participating devices • Establish online connection to participating devices • Activating/deactivating project traces • Deleting project traces • Transferring measurements from the devices to the project
③ Status display of the project trace Display of the current status of the recording.

④ Configuration tab Configuration of the participating devices and signals for the project trace.
⑤ Time diagram tab Display of the recorded values as a curve diagram and the signals from the displayed measurement. Specification of the display options.
"Trace" task card⑥ Display of the measurement cursor data with mathematical evaluation ⑥ and snapshots.
Inspector window⑦ Device-specific configuration of the recording duration, trigger condition and signal selection. Display of general information about the project trace.

5.2 Project tree

5.2.1 User interface - Project tree folder "Cross-device functions" - "Project traces"

Project trace configurations and measurements 🖫are shown in the system folder 🖿 "Project traces".

Double-click a project trace to open the corresponding "Configuration" or "Time diagram" tab in the working area.

Symbols in the "Project traces" folder

The following table explains the symbols in the folder 🖿 "Project traces":

Icon	Description
🖫	Adding a project trace configuration Double-click the symbol to add a new project trace configuration and open the "Configuration" tab.
🖫	Project trace configuration Double-click the icon to open the "Configuration" or "Time diagram" tab.
🖫	**"Measurements" folder** The folder contains combined measurements that were added using the 🖫 button. The measurements are compatible with the combined measurements within the devices. The configurations of the individual measurements are displayed when the combined measurement is copied or moved to the corresponding folder of a device.
🖫	Measurement Double-click the icon to open the "Time diagram" tab.

Shortcut menu commands

The following table shows the shortcut-menu commands for the system folder ▦ "Project traces":

Shortcut menu command	Description
"Add new project trace"	Adds a new project trace and opens the "Configuration" tab.

The following table shows the shortcut-menu commands for the project trace configuration ▦:

Shortcut menu command	Description
"Delete"	Deletes the selected objects from the project tree or from the device.
"Rename"	Switches the selected object to the editing mode.

NOTE

Shortcut menu commands for the 🗐 "Measurements" system folder

The shortcut commands are described in User interface - "Combined measurements" project tree folder (Page 33).

You can export measurements of the project trace as combined measurement and import them again under a device. For the import, use the shortcut menu of the system folder 🗐 "Combined measurements" under the device.

5.3 Working area

5.3.1 User interface - Project trace toolbar

Buttons provide tools for handling the project trace.
The following table shows the functions of the buttons:

Icon	Description
◥	Transferring the trace configurations to the devices The trace configurations are transferred to the participating devices.
◥	Display of the status overview Shows the status overview of the participating devices (Page 75).
◢	Establishing an online connection The online connection to the participating devices is established.
◥	Activate recording If the recording of an installed trace is repeated, then the settings relevant for the display (curve diagram and signal table) are also retained for the new recording. You cannot redo an interrupted recording. **Note** When a recording is restarted, the previously recorded values are lost.

Icon	Description
	To save the recorded values, save the measurement in the project before you activate the recording again.
	Deactivate recording Deactivates the traces in all devices that can be reached online.
	Delete traces from devices Deletes the traces from the participating devices that can be reached online.
	Transferring measurements from the devices to the project The measurements are added to the system folder "Measurements". **Note** Only the data loaded from the devices is saved. This data is displayed in the curve diagram. If necessary, wait until the display is updated.

5.3.2 User interface - status overview of the participating devices

The dialog shows status information about the participating devices.

For participating devices with status without error, you can apply trace configurations to the devices.

Display in the status overview table

The following table shows the displays of the status overview:

Column	Description
-	Display of whether there is an error for the project trace in the participating device or whether the trace configuration is faulty. A tooltip above the symbol displays information about the cause of the error.
	Meaning in offline mode • Configured trace is faulty **Meaning in online mode** • Configured trace is faulty • Recording was interrupted • Connection error
Device	Display of the device name
Device status	Status display of the online connection
	Offline
	Connect or disconnect
	Online
Trace status	Status display of the devices If there is an existing online connection, a symbol indicates the status of the trace configuration for the corresponding device. In addition, the trace status for the device is displayed, for example, "Monitoring". **Note** If only one device in the project trace shows the "Monitoring" trace status, the project trace is not working correctly; there is no time synchronization between the devices.

Column	Description
🟢	Online and offline configuration are identical
🔵	Online and offline configuration are different
🔵	Configuration only exists offline

Remedy for errors

The following list shows possible sources of error and the remedy.

- Firmware
  With the devices it is described if and from which firmware a device supports the project trace.
- Trace configuration
  Check the settings for the respective device in the "Properties" tab of the Inspector window.
- Canceled recording
  You can restart an interrupted recording by transferring the trace configurations again.
- Project trace requirements
  Check that the general requirements for the project trace (Page 23) are met.

5.3.3   User interface - Configuration tab

5.3.3.1   User interface - Configuration

The "Configuration" tab is used to define the participating devices for the project trace. You configure the device-dependent trace configuration and the properties of the project trace in the Inspector window (Page 78).

The displayed trace configuration is always the offline configuration, even with an existing online connection. Transfer changes of the trace configurations to the devices using the 🔳 button.

Setting options and displays in the overview of the participating devices

The figure below shows an example of the display of the overviews table:

The following table shows the settings and displays of the participating devices:

Column	Description
Device	Input of the device name
🔳	Button to open the device selection table The button is displayed when the table line is selected. Clicking the symbol opens a table which offers possible devices for selection. The selected device is displayed in the input field.

Column	Description
Trigger	The symbol ▥ indicates which devices can activate a trigger. Configure this device-dependent setting in the "Properties" tab of the Inspector window.
Trace sample event	Display of the trace sample event In the "Properties" tab of the Inspector window, configure in which cycle (OB with a SIMATIC CPU) the recording should take place.
Cycle time	Display of the time cycle resulting from the selection of the trace sample event
Record every	Input of the reduction ratio
Number of samples	Input of the number of samples to be recorded The recording duration is adjusted according to the input.
Recording duration	Input of the recording duration The number of samples is adjusted according to the input.
Errors	Display of an error in the trace configuration
⊗	A tooltip above the symbol displays information about the cause of the error. Configured traces with the Error status cannot be transferred to the device.

5.3.4 User interface - Time diagram tab

The "Time diagram" tab of the project trace behaves in the same way as the trace and is described in the section User interface - Time diagram tab (Page 38).

5.4 Inspector window

5.4.1 Interface - Inspector window

The display in the "Properties" tab of the Inspector window depends on the current selection in the working area.

If no table row with a device is selected in the working area, general information about the project trace is displayed. If a table row with a device is selected, the device-dependent trace configuration is displayed, which is described for the respective device.

General information in the "Properties" tab.

The following figure shows an example of the display:

The following table shows the settings and displays of the recorded signals:

| Field	Description
Name	Input field for the name of the project trace
Author	Input field for the name of the author
Comment	Input field for a comment.
Trace ID	Display of the Trace ID Using this ID, you can distinguish, for example, between several active project traces.
Port number	Input field for the port number of the connection The devices participating in the project trace communicate via this port. The numbers must be identical and unique on all devices. Observe also the instructions for assigning port numbers in the TIA Portal information system.

5.5 Trace task card

The displayed panes are described in the section "Trace task card (Page 69)".

Long-term project trace software user interface

6

6.1 Structure of the user interface

The user interface of the long-term project trace consists of several combined areas.
The figure below shows an example of the layout of the user interface:
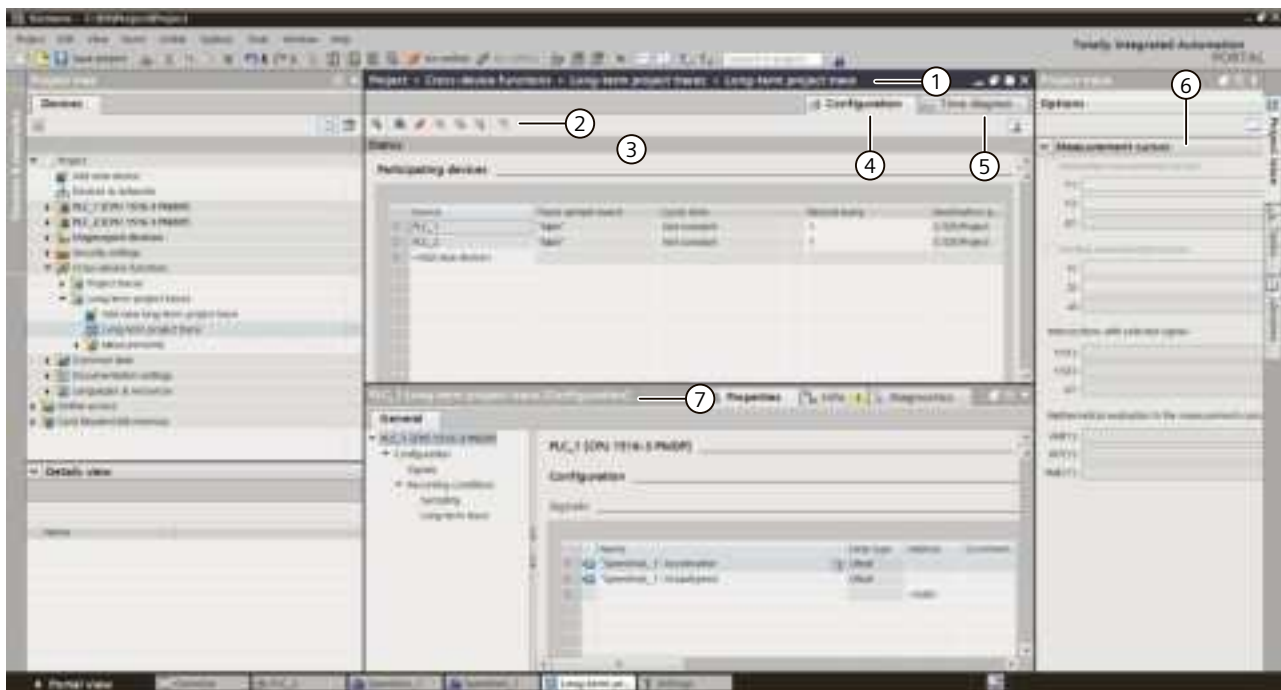
Project tree Manage and create long-term project traces and measurements directly in the project tree and via shortcut-menu commands.	
Workspace	
① Title bar of the workspace Shows the name of the long-term project trace	
② Toolbar of the long-term project trace. Buttons to manage the long-term project traces: • Apply trace configurations to the devices • Display status overview of participating devices • Establish online connection to participating devices • Activate/deactivate recording • Delete traces from devices • Add to measurements	
③ Status display of long-term project trace. Display of the current status of the recording.	

④ Configuration tab Configuration of the participating devices and signals for the long-term project trace.	
⑤ Time diagram tab Display the recorded values as a curve diagram and the signals from the displayed measurement. Specify the display options.	
"Trace" task card⑥ Display of the measurement cursor data with mathematical evaluation	
Inspector window⑦ Device-specific configuration Display of general information for the long-term project trace	

6.2 Project tree

6.2.1 User interface - Project tree folder "Cross-device functions" - "Long-term project traces"

Long-term project traces configurations and measurements 🔲 are shown in the system folder 🔲 "Long-term project traces".

Double-click on a long-term project trace to open the corresponding "Configuration" or "Time diagram" tab in the workspace.

Icons in the "Long-term project traces" folder

The following table explains the icons in the 🔲 "Long-term project traces" folder:

Icon	Description
🔲	Add long-term project trace configuration Double-click the icon to add a new long-term project trace configuration and open the "Configuration" tab.
🔲	Long-term project trace configuration Double-click the icon to open the "Configuration" or "Time diagram" tab.
🔲	"Measurements" folder The folder contains combined measurements that were added using the 🔲 button. The measurements are compatible with the combined measurements within the devices. The configurations of the individual measurements are displayed when the combined measurement is copied or moved to the corresponding folder of a device.
🔲	Measurement Double-click the icon to open the "Time diagram" tab.

Shortcut menu commands

The following table shows the shortcut-menu commands for the system folder "Long-term project traces":

Shortcut menu command	Description
"Add new long-term project trace"	Adds a new long-term project trace and opens the "Configuration" tab.

The following table shows the shortcut-menu commands for the long-term project trace configuration :

Shortcut menu command	Description
"Delete"	Deletes the selected objects from the project tree or from the device.
"Rename"	Switches the selected object to the editing mode.

NOTE

Shortcut menu commands for the "Measurements" system folder

The shortcut commands are described in User interface - "Combined measurements" project tree folder (Page 33).

6.3 Workspace

6.3.1 User interface - Long-term project trace toolbar

Tools for handling the long-term project trace are available via buttons.
The following table shows the functions of the buttons:

Icon	Description
	Transferring the trace configurations to the devices The trace configurations are transferred to the participating devices.
	Display of the status overview Shows the status overview of the participating devices (Page 83).
	Establishing an online connection The online connection to the participating devices is established.
	Activate recording If the recording of a trace is repeated, then the settings relevant for the display (curve diagram and signal table) are also retained for the new recording. You cannot redo an interrupted recording. **Note** When a recording is restarted, the previously recorded values are lost. To save the recorded values, save the measurement in the project before you activate the recording again.

Icon	Description
	Deactivate recording Deactivates the traces in all devices that can be reached online.
	Delete traces from devices Deletes the traces from the participating devices that can be reached online.
	Add to measurements The recording is added as a measurement in the system folder "Measurements".

6.3.2 User interface - status overview of the participating devices

The dialog shows status information about the participating devices.

For participating devices with status without error, you can apply trace configurations to the devices.

