SIEMENS

SIMATIC

S7-1500, S7-1200
Trace and logic analyzer function

Function Manual

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Legal information

Warning notice system

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

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Disclaimer of Liability

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

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Introduction

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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.

"mySupport"

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.

You need to register once to use the full functionality of "mySupport".

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 additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

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 customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://new.siemens.com/cert.

Overview of functions

3

3.1 Application areas for trace and logic analyzer functions

Use the trace and logic analyzer functions to monitor highly dynamic processes. They record tags from one or more devices and evaluate the recordings. Tags, for example, are drive parameters or the system and user tags of a CPU.

The trace and logic analyzer functions offer you the following recording options:

- Recording tags of a device over a certain duration with a trace (Page 17)
- Recording tags of a device without a time limit with a long-term trace (Page 21)
- Recording tags from multiple devices over a certain duration with a project trace (Page 24)
- Recording of tags from multiple devices without a time limit with a long-term project trace (Page 28)
- Recording events from technology objects on an S7-1500 CPU (Page 102)

The trace and logic analyzer functions are also used in the commissioning editors of technology objects (for example, an axis control panel or kinematic trace). Active recordings from the axis control panel are displayed in the "Traces" system folder as "Traces". The measurements on the memory card can also be read and displayed via the diagnostic interface of the Web server.

To record and analyze tags from multiple projects, you can interconnect the projects by coupling the Ethernet subnets with a PN/PN coupler. You can find more information on using a PN/PN coupler in the help under "Bus coupling with PN/PN coupler".

The recorded values can be permanently saved as a measurement. When the recording is reactivated, the current values are overwritten. Recordings can be added to the measurements in the curve diagram of the axis control panel or the PID via a context menu command.

A variety of options are available for evaluating the recording, e.g.:

- Evaluation of a certain instant of an ongoing recording (Page 63)
- Monitor an ongoing recording (Page 54)
- Evaluation of the difference between two samples (Page 75)

The recording options may vary depending on the device used.

You can find a video demonstration of the recording with the trace function and export for further diagnostics under (https://support.industry.siemens.com/cs/us/en/view/109822276).

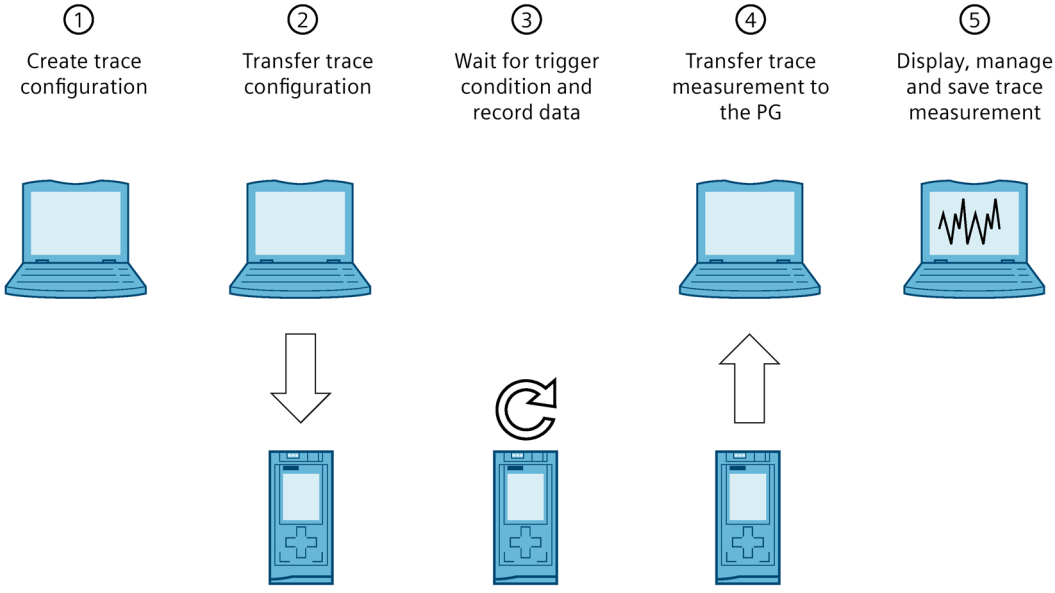
3.2 Measured value recording with a trace

You can use a trace to record selected tags from a device over a specific duration.

You can find a device overview with the respective supported trace in the section "Supported hardware (Page 31)".

3.2.1 How a trace works

The following section shows how a trace works:



① Trace configuration on the programming device (PG) in the TIA Portal

Note

The following description applies to an S7-1500. The configuration depends on the device and is described for each device (Page 90).

In the trace configuration (Page 37), you select the signals to be recorded and define the conditions for the sampling and the trigger. Optionally, you can either activate the recording of events from technology objects or set the measurement in the device (memory card).

② Transfer the trace configuration from the PG to the device

You transfer the complete trace configuration to the device (Page 50) with an existing online connection.

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.

③ Wait for the recording

When the trace configuration is activated (Page 53), recording occurs independently of the PG. The recording is started as soon as the trigger condition is met.

A recording in the device is not retentive (it is lost after the device is switched off/on), but can be saved permanently as a measurement in the project or on the memory card in the device.

④ Transfer the trace measurement from the device to the PG

The saving of the measurement in the project (Page 63) stores the measurement in the opened project of the TIA Portal. 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 measurement is saved regardless of the time of the measurement and can also be saved at any time once the recording is completed. The configuration data is displayed write-protected.

⑤ Evaluate, manage and save the trace measurement

A wide range of options are available for evaluating the measurement in the curve diagram and in the signal table (Page 68) (e.g. grouping displays, inserting formulas, etc.). Various display types are possible, for example, a bit representation for binary signals. Signal curves from different measurements can be compiled as a combined measurement and compared with each other (Page 66).

Changes to the settings for measurements within the combined trace measurement have no impact on the original measurements. The original measurements remain unchanged.
Measurements can also be exported (Page 64) and imported (Page 64) as a CSV file.
By saving the project in the TIA Portal, the measurements transferred to the project are also saved.

The event recording (Page 102) function is available running diagnostics on any events of technology objects as of version V9.0 on an S7-1500 CPU.

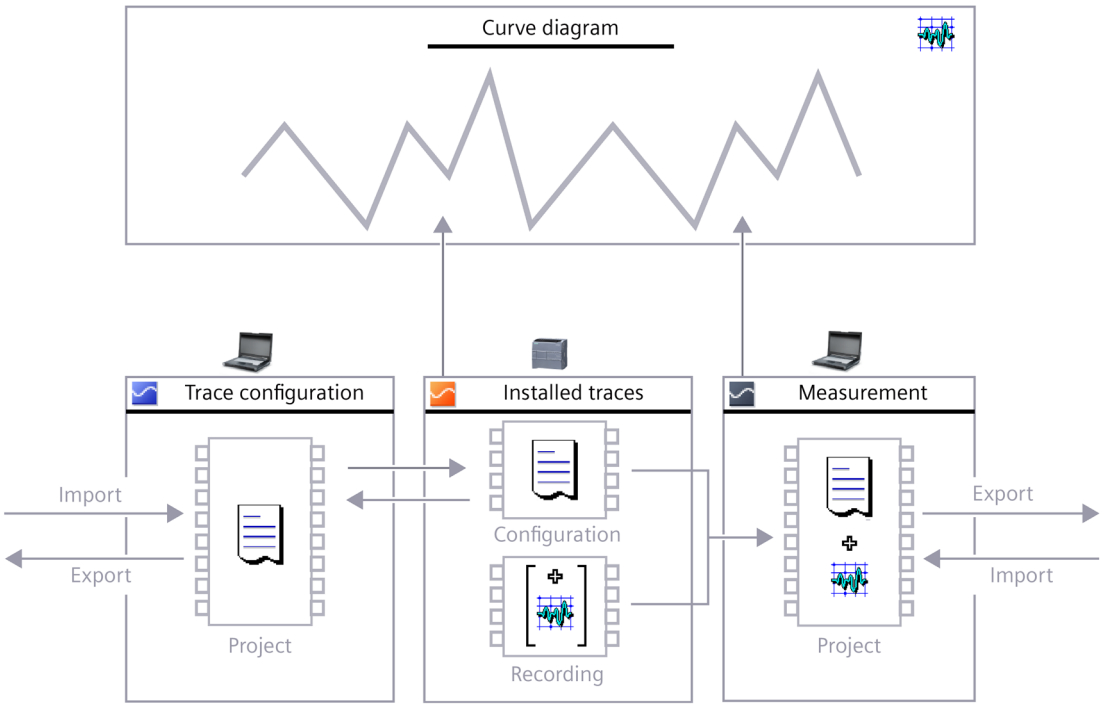
See also

Display of the recording in the curve diagram (Page 55)

3.2.2 Functionality of an installed trace

An installed trace consists of a trace configuration, which was transferred to the device via TIA Portal and optionally a recording.

The following diagram shows how an installed trace works:



Note

Save the trace configuration and measurement

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

See also

Configuring (Page 37)

Recording (Page 53)

Save recordings as measurements (Page 63)

Evaluating the measurement (Page 66)

3.2.3 Configuration overview

Note

The following description applies to an S7-1500. The configuration depends on the device and is described for each device (Page 90).

Make the following settings in the trace configuration :

- Signals (Page 38) to be recorded
- Optional: Event recording (Page 102)
- Recording conditions
  - Sampling (Page 38)
  - Trigger (Page 39)
  - Optional: Measurements on the device (memory card) (Page 40)

Note

Note that the "Event recording" function and the "Measurement in the device (memory card)" function cannot be activated at the same time.

Trace configuration with the same name in the project

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.

Copy and apply configuration

You can copy trace configurations to the "Traces" system folder using drag-and-drop or the clipboard. The application of a configuration depends on the device type. The following sources are possible:

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

The trace configuration is stored retentively on the device. Depending on the device, the retentive storage of the trace configuration can also be configurable, e.g. on the S120.

The configuration data is displayed write-protected.

3.2.4 Evaluation options

The following options are available for evaluating a trace recording:

- Time diagram
- Compare recordings (combined measurement) (Page 66)
- FFT diagram
- Bode diagram

See also

Displaying and analyzing measured values (Page 32)

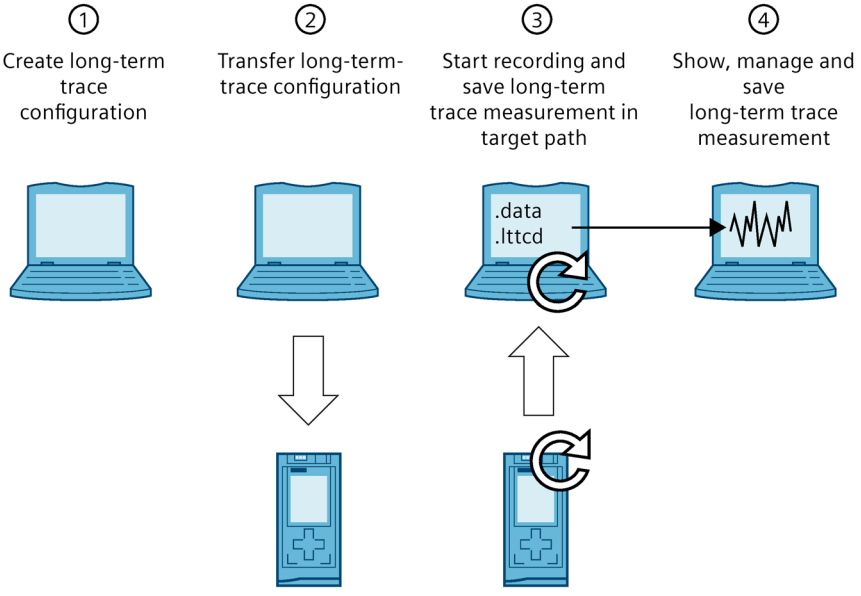
3.3 Measured value recording with a long-term trace

With a long-term trace, you can continuously record data from a device without limiting the recording duration. If you activate the long-term trace, the recording is started and continues until you deactivate the long-term trace. The recording data is stored in a selected target path on the programming device.

You can find a device overview with the respective supported trace in the section "Supported hardware (Page 31)".

3.3.1 How a long-term trace works

The following section shows how a long-term trace works:



① Long-term trace configuration on the programming device (PG) in the TIA Portal

In the long-term trace configuration (Page 42), you select the signals to be recorded and define the conditions for sampling and the target path for the recording. The configuration depends on the device and is described for each device (Page 90).

② Transfer the long-term trace configuration from the PG to the device

The complete long-term trace configuration can be transferred to the device (Page 50) when an online connection is established.

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.

③ Start the long-term trace recording and save the long-term trace measurement to target path

You start the long-term trace recording by activating the configuration (Page 53). The long-term trace recording is displayed in the time diagram.

Note

As of TIA Portal V20, the recording is saved as binary code in ".dat" format. To be able to use the recording data for external evaluation, export the measurement as a CSV file together with the LTTCD file.

④ Display, manage, and evaluate the long-term trace measurement

You can save the long-term trace recording as a measurement in the project (Page 63) for evaluation. The configuration data is displayed write-protected.

Completed measurements can also be exported (Page 64) and imported (Page 64) as a CSV file.

A wide range of options are available for evaluating the measurement in the curve diagram (Page 55) and in the signal table (Page 68) (e.g. grouping displays, embedding formulas, etc.). Various display types are possible, for example, a bit representation for binary signals.

Signal curves from different measurements can be compiled as a combined measurement (Page 66) and compared with each other. 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.

Note

A maximum of 100000 samples are shown in the curve diagram.

If a recording contains more samples, you will only see the corresponding part of the measurement.

3.3.2 Configuration overview

Note

The following description applies to an S7-1500. The configuration depends on the device and is described for each device (Page 90).

Make the following settings in the long-term trace configuration :

- Signals (Page 42) to be recorded
- Recording conditions
  - Sampling (Page 42)
- Target path for the recording (Page 43)

In the long-term trace configuration, you define a target path for the recording. The data of the long-term trace recording is saved together with the configuration file (.lttcd) in the configured target path.

Note

As of TIA Portal V20, the recording is saved as binary code in ".dat" format. To be able to use the recording data for external evaluation, export the measurement (Page 64) as a CSV file together with the LTTCD file.

Copy and apply configuration

Long-term trace configurations are copied and transferred in the same way as with Trace (Page 20).

See also

Long-term trace recording (Page 96)

3.3.3 Evaluation options

The following options are available for evaluating a long-term trace recording:

- Time diagram
- Compare recordings (combined measurement) (Page 66)

See also

Displaying and analyzing measured values (Page 32)

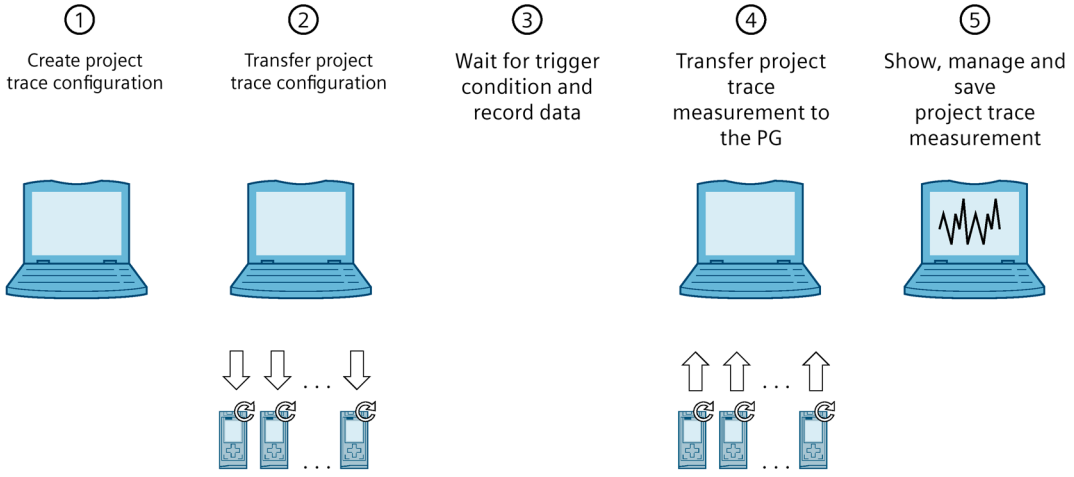
3.4 Measured value recording with a project trace

With a project trace, you record selected tags across multiple devices over a specific duration. A project trace contains trace configurations from several devices. Each device can trigger the recording on all participating devices. After receiving the global trigger, the devices with a valid project trace configuration start recording.

