

BECKHOFF New Automation Technology

Manual | EN

TF3300

TwinCAT 3 | Scope Server

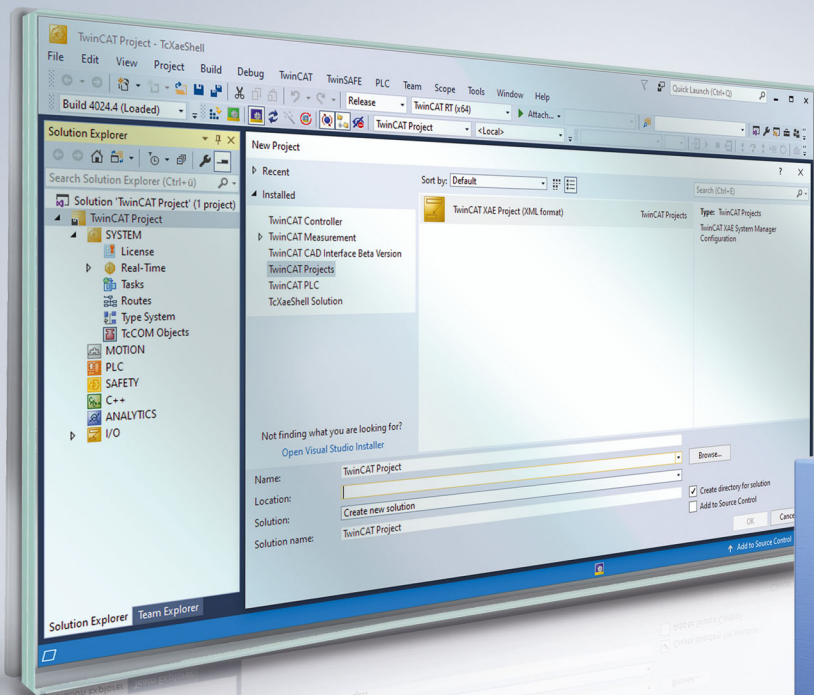


Table of contents

1 Foreword	5
1.1 Notes on the documentation	5
1.2 Safety instructions	6
1.3 Notes on information security.....	7
2 Overview	8
3 Installation	13
3.1 System requirements	13
3.2 Downloading the setup file	13
3.3 Installation	13
3.4 After the Installation	16
3.5 Licensing	16
4 Configuration	19
4.1 Scope Server configuration.....	19
4.2 Exporting data	21
4.2.1 Automated export.....	22
5 Appendix	24
5.1 FAQ – frequently asked questions and answers.....	24
5.2 Third-party components	25

1 Foreword

1.1 Notes on the documentation

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with applicable national standards.

It is essential that the documentation and the following notes and explanations are followed when installing and commissioning the components.

It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.

We reserve the right to revise and change the documentation at any time and without prior announcement. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

Trademarks

Beckhoff®, TwinCAT®, TwinCAT/BSD®, TC/BSD®, EtherCAT®, EtherCAT G®, EtherCAT G10®, EtherCAT P®, Safety over EtherCAT®, TwinSAFE®, XFC®, XTS® and XPlanar® are registered trademarks of and licensed by Beckhoff Automation GmbH.

Other designations used in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owners.

Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents:

EP1590927, EP1789857, EP1456722, EP2137893, DE102015105702
with corresponding applications or registrations in various other countries.

EtherCAT®

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany

Copyright

© Beckhoff Automation GmbH & Co. KG, Germany.

The reproduction, distribution and utilization of this document as well as the communication of its contents to others without express authorization are prohibited.

Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility model or design.

1.2 Safety instructions

Safety regulations

Please note the following safety instructions and explanations!
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

Description of symbols

In this documentation the following symbols are used with an accompanying safety instruction or note. The safety instructions must be read carefully and followed without fail!

DANGER

Serious risk of injury!

Failure to follow the safety instructions associated with this symbol directly endangers the life and health of persons.

WARNING

Risk of injury!

Failure to follow the safety instructions associated with this symbol endangers the life and health of persons.

CAUTION

Personal injuries!

Failure to follow the safety instructions associated with this symbol can lead to injuries to persons.

NOTE

Damage to the environment or devices

Failure to follow the instructions associated with this symbol can lead to damage to the environment or equipment.



Tip or pointer

This symbol indicates information that contributes to better understanding.

1.3 Notes on information security

The products of Beckhoff Automation GmbH & Co. KG (Beckhoff), insofar as they can be accessed online, are equipped with security functions that support the secure operation of plants, systems, machines and networks. Despite the security functions, the creation, implementation and constant updating of a holistic security concept for the operation are necessary to protect the respective plant, system, machine and networks against cyber threats. The products sold by Beckhoff are only part of the overall security concept. The customer is responsible for preventing unauthorized access by third parties to its equipment, systems, machines and networks. The latter should be connected to the corporate network or the Internet only if appropriate protective measures have been set up.