Display in the status overview table

The following table shows the displays of the status overview:

Column		Description
-		Display of whether there is an error for the long-term project trace in the participating device or whether the trace configuration is faulty. A tooltip above the symbol displays information about the cause of the error.
		Meaning in offline mode • Configured trace is faulty **Meaning in online mode** • Configured trace is faulty • Recording was interrupted • Connection error
Device		Display of the device name
Device status		Status display of the online connection
		Offline
		Connect or disconnect
		Online
Trace status		Status display of the devices If there is an existing online connection, a symbol indicates the status of the trace configuration for the corresponding device. In addition, the trace status for the device is displayed, for example, "Monitoring". **Note** If only one device in the long-term project trace shows the "Monitoring" trace status, the long-term project trace is not working correctly; there is no time synchronization between the devices.
		Online and offline configuration are identical
		Online and offline configuration are different
		Configuration only exists offline

Remedy for errors

The following list shows possible sources of error and the remedy.

- Firmware
  With the devices it is described if and from which firmware a device supports the long-term project trace.
- Trace configuration
  Check the settings for the respective device in the "Properties" tab of the Inspector window.
- Canceled recording
  You can restart an interrupted recording by transferring the trace configurations again.
- Project trace requirements
  Check that the general requirements for the long-term project trace are fulfilled.

6.3.3 User interface - Configuration tab

6.3.3.1 User interface - Configuration

The "Configuration" tab is used to define the participating devices for the long-term project trace. You configure the device-dependent trace configuration and the properties of the long-term project trace in the Inspector window (Page 85).

The displayed trace configuration is always the offline configuration, even with an existing online connection. Transfer changes of the trace configurations to the devices using the 🔧 button.

Setting options and displays in the overview of the participating devices

The figure below shows an example of the display of the overviews table:

The following table shows the settings and displays of the participating devices:

Column	Description
Device	Input of the device name
📱	Button to open the device selection table The button is displayed when the table line is selected. Clicking the symbol opens a table which offers possible devices for selection. The selected device is displayed in the input field. The number of devices that can be selected in the table is limited to 5. After 5 devices have been selected, this button is available only in read mode.

Column	Description
Cycle time	Display of the time cycle resulting from the selection of the trace sample event
Record every	Input of the reduction ratio
Target path	Display of the folder used for recording the long-term project traces.
Errors	Display of an error in the trace configuration
⊗	A tooltip above the symbol displays information about the cause of the error. Configured traces with the Error status cannot be transferred to the device.

6.3.4 User interface - Time diagram tab

The "Time diagram" tab of the long-term project trace behaves in the same way as the trace and is described in the section User interface - Time diagram tab (Page 38).

6.4 Inspector window

6.4.1 Interface - Inspector window

The display in the "Properties" tab of the Inspector window depends on the current selection in the workspace.
If no table row with a device is selected in the workspace, general information about the long-term project trace is displayed. If a table row with a device is selected, the device-dependent trace configuration is displayed, which is described for the respective device (Page 114).

General information in the "Properties" tab.

The following figure shows an example of the display:

The following table shows the settings and displays of the recorded signals:

Field	Description
Name	Input field for the name of the long-term project trace
Author	Input field for the name of the author
Comment	Input field for a comment.
Target path	Display of the folder used for storing the long-term project trace
Trace ID	Display of the Trace ID Using this ID, you can distinguish, for example, between several active long-term project traces.

6.5   Trace task card

The displayed panes are described in the section Trace task card .

Operation

<div style="text-align: right; font-size: large;">**7**</div>

7.1 Quick start

7.1.1 Trace quick start

This description shows the steps for a recording of the S7-1500 CPU as an example. The displayed settings can differ depending on the device.

Requirement

A device is configured that supports the trace and logic analyzer function.

Creating a trace

The following figure shows the project tree with the "Traces" system folder below the device:
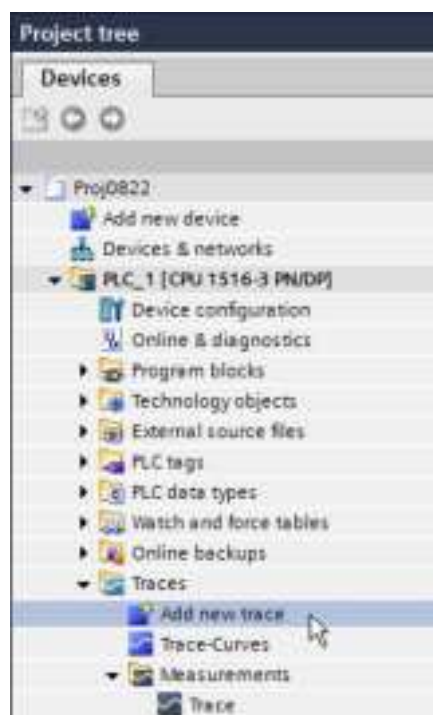
Procedure:

1. Double-click the "Add new trace" entry.
   A new trace configuration is created and the "Configuration" tab opens in the working area.
2. Adapt the name of the trace configuration by clicking the text.

Selecting signals

The following figure shows the configuration of the signals:
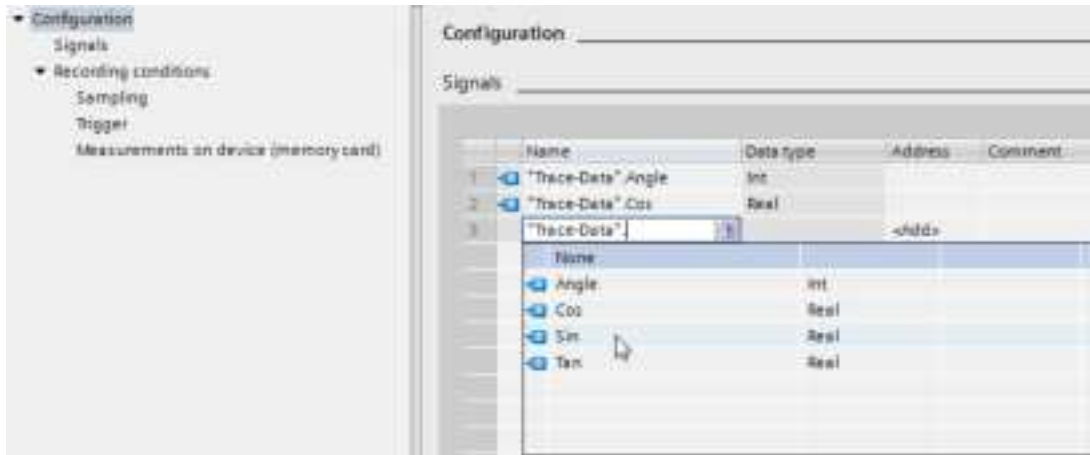
Procedure:
1. Select the signals to be recorded in the "Signals" area.
   Or:
2. Drag one or more signals, e.g. from a tag table, and drop them in the signal table.

Configuring the recording cycle

The following figure shows the configuration of the sampling:

Procedure:
1. Under "Sampling", configure the recording conditions for the measurement.

Configuring the trigger

The following figure shows the configuration of the trigger:
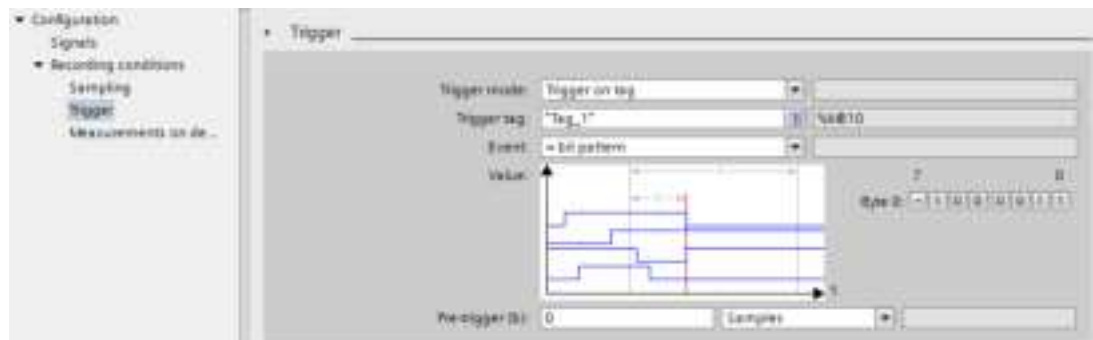
Procedure:

1. Configure the trigger mode and the condition for the selected trigger.

Configuring display options (optional)

The following figure shows the configuration of the display options:
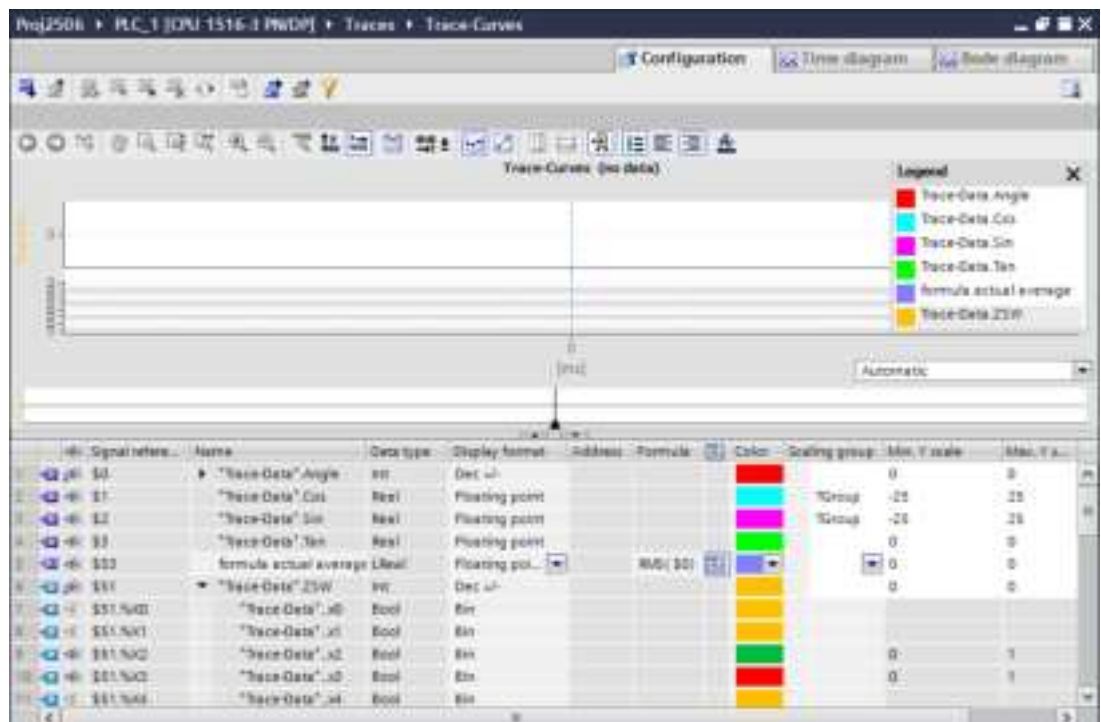
Procedure:

1. Switch to the "Time diagram" tab.
2. Set the desired display options in the curve diagram and in the signal table.

Transferring the trace configuration to the device

Procedure:

1. Transfer the trace configuration to the device with the ⬛ button.
   The following functions are executed:
   – An online connection is established to the device.
   – The trace configuration is transferred to the device.
   – The monitoring is activated.
   – The display switches to the "Time diagram" tab.

Activating a recording

Procedure:

1. Click ⬛.

Displaying the recording

The following figure shows the curve diagram with a recording:

Procedure:

1. Wait until the "Recording" or "Recording completed" status is displayed in the status display of the trace.
2. Switch to the "Time diagram" tab.
3. Click the ▶ icon of a signal in the signal table.
   The individual bits of the signal are offered for display as a bit track.
4. In the signal table, select or deselect the individual signals and bits for display with the ◀ ◀ icon.

Saving the measurement in the project

Procedure:

1. Transfer the measurement to the project with the 🔲 button.
   The measurement is displayed in the project tree under the 🔲 "Measurements" system folder.

See also

## 7.1.2 Quick Start for long-term trace

This description shows the steps for a long-term trace recording of the S7-1500 CPU as an example. The displayed settings can differ depending on the device.

Requirement

A device that supports the long-term trace function is created in the TIA Portal project.

Creating a long-term trace

The following figure shows the project tree with the [icon] "Traces" system folder below the device:
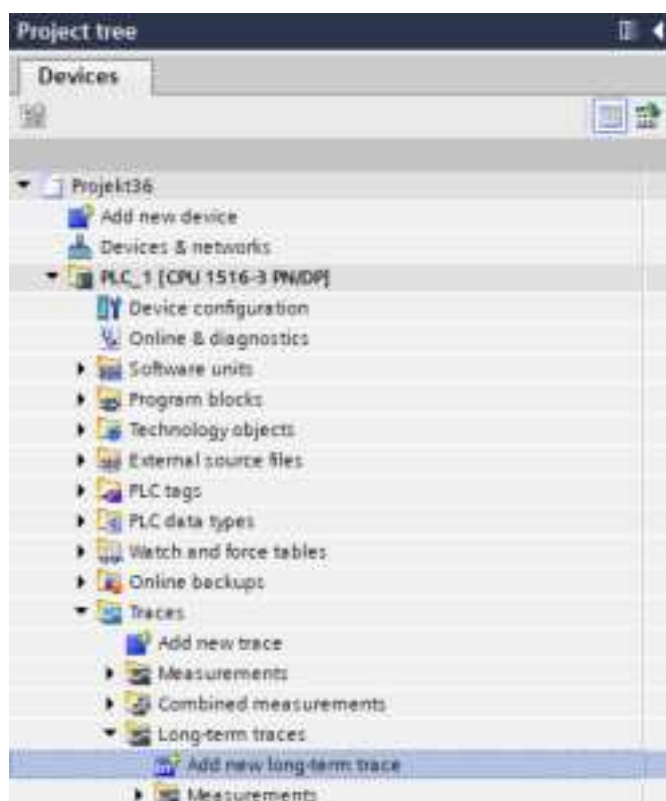
Procedure:

1. Double-click the "Add new long-term trace" entry.
   A new long-term trace configuration [icon] is created and the "Configuration" tab opens in the workspace.
2. Adapt the name of the trace configuration by clicking the text.