You can find a device overview with the respective supported trace in the section "Supported hardware (Page 31)".

3.4.1 How a project trace works

The following section shows how a project trace works:



① Project trace configuration on the programming device (PG) in the TIA Portal

Select the participating devices in the Project trace configuration (Page 44). In the Inspector window of the respective participating device, select the signals to be recorded and define the conditions for sampling and the trigger. The project trace configuration depends on the device and is described for the respective devices (Page 90).

② Transfer the project trace configuration from the PG to all the participating devices

You transfer the complete project trace configuration (Page 50) to all participating devices with an existing online connection.

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.

③ Wait for the recording

When the project trace configuration is activated (Page 53), recording occurs independently of the PG. As soon as the trigger condition is met, recording is started on all participating devices.

④ Transfer the project trace measurement from the device to the PG

The saving of the measurement in the project (Page 63) stores the measurement in the opened project of the TIA Portal. A project trace measurement consists of a project trace configuration and a recording, if recorded data is available. The recording of a measurement can be analyzed offline. The measurement is saved regardless of the time of the measurement and can also be saved at any time once the recording is completed. The configuration data is displayed write-protected.

⑤ Evaluate, manage and save the project trace measurement

A wide range of options are available for evaluating the measurement in the curve diagram (Page 55) and in the signal table (Page 68) (e.g. grouping displays, embedding formulas, etc.). Various display formats are possible, e.g. a bit display for binary signals.
Measurements can also be exported (Page 64) and imported (Page 64) as a CSV file.
By saving the project in the TIA Portal, the measurements transferred to the project are also saved.

3.4.2 Configuration overview

Note

The following description applies to an S7-1500. The configuration depends on the device and is described for each device (Page 90).

Make the following settings in the project trace configuration :

- Select participating devices (Page 44)
- Signals (Page 45) to be recorded
- Recording conditions
  - Sampling (Page 45)
  - Trigger (Page 46)

Requirements

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

- PROFINET RT or IRT communication
- All devices are on a 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.

Copy and apply configuration

Project trace configurations are copied and transferred in the same way as with Trace (Page 20).

3.4.3 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 in which the signals are recorded is used.

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 evaluation with absolute time, you must synchronize the time of day on the devices.

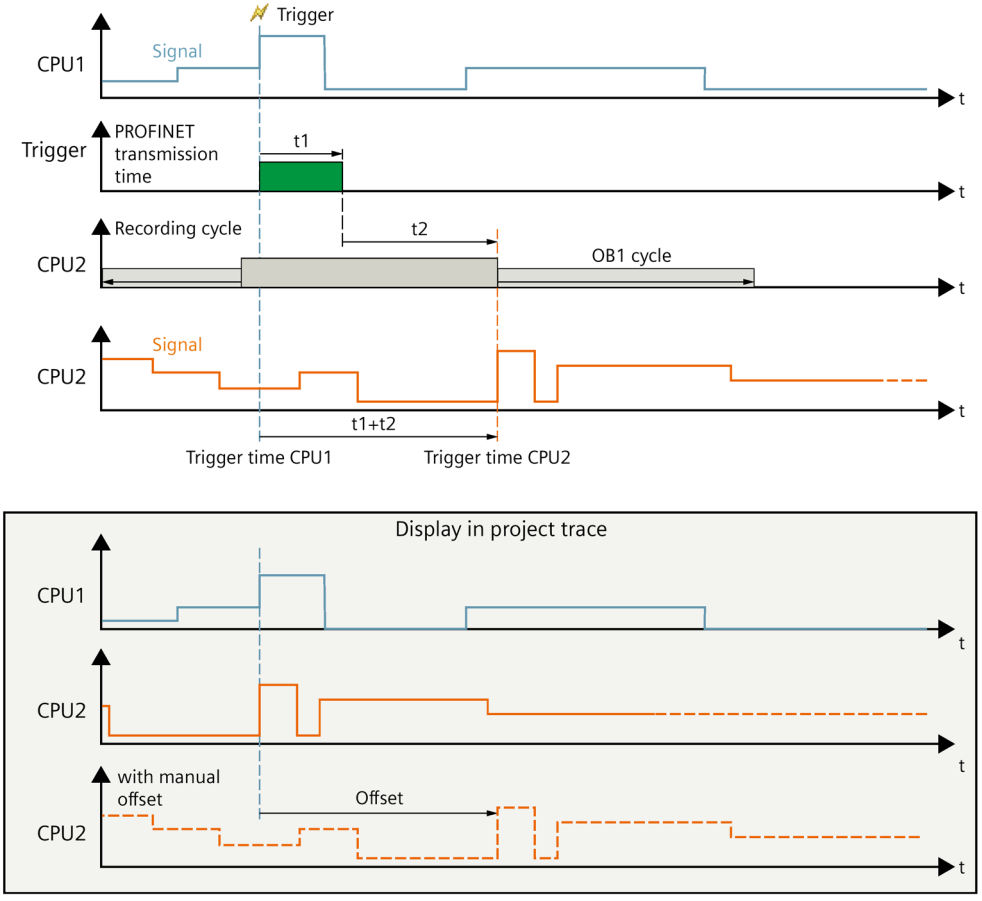
You can find information on the recording time in the device-specific descriptions.

3.4.4 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 following figure shows a recording with project trace and the correction of the display with an offset:



3.4.5 Evaluation options

The time diagram is available for evaluating a project trace recording.

See also

Displaying and analyzing measured values (Page 32)

3.5 Measured value recording with a long-term project trace

With a long-term project trace, you can continuously record selected tags across multiple devices without limiting the recording duration. A long-term project trace contains long-term trace configurations of several devices. If you activate the long-term project trace, recording is started on all participating devices and continues until you deactivate the long-term project trace. The recording data is stored in a selected target path on the programming device.

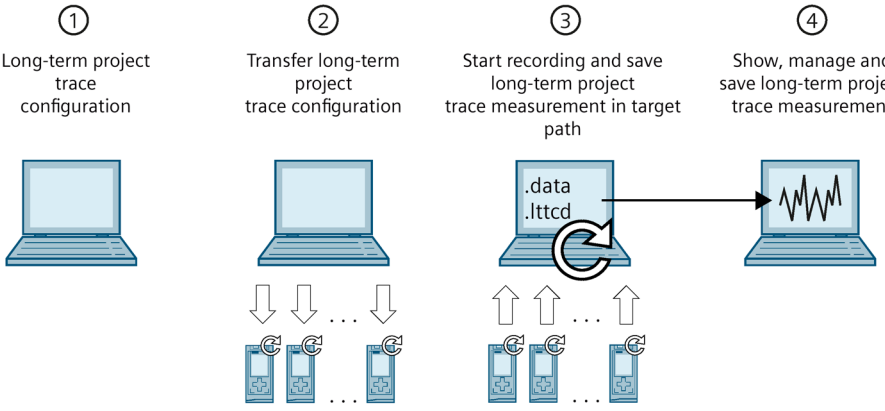
You can find a device overview with the respective supported trace in the section "Supported hardware (Page 31)".

Note

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

3.5.1 How a long-term project trace works

The following section shows how the long-term project trace works:



① Long-term project trace configuration on the programming device (PG) in the TIA Portal

Select the participating devices in the long-term project trace configuration (Page 47). In the Inspector window of the respective participating device, select the signals to be recorded and define the conditions for sampling and the target path for the recording. The configuration depends on the device and is described for each device (Page 90).

② Transfer the long-term project trace configuration from the PG to the device

You transfer the complete long-term project trace configuration (Page 50) to all participating devices with an existing online connection.

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.

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

You start the recording by activating the configuration (Page 53). The long-term project trace recording is displayed in the time diagram.

Note

If a measured variable is renamed during the recording of a long-term project trace, the display in the diagram is lost. However, the signals are still recorded and stored in the target path. To make the values visible in the diagram again, you need to rename the tag back to its original name.

The data of the long-term project trace recording is saved together with the configuration file (.lttcd) in the configured target path.

Note

As of TIA Portal V20, the recording is saved as binary code in ".dat" format. To be able to use the recording data for external evaluation, export the measurement as a CSV file together with the LTTCD file.

④ Display, manage, and evaluate the long-term project trace measurement

For evaluation purposes, you can save the long-term project trace recording as a measurement in the project (Page 63). The configuration data is displayed write-protected.

Completed measurements can also be exported (Page 64) and imported (Page 64) as a CSV file.

A wide range of options are available for evaluating the measurement in the curve diagram (Page 55) and in the signal table (Page 68) (e.g. grouping displays, embedding formulas, etc.). Various display types are possible, for example, a bit representation for binary signals.

Note

A maximum of 100000 samples are shown in the curve diagram.

If a recording contains more samples, you will only see the corresponding part of the measurement.

3.5.2 Configuration overview

Note

The following description applies to an S7-1500. The configuration depends on the device and is described for each device.

Make the following settings in the long-term project trace configuration :

- Select participating devices (Page 48)
- Signals (Page 48) to be recorded
- Recording conditions
  - Sampling (Page 48)
- Target path for the recording (Page 49)

In the long-term project trace configuration, you define a target path for the recording. The data of the long-term project trace recording is saved together with the configuration file (.lttcd) in the configured target path.

Note

As of TIA Portal V20, the recording is saved as binary code in ".dat" format. To be able to use the recording data for external evaluation, export the measurement (Page 64) as a CSV file together with the LTTCD file.

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 in order to transfer the long-term project trace to the devices

Copy and apply configuration

Long-term project trace configurations are copied and transferred in the same way as with Trace (Page 20).

See also

Long-term project trace recording (Page 99)

3.5.3 Time synchronization

Time synchronization works in the same way as with the project trace (Page 26).

3.5.4 Trigger time for RT communication

The trigger time for real-time communication works in the same way as for the project trace (Page 27).

3.5.5 Evaluation options

The time diagram is available for evaluating a long-term project trace recording.

See also

Displaying and analyzing measured values (Page 32)

3.6 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 Drive Controller
- SIMATIC S7-1500 Software 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)

Overview of the supported trace functions by device family

The following table shows the trace functions that are available for the respective device family:

Device family	Trace	Long-term trace	Project trace	Long-term project trace
SIMATIC S7-1200 CPUs (as of firmware version V4.0)	✓	-	-	-
SIMATIC S7-1500, ET 200SP, CPU 1513pro-2 PN and 1516pro-2 PN CPUs	✓	✓	✓ (as of firmware V2.8)	✓ (as of firmware V2.8)
SIMATIC Drive Controller	✓	✓	✓ (as of firmware V2.8)	✓ (as of firmware V2.8)
SIMATIC S7-1500 Software Controller	✓	✓	✓ (as of firmware V2.8)	✓ (as of firmware V2.8)
ET 200SP Open Controller	✓	✓	✓ (as of firmware V20.8)	✓ (as of firmware V20.8)
SINAMICS drives that are configured in Startdrive	✓	-	-	-
SINAMICS V90 (with HSP 0185)	✓	-	-	-
SIRIUS SIMOCODE pro (with Simocode ES)	✓	-	-	-

3.7 Displaying and analyzing measured values

The curve diagrams show the signals of a recording selected in the signal table.

The display area can be zoomed as required. Using the measurement cursors and formula editor, individual values can be selected for display in the signal table and calculated using formulas.

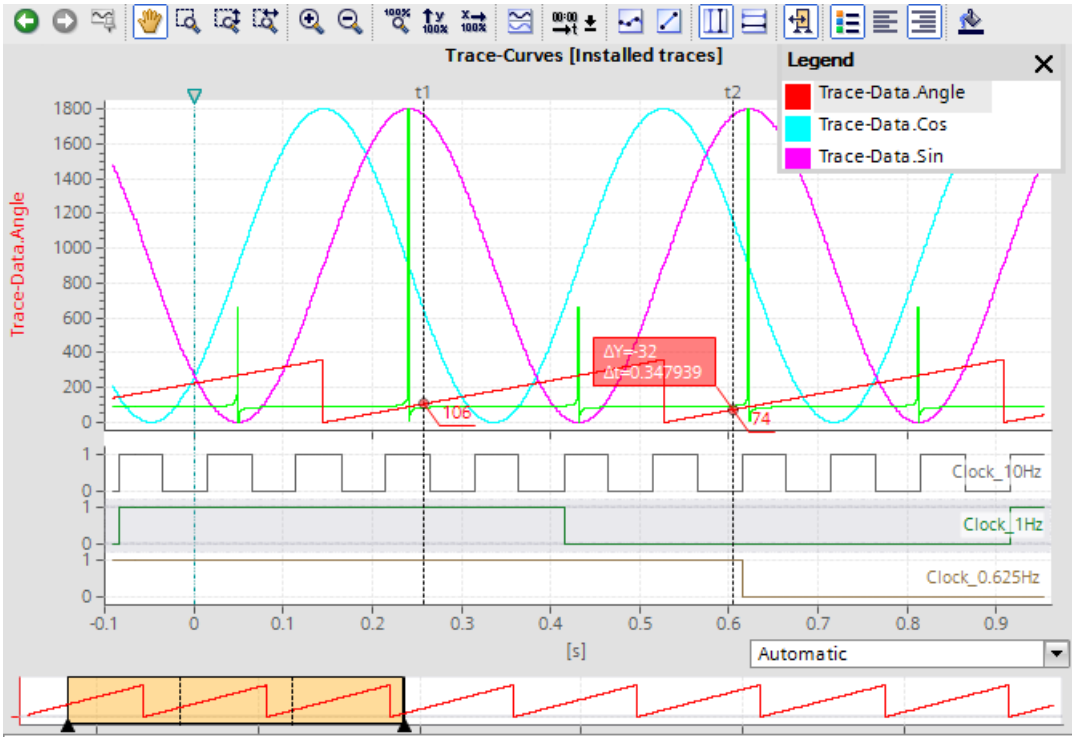
Time diagram

The time diagram shows the selected signals of a recording. Analog signals are displayed in the upper curve diagram. Binary signals are displayed in the lower diagram as a bit trace. You can adapt the display of the signals in the signal table and with the toolbar of the curve diagram.

Individual bits can be selected for some data types and displayed as a bit track. Binary signals cannot be grouped.

In the project trace, the curve diagram shows a completed or aborted recording. You can monitor any recording under the device.

The following figure shows an example of the display:

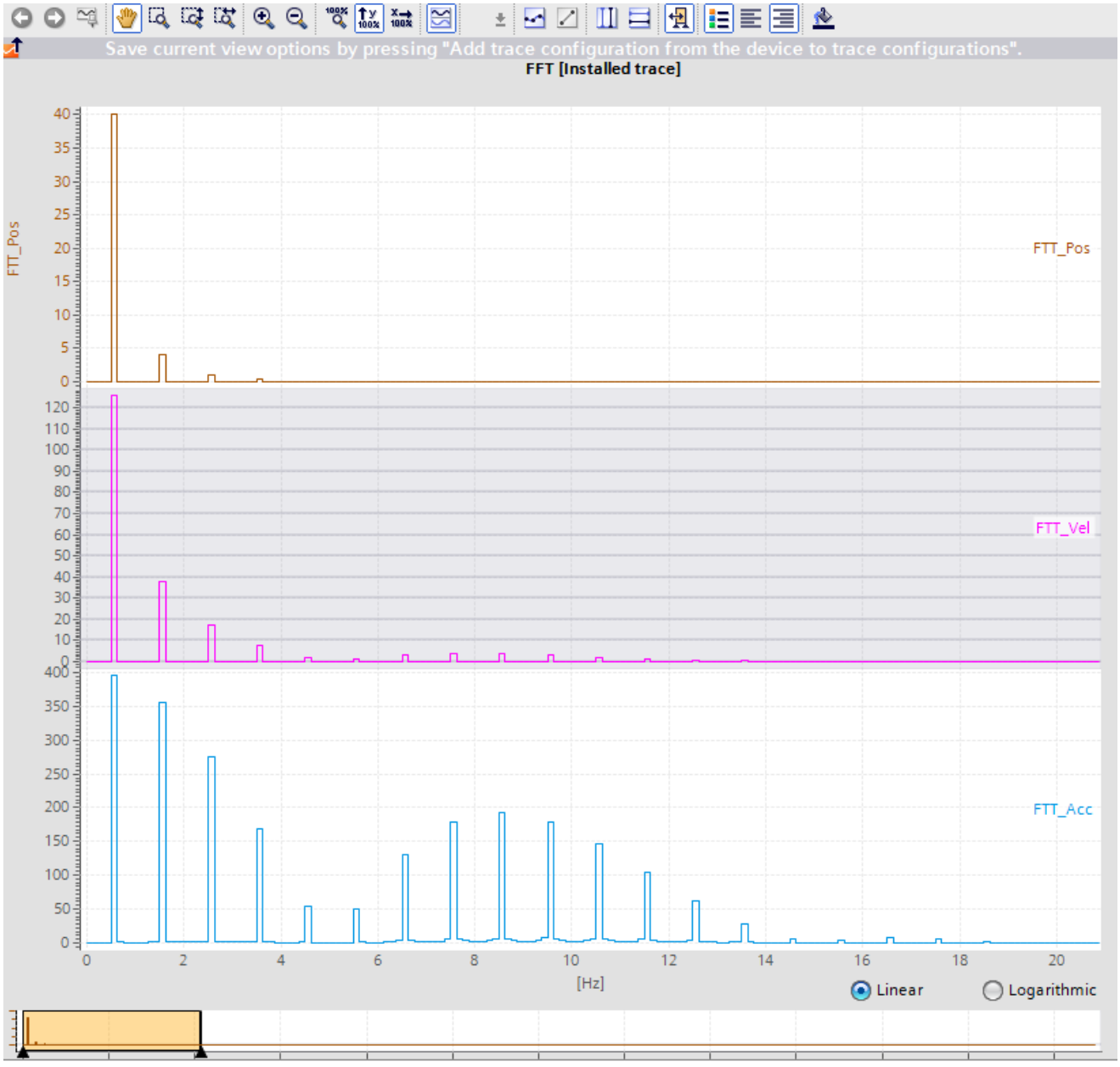


FFT diagram

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.