In addition, the recommendations from Beckhoff regarding appropriate protective measures should be observed. Further information regarding information security and industrial security can be found in our <https://www.beckhoff.com/secguide>.

Beckhoff products and solutions undergo continuous further development. This also applies to security functions. In light of this continuous further development, Beckhoff expressly recommends that the products are kept up to date at all times and that updates are installed for the products once they have been made available. Using outdated or unsupported product versions can increase the risk of cyber threats.

To stay informed about information security for Beckhoff products, subscribe to the RSS feed at <https://www.beckhoff.com/secinfo>.

2 Overview

TwinCAT 3 Scope is the charting and analysis tool for TwinCAT. Variables in TwinCAT can be recorded and displayed graphically. Sampling rates can be adjusted individually for each channel. Recordings in the μs range and long-term recordings over several days are equally possible. Due to division into a Scope View with multi-core support for the display of the signals and a Scope Server for the recording of the values, it is possible to connect to servers distributed in the field from a central View. A tool is thus available not only for machine commissioning, but also for process monitoring. The TwinCAT 3 Scope functionality includes cursor tools and trigger functions.

TwinCAT 3 Scope also sets new standards for Engineering. Like TwinCAT 3 itself, it is integrated in Microsoft Visual Studio. It is thus possible to use TwinCAT 3 projects and Scope projects in parallel in a single solution. Variables can be shifted very simply from the TwinCAT 3 project to a Scope configuration. Of course the Scope can also still be used as a standalone tool in the framework of the TwinCAT XAE Shell.

Due to the constantly increasing range of functions required of data analysis tools, the TwinCAT 3 Scope is subdivided into product levels with different ranges of features. The TwinCAT 3 Scope Base contains a license-free View and a license-free Server. Both are installed together with TwinCAT 3 XAE.

Product note

The TwinCAT 3 Scope software consists of two products:

- TwinCAT 3 Scope View is a TwinCAT 3 engineering product and supplies the graphic interface for the configuration of recordings and the display of signal curves. The View is available in different product levels and is licensed for the device on which it is displayed. This document contains the technical product description.
- TwinCAT 3 Scope Server is a TwinCAT 3 function and provides the software for data logging. The server sends the recorded data to the View. The software is installed on distributed devices or on the local target device. The server license is issued for the device on which the server runs. In most cases the Base version, which is installed together with TwinCAT XAE or the Scope View, is sufficient. The server license is only required if it is used independently, i.e. without View, e.g. for control via a PLC function block. The TwinCAT 3 Scope server is documented separately as part of the TwinCAT 3 functions.

Both components must be available in the system in order to be able to use the Scope.

Principle of operation

The principle of operation of the two main components View and Server is explained in detail in the Basic Concept in the Technical Introduction.

Product level / feature list

The following table shows which functionalities are available with which TwinCAT Scope level and the corresponding licensing arrangement.

Features	Scope Base		Scope Server Full Licence		Scope View Professional	
	Server	View	Server		View	
			Full	7 days trial version	Full	7 days trial version
General:						
Free of charge	✓	✓	✗	✓	✗	✓
Local record	✓	✓	✓	✓	✓	✓
Remote Record using Target Server	✗	✓	✓	✓	✓	✓
Remote Record using Local Server	✓	✓	✓	✓	✓	✓
Scope Control Integration	-	✗	-	-	✓	✓
Long Time Records > 1h	-	✗	-	-	✓	✗
Ring Buffer	✓	✓	✓	✓	✓	✓
Auto Save	-	✗	-	-	✓	✓
Auto Export	-	✗	-	-	✓	✗
Restart Record	-	✗	-	-	✓	✓
View Multicore Support	-	✓	-	-	✓	✓
Communication:						
ADS	✓	✓	✓	✓	✓	✓
OPC UA	✗	✗	✓	✓ (3 Nodes)	✓	✓ (3 Nodes)
Base:						
Configuration Wizard	-	✓	-	-	✓	✓
Target Browser Filter	-	✓	-	-	✓	✓
Individual Sample Rate	-	✓	-	-	✓	✓
Drag and Drop for Configuration	-	✓	-	-	✓	✓
Docking Windows	-	✓	-	-	✓	✓
YT Time based Charts	-	✓	-	-	✓	✓
XY Charts	-	✓	-	-	✓	✓
Array Bar Charts	-	✓	-	-	✓	✓