Selecting signals

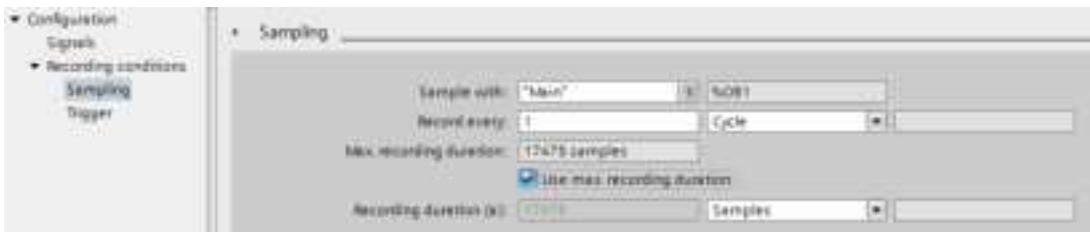The following figure shows the configuration of the signals:

Configuring the recording cycle

The following figure shows the configuration of the sampling:
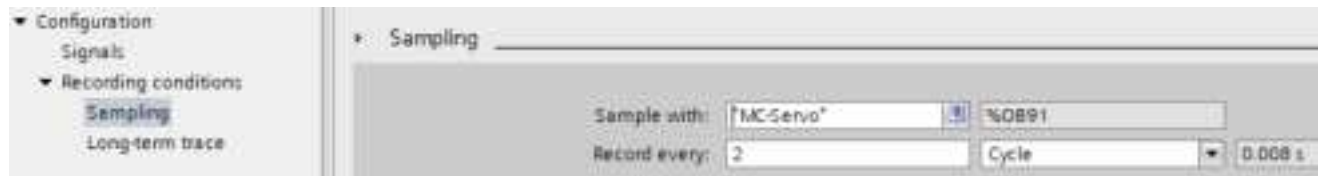
Procedure:

1. Under "Sampling", configure the recording conditions for the measurement.

Configuring the target path

The default target path is the folder of the STEP 7 project.

The following figure shows the configuration of the target path:

Transferring the trace configuration to the device

Procedure:

1. Transfer the trace configuration to the device with the 🔛 button.
   The following functions are executed:
   - An online connection is established to the device.
   - The trace configuration is transferred to the device.
   - The monitoring is activated.
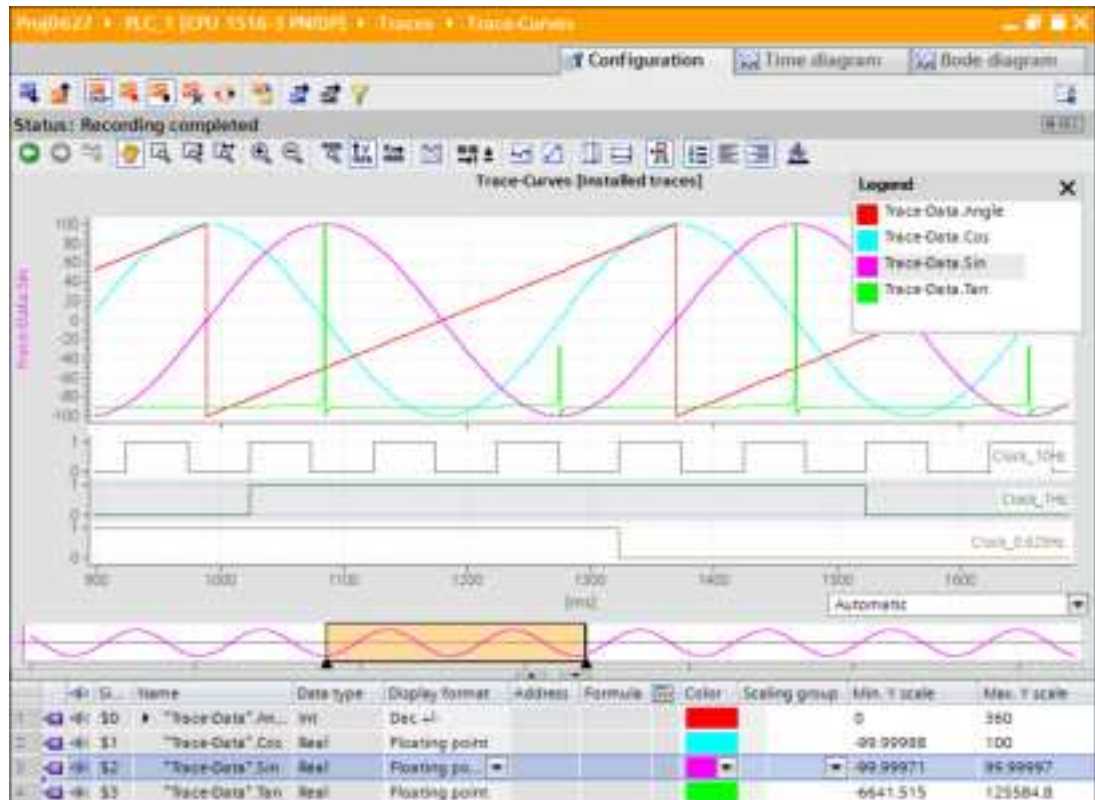   - The display switches to the "Time diagram" tab.

The trace configuration is saved in the target path as an .lttcd file.

Activating recording

Procedure:

1. Click the 🟥 button.

The "Recording in progress" status is displayed.
The recording is saved in the target path as a .csv file.

NOTE

Note that problems with online access between the PG and the CPU can result in errors or even failure of the recording.

If possible, connect the PG directly to the CPU.

You can also find more information about long-term trace recording as a csv file in the sectionLong-term trace recording .

Deactivating recording

Procedure:

1. Click 🟥.

The "Stopped" status is displayed.

Displaying the recording

The recording from the long-term trace is displayed in the time diagram.
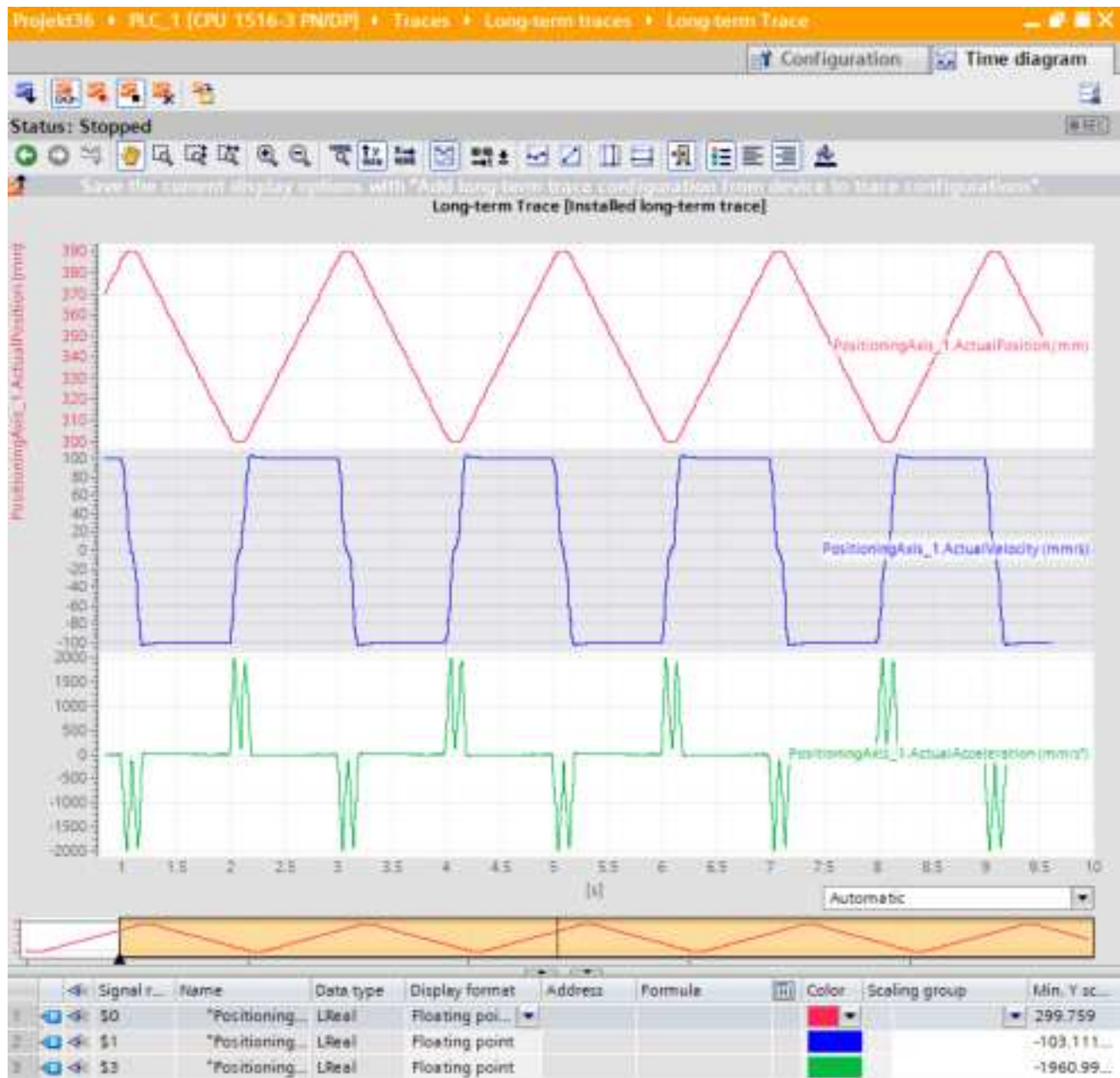
Saving the long-term trace measurement in the project

Procedure:

1. Transfer the measurement to the project with the 📑 button.

The long-term trace measurement is displayed in the project tree under the 📊 "Measurements" system folder.

Add to combined long-term trace measurement

To create a combined long-term trace measurement based on the long-term trace measurement, proceed as follows:

1. In the ⊡ "Measurements" system folder, select the long-term trace measurement.

2. Use drag-and-drop to move the long-term trace measurement ( ) to the system folder "Combined measurements".

The combined long-term trace measurement ( ) is displayed in the system folder.

To add another long-term trace measurement to an existing combined long-term trace measurement, proceed as follows:

1. In the ⊡ "Measurements" system folder, select the long-term trace measurement.

2. Use drag-and-drop to move the long-term trace measurement ( ) to the combined long-term trace measurement ( ).

7.1.3   Project trace quick start

This description shows an example of the steps for a recording with project trace for two S7-1500 CPUs. The displayed settings can differ depending on the device.

Requirements

- Two S7-1500 CPUs with firmware version V2.8 or higher are configured.
- The general requirements for the project trace are fulfilled.

Add project trace

The following figure shows the project tree with the ⊞ "Project traces" system folder below the cross-device functions:
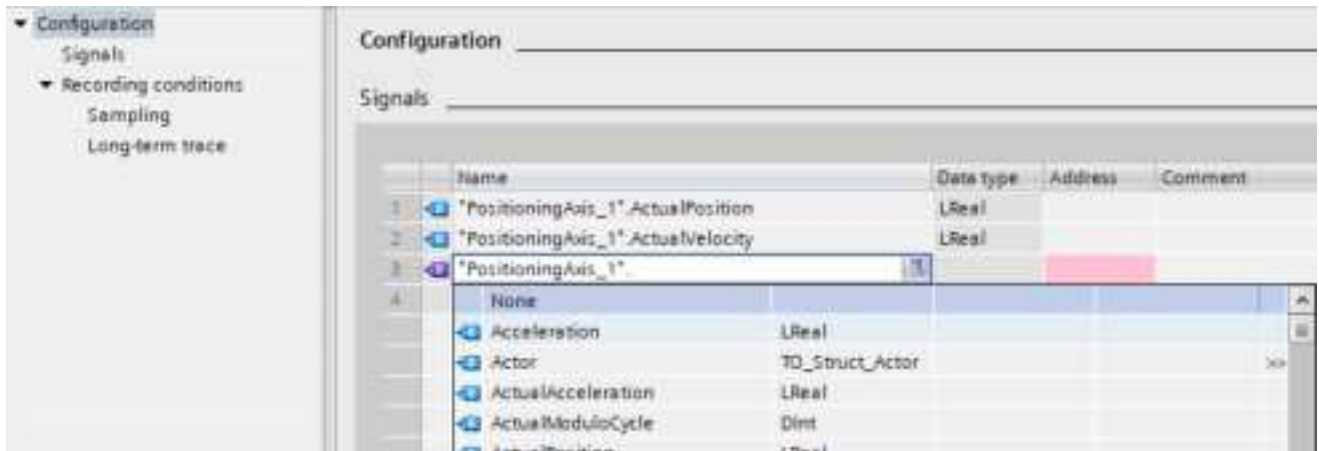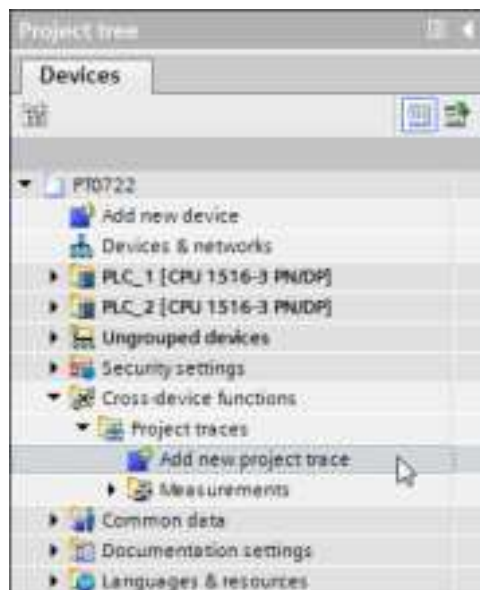
Procedure:

1. Double-click the "Add new project trace" entry.

   A new project trace configuration 🔳 is created and the "Configuration" tab opens in the working area.