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

The following figure shows an example of the display:



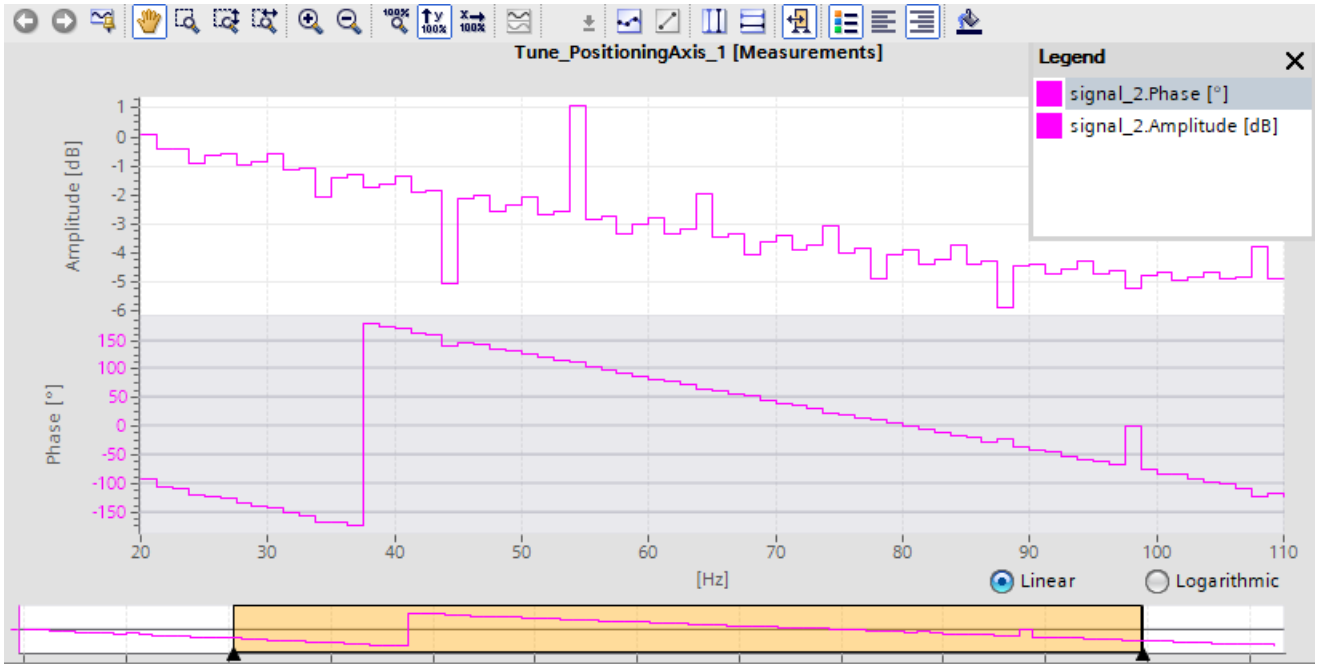
Bode diagram

The Bode diagram shows the amplitude and phase of the transfer function as a function of the frequency. The X axis shows the frequency in Hertz.
The Y axis shows the following values:
• Amplitude response in the upper curve diagram, values linear in decibels
• Phase response in the lower 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 isochronous.
• The input signal must contain at least 3 samples.
The curve diagram is calculated using two measured signals with the Bode formula in the formula editor and displayed.

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

The following figure shows an example of the display:



Signal table and formula editor

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. In the table, you can show or hide individual signals for the display, adapt properties for the display, create signal groups and add formulas. You can use signal groups to uniformly scale individual signals, which makes it easier to compare curves, for example.

The formula editor offers various mathematical functions for analyzing signals.

See also

Create an FFT diagram (Page 83)

Create a Bode diagram (Page 85)

Set the view of the curve diagram (Page 55)

Working with the signal table (Page 68)

Using trace functions

4

4.1 Configuring

4.1.1 Configuring the trace

4.1.1.1 Guide to using a trace

Note

The following description applies to an S7-1500. The configuration depends on the device and is described for each device.

1. Add a new trace to the project (Page 37)
2. Select the signals (Page 38), define criteria for sampling (Page 38) and the trigger (Page 39)
3. Optional: Activate event recording (Page 119), or set measurements in the device (memory card) (Page 40)
4. Transfer the configuration to the device (Page 50)
5. Activate recording (Page 53), monitor (Page 54) and deactivate recording (Page 53)
6. Save the recording as measurement in the project (Page 63)
7. Select signals (Page 66)

4.1.1.2 Add a new trace to the project

Procedure:

1. Open the "Traces" folder in the project tree under the selected device.
2. Double-click on the "Add new trace" entry.

   A new trace configuration is created in the project tree and the configuration window is opened in the work area.
3. Click on the name of the trace configuration in the project tree to customize it.

   Or:

   Right-click on the name of the trace configuration in the project tree and select the "Rename" command in the context menu.

4.1.1.3 Selecting signals

Requirement

- 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.

4.1.1.4 Activate event recording

Note

The "Event recording" function is only available on an S7-1500 CPU with an installed trace and is available for all technology objects as of version V9.0.

You can find more information on this function under the respective device in the section "Acquiring events from technology objects in the recording" (Page 119).

4.1.1.5 Configure sampling

Note

The following description applies to an S7-1500. The configuration depends on the device and is described for each device (Page 90).

Requirement

- The "Sampling" area is open in the "Configuration" tab.

Procedure

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

1. Click the button.
2. Select an OB for the recording time (Page 93).
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".
   - Select the "Use max. recording duration" check box.

4.1.1.6 Configure trigger mode

Note

The following description applies to an S7-1500. The configuration depends on the device and is described for each device (Page 90).

Requirements

- The "Trigger" area is opened in the "Configuration" tab.

Trigger mode "Monitor without trigger"

Proceed as follows to start recording immediately without it being ended automatically:

1. Select the "Monitor without trigger" entry in the "Trigger mode" drop-down list.

   The input fields for the trigger tag are hidden. After you stop recording, the maximum number of measured values in the device is the number you have configured under Recording duration. The trigger mode is particularly suitable for monitoring slow signals.

"Record immediately" trigger condition

To start the recording immediately, proceed as follows:

1. In the "Trigger mode" drop-down list, select the "Record immediately" entry.

   The input fields for the trigger tag are hidden.

"Trigger on tag" trigger mode

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

1. In the "Trigger mode" drop-down list, select the "Trigger on tag" entry.
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 trigger tag (Page 113).
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 the cycle of the OB in which the trigger tag is processed, regardless of the setting in "Record every". To reliably identify the trigger, the trigger signal must be present for at least one full cycle.

4.1.1.7 Set the measurement in the device (memory card)

Note

The following description applies to an S7-1500. These settings are device-specific and are described for the respective device.

Requirement

- The "Event recording" function is not used.
- The "Trigger on tag" trigger mode is set.
- The "Recording conditions" area is open in the "Configuration" tab.
- The firmware on the device supports the recording of an installed measurement.

Procedure

To save the measurement in the device (memory card), proceed as follows:

1. Select the "Save measurements in the 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. In the "Response when number reached" drop-down list, set the desired response when the number of measurements has been reached:
   - "Deactivate recording"
     The measurements are repeated until the configured "Number of measurements" is reached.
   - "Overwrite oldest recording"
     The measurements are saved in a ring buffer and repeated until you deactivate the recording. As soon as the number of measurements exceeds the configured "Number of measurements", the oldest measurement on the card is overwritten in each case.

Result

The measurements are stored in the "Measurements on device (memory card)" folder in the project tree. The folder is only visible when the device is actively connected online.

These measurements are retentive and can only be deleted by you as the user.

Note

The measurements on the device (memory card) can be transferred to the "Measurements" folder using drag-and-drop and thus saved as a measurement in the project.

Required information on the measurement in the device (memory card)

Note the following when using the "Measurement in the device" function:

- Only completed measurements are stored in the device. A recording that you have deactivated is not saved in the device.
- No new trigger can be evaluated as long as the recording is being saved.
- Frequently repeated write operations can damage the memory card.
- Do not delete any measurements on the device as long as an installed trace still generates new measurements on the memory card.
- Following a device reboot, the maximum number of measurements saved in the device is the number configured under "Number of measurements". Repeated restarts will not overwrite measurements that have already been saved and the configured "Number of measurements" will be saved in the device again.
- The memory in the device (memory card) is partly used by system-relevant functions or reserved for that purpose. It is therefore not possible for the entire memory to be used for saving measurements.
  You can find more information in the Structure and Use of the CPU Memory (https://support.industry.siemens.com/cs/ww/en/view/59193101) Function Manual.

4.1.2 Configuring the long-term trace

4.1.2.1 Guide to using a long-term trace

1. Add a new long-term trace to the project (Page 42)
2. Select signals (Page 42), define criteria for sampling (Page 42) and set the target path for the recording (Page 43).
3. Transfer the configuration to the device (Page 50)
4. Activate recording, monitor and deactivate recording
5. Save the recording as measurement in the project
6. Select signals (Page 66)

4.1.2.2 Add a new long-term trace to the project

Procedure:

1. Open the "Long-term traces" subfolder, which is located in the "Traces" folder in the project tree under the selected CPU.
2. Double-click on the "Add new long-term trace" entry.

   A new long-term trace configuration is created and the configuration window is opened in the work area.
3. Click on the name of the long-term trace configuration in the project tree to customize it.

   Or:

   Right-click on the name of the long-term trace configuration in the project tree and select the "Rename" command in the context menu.

4.1.2.3 Select signals

The signals are selected (Page 38) in the same way as for a trace.

4.1.2.4 Configure sampling

Note

The following description applies to an S7-1500. These settings are device-specific and are described for the respective device.

Requirement

- The "Sampling" area is open in the "Configuration" tab.

Procedure

To configure the cycle of a long-term trace recording, proceed as follows:

1. Click for the recording time.
2. Select an OB for the recording time (Page 93).
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".

4.1.2.5 Configure target path for long-term trace recording

Requirement

- The "Long-term trace" area is opened in the "Configuration" tab.

Procedure

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 setting.

   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".

   The long-term trace recording data is saved together with the configuration file (.lttcd) in the configured target path.

Note

As of TIA Portal V20, the recording is saved as binary code in ".dat" format. To be able to use the recording data for external evaluation, export the measurement as a CSV file together with the LTTCD file.

See also

Long-term trace recording (Page 96)

4.1.3 Configuring the project trace

4.1.3.1 Guide to using a project trace

1. Add a new project trace to the project (Page 44)
2. Select participating devices (Page 44)
3. In the "Participating devices" interface, select a device for which the recording conditions are configured.

   In the Properties tab of the Inspector window, select the signals to be recorded (Page 45), define criteria for sampling (Page 45) and for the trigger (Page 46). Repeat this step for each participating device.
4. Transfer the configuration to the devices (Page 50)
5. Activate recording (Page 53), monitor (Page 54) and deactivate recording (Page 53)
6. Save the recording as measurement in the project (Page 63)
7. Select signals (Page 66)

4.1.3.2 Add a new project trace to the project

Procedure:

1. Open the "Project traces" folder located in the "Cross-device functions" system folder in the project tree.
2. Double-click the "Add new project trace" entry.

   A new project trace configuration is created and the "Participating devices" interface is opened in the work area.
3. Click on the name of the project trace configuration in the project tree to customize it.

   Or:

   Right-click on the name of the project trace configuration in the project tree and select the "Rename" command in the context menu.

4.1.3.3 Select participating devices

Requirement

- At least two devices that support the cross-device functions are configured.
- The "Participating devices" interface is open in the work area.

Procedure

To select participating devices, proceed as follows:

1. In the "Participating devices" interface, use the button to select the devices that are to participate in the project trace recording.

4.1.3.4 Selecting signals

Requirement

- A device is selected in the "Participating devices" interface.
- The "Properties" tab is open in the Inspector window.
- The "Signals" area is open in the "Properties" 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.

4.1.3.5 Configure sampling

Note

The following description applies to an S7-1500. The configuration depends on the device and is described for each device (Page 90).

Requirement

- A device is selected in the "Participating devices" interface.
- The "Properties" tab is open in the Inspector window.
- The "Sampling" area is opened in the "Properties" tab.

Procedure

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

1. Click the button.
2. Select an OB for the recording time (Page 93).
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".
   - Select the "Use max. recording duration" check box.

4.1.3.6 Configure trigger mode

Note

The following description applies to an S7-1500. The configuration depends on the device and is described for each device (Page 90).

Requirement

- A device is selected in the "Participating devices" interface.
- The "Properties" tab is open in the Inspector window.
- The "Trigger" area is open in the "Properties" tab.

"Record immediately" trigger condition

This trigger mode is selected in the same way as for a trace (Page 39).

"Trigger on tag" trigger mode

This trigger mode is selected in the same way as for a trace (Page 39).

Trigger mode "Trigger from another device"

To start recording on the participating device depending on the trigger condition of another participating device, proceed as follows:

1. Select the "Trigger from another device" entry in the "Trigger mode" drop-down list.
2. Select a unit for the pretrigger in the drop-down list for "Pretrigger".
3. In order to record a period before the trigger event, enter a value greater than 0 in the input field for the pretrigger.

Note

Devices which receive the trigger from another device, have a time-delayed trigger event. You can find more information on this in the Time synchronization (Page 26) section.

4.1.4 Configure long-term project trace

4.1.4.1 Guide to using a long-term project trace

1. Add a new long-term project trace to the project (Page 48)
2. Select participating devices (Page 48)
3. In the "Participating devices" interface, select a device for which the recording conditions are configured.

   In the Properties tab of the Inspector window, select the signals (Page 48), define criteria for sampling (Page 48) and set the target path for the recording (Page 49). Repeat this step for each participating device.
4. Transfer the configuration to the devices (Page 50)
5. Activate recording (Page 53), monitor (Page 54) and deactivate recording (Page 53)
6. Save the recording as measurement in the project (Page 63)
7. Select signals (Page 66)

4.1.4.2 Add a new long-term project trace to the project

Procedure:

1. Open the "Long-term project traces" folder, which is located in the "Cross-device functions" system folder in the project tree.
2. Double-click on the "Add new long-term project trace" entry.

   A new long-term project trace configuration is created and the "Participating devices" interface is opened in the work area.
3. Click on the name of the long-term project trace configuration in the project tree to customize it.

   Or:

   Right-click on the name of the long-term project trace configuration in the project tree and select the "Rename" command in the context menu.

4.1.4.3 Select participating devices

Participating devices are selected in the same way as for a project trace (Page 44).

4.1.4.4 Select signals

The signals are selected in the same way as for a project trace (Page 45).

4.1.4.5 Configure sampling

Note

The following description applies to an S7-1500. The configuration depends on the device and is described for each device (Page 90).

Requirement

- A device is selected in the "Participating devices" interface.
- The "Properties" tab is open in the Inspector window.
- The "Sampling" area is opened in the "Properties" tab.

Procedure

To configure the cycle of the long-term project trace recording, proceed as follows:

1. Click the button.
2. Select an OB for the recording time (Page 93).
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".

4.1.4.6 Configure target path for long-term project trace recording

Change the target path for a participating device

Requirements:

- A device is selected in the "Participating devices" interface.
- The "Properties" tab is open in the Inspector window.
- The "Long-term trace" area is open in the "Properties" tab.

Procedure:

1. Click the ... button for the target path setting.

   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".

   The data of the long-term project trace recording is saved together with the configuration file (.lttcd) in the configured target path.

Change target path for all participating devices

Requirements:

- No device is selected in the "Participating devices" interface.
- The "Properties" tab is open in the Inspector window.
- The "General" area is open in the "Properties" tab.

  Or:
- The "Properties" window was opened in the project tree via the context menu of the long-term project trace.

Procedure:

1. Click the ... button for the target path setting.

   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".

   The data of the long-term project trace recording is saved together with the configuration file (.lttcd) in the configured target path.

Note

As of TIA Portal V20, the recording is saved as binary code in ".dat" format. To be able to use the recording data for external evaluation, export the measurement as a CSV file together with the LTTCD file.

See also

Long-term project trace recording (Page 99)

4.1.5 Transfer configuration

Transfer the configuration to the device (trace and long-term trace)

Requirements:

- A trace or long-term trace is configured.
- The trace or long-term trace is open in the work area.

Procedure:

1. Click the "Transfer the configuration to the devices" button in the toolbar.

   An online connection to the device is established and the display switches to the "Time diagram" tab.

Transfer configuration to all participating devices (project trace and long-term project trace)

Requirements:

- A project trace or long-term project trace is configured.
- The project trace or long-term project trace is open in the work area.

Procedure:

1. Click the "Transfer the configuration to the devices" button in the toolbar.

   An online connection to all participating devices is established and the display switches to the "Time diagram" tab.

2. Click the "Status overview" button to check the status of the devices.

Result

The trace or long-term trace is prepared and the recording can be activated (Page 53).

See also

Status overview of the participating devices (Page 88)

4.1.6 Transfer the installed trace to the project as a trace configuration

Requirement

- There is an installed trace .
- There is an online connection to the device.
- The installed trace is open in the work area.

Procedure

To transfer an installed trace as a new trace configuration to the "Traces" system folder, proceed as follows:

1. Click the "Add installed trace to trace configurations" button in the toolbar.
   The current display options remain in the new trace configuration. A trace configuration with the same name in the system folder is overwritten.

4.1.7 Deleting a trace from the device

Delete trace from the device (trace and long-term trace)

Requirements:

- There is an installed trace .
- There is an online connection to the device.
- The installed trace is open in the work area.

Procedure:

1. Click the "Delete trace from device" button in the toolbar.

   The trace is deleted from the device.

Delete traces from the participating devices (project trace and long-term project trace)

Requirements:

- There are installed traces .
- There is an online connection to at least one device.
- The project trace or long-term project trace is open in the work area.

Procedure:

1. Click the "Delete traces from devices" button in the toolbar.

   The traces are deleted from the participating devices that are accessible online.

4.1.8 Export configuration

Requirement

- The trace configuration is opened in the work area.

Procedure

To save the trace configuration in a specified location as a file in ".ttcfgx" format, proceed as follows:

1. Click the "Export trace configuration" button in the toolbar.

   Or:

   Right-click on the trace configuration to be exported in the project tree and select the "Export trace configuration" command in the context menu.

   The "Save as" window opens.
2. In the folder structure, navigate to the desired target folder or enter the target path under "Folder".
3. Click "Save".

   The trace configuration is stored in the specified location.

4.1.9 Import configuration

Requirement

- A trace configuration is available in the ".ttcfgx" format.

Procedure

To import a trace configuration as a TTCFGX file into the "Traces" folder in the project tree, proceed as follows:

1. Right-click on the "Traces" folder in the project tree.
2. Select the "Import trace configuration" command in the context menu.

   The "Open" window opens.
3. In the folder structure, navigate to the desired TTCFGX file or enter the target path under "Folder".
4. Click the "Open" button.

   The trace configuration is added to the "Traces" folder.

4.1.10 Create a configuration from an existing measurement

Requirement

- A measurement is available in the "Measurements" system folder.
- The measurement is open in the work area.

Procedure

To create a new trace configuration from an existing measurement, proceed as follows:

1. Click the "Create trace configuration" button in the toolbar.

   The trace configuration is added to the "Traces" system folder.

4.2 Recording

4.2.1 Activating/deactivating a recording

Requirement

- The configuration is transferred (Page 50).
- The configuration is opened in the work area.

Activate recording

Proceed as follows to activate the recording:

1. Click the "Activate recording" button in the toolbar.

   Recording is started according to the configured trigger condition.

   The trigger condition is device-specific and is described under the respective device (Page 90).

   If the recording is repeated, 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 63) before you activate the recording again.

Deactivate recording

To deactivate an active recording, proceed as follows:

1. Click the "Deactivate recording" button in the toolbar.

   The recording is deactivated.

Note

Deactivation of the recording with active event recording

Manually deactivating a recording with active event recording can result in missing signal data in the CSV file with event data.

4.2.2 Automatically repeat recording

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

Requirements

- There is an online connection to the device.
- There is an installed trace.
- The "Event recording" function is not used.

Procedure

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

1. Select an installed trace.
2. Double-click the selected trace.
3. Activate the "Monitoring On/Off" button to monitor the recording.
4. Click "Automatically repeat recording" button to automatically repeat the recording.

4.2.3 Monitor ongoing recording in the time diagram

To monitor a running recording in the time diagram, proceed as follows:

1. Click the button "Monitoring on/off" button in the toolbar.

   The display switches to the "Time diagram" tab.

Note

If monitoring and automatic scaling are activated at the same time, no more actions can be undone using the "Undo" button.

When a recording is started for the first time, the display in the curve diagram is preset to automatic scaling. If you start the recording again, note that changed scaling settings are retained. Reactivate automatic scaling manually if necessary in order to monitor the recording.

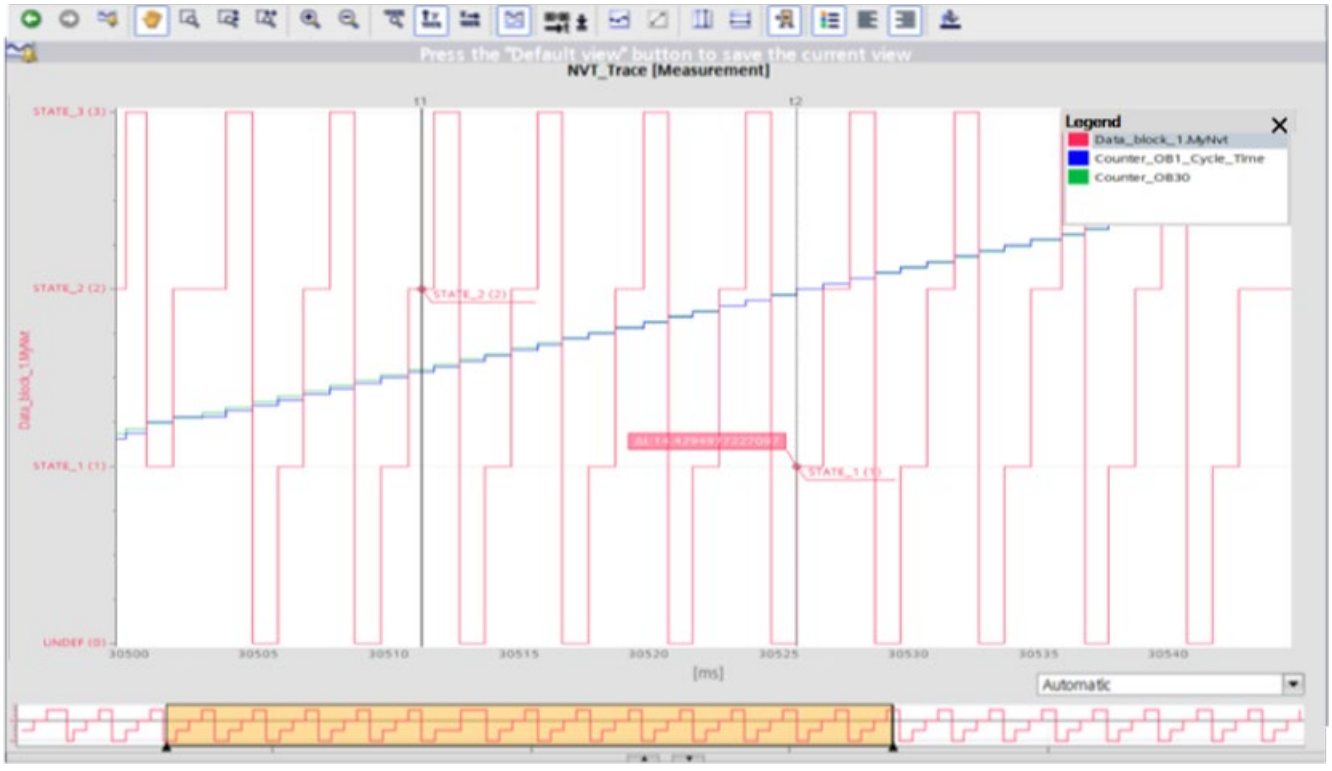
See also

Additional display options for the curve diagram (Page 58)

4.3 Set the view of the curve diagram

4.3.1 Display of the recording in the curve diagram

The following figure shows an example of a recording in the time diagram, using named value data types:



The scale in the diagram applies to the selected signal (highlighted in gray) in the legend. The legend can be moved and resized using the mouse.

When using named value data types in the recording, the corresponding data type values are displayed on the Y axis.

Invalid floating point numbers such as NaN (Not a Number) or TOD (Time of Day) are displayed as hexadecimal numbers on the Y axis. Infinite numbers in the number range +Inf/-Inf (Infinity) are shown as gaps in the diagram.

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

With the "Time (relative)" setting for the time axis, a drop-down list for selecting the unit is available below the curve diagram. The "Automatic" setting automatically adjusts the unit according to the displayed time range.

The time range display below the diagram shows the display range in the curve diagram as a yellow area based on a selected signal. In the FFT and Bode diagram, this area shows the frequency range. You can move the yellow area with the mouse and change its size horizontally at the borders.

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.

4.3.2 Bring a signal into the foreground

To bring a signal to the foreground in the curve diagram, proceed as follows:

1. Show/hide the legend using the "Show/hide chart legend" button.

   Note

   The display of the legend depends on the track arrangement setting. If the track arrangement is active, signal legends are displayed in the respective tracks. If the track arrangement is inactive, a legend table is displayed.

2. Click on a signal in the track or in the legend table.

   Or:

   Click a signal in the curve diagram.

   Or:

   Select a signal in the signal table (Page 68).

4.3.3 Scale the display in the curve diagram

Scale view

The following procedures are available to reduce or enlarge the entire view:

- Click the "Zoom in" or "Zoom out" buttons in the toolbar.
- Turn the mouse wheel while holding down the <Ctrl> key. The mouse pointer must be positioned over the curve diagram.
- Press the <Ctrl++> or <Ctrl+-> shortcut on the keyboard.
- Right-click on the curve diagram and select the "Zoom in" or "Zoom out" commands in the context menu.

Scale a specific area

To scale a specific area in the curve diagram, proceed as follows:

1. Click the "Activate zoom selection" button in the toolbar.
2. Select any area by holding down the mouse button.

   The display is scaled to the range selection.

To scale a specific vertical area, proceed as follows:

1. Click the "Select vertical zoom" button in the toolbar.
2. Select a vertical area with the mouse button held down.

   The display is scaled to the range selection. Selection affects either amplitude response or phase response depending on the mouse position.

To scale a specific horizontal area, proceed as follows:

1. Click the "Select horizontal zoom" button in the toolbar.
2. Select a horizontal area by holding down the mouse button.

   The display is scaled to the range selection.

Show all

The following procedures are available to scale the display so that the entire time range and all values are displayed:

- Click the "Display all" button in the toolbar.
- Press the shortcut <Ctrl+0> on the keyboard.
- Right-click on the curve diagram and select the "Display all" command in the context menu.

See also

Additional display options for the curve diagram (Page 58)

4.3.4 Show or hide individual signals and adapt color

To show or hide individual signals and change their color display in the curve diagram, proceed as follows:

1. In the signal table, click on the symbol next to the respective signal to deselect or select it for display.

   The selected signal is shown or hidden in the curve diagram.

2. In the signal table, click in the "Color" column for the respective signal and select a color.

   The default color for the signal changes.

See also

Setting options and displays in the signal table (Page 71)

4.3.5 Additional display options for the curve diagram

Use default view (measurements only)

To use the current view in the curve diagram as the default view, proceed as follows:

1. Click the "Set measurement settings default view" button in the toolbar.

   The measurement settings are restored for a later display.

Move view

The following procedures are available to move the view in the curve diagram:

- Click the "Move view" button in the toolbar and move the display by holding down the mouse button.
- Move the display vertically by turning the mouse wheel or horizontally by turning the mouse wheel while holding down the <Shift> key. The mouse pointer must be positioned above the curve diagram with the analog signals. If the signals are arranged in traces, the display of the group is shifted below the cursor.

Scale the value axis automatically

The following procedures are available to scale the display for the entire value range in the configured time range:

- Click the "Automatic scaling of the value axis" button in the toolbar.
- Right-click on the curve diagram and activate the "Automatic scaling of the value axis" check box in the context menu.

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.

Scale the time range automatically

The following procedures are available to display the entire time range in the curve diagram:

- Click the "Display entire time range" button in the toolbar.
- Right-click on the curve diagram and activate the "Display entire time range" check box in the context menu.

Note

Automatic scaling of the time range is stopped when a zoom function of the value axis is activated. This button reactivates the automatic adjustments to the minimum/maximum values.

Arranging signals in tracks

The following procedures are available to arrange the signals one below the other with the respective value axes and to display signal groups in the same track:

- Click the "Arrange in tracks" button in the toolbar.
- Right-click on the curve diagram and activate the "Arrange in tracks" check box in the context menu.

Switching the time axis units

To switch the unit of the time axis, proceed as follows:

1. Click the "Change X axis unit" button in the toolbar.

   The following units are available for selection:

   - "Samples"
   - "Time (relative)"

     Relative time in relation to the trigger time.
   - "Time stamp of the samples"

Note

Unit switchover is only possible in the time diagram.

Display samples

To display the samples of the recording as small circles, proceed as follows:

1. Click the "Display samples" button in the toolbar.

Displaying linear interpolation

To display the linear interpolation between two consecutive samples for floating-point numbers, proceed as follows:

1. Click the "Interpolated view (linear)" button in the toolbar.

Note

If linear interpolation is not activated (default), the connection between measuring points is drawn in steps.

Show/hide measurement cursor

The following procedures are available to display the vertical measurement cursor:

- Click the "Show vertical measurement cursor" button in the toolbar.
- Right-click on the curve diagram and activate the "Show or hide vertical measurement cursors" check box in the context menu.
- Press the <Ctrl+Spacebar> shortcut on the keyboard.

The following procedures are available to display the horizontal measurement cursor:

- Click the "Show horizontal measurement cursor" button in the toolbar.
- Right-click on the curve diagram and activate the "Show or hide horizontal measurement cursors" check box in the context menu.

Note

The values of the measurement cursors are displayed in the signal table and in the "Measurement cursors" palette.

Show/hide time range

To show/hide the time range display, proceed as follows:

1. Click the "Show/hide time range display" button in the toolbar.

   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. You can move the yellow area with the mouse and change its size horizontally at the borders.

Show legend in the curve diagram

To show/hide the legend in the curve diagram and display it aligned, proceed as follows:

1. Click the "Show/hide chart legend" button in the toolbar.

To display the legend on the left side of the curve diagram, proceed as follows:

1. Click the "Display legend left-aligned" button in the toolbar.

To display the legend on the right side of the curve diagram, proceed as follows:

1. Click the "Display legend right-aligned" button in the toolbar.

Changing the background color

To change the color of the background in the curve diagram, proceed as follows:

1. Click the "Change background color" button. Click this button again to switch between other background colors.

Automatically adapt the height of the bit tracks

To automatically adapt the height of the bit tracks and thereby define the size of the lower curve diagram, proceed as follows:

1. Right-click on the curve diagram and activate the "Automatic bit track height" check box in the context menu.

   The setting is automatically deactivated as soon as you manually change the space allocation between the curve diagrams.

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.

Undo / redo display adjustments

The following procedures are available to undo your last display adjustments step-by-step:

- Click the "Undo" button in the toolbar.
- Right-click on the curve diagram and select the "Undo" command in the context menu.