2. Adapt the name of the project trace configuration by clicking the text.

Adding devices

The following figure shows the adding of the devices.
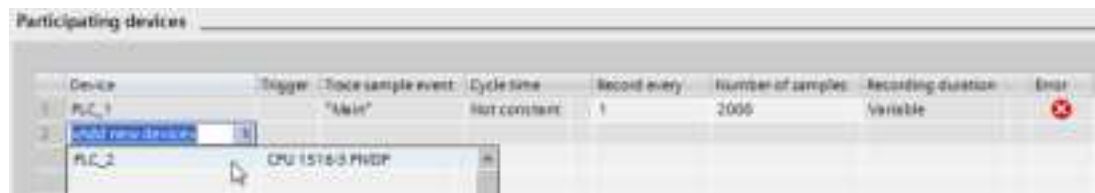
Procedure:

1. Select the devices in the "Participating devices" area.

Configuring signals and recording conditions of devices

The following figure shows two participating devices and the configuration of "PLC_1".
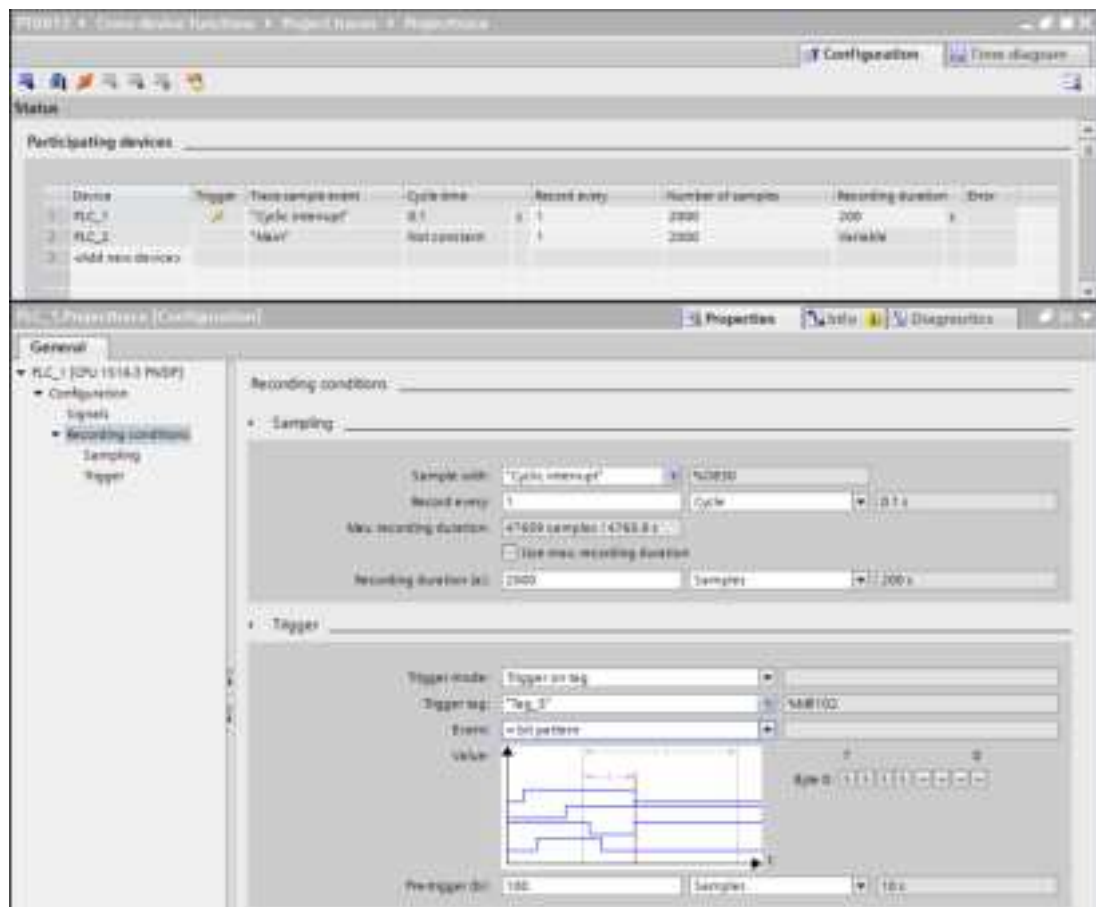
Procedure:

1. Select a device in the "Participating devices" area.
2. Select the "Properties" tab in the Inspector window.
3. Select the signals to be recorded in the "Signals" area.
   Or:
4. Drag one or more signals, e.g. from a tag table, and drop them in the signal table.
5. Configure the sampling.
6. Configure the trigger mode and the condition for the selected trigger.
7. Redo the configuration from step 1 for each participating device.

For "PLC_2", "Trigger from another Device" is configured as trigger mode in the example shown here.

Apply trace configurations to the devices

Procedure:

1. Open the status overview of the participating devices using the ⬛ button.
2. Transferring the trace configurations to the devices using the ⬛ button.
3. Check the status in Status overview (Page 75) and correct any errors that have occurred.

Activate recording

Procedure:

1. Click ▣.

Displaying recordings

Procedure:

1. In the status overview of the participating devices, check whether the required recordings have already been completed.
2. Switch to the "Time diagram" tab.

Saving measurements in the project

Procedure:

1. Transfer the measurements to the project using the ▣ button.

   The measurements are displayed in the project tree under the system folder ▣ "Measurements".

7.1.4   Quick access to the long-term project trace

This description shows an example of the steps for a recording with long-term project trace for two S7-1500 CPUs. The displayed settings can differ depending on the device.

Requirements

- Two S7-1500 CPUs with firmware version V2.8 or higher are configured.
- The general requirements for the long-term project trace are fulfilled.

NOTE

In read-only mode, the long-term project trace option is disabled or can only be used with restrictions.

Add long-term project trace

The following figure shows the project tree with the ⊞ "Long-term project traces" system folder below the cross-device functions:
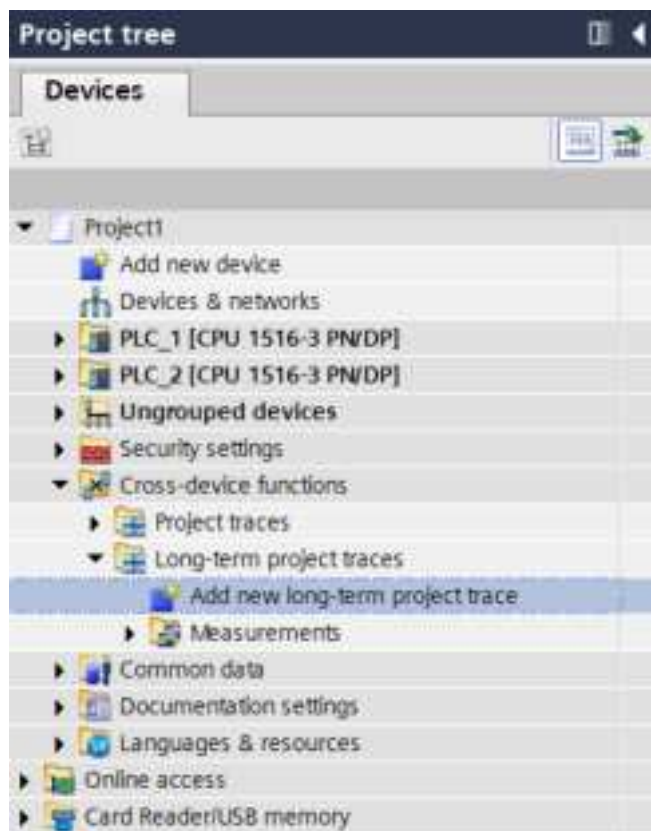
Procedure:

1. Double-click on the "Add new long-term project trace" entry.
   A new long-term project trace configuration is created and the "Configuration" tab opens in the workspace.

2. Adapt the name of the long-term project trace configuration by clicking the text.

Adding devices

The following figure shows the adding of the devices.
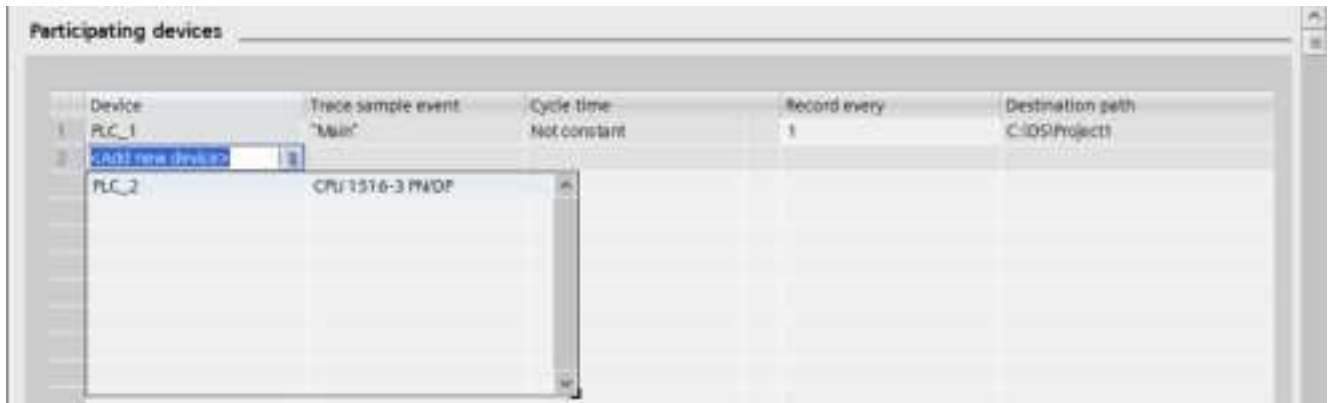
Procedure:

1. Select the devices under the "Participating devices".

Configuring signals and recording conditions of devices

The following figure shows two participating devices and the configuration of "PLC_1".
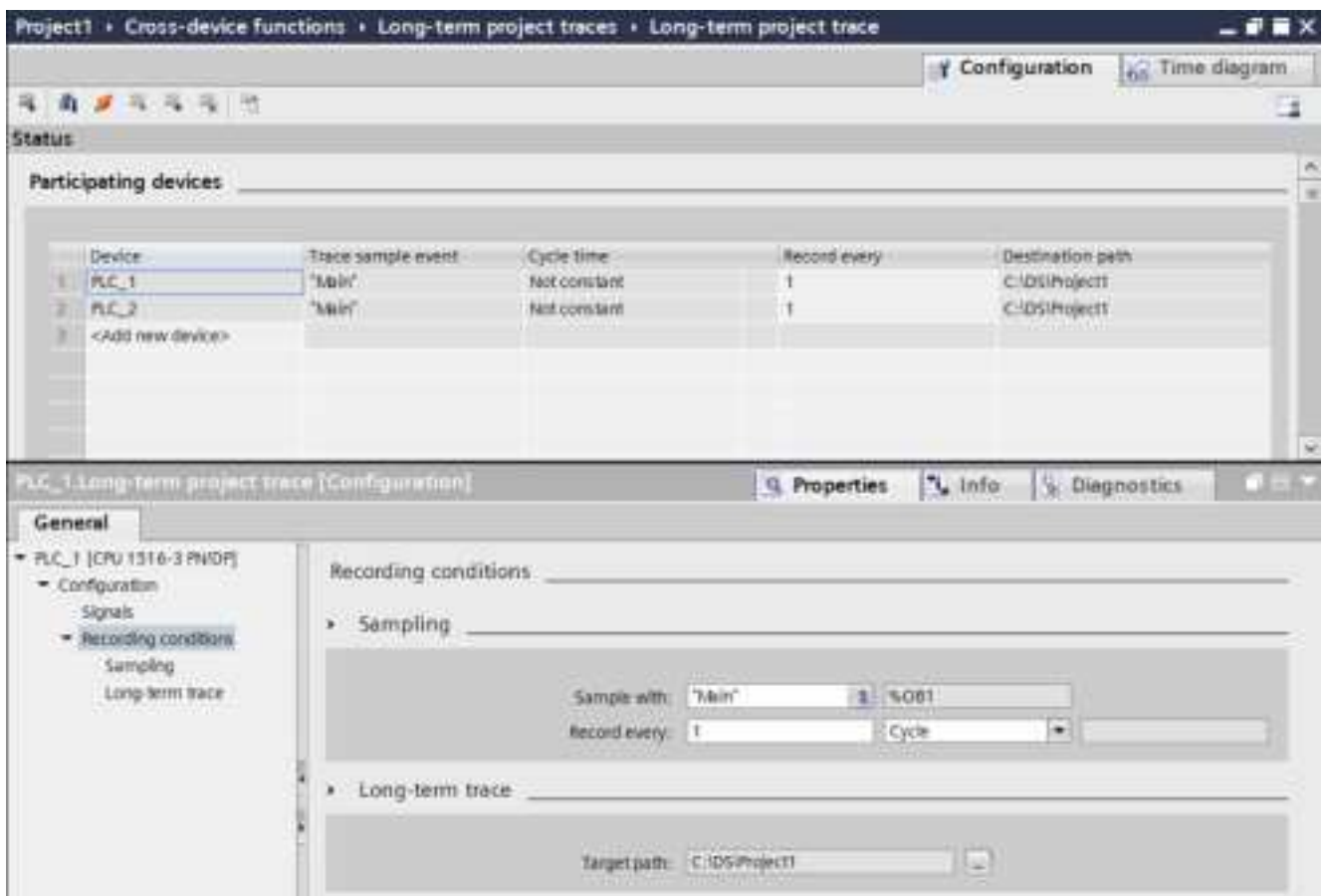
Procedure:

1. Select a device in the "Participating devices" area.
2. Select the "Properties" tab in the Inspector window.
3. Select the recording conditions in the "Signals" area.
   Or:
4. Drag one or more signals, e.g. from a tag table, and drop them in the signal table.
5. Configure the recording conditions.
6. Redo the configuration from step 1 for each participating device.