The following procedures are available to repeat the last display adjustments you undid step-by-step:

- Click the "Redo" button in the toolbar.
- Right-click on the curve diagram and select the "Redo" command in the context menu.

Note

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

Save the current display of the diagram as an image

To save the current display of the curve diagram in a graphic format as a file, e.g. for printing, proceed as follows:

1. Right-click on the curve diagram and select the "Save diagram as image" command in the context menu.

   The "Save as image file" window opens.

2. In the folder structure, navigate to the desired target folder or enter the target path under "Folder".
3. Select the desired graphic format.
4. Click "Save".

   The diagram display is saved in the specified storage location in the selected graphic format.

Copy the current display to the clipboard

To copy the current display of the curve diagram to the clipboard, e.g. to insert it into another file, proceed as follows:

1. Right-click on the curve diagram and select the "Copy image to clipboard" command in the context menu.
2. Navigate to the desired destination for pasting the image from the clipboard (e.g. Microsoft Excel) and paste the image.

4.4 Save recordings as measurements

A measurement consists of a configuration and a recording, if recorded data is available. The recording of a measurement can be viewed offline.

The configuration data is displayed write-protected.

4.4.1 Save the recording as measurement in the project

Requirement

- There is an online connection to the device.
- The data of the recording 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 as a measurement in the project, proceed as follows:

1. Open the installed trace with the recorded data.
2. If necessary, ensure that the current data is loaded from the device by activating the "Monitoring On/Off" button.
3. Wait until all data has been loaded and is displayed.
4. Click the "Add to measurements" button.

   The measurement is added to the "Measurements" system folder.
5. Save the project in the TIA Portal.

Note

A measurement can be made from a current recording at any time without affecting the current recording. The recording continues to run uninterrupted. This function is therefore suitable for analyzing any areas of a running recording.

4.4.2 Import measurement

Requirement

- A trace measurement is available in the ".ttrecx" format or a long-term trace measurement in the ".lttcd" format.

Procedure

To import a measurement into the respective "Measurements" system folder, proceed as follows:

1. Right-click on the respective "Measurements" system folder into which you want to import the measurement and select the "Import measurement" command in the context menu.

   The "Open" window opens.

2. Navigate to the desired file in the folder structure or enter the target path under "Folder".
3. Click the "Open" button.

   The measurement is displayed in the respective "Measurements" system folder.

4.4.3 Export measurement

Requirement

- A measurement is available in the respective "Measurements" system folder.
- The measurement is open in the work area.

Procedure

To export an existing measurement, proceed as follows:

1. Click the "Export measurement with the settings of the current view" button in the toolbar.

   Or:

   Right-click on the measurement to be exported and select the "Export measurement" command in the context menu.

   The "Open" window opens.

2. In the folder structure, navigate to the desired target folder or enter the target path under "Folder".
3. Select the desired file extension.
4. Click "Save".

   The measurement is saved in the specified location.

4.4.4 Add a measurement in the device to measurements in the project

Requirement

- There is an online connection to the device in which the measurement is available.
- The measurement is displayed in the "Measurements on device (memory card)" folder in the project tree.

Procedure

To save a measurement in the device (memory card) together with the project, proceed as follows:

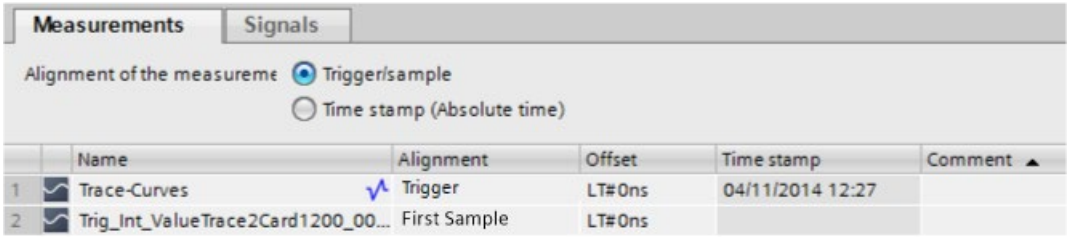
1. Drag-and-drop the measurement from the "Measurements on device (memory card)" folder into the "Measurements" folder.
2. Save the project.

Note

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 cause consume excessive work memory and extend the time needed for copying.

4.4.5 Setting options and displays in the Measurements tab

The following figure shows an example of the Measurements tab:



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

Column		Description
Alignment of the measurements (not available for the Bode diagram)		
	"Trig-ger/measure ment 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.

Column		Description
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.
	"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. 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

4.5 Evaluating the measurement

Note

When evaluating your measurements, take into account that the recording condition may not have been fulfilled between the activation time and the trigger time.

4.5.1 Compare measurements (combined measurement)

Requirements

The following is assumed for the actions described in this section:

- At least two measurements are available in the "Measurements" system folder.
- For "Import measurement":

  At least one measurement is available as a TTRECX file.

4.5.1.1 Apply combined measurement

The following procedures are available to create a new combined measurement:

- Double-click on the "Add new combined measurement" entry .

  A new combined measurement is added to the project tree. This combined measurement does not contain any measurement data and you must add the measurements for comparison.

- Drag-and-drop a measurement from the "Measurements" system folder to the "Combined measurements" system folder.

  A new combined measurement is added to the project tree. This combined measurement contains the measurement data of the measurement that you drag-in-drop. More information Adding measurements for comparison.

- In the "Measurements" system folder, select all the measurements that you want to add to the combined measurement and drag-and-drop them into the "Combined measurements" system folder.

  A new combined measurement is added to the project tree. This combined measurement contains the measurement data from the measurements that you drag-in-drop.

4.5.1.2 Adding measurements for comparison

To add measurements to a combined measurement for comparison, you can use the following procedures:

- In the project tree, drag one or more measurements from the "Measurements" system folder to the icon for the combined measurement .
- Double-click on the combined measurement so that it is displayed in the work area. Click the "Import measurement" button in the toolbar and navigate to the desired measurement in the folder structure or enter the target path under "Folder".
- Right-click on the symbol of the combined measurement and select the "Import measurement" command in the context menu. Navigate to the desired measurement in the folder structure or enter the target path under "Folder".

See also

Aligning measurements with measurement cursor (Page 75)

4.5.1.3 Export combined measurement

Requirement

- A combined measurement is created and opened in the work area.

Procedure

To export a combined measurement from the project, proceed as follows:

1. Click the "Export combined measurement" button in the toolbar.

   Or:

   Right-click the combined measurement to be exported in the project tree and select the "Export combined measurement" command in the context menu.

   The "Save as" window opens.
2. Navigate to the desired target path in the folder structure or enter the target path under "Folder" and select the desired file extension.
3. Click "Save".

   The combined measurement is saved in the specified location.

4.5.1.4 Import combined measurement

Requirement

- A combined measurement in ".ttcbmx" format is available.

Core statement

To import a combined measurement as a TTCMBX file into the "Combined measurements" system folder, proceed as follows:

1. Right-click on the "Combined measurements" folder in the project tree and select the "Import combined measurement" command in the context menu.

   The "Open" window opens.
2. In the folder structure, navigate to the desired TTCMBX file or enter the target path under "Folder".
3. Click the "Open" button.

   The combined measurement is added to the "Combined measurements" folder.

4.5.2 Working with the signal table

The signal table lists the signals of the selected measurement and offers setting options for some properties.

In online mode, trace settings can be changed in the device. Use the button to apply the changes to the display options to the project. Otherwise, the changes are discarded during the switch to offline mode.

When adding the installed trace to the measurements, the current settings of the signal table are saved in the measurement.

The signals can be sorted using drag-and-drop. You can re-sort the bits of a signal within a signal.

Requirements

The following is assumed for the actions described in this section:

- An installed trace or a measurement has been opened in the "Time diagram" tab.
- The "Monitoring On/Off" button is activated in the device for a trace.
- For displaying individual bits as a bit trace:

  At least one recorded signal supports the display as a bit track.
- For assigning signals to a signal group:

  At least two signals that are not of type BOOL are in the signal table.

4.5.2.1 Select signals of the measurements for the signal table

To display the activated signals in the signal table of the "Time diagram" tab, proceed as follows:

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.

4.5.2.2 Show or hide individual signals in the signal table and change the color

To show or hide individual signals in the signal table and change their color, 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.

4.5.2.3 Selecting individual bits for display as a bit track

To deselect or select the individual bits for display, proceed as follows:

1. Click the symbol of a signal in the signal table.
2. Click the icon in the open bit selection of the signal.

Note

Displaying the individual bits as a bit track in the lower curve diagram is supported for the following data types:

- Byte, Word, DWord, LWord
- SInt, USInt, Int, UInt, DInt, UDInt, LInt, ULInt

4.5.2.4 Bring a signal from the signal table to the foreground

To bring the curve of a signal to the foreground in the curve diagram, proceed as follows:

1. In the signal table, select the line of the signal.

   The Y-scale of the signal is displayed.

4.5.2.5 Use 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.

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 chain 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 <Del>.

Or:

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

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

Save scaling groups

The signal groups can be saved individually for each measurement using the "Set measurement settings default view" 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.

4.5.2.6 Setting options and displays in the signal table

The following figure shows an example of how the signal table is displayed:

			Si...	Name	Data type	Display format	Address	Formula		Color	Scaling gro...	Min. Y scale	Max. Y scale	Y(t1)	Y(t2)	Delt...	Unit	Comment
1			$0	"Trace-Data"...	Int	Dec +/-					Temp	0	1800	106	74	-32		
2			$1	"Trace-Data".C...	Real	Floating point					Temp	0	1800	-27....	27....	55....		
3			$2	"Trace-Data".Sir	Real	Floating point						-99.99971	99.99997	96....	96....	-0.0...		

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

Column		Description
Signal or error symbol		
		Signal
		Failsafe signal
		Signal from a data block
		Signal from a failsafe data block
		Calculated signal (formula)
		Error in the formula of the calculated signal

Column	Description
 	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"	Automatically generated number of the signal The signal are accessed via the signal reference in the formulas.
"Device"	Display of the device name
"Name"	Display of the signal name A click on the name of a displayed signal updates the scale in the curve diagram. It is possible to enter a name for a calculated signal in the last line without a signal symbol. The calculated signal is created when the name is entered.
"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:  Click the  button to select or deselect the respective bit for display.
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"	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 the button to open the formula editor. You can find more information on using the formula editor in the section Calculating signals (Page 79).
"Color"	Display and setting option for the color of the signal

Column		Description
"Signal 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 signal group by deleting the signal group name The signal groups are saved using the "Set measurement settings default view" 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.
	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 "Automatic scaling of the value axis" button in 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

Note

Filter signal table

To filter the signal table for signals that match the diagram type, the signal filter is available via the button in the toolbar.

If you are in the Bode diagram tab, for example, only calculated Bode signals are displayed in the signal table when the signal filter is set.

The signal filter does not hide a signal when an invalid value is listed in the "Formula" column of the signal table.

The following context menu commands are also available in 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.

4.5.3 Use measurement cursor

Requirements

The following is assumed for the actions described in this section:

- An installed trace or a measurement has been opened in the "Time diagram" tab.
- The "Monitoring On/Off" button is activated in the device for a trace.
- For the alignment of the measurements for comparison:
  - An combined measurement is applied.
  - Measurements for comparison are added to the combined measurement.
  - Signals of the measurements for the signal table are selected.

4.5.3.1 Check that a certain value has been reached

To check whether a value has been reached in the curve diagram, proceed as follows:

1. Show the horizontal measurement cursors in one of the following ways:
   - Click the "Show horizontal measurement cursor" button in the toolbar.
   - Right-click on the curve diagram and activate the "Show or hide horizontal measurement cursors" check box in the context menu.
2. Use the mouse to move a measurement cursor to the desired value of the recording or position the measurement cursor in the "Measurement cursor" palette by entering the position.

The values of the measurement cursors for the selected signal are displayed in the "Measurement cursors" palette of the "Trace" task card.

4.5.3.2 Evaluation of the difference between two samples

To evaluate the difference between two samples, proceed as follows:

1. Click the "Show vertical measurement cursor" button in the toolbar.
2. Use the mouse to move the two measurement cursors to the desired measuring points in the recording, or position the measurement cursor in the "Measurement cursor" palette by entering the position.

The values of the signals and the difference are displayed in the signal table and in the "Measurement cursor" palette of the "Trace" task card.

4.5.3.3 Aligning measurements with measurement cursor

To align the time axis of two measurements to the measured position difference Δt, proceed as follows:

1. Click the "Show vertical measurement cursor" button in the toolbar.
2. Enlarge the time range until you can position the first measurement cursor exactly on the desired reference point of the first measurement.
3. Move the first measurement cursor with the mouse to the required position.
4. Search for the reference point of the second measurement.
5. Enlarge the time range until you can position the second measurement cursor exactly on the desired reference point of 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.

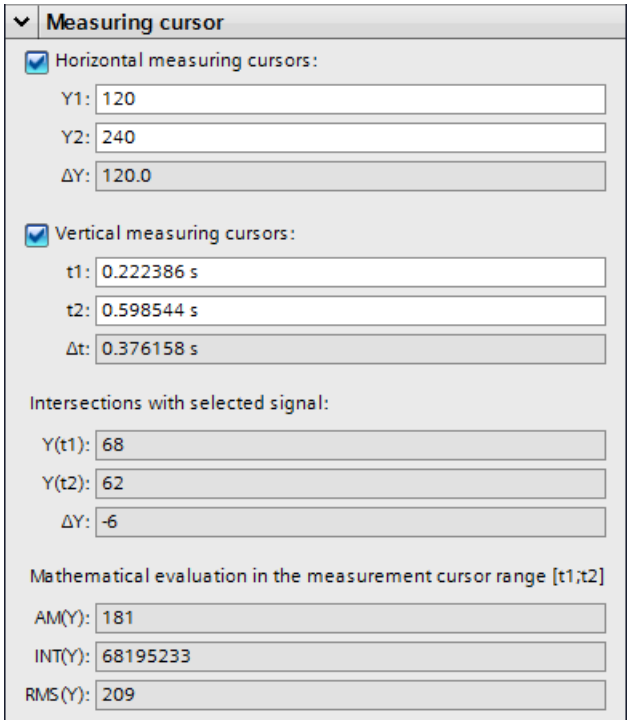
Note

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

4.5.3.4 Setting options and displays of the "Measurement cursor" palette

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

The following figure shows an example of the "Measurement cursor" palette:



The following table describes the settings and displays:

Setting/display		Description
Horizontal measurement cursor		
	Y1	Position of first measurement cursor The value indicates the position in relation to the scale of the currently selected signal. 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 indicates the position in relation to the scale of the currently selected signal. 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		
	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.

Setting/display		Description
	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.

4.5.3.5 Keyboard and context menu commands

Keyboard commands

The following table shows which keyboard commands are possible for using measurement cursors when the focus is on the curve diagram:

Keyboard shortcut	Description
Select 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.
Position a vertical measurement cursor	
<Left>, <Right>	In the "Samples" unit, the selected measurement cursor is moved one sample away from the signal in the foreground. With the "Time (relative)" unit, the measurement cursor is moved by one pixel.
<Shift+Left>, <Shift+Right>	The selected measurement cursor is shifted by 10 measuring points from the signal in the foreground for the "Samples" unit. With the "Time (relative)" unit, the measurement cursor is moved by 10 pixels.
Position a horizontal measurement cursor	
<Up>, <Down>	The selected measurement cursor is shifted by one pixel along the value axis.
<Shift+Up>, <Shift+Down>	The selected measurement cursor is moved by 10 pixels along the value axis.
Vertical measurement cursors display	

Keyboard shortcut	Description
<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.
Change 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%

Shortcut menu commands

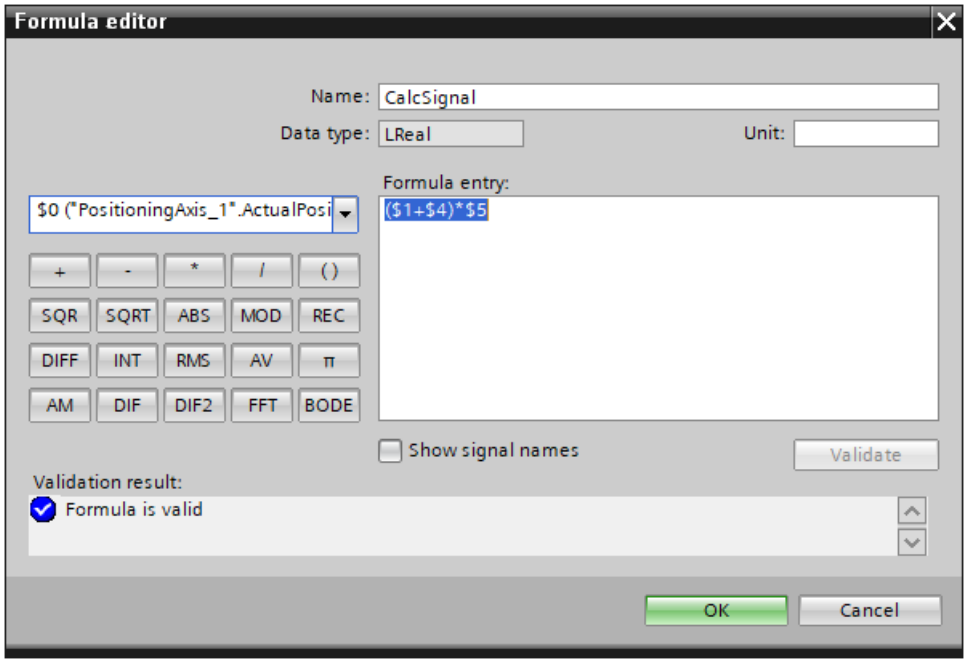
The following table shows which context menu commands are possible for using measurement cursors when the focus is on the curve diagram:

Shortcut menu command	Description	
"Measurement cursor"	You can find the following options in this submenu:	
	"Shows or hides 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" palette 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
	"Shows or hides 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" palette 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.

4.5.4 Calculate signals with formula editor

The formula editor is available for calculating and analyzing recorded signals using various mathematical functions. You can use the formula editor in the same way as for a recording for a measurement. The data type of the formula is preset with a floating-point number of the LREAL type and cannot be changed.

The following figure shows an example of the formula editor:



Requirement

The following is assumed for the actions described in this section:

- Signals for the calculation are displayed in a measurement or a recording in the curve diagram.
- The signal table is displayed.

4.5.4.1 Create and edit formulas

To create and edit the formulas, proceed as follows:

1. Click in the last line in the signal table and enter a name of the calculated signal.

   Or:

   Right-click on the line of the signal you want to use for the calculation and select the "Insert new calculated signal" command in the context menu.
   A new line for the calculated signal is added. The default setting for the name is "CalcSignal". You can change the name of the calculated signal at any time by clicking in the "Name" line. The name must be unique and only contain characters that are allowed in Windows file names.

2. Click the icon in the line of the calculated signal in the signal table to open the "Formula editor" dialog box. When editing an existing formula, the formula editor is also available via the "Edit formula" context menu command by right-clicking on the "Formula" line.
3. Optional: Enter a name for the calculated signal in the "Name" field of the dialog window.
4. Optional: Enter a unit for the calculated value in the "Unit" field of the dialog window. You can enter this freely.
5. Optional: Activate or deactivate the "Show signal names" check box to switch the formula display between signal references and signal names.
6. In the "Formula editor" dialog box, select signals using the drop-down list and mathematical functions using the buttons for the calculation. These are added to the "Formula input" field.

   Note

   Restrictions:

   - Bits from a bit selection (e.g. below the INT data type) are not allowed in the formula.
   - In a formula, do not use signal references to a variable that begins with "$", e.g. $0("$0").

7. Click the "Validate" button to check the validity of the formula. The result is displayed in the "Validation result" field.

   If the formula is invalid, the symbol is displayed next to the calculated signal in the signal table.

8. Click "OK".

   The signal is displayed in the curve diagram

Note

Entering the formulas manually

You can edit the formulas in the "Formula input" field of the formula editor. You can reference signals in the formula text box by using either the signal reference preceded by a $ sign or the name in double quotation marks. Mixed input is possible.

You can also create or edit the formulas manually via the signal table by inserting the formula in the "Formula" line for the calculated signal. The formula is applied directly during this process. The signal is displayed in the curve diagram

See also

Mathematical functions of the formula editor (Page 81)

Setting options and displays in the signal table (Page 71)

4.5.4.2 Mathematical functions of the formula editor

The following table shows the mathematical functions of the formula editor:

Field/Button	Description
+	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)`

Field/Button	Description
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)` → Average value filter 1st order `AV($0,5)` → Average value filter 5th order
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	The Fast Fourier Transform (FFT) is used to break down complex signals into their individual components and analyze them. You can find more information on using this function in the section Creating an FFT diagram (Page 83).
BODE	The Bode function is used to analyze and describe the frequency behavior of a system. You can find more information on using this function in the section Creating a Bode diagram (Page 85).

1) The constant `SAMPLETIME` is only available for equidistant recording cycles. Time unit for `SAMPLETIME` is always µs.

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.

4.5.4.3 Create an FFT diagram

To apply an FFT formula, proceed as follows:

1. Click the icon in the line of the calculated signal in the signal table.

   When editing an existing formula, you can right-click on the "Formula" line and select the "Edit formula" command from the context menu.

   The "Formula editor" dialog box opens.

2. Click the "FFT" button in the formula editor.

   The FFT formula is displayed in the "Formula input" field.

3. Enter an analog signal as an input parameter for the formula. You can select the signal from the drop-down list or insert it manually as a signal reference or signal name in the formula in the "Formula input" field.

   The input parameter must be an analog signal. Calculated signals and further calculations with the FFT function are not permitted.

   Permitted data types are: SINT, INT, DINT, LINT, USINT, UINT, UDINT, ULINT, REAL, LREAL, BYTE, WORD, DWORD, LWORD.

4. Optional: Enter the following parameters:

   - "RemoveDirectCurrent", to remove the direct current component.

     The data type for this parameter is Bool. If the parameter is not set, it is assumed by default that the DC component is to be removed.

   - "RangeStart", to specify the index of the first sample to be displayed on the X axis in the FFT diagram.

     If the parameter is not set, the first sample of the measurement is used by default.

   - "RangeEnd" (RangeStart required) to specify the index of the last sample to be displayed on the X axis in the FFT diagram.

     If the parameter is not set, the last sample of the measurement is used by default.

Valid examples:

$0=Input signal

FFT($0,true)

FFT($0,0,1000)

FFT($0,false,0,1000)

Invalid examples:

$0=Input signal

FFT($0,20)

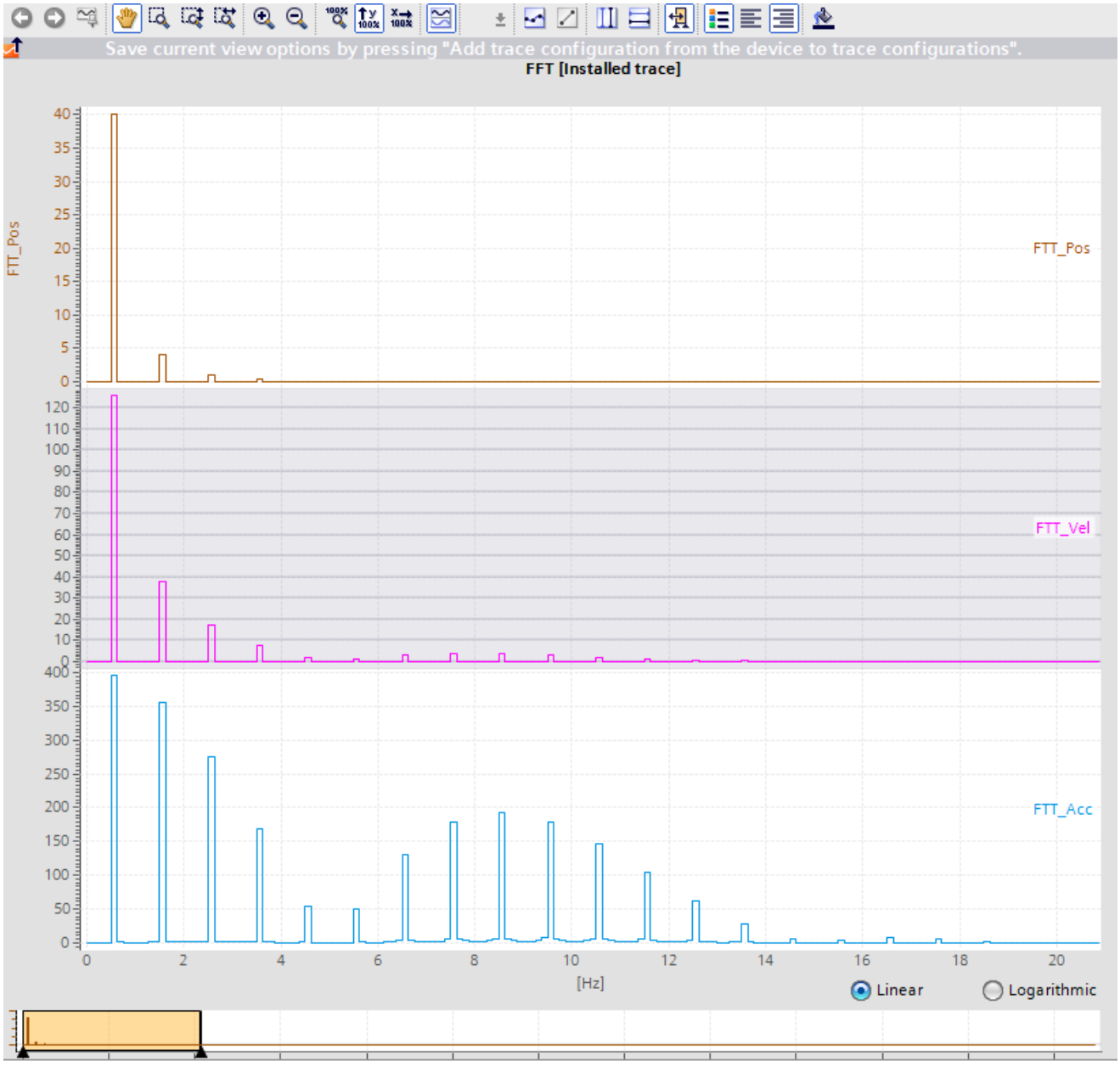
FFT($0,0)

FFT($0,1000,0)

FFT($0)+10

FFT($0)+SQRT($5)

The following figure shows an example of the FFT diagram:



4.5.4.4 Create a Bode diagram

To apply a Bode formula, proceed as follows:

1. Click the icon in the line of the calculated signal in the signal table.

   When editing an existing formula, you can right-click on the "Formula" line and select the "Edit formula" command from the context menu.

   The "Formula editor" dialog box opens.

2. Click the "BODE" button in the formula editor.

   The Bode formula is displayed in the "Formula input" field.

3. Enter an analog signal as the input and output signal for the formula. You can select the signal from the drop-down list or enter it manually as a signal reference or signal name in the formula in the "Formula input" field.

   Analog signals must be entered for input and output signal parameters. Calculated signals and further calculations with the Bode function are not permitted.

   Permitted data types are: SINT, INT, DINT, LINT, USINT, UINT, UDINT, ULINT, REAL, LREAL, BYTE, WORD, DWORD, LWORD

4. Optional: Enter the following parameters:
   - "RangeStart", to specify the index of the first sample to be displayed on the X axis in the Bode diagram.

     If the parameter is not set, the first sample of the measurement is used by default.
   - "RangeEnd" (RangeStart required) to specify the index of the last sample to be displayed on the X axis in the Bode diagram.

     If the parameter is not set, the last sample of the measurement is used by default.

Valid examples:

$0=Input signal, $1=Output signal

BODE($0,$1)

BODE($0,$1,0,1000)

Invalid examples:

$0=Input signal, $1=Output signal

BODE($0,20)

BODE($0,$1,0)

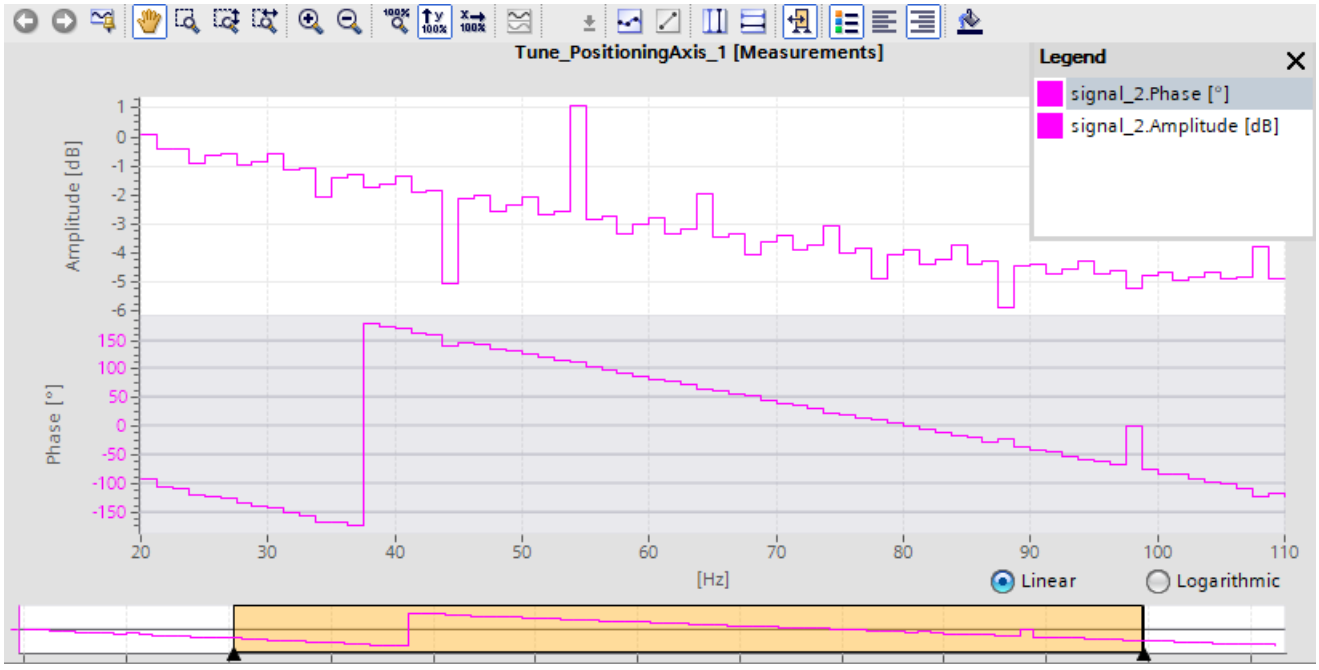
BODE($0,$1,1000)

BODE($0+1,0)

BODE($0,$1)+10

BODE($0,$1)+SQRT($5)

The following figure shows an example of the display of the Bode diagram:

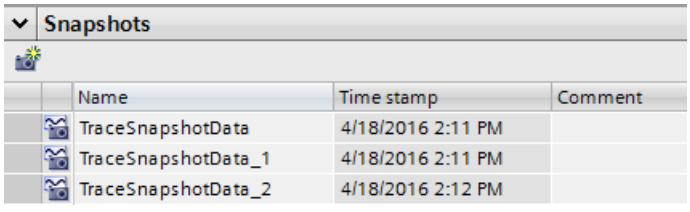


4.6 Snapshots

The "Snapshots" palette of the "Trace" task card allows you to save and restore different views of a measurement.

A snapshot can be created of a current view in the "Time diagram" or "Bode diagram" tab. The snapshots are saved in the measurement with the project.

The following figure shows an example of the "Snapshots" palette:



The following table explains the 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

Create a snapshot

Requirements:

- A measurement is displayed in the curve diagram.

To save the current view in the "Time diagram" or "Bode diagram" tab as a snapshot in the measurement, proceed as follows:

1. Open the "Snapshots" palette in the "Trace" task card.
2. Click the "Create snapshot of current view" button.

The snapshot is displayed in the "Snapshots" palette.

Rename snapshot

Requirements:

- A snapshot is available in the "Snapshots" palette.

The following procedures are available to change the name of the snapshot:

- Right-click on your snapshot in the "Snapshots" palette and select the "Rename" command in the context menu.
- Click in the "Name" column of the snapshot in the "Snapshots" palette.

Restore snapshot

Requirements:

- A snapshot is available in the "Snapshots" palette.

To display your saved view in the "Time diagram" or "Bode diagram" tab, you can use the following procedures:

- Double-click on the snapshot in the "Snapshots" palette.
- Right-click on your snapshot in the "Snapshots" palette and select the "Restore snapshot" command in the context menu.

Deleting a snapshot

Requirements:

- A snapshot is available in the "Snapshots" palette.

The following procedures are available to delete the snapshots from the measurement:

- Click the button in the "Snapshots" palette. Select the snapshot you want to delete and press the <Del> key.
- Right-click on your snapshot in the "Snapshots" palette and select the "Delete" command in the context menu.