Apply trace configurations to the devices

Procedure:

1 Open the status overview of the participating devices using the ⬛ button.

2. Transferring the trace configurations to the devices using the ⬛ button

3. Check the status in Status overview (Page 83) and correct any errors that have occurred.

Activating recording

Procedure:

1. Click the ⬛ button.

Displaying the recording

Procedure:

1. Switch to the "Time diagram" tab.

Saving measurements in the project

Procedure:

1. Transfer the measurements to the project using the ⬛ button.

   The measurements are displayed in the project tree under the system folder ⬛ "Measurements".

7.2 Recording

7.2.1 Activating/deactivating an installed trace

Requirement

- There is an online connection to the device.
- There is a trace in the device.
- The trace in the device is displayed in the working area.
- The ⊞ button is activated for viewing the displayed trace.

Activating an installed trace

To activate the recording for an installed trace, proceed as follows:

1. Click ⊞.

   The installed trace is activated and starts the recording according to the configured trigger condition. The trigger condition is device-specific and described in Section "Configuration" below the respective device.

   The current status of the recording is displayed in the status display of the trace.

   NOTE

   When a recording is restarted, the previously recorded values are lost.

   To save the recorded values, save the measurement in the project (Page 104) before you activate the recording again.

Deactivating an installed trace

To deactivate an activated installed trace, proceed as follows:

1. Click ⊞.

   The installed trace is deactivated.

   The status display of the trace changes to "Inactive".

7.2.2 Transferring the trace configuration from the device to the project

Requirement

- There is an online connection to the device.
- There is a trace in the device.

Procedure

To transfer a trace configuration to the project, proceed as follows:

1. Open a trace in the device.
2. If required, activate the ![icon] button for viewing.
3. Click ![icon] to transfer the trace configuration from the device.

Result

The configuration is taken over as new trace configuration in the ![icon] "Traces" system folder.
The current display options are included in the new trace configuration.
A trace configuration of the same name is overwritten in the system folder.

7.2.3 Saving measurements in the project

Requirement

- There is an online connection to the device.
- There is a trace with recording in the device.
- The installed trace data must have been displayed at least once in the curve diagram. The recording data is loaded from the device for the display.

Procedure

To save a recording in the project, proceed as follows:

1. Open the trace in the device with the recorded data.
2. If required, make sure that the current data is loaded from the device by activating the ![icon] button.
3. After activating the ![icon] button wait until all data has been loaded and displayed.
4. Click ![icon].
   The measurement is added to the ![icon] "Measurements" system folder.
5. Save the project in the TIA Portal.

7.2.4 Automatic repetition of measurements

The recording is automatically re-activated at the end of each recording. The display in the curve is similar to the display of an oscilloscope.

Requirements

- There is an online connection to the device.
- There is a trace in the device.

Procedure

To monitor the progress of a fast signal, proceed as follows:

1. Select a trace in the device.
2. Double-click the selected trace.
3. Click ![icon] for monitoring.
4. Click ![icon] to automatically repeat the recording.

7.3 Analyzing

7.3.1 Analyzing a specific time range of an ongoing recording

A measurement of a trace in the device can be generated at any time.
Use this functionality, for example, to save the data recorded up until this point in a recording and to analyze it as a static measurement.

Requirements

- An ongoing recording is displayed in the "Time diagram" tab.

Procedure

To analyze a certain time range for an ongoing recording, follow these steps:

1. Click ![icon].
   The data recorded up to now is added to the measurements.
   The current recording is not affected by this and continues running uninterrupted.

7.3.2   Use of the curve diagram

The curve diagram shows the signals of a recording selected in the signal table.

The display area can be zoomed as required. Measurement cursors can be used to select individual values for display in the signal table.

The following operating instructions describe the use of the curve diagram and of the measurement cursors as examples.

Requirements

- An installed trace or a measurement has been selected for display.
- The ▦ button is activated to monitor an installed trace.
- The "Time diagram" tab is open in the working area.

Monitor an ongoing recording.

To display all of the data in an ongoing recording, proceed as follows:

1. Activate "Display all" via the ▦ button.

The entire time range and all values for the ongoing recording are displayed.

To display a consistent time window in an ongoing recording, proceed as follows:

1. Activate "Display all" via the ▦ button.
2. Select the desired time range via the ▦ button.

The trend view is updated while the scaling of the time range remains the same.

NOTE

A measurement of a trace in the device can be generated at any time. In this way, you can analyze the data recorded until that point as static measurement.

Evaluation of a certain instant of a recording

To display the values for a specific sample, proceed as follows:

1. Display the vertical measurement cursors via the ▯▯ button.
2. Move a measurement cursor with the mouse to the required position in the recording.
   The values of the signals are displayed in the signal table and in the "Measurement cursor" pane of the "Trace" task card.

Evaluation of the difference between two samples

To display the difference, proceed as follows:

1. Display the vertical measurement cursors via the ⏸ button.
2. Move both measurement cursors with the mouse to the required samples in the recording.
   The values of the signals and the difference are displayed in the signal table and in the "Measurement cursor" pane of the "Trace" task card.

Using horizontal measurement cursors

To check whether a certain value has been reached, proceed as follows:

1. Display the horizontal measurement cursors via the ▭ button.
2. Move a measurement cursor with the mouse to the required value of the recording.
   The values of the measurement cursors for the selected signal are displayed in the "Measurement cursor" pane of the "Trace" task card.

Moving the time range displayed

Proceed as follows to move the time range displayed:

1. Select a time range via the 🔲 button.
2. Move the curve to the desired time range by turning the mouse wheel with the <Shift> key pressed down.

Bringing a signal into the foreground

1. Display the legend via the ▤ button.
2. Click a signal in the legend.

Or:

1. Click a signal in the curve diagram.

The signal is displayed in the foreground and is highlighted/selected in the signal table. The value axis is updated for the selected signal.

See also

User interface - curve diagram (Page 38)

User interface - signal table (Page 45)

7.3.3 Use of the signal table

The signal table shows the signals of an installed trace or a measurement. The preselected signals in the signal selection are displayed with a combined measurement. You can show or hide individual signals for the display in the table and adapt the properties for the display. Individual bits can be selected for some data types and displayed as a bit track.
The following operating instructions describe the operation of the signal table.

Requirements

- An installed trace or a measurement has been opened in the "Time diagram" tab.
- The ⊞ button is activated to monitor an installed trace.
- For the display of individual bits as a bit track:
  at least one recorded signal supports the display as a bit track.

Display or hide individual signals and change the color

To adapt the display to suit your requirements, proceed as follows:

1. Click the icon of the respective signal in the ⊞ column to select or deselect it for the display.
2. Click in the "Color" column for the respective signal and select a color.
   The default color for the signal changes.

Bringing a signal into the foreground

1. In the signal table, select the line of the signal.
   The Y-scale of the signal is displayed.
   The signal curve is brought into the foreground in the curve diagram.

Selecting individual bits for display as a bit track

To display individual bits as a bit track in the lower curve diagram, proceed as follows:

1. Click the ▶ icon of a signal in the signal table.
2. Click the ⊞ icon in the open bit selection of the signal.
   The bits are selected or deselected for display.

7.3.4 Using the signal group in the signal table

Individual signals can be scaled identically in a scaling group, which makes it easier to compare the curve characteristics.
Binary signals cannot be grouped.
The following operating instructions describe how to work with the scaling group.

NOTE

Saving scaling groups

The scaling groups can be saved individually for each measurement via the "Use current view as standard" function (button).

If the scaling groups and the project are not saved, then the scaling groups created will be lost when the "Time diagram" tab is closed.

Requirements

- An installed trace or a measurement is displayed.
- The button is activated to monitor an installed trace.
- The "Time diagram" tab is open in the working area.
- There are at least two signals in the signal table that are not of the BOOL type.

Assigning signals to a scaling group

To apply a scaling group and assign signals to this group, proceed as follows:

1. In the signal table, select the line or cell of the required signal.
2. Click the gray field in the "Scaling group" column.
   The sequence icon is displayed in the gray field and the name of the scaling group is pre-assigned:
3. Click the gray fields of further signals that are to be assigned to this scaling group.

Or:

1. Click in the text field of the "Scaling group" column for a signal to be grouped.
2. Enter a name for the group.
3. Enter the same group name in the respective text fields for further signals or select the group name via the drop-down list.

The Y-scales of the grouped signals are scaled with the values of the signal that was selected first. Changes to a scale value always affect the entire group.

Removing signals from a scaling group

To delete the assignment of a signal to a scaling group, proceed as follows:

1. Click the ✏ sequence icon for the required signal in the "Scaling group" column.

Or:

1. Click the text field for the required signal in the "Scaling group" column.
2. Press the <Del> key.

Or:

1. Select the respective text field in the "Scaling group" column for several signals using the <Shift> and <Ctrl> keys.
2. Press the <Del> key.

The signals are removed from the scaling group or the scaling group is deleted.

7.3.5   Comparing recordings (combined measurement)

7.3.5.1   Apply combined measurement

Combined measurements can be applied in the project tree with a comparison function for different measurements.
The following instructions describe how you can create a combined measurement under the ⬛ "Combined measurements" system folder

Requirement

A device is configured that supports the trace and logic analyzer function.

Procedure

To apply an combined measurement, proceed as follows:

1. Select one or more measurements in the ⬛ "Measurements" system folder.
2. Drag the measurements to the ⬛ "Combined measurements" system folder.

A new combined measurement is created. This contains copies of the selected measurements.

7.3.5.2 Comparing recordings

Requirement

- An combined measurement is created or is created implicitly by dragging the measurements to the system folder ⊞ "Combined measurements".
  See also Apply combined measurement .

Adding measurements for comparison

To compare measurements, insert the measurements to be compared to the combined measurements. Proceed as follows for this:

1. In the project tree drag one or more measurements from the system folder ⊞ "Measurements" to the icon for the ⊞ combined measurement ⊞.

Or:

1. Import saved measurements via the "Import measurement" shortcut menu command.

A copy of the measurements is added to the combined measurement.

Select signals of the measurements for the signal table

Proceed as follows to select the signals for the signal table in the "Time diagram" tab:

1. Double-click on the icon for the combined measurement ⊞ in the project tree.
   The tabs for the combined measurement will be displayed in the working area.
2. Click the "Signal selection" tab in the working area.
   The signals for all measurements are displayed in the table.
3. Activate or deactivate the signal check box for those signals that should be visible or should not be visible in the signal table.

The activated signals are displayed in the signal table of the "Time diagram" tab.

Use of the signal table

Proceed as follows to open and use the signal tables:

1. Click the "Time diagram" tab in the working area.
2. Click on the "Signals" tab within the "Time diagram" tab.
3. Use the signal tables as described under Use of the signal table .

Align measurements

Proceed as follows to align the time axis for the measurements for the comparison:

1. Click on the "Measurements" tab within the "Time diagram" tab.
2. Select the alignment for the measurements via the check box.
3. Adjust the alignment and if necessary set an offset for the alignment of the individual measurements.

The measurements are aligned with each other accordingly on the time axis.

(The alignment of measurements with the measurement cursor is described in Aligning measurements with measurement cursor (Page 112).)

Use of the curve diagram

Proceed as follows to open and use the curve diagram:

1. Click the "Time diagram" tab in the working area.
2. Use the curve diagram as described under Use of the curve diagram (Page 106).

7.3.5.3   Aligning measurements with measurement cursor

Requirement

- An combined measurement is applied.
- Measurements for comparison are added to the combined measurement.
- Signals of the measurements for the signal table are selected.
- The "Time diagram" tab for the combined measurement opens in the working area.

Aligning measurements to measured position difference Δt

Proceed as follows to align the time axis of two measurements:

1. Display the vertical measurement cursors via the ▮▮ button.
2. Zoom into the time range, e.g. with the ▦ button until you are able to position the first measurement cursor precisely on the desired reference point for the first measurement.
3. Move the first measurement cursor with the mouse to the required position.
4. Search for the reference point for the second measurement, e.g. by switching to "Display all" with the ▦ button.
5. Zoom into the time range, e.g. with the ▦ button until you are able to position the second measurement cursor precisely on the desired reference point for the second measurement.
6. Move the second measurement cursor with the mouse to the required position.
7. Open the "Trace" task card.
8. In the "Measurement cursor" pane, select the position difference value Δt.
9. Copy the value to the clipboard.
10. Insert the value from the clipboard into the Offset cell of the first or second measurement.

The two measurements are aligned with each other.

NOTE

When inserting the position difference as the offset make sure that you also adjust the leading character as necessary.

7.3.6   Printing a recording

The curve diagram supports the saving of the display as a graphic and the copying of the display to the clipboard. Also use these functions (Page 38) for printing.

Devices

8

8.1 S7-1200/1500 CPUs

8.1.1 Recordable variables

Device-dependent recording of tags

The following list shows the operand areas from which tags can be recorded:
- Process image input
- Process image output
- Bit memory
- Data blocks
- I/O devices

The recording of tags that are in the InOut area of a function block is not supported.

Data types

A selection of elementary and composite data types can be recorded. The availability of the individual data types depends on the device used:

For more information, see the help under "Overview of valid data types".

The following table lists the supported data types:

Data types	Note
Binary numbers	
BOOL	-
Bit strings	
BYTE	-
WORD	-
DWORD	-
LWORD [1]	Symbolic name required
Integers	
SINT	-
USINT	-
INT	-
UINT	-
DINT	-
UDINT	-

1) Not supported by S7-1200.

Data types	Note
LINT [1]	Symbolic name required
ULINT [1]	Symbolic name required
Floating-point numbers	
REAL	-
LREAL	Symbolic name required
Timers	
TIME	-
LTIME [1]	-
Date and time	
DATE	-
TOD	-
LTOD [1]	-
LDT [1]	-

1) Not supported by S7-1200.