Note

Several rows can be selected and deleted.

4.7 Status overview of the participating devices

The "Status overview" dialog box displays status information on 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** • Trace configuration is faulty **Meaning in online mode** • Trace configuration 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

4.8 Remedy for errors

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

Firmware

With the devices (Page 90) it is described if and as of which firmware a device supports the respective trace function.

Configuration

Check the configuration of the respective trace function (Page 37). For cross-device functions, check the settings for all participating devices.

Canceled recording

You can restart an interrupted recording by transferring the configuration (Page 50) again.

Requirements

Ensure that the general requirements for the employed trace function are fulfilled.

Devices

5

5.1 S7-1200/1500 CPUs (S7-1200, S7-1500)

5.1.1 Recordable variables (S7-1200, S7-1500)

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	-

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]	-
Named value data types	
	You can find more information on using named value data types in the help under "Named value data types".

1) Not supported by S7-1200.

5.1.2 Recordable events (S7-1500)

Note

The "Event recording" function is only available on an S7-1500 CPU with an installed trace and is available for all technology objects as of version V9.0.

The recorded events cannot be monitored or analyzed in the TIA Portal. You will need third-party software to analyze the CSV file.

Overview of recordable events of technology objects

The following table shows which events are recorded by the technology objects. These are shown in the CSV file in the "Status" column:

Status	Description
First_information	First call of the instruction This event is recorded after the instruction is called for the first time.
Start	Instruction has started This event is recorded when the edge of the "Enable" or "Execute" parameter is set from FALSE to TRUE.
Update	Value change at the input or output parameter This event is recorded when the input or output parameters change after the instruction has been started. Some output parameters may change with each call (e.g. "RemainingDistance"). A new event is recorded for each value change.
Change	Value change at the input parameter This event is recorded when the input parameters change without leading to an "Update" event (for example, without any effect on the technological process).
End	Instruction was finished successfully This event is recorded when the instruction is successfully completed, either by completing the instruction or by deactivating it.
Aborted	Motion interrupted This event is only recorded if the edge of the "CommandAborted" parameter is set from FALSE to TRUE.
First_information: error.	Application error This event is recorded when the edge at the "Error" parameter is set from FALSE to TRUE. The value of the "ErrorId" parameter is saved together with the event data.
Start: error.	
Change: error.	
End: error.	

You can find more information on the parameter of each event in the CSV file in the corresponding "Details" column.

Overview of detectable program and technology alarm events

The table below shows which events are recorded by program or technology alarms. These are shown in the CSV file in the "Status" column:

Status	Description
Incoming	Message has come in This event is recorded as soon as there is a new incoming alarm.
Gone	Message has gone out

More information texts about each alarm can be found in the CSV file in the corresponding "Details" column.

5.1.3 Lifetime of the configuration and recorded values in the device (S7-1200, S7-1500)

Configurations in the device are retained when the power is switched 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 changes are made to trigger tags that affect the address, the 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.

5.1.4 Recording levels (S7-1200, S7-1500)

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 94).

See also

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

5.1.5 Time synchronization with Motion Control (S7-1200, S7-1500)

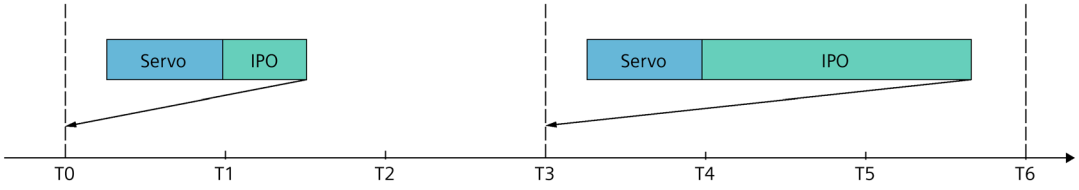
With Motion Control, a time reference to the cycle limits of the application cycle is required for the analysis. For this reason, the time reference for the measured values in the configuration of Motion Control organization blocks is determined differently than trace sample event. The synchronized (absolute) 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.

5.1.6 Quantity structure (S7-1200, S7-1500)

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
S7-1200 (as of firmware version V4.0)	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 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).

5.1.7 Long-term trace recording (S7-1500)

Note

As of TIA Portal V20, the recording is saved as binary code in ".dat" format. To be able to use the recording data for external evaluation, export the measurement (Page 64) as a CSV file together with the LTTCD file.

Requirement

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

Starting the recording

The DAT file is saved in the target path with the following name:

<Name of CPU>_<Name of long-term trace>_<Time stamp>_<Consecutive number>.dat

Structure of the time stamp:

<YYYYMMDD>_<HHMMSS>_<ms(3 places)>

Example

PLC_1_Long-term Trace_20220721_120422_356_0001.dat

Behavior during operation

As soon as the recording of the long-term trace in a DAT file has reached a file size of 2 GB, a new DAT file is created. The new 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 DAT file is created. The new DAT file has the same time stamp as the DAT 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.dat

Continued recording:

PLC_1_Long-term Trace_20220721_120422_356_0002.dat

CAUTION

Inconsistent data when opening the DAT file during the recording

Opening the DAT file during recording can lead to inconsistent data and therefore render it unusable.

Do not open the DAT file during the recording.

Cancellation of the recording

After a recording has been canceled, a new DAT 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.dat

New recording

PLC_1_Long-term Trace_20220721_121212_999_0001.dat

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 to Microsoft Excel.

Invalid values (e.g.Time Of Day values less than 0 or greater than 24) are displayed as hexadecimal numbers.

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

5.1.8 Long-term project trace recording (S7-1500)

Note

As of TIA Portal V20, the recording is saved as binary code in ".dat" format. To be able to use the recording data for external evaluation, export the measurement as a CSV file together with the LTTCD file.

Requirement

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

Starting the recording

The DAT file is saved in the target path with the following name:

<Name of CPU>_<Name of long-term project trace>_<Time stamp>_<Consecutive number>.dat

Structure of the time stamp:

<YYYYMMDD>_<HHMMSS>_<ms(3 places)>

Example

PLC_1_Long-term Trace_20220721_120422_356_0001.dat

Behavior during operation

As soon as the recording of the long-term trace in a DAT file has reached a file size of 2 GB, a new DAT file is created. The new 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 DAT file is created. The new DAT file has the same time stamp as the DAT 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.dat

Continued recording:

PLC_1_Long-term Trace_20220721_120422_356_0002.dat

CAUTION

Inconsistent data when opening the DAT file during the recording

Opening the DAT file during recording can lead to inconsistent data and therefore render it unusable.

Do not open the DAT file during the recording.

Cancellation of the recording

After a recording has been canceled, a new .dat 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.dat

New recording

PLC_1_Long-term Trace_20220721_121212_999_0001.dat

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 to Microsoft Excel.

Invalid values (e.g.Time Of Day values less than 0 or greater than 24) are displayed as hexadecimal numbers.

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

See also

Export measurement (Page 64)

5.1.9 CPU load through trace recording (S7-1200, S7-1500)

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**

5.1.10 Project trace (S7-1500)

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

5.1.11 Event recording (S7-1500)

Note

The "Event recording" function is only available on an S7-1500 CPU with an installed trace and is available for all Motion Control technology objects as of version V9.0.

This function enables you to record the events that occur on a Motion Control technology object during the recording with a trace. Events are orders for the technology objects, as well as program and technology alerts.

When this function is activated in the configuration, events are received from the device in addition to the signals. These are saved in a CSV file. The events recorded by the device cannot be monitored or analyzed in the TIA Portal. You will need third-party software to analyze the CSV file.

With this function you can, for example, analyze the correct sequence and parameterization of commands in complex Motion Control applications.

See also

Acquiring events from technology objects in the recording (Page 119)

Analysis of technology object events (Page 124)

Recordable events (Page 91)

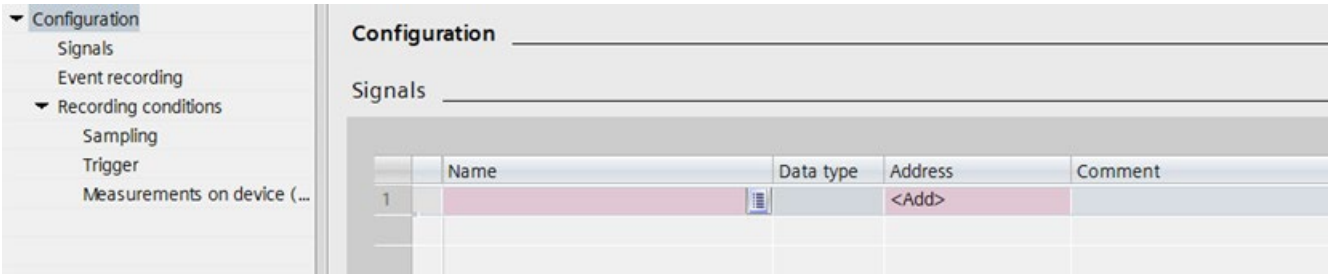
5.1.12 Software user interface of the configuration (S7-1200, S7-1500)

5.1.12.1 Layout of the trace user interface (S7-1200, S7-1500)

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 of a S7-1500 CPU:



The area navigation provides the following entries for selection:

- Configuration
  - Signals (Page 106)
  - Event recording (Page 119)
  - Recording conditions (Page 107)

Displaying and changing the properties of a trace configuration

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

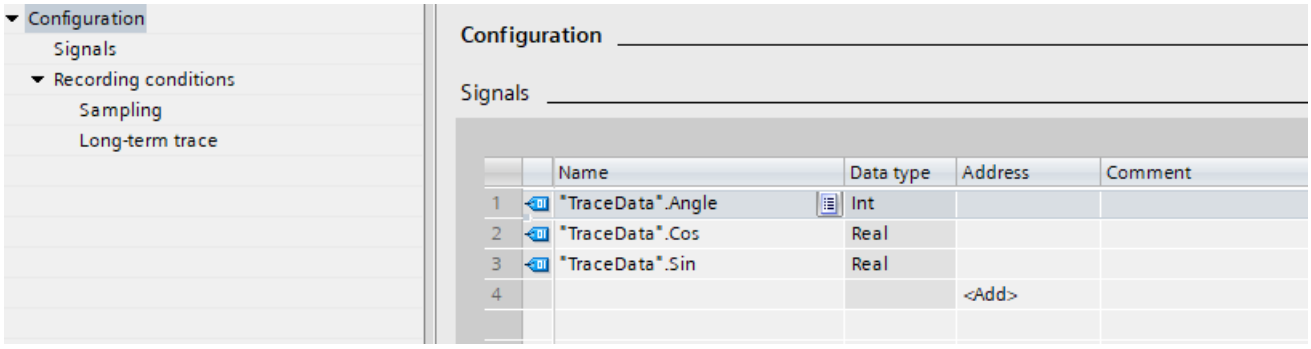
You change the trace configuration offline. Online, the trace configuration is displayed read-only.

5.1.12.2 Layout of the long-term trace user interface (S7-1500)

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 106)
  - Recording conditions (Page 106)

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 long-term trace configuration is displayed read-only.

See also

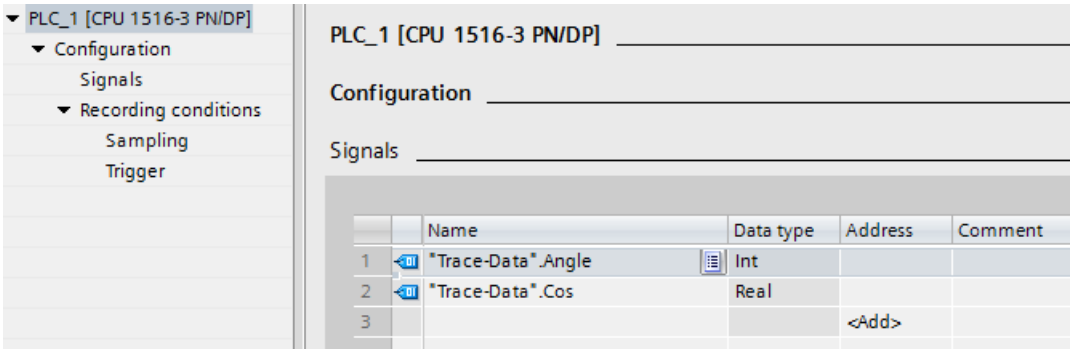
Recording conditions (Page 107)

5.1.12.3 Layout of the project trace user interface (S7-1500)

The device-dependent project 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:

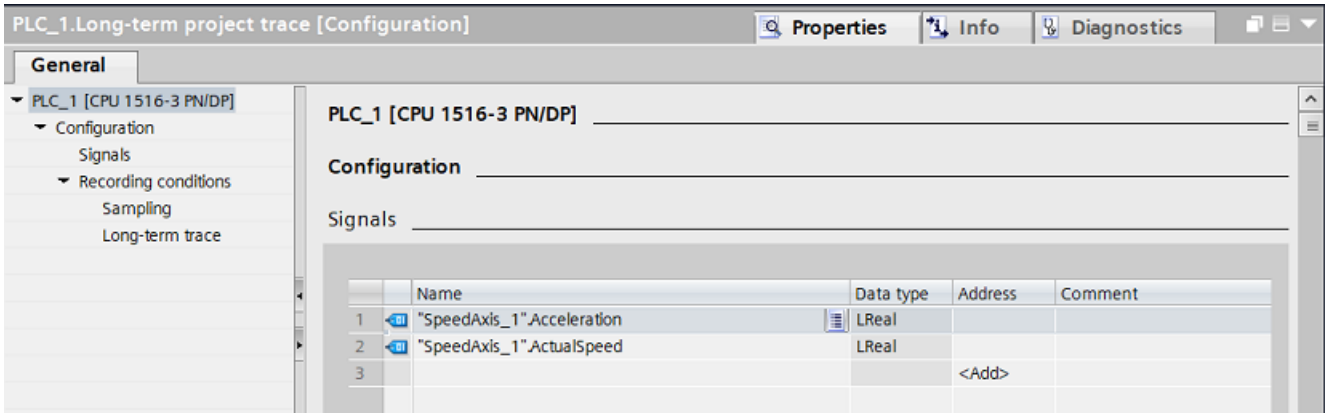
- Configuration
  - Signals (Page 106)
  - Recording conditions (Page 107)

5.1.12.4 Layout of the interface for long-term project trace (S7-1500)

The device-dependent long-term project 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 (Page 106)
  - Recording conditions (Page 107)

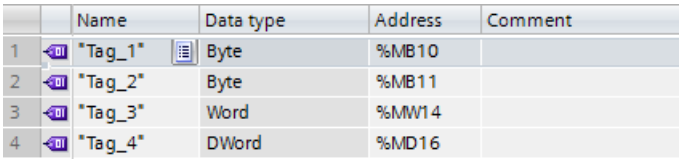
5.1.12.5 User interface - Signals (S7-1200, S7-1500)

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:



	Name	Data type	Address	Comment
1	"Tag_1"	Byte	%MB10	
2	"Tag_2"	Byte	%MB11	
3	"Tag_3"	Word	%MW14	
4	"Tag_4"	DWord	%MD16	

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 context 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.

See also

Layout of the long-term trace user interface (Page 104)

Layout of the project trace user interface (Page 104)

Layout of the interface for long-term project trace (Page 105)

5.1.12.6 Recording conditions (S7-1200, S7-1500)

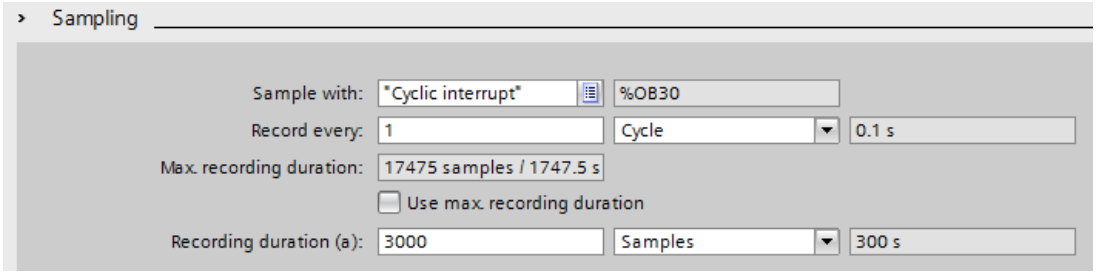
User interface - Recording conditions (S7-1200, S7-1500)

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.

You cannot specify a recording duration or trigger for a Long-term trace configuration (Page 23).