8.1.2 Lifetime of the installed trace configuration and recorded values

Installed trace configurations are retained after POWER OFF. The recording is activated again after the restart of the CPU.

Recorded values are lost during the restart.

NOTE

Downloading a configuration to the device in the "STOP" operating state

Note that after downloading a configuration in the "STOP" operating state, you must check the installed traces and, if required, reactivate them or transfer them again.

NOTE

If trigger tags that affect the address are changed, the trace configuration must also be transferred to the device again.

This is the case for example, when a data block is shortened or extended or the data type is changed.

8.1.3 Recording levels

All runtime levels can be used for the recording cycle. The cyclic execution levels are offered for selection via the button ▥. In non-periodic recording levels, the recording time is undefined.

NOTE

The measured values are recorded at the end of the OB after the processing of the user program.

NOTE

Trace sample event with Motion Control

The time reference for the measured values is determined differently if a Motion Control organization block is configured as trace sample event and the device is time synchronized via IRT. This behavior is described in Time synchronization with Motion Control (Page 116).

See also

Time synchronization of SIMATIC S7 CPUs
(https://support.industry.siemens.com/cs/ww/en/view/82203451)

8.1.4 Time synchronization with Motion Control

With Motion Control, a time reference to the cycle limits of the application cycle is required for the analysis. For this reason, the time reference for the measured values in the configuration of Motion Control organization blocks is determined differently than trace sample event. The synchronized (absolute) time from the start of the current application cycle is always stored as the time for the measured value. The tags of the technology objects are always consistently related to cycle limits.

The described behavior applies to the following Motion Control organization blocks:

- MC-Servo [OB91]
- MC-PreServo [OB67]
- MC-PostServo [OB95]
- MC-Interpolator [OB92]
- MC PreInterpolator [OB68]

The devices must communicate via IRT.

The following figure shows the stored times of the measured values with an application cycle of 3 and MC interpolator as configured trace sample event:

T0 to T6	IRT cycle
T0	Start of application cycle n
T3	Start of application cycle n+1
T6	Start of application cycle n+2
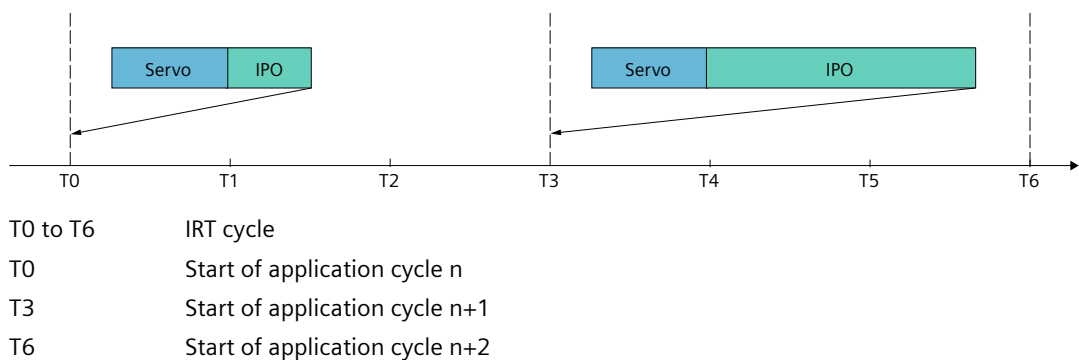
NOTE

OB61-OB63 as trace sample event

With these OBs as configured trace sample event, the system time is used independently of the communication. The recording behavior is the same as for devices without IRT communication.

To facilitate the evaluation with absolute time, synchronize the clock times of the devices.

NOTE

Measured values with identical timers

An overflow of the recording level (such as MC-Interpolator OB in the example above) can result in measured values with identical time stamp.

8.1.5 Quantity structure

The following table shows the maximum quantity structure that you can record using the trace and logic analyzer function:

Device	Maximum number of installed traces	Maximum number of signals per trace configuration
(as of firmware version V4.0)S7-1200	2[1]	16
S7-1500, ET 200SP, CPU 1513pro-2 PN, CPU 1516pro-2 PN, S7-1500 Software Controller, S7-1500 Drive Controller, ET 200SP Open Controller	Minimum 4[2] (depending on the CPU type)	16
S7-1500, ET 200SP, CPU 1513pro-2 PN, CPU 1516pro-2 PN, S7-1500 Software Controller, S7-1500 Drive Controller, ET 200SP Open Controller (as of firmware version V3.0)	Minimum 4[2] (depending on the CPU type)	64

[1] The S7-1200 does not support long-term trace

[2] In STEP 7 as of V18, the S7-1500 supports maximum two long-term traces which are recorded at the same time.

NOTE

Maximum number of signals per trace configuration exceeded

Signals that exceed the maximum number of signals in the trace are marked in the configuration.

You cannot load a trace configuration with more than the maximum number of signals into the device.

The maximum number of signals is exceeded during the following actions:

- Copy: A trace configuration with more than 16 signals is copied into a device that only supports 16 signals per trace configuration.
- Device replacement: A device in which a trace configuration with more than 16 signals is created is replaced with a device that supports a maximum of 16 signals per trace configuration.

To load the trace configuration into the device, delete the excess, selected signals.

The same quantity structures apply for the project trace as for the devices.

Example CPU 1516-3 PN/DP

- Maximum of 7281 samples for 16 signals from PLC tags of the DWORD data type
- Maximum of 21844 samples for 16 signals from PLC tags of the BOOL data type
- Maximum of 58250 samples for 1 signal from a PLC tag of the BOOL data type

You can also find more information in the form of FAQs under the ID 102781176 (http://support.automation.siemens.com/WW/view/en/102781176).

8.1.6 Long-term trace recording

Requirement

You need at least 4 GB free space on your hard disk for recording a long-term trace.

Starting the recording

The csv file is saved in the target path with the following name:
<name of the CPU>_<name of the long-term trace>_<time stamp>_<running serial number>.csv
Structure of the time stamp:
<YYYYMMDD>_<HHMMSS>_<ms(3 places)>
Example
PLC_1_Long-term Trace_20220721_120422_356_0001.csv

Behavior during operation

As soon as the recording of the long-term trace in a csv file has reached a file size of 2 GB, a new csv file is created. The new csv file has the same time stamp as the file that has overflowed and the running serial number is incremented by 1. The recording is continued without any break.

You can use the "Monitoring on/off" button to interrupt the recording. If you click the "Monitoring on/off" button again, a new csv file is created. The new csv file has the same time stamp as the csv file of the interrupted recording and the running serial number is incremented by 1. The recording is continued.

Example
Overflowed/Canceled recording
PLC_1_Long-term Trace_20220721_120422_356_0001.csv
Continued recording:
PLC_1_Long-term Trace_20220721_120422_356_0002.csv

> ⚠ **CAUTION**
>
> **Inconsistent data when opening the .csv file during the recording**
>
> Opening the csv file during the recording, for example, with Excel, can result in inconsistent data. The csv file can become unusable.
>
> Do not open the csv file during the recording.

Canceling the recording

After a recording has been canceled, a new csv file is created with the current time stamp when a new recording is started.

Example

Interrupted recording

PLC_1_Long-term Trace_20220721_120422_356_0001.csv

New recording

PLC_1_Long-term Trace_20220721_121212_999_0001.csv

Output formats of the data types in the csv file

NOTE

Displaying the values in Excel

If you open the csv file directly with a double-click, Excel can show the values wrongly formatted.

To display the values correctly, always import the data from the csv file.

The table below provides an overview of the data formats in which the data types in the csv file are output:

Data type	Output format		Example	
Bool	True = 1 False = 0			1
Int	Full decimal number			-12
Int				-123
DInt				-1234
LInt				-123456
USInt				12
UInt				123
UDInt				1234
ULInt				123456
Real	Scientific notation	Hexadecimal for Infinite/Denormal/NaN	3.713193E+29	16#7F80_0000
LReal				
Byte	Full decimal number			12
Word				123
DWord				1234
Lword				12345
Date	YYYY-MM-DD			1970-01-01
Time	Seconds without measurement unit			62.78
LTime				0.00307
Time Of Day	HH:MM:SS.ms (ms up to 3 places)			00:00:54.078
Long Time Of Day	HH:MM:SS.ms (ms up to 9 places)			00:00:00.000033566
Long Date Time	YYYY-MM-DD-HH:MM:SS.ms (ms up to 9 places)			1970-01-01-00:00:00.000033566

Unsupported data types

The following data types are not supported by the csv file:

- Date_And_Time
- Date_And_LTime
- Char
- WChar
- String
- S5Count
- S5Time

8.1.7 Long-term project trace recording

Requirement

To record a long-term project trace you need at least 4 GB free space on your hard disk.

Starting the recording

The csv file is saved in the target path with the following name:
<Name of CPU>_<Name of long-term project trace>_<Time stamp>_<Consecutive number>.csv
Structure of the time stamp:
<YYYYMMDD>_<HHMMSS>_<ms(3 places)>
Example
PLC_1_Long-term Trace_20220721_120422_356_0001.csv

Behavior during operation

As soon as the recording of the long-term project trace in a csv file has reached a file size of 2 GB, a new csv file is created. The new csv file has the same time stamp as the file that has overflowed and the running serial number is incremented by 1. The recording is continued without any break.

You can use the "Monitoring on/off" button to interrupt the recording. If you click the "Monitoring on/off" button again, a new csv file is created. The new csv file has the same time stamp as the csv file of the interrupted recording and the running serial number is incremented by 1. The recording is continued.
Example
Overflowed/Canceled recording
PLC_1_Long-term Trace_20220721_120422_356_0001.csv
Continued recording:

PLC_1_Long-term Trace_20220721_120422_356_0002.csv

⚠ CAUTION
Inconsistent data when opening the .csv file during the recording
Opening the csv file during the recording, for example, with Excel, can result in inconsistent data. The csv file can become unusable.
Do not open the csv file during the recording.

Canceling the recording

After a recording has been canceled, a new csv file is created with the current time stamp when a new recording is started.
Example
Interrupted recording
PLC_1_Long-term Trace_20220721_120422_356_0001.csv
New recording
PLC_1_Long-term Trace_20220721_121212_999_0001.csv

Output formats of the data types in the csv file

NOTE
Displaying the values in Excel
If you open the csv file directly with a double-click, Excel can show the values wrongly formatted.
To display the values correctly, always import the data from the csv file.

The table below provides an overview of the data formats in which the data types in the csv file are output:

Data type	Output format		Example	
Bool	True = 1 False = 0			1
Int	Full decimal number			-12
Int				-123
DInt				-1234
LInt				-123456
USInt				12
UInt				123
UDInt				1234
ULInt				123456
Real	Scientific notation	Hexadecimal for Infinite/Denormal/NaN	3.713193E+29	16#7F80_0000
LReal				
Byte	Full decimal number			12

Data type	Output format	Example
Word	Full decimal number	123
DWord		1234
Lword		12345
Date	YYYY-MM-DD	1970-01-01
Time	Seconds without measurement unit	62.78
LTime		0.00307
Time Of Day	HH:MM:SS.ms (ms up to 3 places)	00:00:54.078
Long Time Of Day	HH:MM:SS.ms (ms up to 9 places)	00:00:00.000033566
Long Date Time	YYYY-MM-DD-HH:MM:SS.ms (ms up to 9 places)	1970-01-01-00:00:00.000033566

Unsupported data types

The following data types are not supported by the csv file:

- Date_And_Time
- Date_And_LTime
- Char
- WChar
- String
- S5Count
- S5Time

8.1.8   CPU load through trace recording

An activated trace recording increases the runtime of the respective recording level that can result in an execution level overflow with high utilization of the CPU.

Remedy for execution level overflow:

- **Change the trace configuration**
  1) Configure fewer tags and signals.
  2) Then increase the number of tags and signals up to the maximum number of signals step-by-step without an execution level overflow.

- **Select a slower recording level**

8.1.9 Project trace

Note the required firmware version of the devices for the support of the project trace and the long-term project trace.

The following table lists the devices supported by the project trace and long-term project trace.

Device	Support as of firmware
SIMATIC S7-1500, ET 200SP, CPU 1513pro-2 PN and CPU 1516pro-2 PN CPUs	V2.8
SIMATIC S7-1500 Software Controller	V2.8
SIMATIC Drive Controller	V2.8
ET 200SP Open Controller	V20.8

8.1.10 Software user interface of the configuration

8.1.10.1 Layout of the trace user interface

The settings options differ depending on the configured device.

Display in the "Configuration" tab of the working area

The following figure shows an example of the display:

The area navigation provides the following entries for selection:

- Configuration
  - Signals (Page 127)
  - Recording conditions (Page 128)

Displaying and changing properties of a trace configuration

A trace is selected in the project tree and displayed in the "Configuration" tab.

You change the trace configuration offline. Online, the trace configuration is displayed ready-only.

8.1.10.2 Layout of the long-term trace user interface

The settings options differ depending on the configured device.