Sampling

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



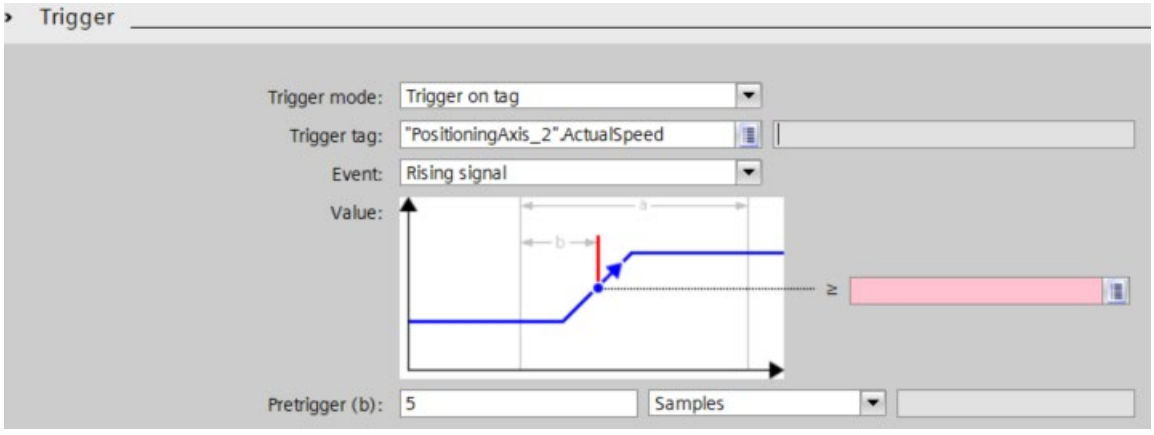
The following table explains the settings and displays:

Setting/display		Description
"Trace sample event"		
	Recording level entry field	Selection of the trace sample event. See Recording levels (Page 93)
	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. You can also find more information 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:



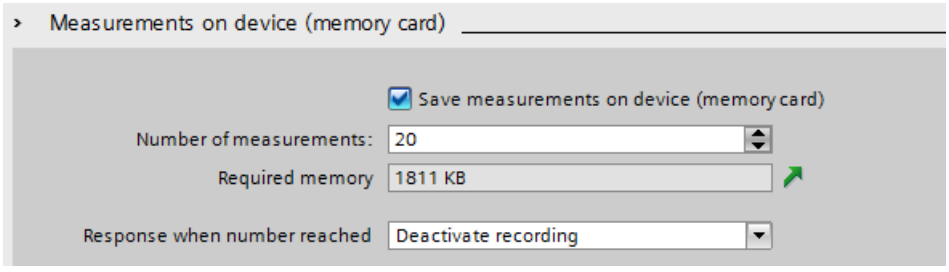
The following table explains the settings and displays:

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 you stop recording, the maximum number of measured values in the device is the number you have 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	-

Setting/display		Description
"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 113).
		Opens the signal selection table. Click the button to open a table that offers possible signals for selection as trigger tags. 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 113).
	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 113).
"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 the 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 an installed trace 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.

It is therefore not possible for the entire memory to be used for saving measurements.

You can find more information in the Structure and Use of the CPU Memory (https://support.industry.siemens.com/cs/us/en/view/59193101) Function Manual.

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".

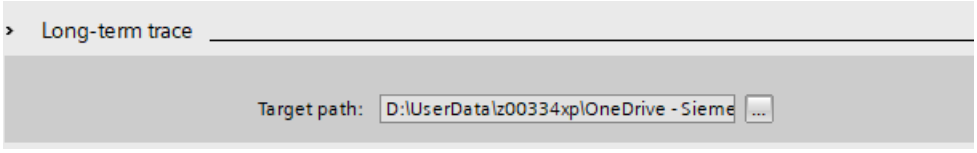
With repeated restarts note that the measurements already saved are not overwritten and the "Number of measurements" configured in the device is saved once again.

The following table explains the settings and displays:

Setting/display	Description
"Save 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. A recording that you have deactivated is not saved in 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 you deactivate 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 122) Long-term trace recording (Page 96)

Data types for trigger tags (S7-1200, S7-1500)

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.

Trigger event (S7-1200, S7-1500)

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 113)

The recording starts when the state of the trigger is TRUE.

"=FALSE"

Supported data types: Bit (Page 113)

The recording starts when the state of the trigger is FALSE.

"Rising edge"

Supported data types: Bit (Page 113)

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 113) (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 113)

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 113) (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 113)

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 113)

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 113)

The recording starts when the value of the trigger is equal to the value configured for this event.

"<> value"

Supported data types: Integers (Page 113)

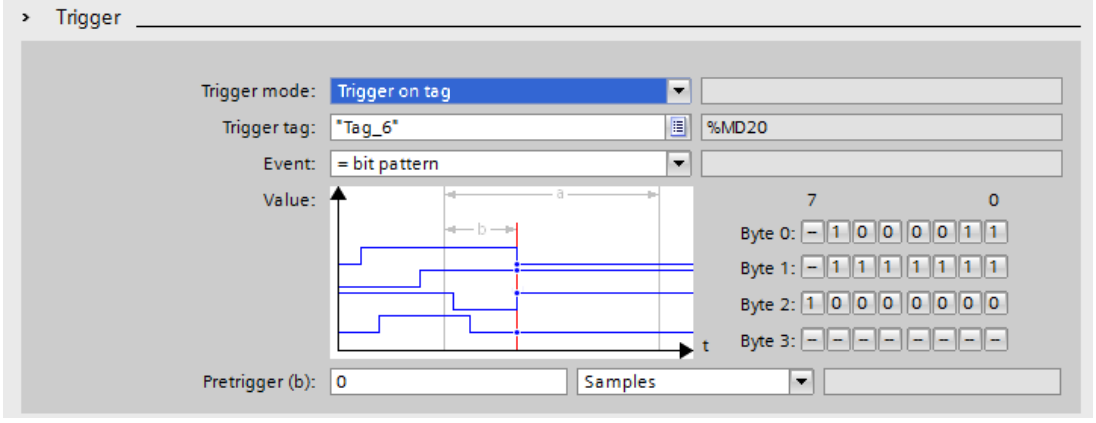
The recording starts when the value of the trigger is not equal to the value configured for this event.

"= bit pattern"

Supported data types: Integers and floating-point numbers (Page 113) (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 113) (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

Configuring the trigger conditions (Page 121)

Recordable variables (Page 90)

5.1.13 Configuration (S7-1200, S7-1500)

5.1.13.1 Trace configuration - overview (S7-1500)

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 work area of the "Configuration" tab.

Procedure

The following table shows an example of the procedure for configuring a trace.

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 118) Select the signals to be recorded in the "Signals" area.
3	Activate event recording (optional) (Page 119) In the "Event recording" area, specify whether the events of technology objects should be recorded during recording
4	Configuring the recording cycle and duration (Page 120) Select a recording time, a cycle and the duration in the "Recording conditions" area.
5	Configuring the trigger conditions (Page 121) In the "Recording conditions" area, select whether the recording is to be performed immediately or depending on a trigger condition.
6	Configure installed measurements (memory card) (optional) (Page 122) In the "Recording conditions" area, specify whether the measurement in the device (memory card) is to be saved.

5.1.13.2 Long-term trace configuration – overview (S7-1500)

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 118) Select the signals to be recorded in the "Signals" area.
2	Configuring the recording cycle and target path for long-term trace (Page 122) 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 120)

5.1.13.3 Configuring long-term project trace - Overview (S7-1500)

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.

5.1.13.4 Select participating devices (S7-1200, S7-1500)

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.

5.1.13.5 Selecting signals (S7-1200, S7-1500)

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.

5.1.13.6 Acquiring events from technology objects in the recording (S7-1500)

Note

Only one trace with active event recording can be activated for a PLC.

If an additional trace with active "Event recording" function is activated, the deactivation of the first trace must be confirmed. Alternatively, the "Event recording" function must be deactivated in the further trace.

Requirement

• The "Event recording" section is open in the "Configuration" tab.

Procedure

To collect events from technology objects in a CSV file when recording, proceed as follows:

1. Select the "Record events from technology objects" check box.

   This area shows you the directory for the created CSV file with the events. The CSV file is created after the trace recording is done and stored in this directory. While loading the data into the CSV file, the toolbar buttons remain inactive. If the working area is closed during loading, the CSV file is not created and the upload starts again when recording is reopened. The directory is pre-set and cannot be configured. The link to the CSV file is displayed in the status bar after the trace recording is done.

Note

Manually disabling recording may result in no signal data being displayed in the CSV file at the end of recording.

Copying a trace configuration with active event recording

There is no restriction on the function when copying the trace configuration with active event recording between compatible devices.

This function is not available when copying the trace configuration with active event recording to an incompatible device (e.g. an S7-15xx CPU with Motion Control Technology Object version 8.0).

Note

If you copy the trace configuration with active event recording to a non-compatible device and activate the "Measurement in the device" function, this setting is applied in the configuration. This deactivates the "Event recording" function when using such configuration in a compatible device.

See also

Analysis of technology object events (Page 124)

Event recording (Page 102)

Recordable events (Page 91)

5.1.13.7 Configuring the recording cycle and duration (S7-1200, S7-1500)

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 (Page 93).
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".
   - Select the "Use max. recording duration" check box.

5.1.13.8 Configuring the trigger conditions (S7-1200, S7-1500)

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.

5.1.13.9 Configure installed measurements (memory card) (S7-1200, S7-1500)

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.
- The "Event recording" function is not used.

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.

5.1.13.10 Configuring the recording cycle and target path for long-term trace (S7-1500)

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".

5.1.13.11 Configuring recording cycle and target path for long-term project trace (S7-1500)

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".

5.1.14 Analysis of technology object events (S7-1500)

Note

The recorded events cannot be monitored or analyzed in the TIA Portal. You will need third-party software to analyze the CSV file.

After a trace recording with active event recording is done, a CSV file with the events is automatically created. This file is located in the project directory that is displayed in the configuration area of this function in the TIA Portal.

Structure of the file name

A CSV file with the event data is saved under the following name:

<Name of the PLC>_<Name of the trace>_<Time stamp>.csv

Structure of the time stamp:

<YYYYMMDD>_<HHMMSS>

Example

PLC_1_Trace_20241010_120422.csv

Structure of the CSV file with the events and display in Microsoft Excel

Note

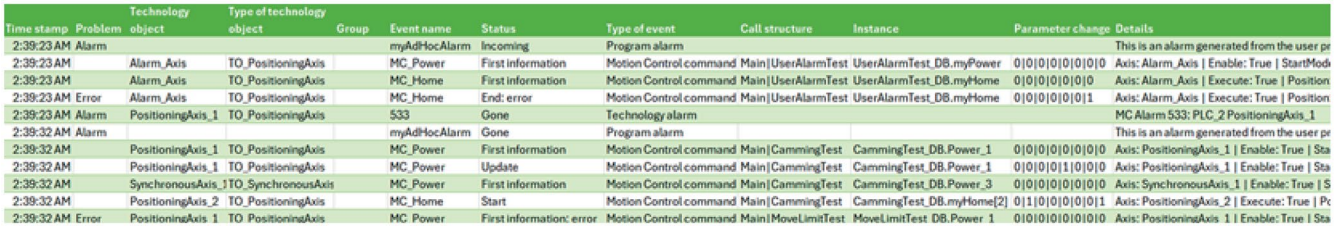
Display of the values in Microsoft Excel

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

To display the values correctly, always import the data from the CSV file to Microsoft Excel.

After you import the CSV file into Microsoft Excel, all recorded values of the signals and recorded event data are displayed in addition to the signal data. Each recorded event is displayed in a new line. You can adjust and filter the columns and rows as usual.

The following figure shows an example of the columns in the CSV file that are relevant for event recording:



Time stamp	Problem	Technology object	Type of technology object	Group	Event name	Status	Type of event	Call structure	Instance	Parameter change	Details
2:39:23 AM	Alarm				myAdHocAlarm	Incoming	Program alarm				This is an alarm generated from the user pr
2:39:23 AM		Alarm_Axis	TO_PositioningAxis		MC_Power	First information	Motion Control command	Main|UserAlarmTest	UserAlarmTest_DB.myPower	0|0|0|0|0|0|0|0	Axis: Alarm_Axis | Enable: True | StartMod
2:39:23 AM		Alarm_Axis	TO_PositioningAxis		MC_Home	First information	Motion Control command	Main|UserAlarmTest	UserAlarmTest_DB.myHome	0|0|0|0|0|0|0	Axis: Alarm_Axis | Execute: True | Position
2:39:23 AM	Error	Alarm_Axis	TO_PositioningAxis		MC_Home	End: error	Motion Control command	Main|UserAlarmTest	UserAlarmTest_DB.myHome	0|0|0|0|0|0|1	Axis: Alarm_Axis | Execute: True | Position
2:39:23 AM	Alarm	PositioningAxis_1	TO_PositioningAxis		533	Gone	Technology alarm				MC Alarm 533: PLC_2 PositioningAxis_1
2:39:32 AM	Alarm				myAdHocAlarm	Gone	Program alarm				This is an alarm generated from the user pr
2:39:32 AM		PositioningAxis_1	TO_PositioningAxis		MC_Power	First information	Motion Control command	Main|CammingTest	CammingTest_DB.Power_1	0|0|0|0|0|0|0|0	Axis: PositioningAxis_1 | Enable: True | Sta
2:39:32 AM		PositioningAxis_1	TO_PositioningAxis		MC_Power	Update	Motion Control command	Main|CammingTest	CammingTest_DB.Power_1	0|0|0|0|1|0|0|0	Axis: PositioningAxis_1 | Enable: True | Sta
2:39:32 AM		SynchronousAxis_1	TO_SynchronousAxis		MC_Power	First information	Motion Control command	Main|CammingTest	CammingTest_DB.Power_3	0|0|0|0|0|0|0|0	Axis: SynchronousAxis_1 | Enable: True | S
2:39:32 AM		PositioningAxis_2	TO_PositioningAxis		MC_Home	Start	Motion Control command	Main|CammingTest	CammingTest_DB.myHome[2]	0|1|0|0|0|0|0|1	Axis: PositioningAxis_2 | Execute: True | Po
2:39:32 AM	Error	PositioningAxis_1	TO_PositioningAxis		MC_Power	First information: error	Motion Control command	Main|MoveLimitTest	MoveLimitTest_DB.Power_1	0|0|0|0|0|0|0|0	Axis: PositioningAxis_1 | Enable: True | Sta

CAUTION

Inconsistencies in projects with active event recording

If there are inconsistencies in the projects (online/offline), the event data may not be displayed correctly.

Make sure you are using the correct projects and that the projects are consistent.

The following table provides a description of the columns that are relevant for event recording:

Column	Description
Problem	A problem that has occurred in the recording: • Error An error has occurred with this instruction. • Aborted The instruction was interrupted. • Alarm An alarm has occurred. • Event recording has stopped. No events occurred during recording. No events have occurred in the recording • Due to insufficient memory, no events from technology objects are available before this timestamp. Due to storage capacity, there is no event data available up to this point.
Technology object	Name of the technology object for which the event was recorded
Type of technology object	Type of technology object for which the event was recorded
Group	Group in which the technology object is located
Event name	Display of the instruction or alarm
Status	Status of the event or alarm (Page 91)

Column	Description
Type of event	The following event types can be displayed: • Motion Control instruction • Program alarm • Technology alarm
Call structure	Call structure (e.g., interconnected calls from FBs that start with the OB and end with the Motion Control instruction)
Instance	Instance DB used for the Motion Control instruction call
Parameter change	Display of the parameter change: • 0 No change at the parameter • 1 Change at the parameter **Example:** 0|1|0|0|1|0 Change at the second and fifth parameters. The respective parameters are available in the column "Details".
Details	This column contains all relevant details of the event or alarm. You can resize the cell to see all of the content. The details are displayed below: • The details of a technology object event are displayed here in the following format: <Parameter:1>:<Value1>|<Parameter2>:<Value2>|<Parameter3>:<Value3>| ... **Example:** Distance: 10.0 | Velocity: 1.0 | Acceleration: 2.0 | Jerk: 40.0 | Command Aborted: FALSE | ErrorID: 16#0 If there are multiple technology objects at the event, they are displayed in the following format: <TO_1>(<Role>;<Type of TO>)~< TO_2>(<Role>;<Type of TO>)~ <TO_3>(<Role>;<Type of TO>)~ ... **Example:** Sync_1 (Slave; TO_SynchronousAxis) ~ Pos_1 (Master; TO_PositioningAxis) ~ Cam_1 (Cam; TO_Cam_10k) • The details of an event of an alarm are displayed with all relevant information texts in this cell.

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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