Display in the "Configuration" tab of the working area

The following figure shows an example of the display:
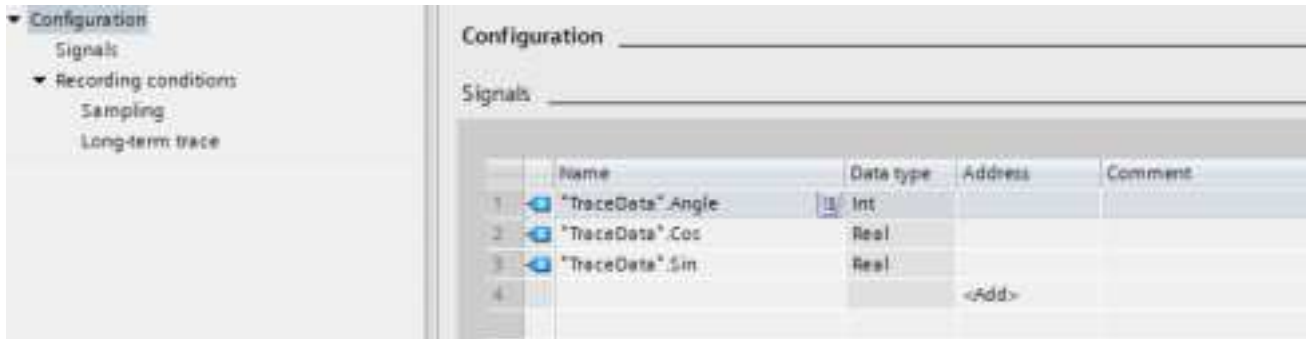
The area navigation provides the following entries for selection:

- Configuration
  - Signals (Page 127)
  - Recording conditions (Page 127)

Displaying and changing properties of a long-term trace configuration

A long-term trace is selected in the project tree and displayed in the "Configuration" tab. You can change the long-term trace configuration offline. Online, the trace configuration is displayed ready-only.

See also

Recording conditions (Page 128)

8.1.10.3 Layout of the project trace user interface

The device-dependent trace configuration is displayed in the Inspector window when a device is selected in the configuration tab of the "Participating devices" table.

Configuration in the "Properties" tab of the Inspector window

The following figure shows an example of the display for a selected device:
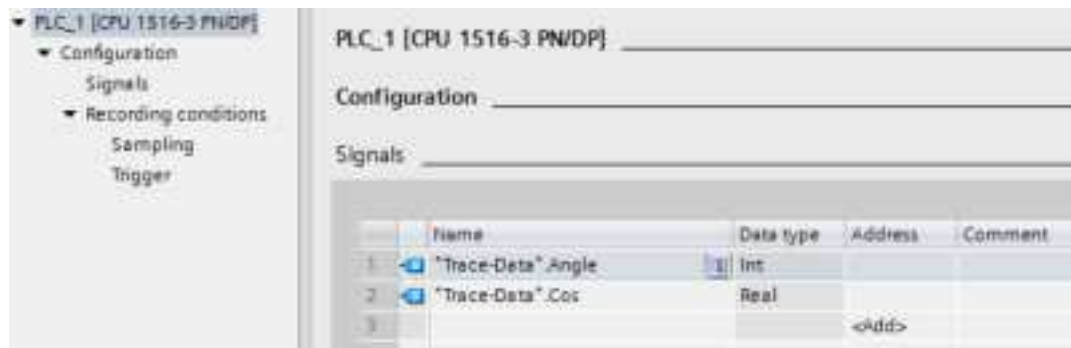
The area navigation provides the following entries for selection:
- Configuration
  - Signals
  - Recording conditions

8.1.10.4 Structure of the interface for long-term project trace

The device-dependent trace configuration is displayed in the Inspector window when a device is selected in the Configuration tab of the "Participating devices" table.{"Long-term project trace interface"}

Configuration in the "Properties" tab of the Inspector window

The following figure shows an example of the display for a selected device:
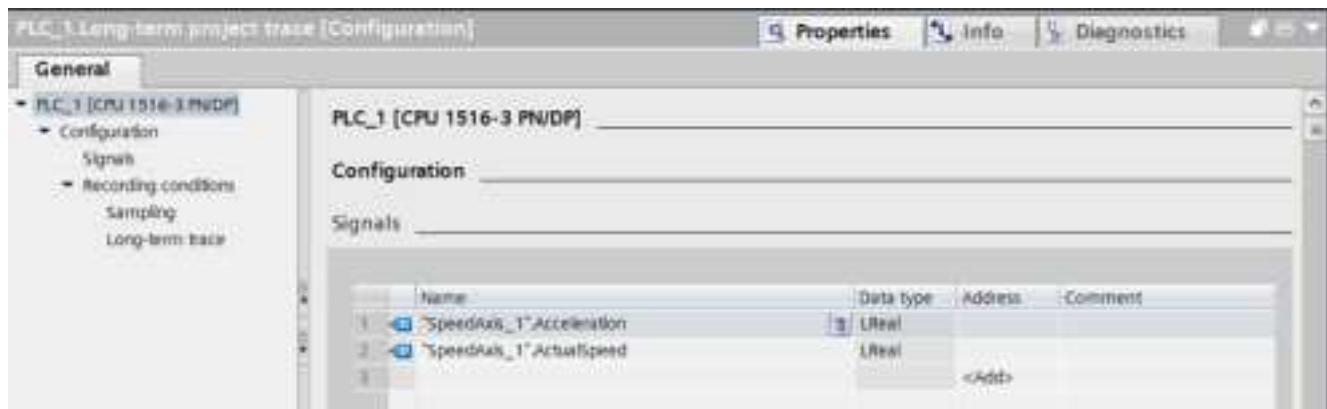
The area navigation provides the following entries for selection:

- Configuration

8.1.10.5   User interface - Signals

The "Signals" area shows a table in which the signals to be recorded are configured for the selected trace configuration.

Signals can also be inserted in the table using drag-and-drop.

The signals can be sorted using drag-and-drop.

Setting options and displays in "Signals"

The following figure shows an example of the display:

The following table shows the settings and displays:

Column	Icon	Description
-		Display of the signal icon for a selected signal.
"Name"	-	Input field for the name or address of the signal. **Examples:** • "Data_block_1".pressure • M0.0 • DB1.DBW3
-		Button to open the signal selection table. The button is displayed when the table line is selected. Clicking the icon opens a table which offers possible signals for selection. The selected signal is displayed in the input field.
"Data type"	-	Text field with display of the data type for the signal.
"Address"	-	Input field for the address of the signal. The field remains empty with optimized / type correct tags.
"Comment"	-	Input field for a comment on the signal.

Shortcut menu commands

The following table shows the shortcut menu commands of the table:

Shortcut menu command	Description
"Cut"	Cannot be selected
"Copy"	Copies the contents of the selected lines to the clipboard.
"Paste"	Pastes the contents of the clipboard to the selected line. The existing contents are overwritten.
"Delete"	Deletes the selected lines from the table or deletes the content of the selected cell.
"Rename"	Switches the selected cell to the editing mode.

8.1.10.6 Recording conditions

The "Recording conditions" area shows the trigger condition for the selected trace configuration and in which cycle, how fast and how long the recording is made.

Sampling

The following figure shows an example of the settings for the sampling:
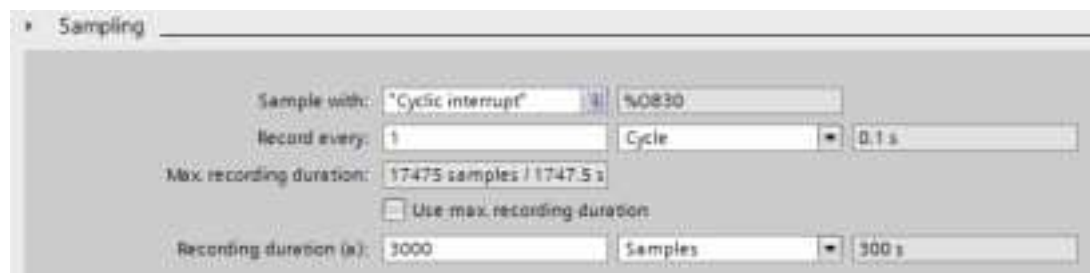
The following table explains the settings and displays:

Setting/display	Description
"Trace sample event"	
Recording level entry field	Selection of the trace sample event. See Recording levels (Page 116)
Address of the OB text field	Detailed information on the selected trace sample event.
"Record every"	
Reduction entry field	Input of the reduction in relation to the reduction ratio and the unit.
Reduction ratio drop-down list	Selection of the reduction ratio unit The following settings are possible: • "Cycle" • "s" for seconds The setting depends on the recording level selected in "Trace sample event".
Sampling time text field	Display of the sampling time, taking into account the configured reduction and the selected unit (only for constant bus cycle time OBs).

Setting/display	Description
"Max. recording duration"	
Max. recording duration text field	Displays the calculated maximum recording duration. The "Max. recording duration" depends on how many signals are recorded and the data type of these signals.
"Use max. recording duration"	Set the recording duration to the maximum value. When the checkbox is activated, the recording duration is set to the maximum possible recording duration. The set reduction in the "Record every" input field is taken into account. If more signals are added, the recording duration will be adjusted. More information can also be found in the form of FAQs under the ID 102781176 (http://support.automation.siemens.com/WW/view/en/102781176).
"Recording duration"	
Recording duration entry field	Input of the recording duration in relation to the selected unit. If the "Recording duration = max. recording duration" checkbox is activated, entries are overwritten by the value displayed in "Max. recording duration".

Unit drop-down list	Selection of the unit for the recording duration.
	The following settings are possible:
	• "Samples"
	  The maximum number of samples recorded is the number for which parameters are assigned under recording duration.
	• "s" for seconds
	  The setting depends on the recording level selected in "Trace sample event".

Calculated recording duration text field	Display of the calculated recording duration (only for constant bus cycle time OBs)

Trigger

The following figure shows an example of the settings for the trigger:

The following table explains the settings and displays:

Setting/display		Description
"Trigger mode"		Selection of the trigger mode.
	Trigger mode drop-down list	The following settings are possible: • "Record immediately" Recording is started immediately after the activation in the device. The global trigger is triggered immediately, regardless of the operating state of the device. • "Trigger on tag" The recording is made as soon as the installed trace is activated and the configured trigger condition is fulfilled. • "Monitor without trigger" (traces) The recording takes place as soon as the installed trace is activated and is not automatically terminated. After termination by the user, there are a maximum of as many measured values in the device as were configured under recording duration. This trigger mode is particularly suitable for monitoring slow signals and is only available for traces. • "Trigger from another device" (project trace) The global trigger for the start of the trace is triggered by another device. This trigger mode is only available for a project trace.
	Text field	-
"Trigger tag"		The "Trigger tag" specifies a signal that triggers the recording.
	Trigger tag entry field	Enter a signal. **Examples:** • "DataBlock_1".Temperature • M0.0 • DB1.DBW3 See also Data types for trigger tags (Page 133).
	📖	Opens the signal selection table. Clicking the symbol opens a table offering possible signals for selection as trigger tag. The selected signal is displayed in the input field.
	Trigger tag address text field	Display of the trigger tag address. With purely symbolic signals the field remains empty.
"Event"		The events that can be used on this trigger tag are offered for selection according to the data type of the trigger tag. The event can be configured provided a valid signal is entered as trigger tag.
	Trigger events drop-down list	Event selection for which the trigger tag is checked. The entries in the drop-down list are described in Section Trigger event (Page 133).
	Text field	-
"Value"		Configuration of the selected event. The configuration options differ depending on the format of the trigger tag and the selected event. See Trigger event (Page 133).

Setting/display		Description

"Pretrigger"		"Pretrigger" defines the number of samples that are already recorded before the actual trigger condition is fulfilled.
		If the trigger event occurs immediately or shortly after the recording has been activated, this may result in a shorter recording duration.
		Examples of "Recording duration (a)" = 20 samples and "Pretrigger (b)" = 5 samples:
		• Case 1: Trigger event occurs 50 samples after activation of the recording
		  Actual recording duration (a) = 20 samples
		• Case 2: Trigger event occurs 2 samples after activation of the recording
		  Actual recording duration (a) = 17 samples

	Duration entry field	Input of the duration in relation to the selection in the drop-down list.
	Unit drop-down list	Selection of the unit The following settings are possible: • "Samples" • "s" for seconds The setting depends on the recording level selected in "Trace sample event".
	Resulting pretrigger duration text field	Display of the calculated "Pretrigger" duration The duration is displayed when recording in constant bus cycle time OBs.

Measurements on device (memory card)

The following figure shows an example of the settings for the saving of installed measurements:

Saving measurements on device (memory card) is not possible with project traces.

NOTE

Deleting measurements on device (memory card) (S7-1200)

Do not delete any measurements on the device as long as a trace in the device still generates new measurements on the memory card.

NOTE

Available memory in the device (memory card)

The memory in the device (memory card) is partly used by system-relevant functions or reserved for that purpose.

Thus it is not possible for the entire memory to be used for saving measurements.

For further information please refer to the Function Manual Structure and Use of the CPU Memory (https://support.industry.siemens.com/cs/us/en/view/59193101).

NOTE

Memory requirements upon restart

Following a device reboot the maximum number of measurements saved in the device is the number configured under "Number of measurements".

With repeated restarts note that the measurements already saved are not overwritten and the "Number of measurements" configured in the device is saved once again.

The following table explains the settings and displays:

Setting/display	Description
"Saving of installed measurements (memory card)"	Repeat measurement automatically and store in the device retentively This setting is only possible with "Trigger on tag" trigger mode. The measurements are stored on the "primary" memory card. For traces which have been saved in the device (memory card), the function for automatically repeating the recording is not available. **Note** Only completed measurements are stored in the device. Any recording deactivated by the user is not saved on the device. **This function is available with the following firmware versions:** • S7-1200 as of V4.2 • S7-1500 as of V2.0 The function is not supported by CPU S7-1500 R/H.
"Number of measurements"	Enter the number of reserved measurements on the memory card for this trace configuration. The CPU supports a maximum of 999 measurements on the memory card.
"Memory requirements"	Display of the expected memory requirement for all measurements
	Displaying memory usage Shows the tab with the memory usage

"Behavior if number reached"	Selection for the behavior once "Number of measurements" is reached The following settings are possible:
	• "Deactivating a recording"
	  The measurements are repeated until the "Number of measurements on the card" is reached.
	• "Overwrite oldest recording"
	  The measurements are saved in a ring buffer and repeated until the user deactivates the recording. Once the number of measurements exceeds the "Number of measurements on the card" the oldest measurement on the card is overwritten in each case.
	  Note
	  Note that write processes that are repeated frequently may damage the card.

Long-term trace

The following figure shows an example of the settings for the saving of installed measurements:

The following table explains the settings and displays:

Setting/display	Description
"Target path"	Display of the folder used for recording the long-term traces.
	Configuring the recording cycle and target path for long-term trace (Page 141)
	Long-term trace recording (Page 119)

The following table shows the supported data types for the trigger tag:

Memory requirement and format of the number	Data type
1 byte	BOOL
8-bit integers	SINT, USINT, BYTE
16-bit integers	INT, UINT, WORD, DATE
32-bit integers	DINT, UDINT, DWORD, TIME, TOD
64-bit integers [1]	LINT, ULINT, LWORD, LTIME, LTOD, LDT
32-bit floating-point numbers	REAL
64-bit floating-point numbers	LREAL

1) Not supported by S7-1200.

Depending on the selection in the drop-down list, the further settings differ for the "event". The individual events are described below.

"=TRUE"

Supported data types: Bit (Page 133)
The recording starts when the state of the trigger is TRUE.

"=FALSE"

Supported data types: Bit (Page 133)
The recording starts when the state of the trigger is FALSE.

"Rising edge"

Supported data types: Bit (Page 133)
The recording is started when the trigger state changes from FALSE to TRUE.
After activation of the installed trace, at least two cycles are required to identify the edge.

"Rising signal"

Supported data types: Integers and floating-point numbers (Page 133) (no times, date and time of day)

The recording is started when the rising value of the trigger reaches or exceeds the value configured for this event.

After activation of the installed trace, at least two cycles are required to identify the edge.

"Falling edge"

Supported data types: Bit (Page 133)

The recording is started when the trigger state changes from TRUE to FALSE.

After activation of the installed trace, at least two cycles are required to identify the edge.

"Falling signal"

Supported data types: Integers and floating-point numbers (Page 133) (no times, date and time of day)

The recording is started when the falling value of the trigger reaches or falls below the value configured for this event.

After activation of the installed trace, at least two cycles are required to identify the edge.

"In the range"

Supported data types: Integers and floating-point numbers (Page 133)

The recording starts as soon as the value of the trigger is in the value range configured for this event.

"Outside of the range"

Supported data types: Integers and floating-point numbers (Page 133)

The recording starts as soon as the value of the trigger is outside the value range configured for this event.

"Value change"

All data types are supported.

The value is checked for change when the recording is activated. The recording starts when the value of the trigger changes.

This trigger event is supported as of V13 SP1. Older versions of the TIA Portal cannot interpret the trigger. Note that no explicit information is output in this case. This can occur, for example, when the trace is transferred from a CPU to TIA Portal V13 SP1 or lower or a trace configuration is imported.

"= value"

Supported data types: Integers (Page 133)
The recording starts when the value of the trigger is equal to the value configured for this event.

"<> value"
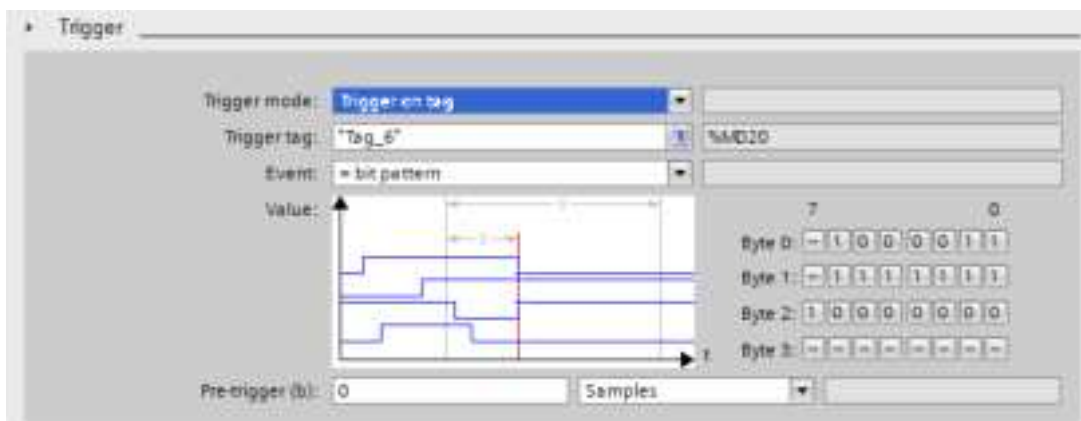
Supported data types: Integers (Page 133)
The recording starts when the value of the trigger is not equal to the value configured for this event.

"= bit pattern"

Supported data types: Integers and floating-point numbers (Page 133) (no times, date and time of day)
The recording starts when the value of the trigger matches the bit pattern configured for this event.
The following figure shows the setting options for a "bit pattern":

It is possible to switch between the icons by clicking the respective button.
The following table shows the icons:

Icon	Description
–	Bit is not evaluated
0	Bit is checked for FALSE
1	Bit is checked for TRUE

"<> bit pattern"

Supported data types: Integers and floating-point numbers (Page 133) (no times, date and time of day)
The recording starts when the value of the trigger does not match the bit pattern configured for this event.

See also

8.1.11 Configuration

8.1.11.1 Trace configuration - overview

The configuration of the recording conditions and the signals to be recorded is device-specific.

Requirement

A trace configuration has been created and opened in the working area of the "Configuration" tab.

Procedure

The following table shows the procedure for configuring.

Step	Description
1	Documentation of the configuration (optional) Enter a comment and an author for the configuration in the Inspector window.
2	Selecting signals (Page 138) Select the signals to be recorded in the "Signals" area.
3	Configuring the recording cycle and duration (Page 139) Select a recording time, a cycle and the duration in the "Recording conditions" area.
4	Configuring the trigger conditions (Page 139) In the "Recording conditions" area, select whether the recording is to be performed immediately or depending on a trigger condition.
5	Configure installed measurements (memory card) (Page 140) In the "Recording conditions" area, select whether the recording is to be saved on the device (memory card).

8.1.11.2 Long-term trace configuration – overview

The configuration of the recording conditions and the signals to be recorded is device-specific.

Requirement

A long-term trace configuration has been created and opened in the working area of the "Configuration" tab.

Procedure

The following table shows the procedure for configuring.

Step	Description
1	Selecting signals (Page 138) Select the signals to be recorded in the "Signals" area.
2	Configuring the recording cycle and target path for long-term trace (Page 141) In the "Recording conditions" tab, define the recording cycle and change the target path, if necessary.

See also

Configuring the recording cycle and duration (Page 139)

8.1.11.3 Configuring long-term project trace - Overview

The configuration of the recording conditions and the signals to be recorded is device-specific.

Procedure

The following table shows the procedure for configuring.

Step	Description
1	Select participating devices In the area "Participating devices" area, select the devices for the long-term project trace configuration
2	Selecting signals Select the signals to be recorded in the "Signals" area.
3	Configuring recording cycle and target path for long-term project trace In the "Recording conditions" tab, define the recording cycle and change the target path, if necessary.

8.1.11.4 Select participating devices

Requirement

- At least two devices are created that support the project or long-term project trace
- A project or long-term project trace is created

Procedure

To select participating devices for a project or long-term project trace, proceed as follows:

1. Select the project or long-term project trace in the project tree.

2. In the "Participating devices" interface, select the devices you want to use for the project or long-term project trace.

8.1.11.5 Selecting signals

Requirement

- A trace, project trace, long-term trace or long-term project trace configuration is created and opened.
- The "Signals" area is open in the "Configuration" tab.

Procedure

To configure the signals to be recorded, proceed as follows:

1. Select a signal. The following options are available:
   - In the "Name" column, click the ▥ button and select a tag.
   - Enter the symbolic tag name in the cell in the "Name" column.
   - Enter the address directly in the "Address" column.
   - Drag a signal to the table using drag-and-drop.
2. Click in the "Comment" column and enter a comment for the signal.
3. Repeat the procedure from step 1 until all the signals to be recorded have been entered in the table.

8.1.11.6   Configuring the recording cycle and duration

Requirement

- A trace configuration has been created and opened.
- The "Recording conditions" area is open in the "Configuration" tab.

Procedure

To configure the cycle and the duration of a recording, proceed as follows:

1. Click ⬛ for the recording time.
2. Select an OB for the recording time .
3. Select a unit for the reduction factor in the drop-down list for "Record every".
4. Enter the factor for the reduction in the input field for "Record every".
5. Select a unit in the drop-down list for "Recording duration".
6. Specify the recording duration.
   The following options are available:
   - Enter a value for the duration in the input field for "Recording duration".
   - Activate the "Use max. recording duration" checkbox.

8.1.11.7   Configuring the trigger conditions

Requirements

- A trace configuration has been created and opened.
- The "Recording conditions" area is open in the "Configuration" tab.

"Record immediately" trigger condition

To start the recording immediately, proceed as follows:

1. Select the "Record immediately" entry in the drop-down list for "Trigger mode".
   The input fields for the trigger tag are hidden.

"Trigger on tag" trigger condition

To start the recording depending on a condition, proceed as follows:

1. Select the "Trigger on tag" entry in the drop-down list for "Trigger mode".
2. Select a trigger tag. The following options are available:
   – Click 🖳 for the trigger tag and select a tag.
   – Enter the address or the symbolic name of the tag directly in the input field for the trigger tag.

   A drop-down list with events and input fields is displayed. The display depends on the data type of the tag.
3. Configure the event.
4. Select a unit for the pretrigger in the drop-down list for "Pretrigger".
5. In order to record a period before the trigger event, enter a value greater than 0 in the input field for the pretrigger.

NOTE

Cyclic test of the trigger condition

The trigger condition is checked in every cycle irrespective of the setting in "Record every". To reliably identify the trigger, the trigger signal must be present for at least one full cycle.

8.1.11.8 Configure installed measurements (memory card)

Requirement

- A trace configuration has been created and opened.
- The "Recording conditions" area is open in the "Configuration" tab.
- The "Trigger on tag" trigger mode is set.
- The firmware on the device supports the recording of an installed measurement.

Procedure

Proceed as follows to save the installed measurement (on the memory card):

1. Select the "Save measurements on device (memory card)" check box.
2. Enter the number of measurements that ought to be saved on the card in the "Number of measurements" entry field.
3. Set the desired behavior once the "Number of measurements" has been reached in the "Behavior if number reached" drop-down list.

NOTE

No evaluation of the trigger during saving

No new trigger can be evaluated as long as the recording is saved.

8.1.11.9 Configuring the recording cycle and target path for long-term trace

Requirement

- A long-term trace configuration has been created and opened.
- The "Recording conditions" area is open in the "Configuration" tab.

Procedure

To configure the cycle of a recording, proceed as follows:

1. Click the ▣ button for the trace sample event.
2. Select an OB for the trace sample event.
3. Enter the factor for the reduction in the import field for "Record every".
4. Select a unit for the reduction factor in the drop-down list for "Record every".

The default target path is the folder of the STEP 7 project.
To change the target path, follow these steps:

1. Click the ▢ button for the target path.
   The "Select folder" window opens.
2. In the folder structure, navigate to the target folder or enter the target path under "Folder".
3. Click "Select folder".

8.1.11.10 Configuring recording cycle and target path for long-term project trace

You can change the target path either individually for each participating device or simultaneously for all participating devices.

Requirements

- A long-term project trace configuration has been created and opened.
- At least one CPU has been created as a participating device.

Configuring recording cycle and target path for a participating device

To reach the configuration of a participating device, first select the device in the "Participating devices" table. You can find the configuration for this device in the Inspector window under "Properties" > "General" > "<Name of CPU>" > "Configuration".
To configure the cycle of a recording for a participating device of a long-term project trace, proceed as follows:

1. Click on the ▣ button for the recording point.
2. Select an OB for the trace sample event.
3. Enter the factor for the reduction in the import field for "Record every".
4. Select a unit for the reduction factor in the drop-down list for "Record every".

The default target path is the folder of the STEP 7 project.

1. Click the ⬚ button for the target path.
   The "Select folder" window opens.

2. In the folder structure, navigate to the target folder or enter the target path under "Folder".

3. Click "Select folder".

Changing the target path for all participating devices

Requirements: No participating device has been selected.

You can find the configuration for the target path in the Inspector window under "Properties" > "General".

To change the target path for all participating devices of a long-term project trace, follow these steps:

1. Click the ⬚ button in the "Target path:" row.
   The "Select folder" window opens.

2. In the folder structure, navigate to the target folder or enter the target path under "Folder".

3. Click "Select folder".

Glossary

Combined measurement

Permits a comparison and analysis of signals from different measurements.

Curve diagram

Displays the selected signals of a recording.

Global trigger

If a project trace is triggered by a participating device to start recording synchronously in all participating devices.

Installed trace

Consists of a trace configuration and optionally a recording.

Measurement

Consists of a trace configuration with an associated recording.

Pretrigger

Defines the interval in which the signals are already recorded before the actual trigger condition is fulfilled.

Project trace

Contains all the information to record signals from multiple devices with a global trigger.

Recording

Is performed in the device. There is only one recording for each installed trace configuration.

Recording condition

Sampling and trigger for a trace configuration.

Recording duration

Factor in number of samples. The factor of 100 means, for example, that 100 samples are recorded.

Reduction

Factor in number of cycles. A factor of 2 means, for example, that a recording is made every second cycle.

Sampling

Setting, in which cycle, how fast and how long the recording is to be made.

Signal table

Lists the signals of the selected measurement and provides setting options for some properties.

Snapshot

Contains the settings for the view for a measurement.

Trace configuration

Contains all the information required to record signals in a device.

Trigger

Specifies the trigger mode and the condition for the "Trigger on tag" mode.

Trigger mode

Specifies whether the recording should be started immediately or based on a trigger tag.

Trigger tag

Signal to trigger the recording.

Trigger time

The meaning of the measurement trigger time depends on the device.
e.g. SIMATIC S7-1200/1500 CPUs: Specifies the absolute time of the control system at the start of recording.

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