Features	Scope Base		Scope Server Full Licence		Scope View Professional	
Overview Chart	-	✓	-	-	✓	✓
Stacked Y-Axes	-	✓	-	-	✓	✓
Logarithmic Y-Axes	-	✓	-	-	✓	✓
Chart synchronisation	-	✓	-	-	✓	✓
Master Chart synchronisation	-	✓	-	-	✓	✓
Channel Marks	-	✓	-	-	✓	✓
Channel Offset	-	✓	-	-	✓	✓
Channel Scaling	-	✓	-	-	✓	✓
Panning	-	✓	-	-	✓	✓
Zoom	-	✓	-	-	✓	✓
Cursor	-	✓	-	-	✓	✓
Fillmode	-	✓	-	-	✓	✓
Print Report	-	✗	-	-	✓	✓
Data export wizard	-	✓	-	-	✓	✓
Export tool	✓	✓	✓	✓	✓	✓
Extended data export formats	-	✗	-	-	✓	✗
Attach/Detach Client to/from recording server	✗	✗	✓	✗	✓	✓
Autostart Record after Serverstart	✗	-	✓	✗	-	-
Curve Creator		✓			✓	✓
Curve Creator Transformation	-	✗	-	-	✓	✗
Data Scout	-	✓	-	-	✓	✓
Data Scout Toolbar snipping buttons		✗			✓	✗
Trigger:						
Event Marker	-	✓	-	-	✓	✓
Start Record	-	✓	-	-	✓	✓

Features	Scope Base		Scope Server Full Licence		Scope View Professional	
Stop Record	-	✓	-	-	✓	✓
Stop Display	-	✓	-	-	✓	✓
Restart Display	-	✓	-	-	✓	✓
Start Subsave	-	✗	-	-	✓	✓
Stop Subsave	-	✗	-	-	✓	✓
Reporting Trigger	-	✗	-	-	✓	✗
Reporting Collector	-	✗	-	-	✓	✗
Reporting Collector + Trigger	-	✗	-	-	✓	✗
Units:						
Unit Property	-	✓	-	-	✓	✓
Unit Wizard	-	✓	-	-	✓	✓
Unit Dictionary Editor	-	✗	-	-	✓	✗
Unit generation by Terminal selection	-	✗	-	-	✓	✗
Parse Units from PLC Code	-	✓	-	-	✓	✓
Units in Target Browser	-	✓	-	-	✓	✓
Units in Tooltips	-	✓	-	-	✓	✓
Units in Cursor Window	-	✓	-	-	✓	✓
Vision Integration:						
Vision Acquisitions	-	✗			✓	✓ (max 1)
Vision picture export	✗	✗			✓	✗
Layer	-	✗	-	-	✓	✓ (max 1)
Reporting Integration:						
24/7-Reporting with Trigger Groups	-	✗	-	-	✓	✗
On-Demand-Reporting						

Features	Scope Base		Scope Server Full Licence		Scope View Professional	
Adding Additional Information	-	✔ (max 1)	-	-	✔	✔ (max 1)
Select specific Scope Information	-	✘	-	-	✔	✘
Select specific charts	-	✘	-	-	✔	✘

3 Installation

3.1 System requirements

The following system requirements must be fulfilled for proper functioning of the TwinCAT 3 Scope Server.

Supported operating systems

Windows Embedded Standard 7, Windows 7, Windows 10

TwinCAT

Minimum is TwinCAT 3 ADS.

.NET Framework

.NET Framework 4.5.1 is required.

The TwinCAT 3 Scope Base is installed together with TwinCAT 3 XAE. The further product level and features are activated per licensing. If you want to use a new Scope version without a TwinCAT 3 XAE Update or install the Scope standalone on a PC without TwinCAT 3 Engineering, you can download this setup in the internet.

The Scope View can be licensed as full version and as a 7-day-trial-version. Limitations of the 7-day-trial-version you can see on the product overview.

3.2 Downloading the setup file

Like many other TwinCAT 3 Functions, the TwinCAT 3 Scope Server is available for downloading on the Beckhoff website. It is always the most current version of the product, which can be licensed for each product level. Please perform the following steps to download the setup file:

- Start a web browser of your choice and go to the Beckhoff product page www.beckhoff.de/tf3300
- Click on the Download link in order to place the software in the shopping cart. Then click on “Start download”.
- (Optional) Transfer the downloaded file to the TwinCAT runtime system you wish to install the product on.

3.3 Installation

The following section describes how to install the TwinCAT 3 Function for Windows-based operating systems.

✓ The TwinCAT 3 Function setup file was downloaded from the Beckhoff website.

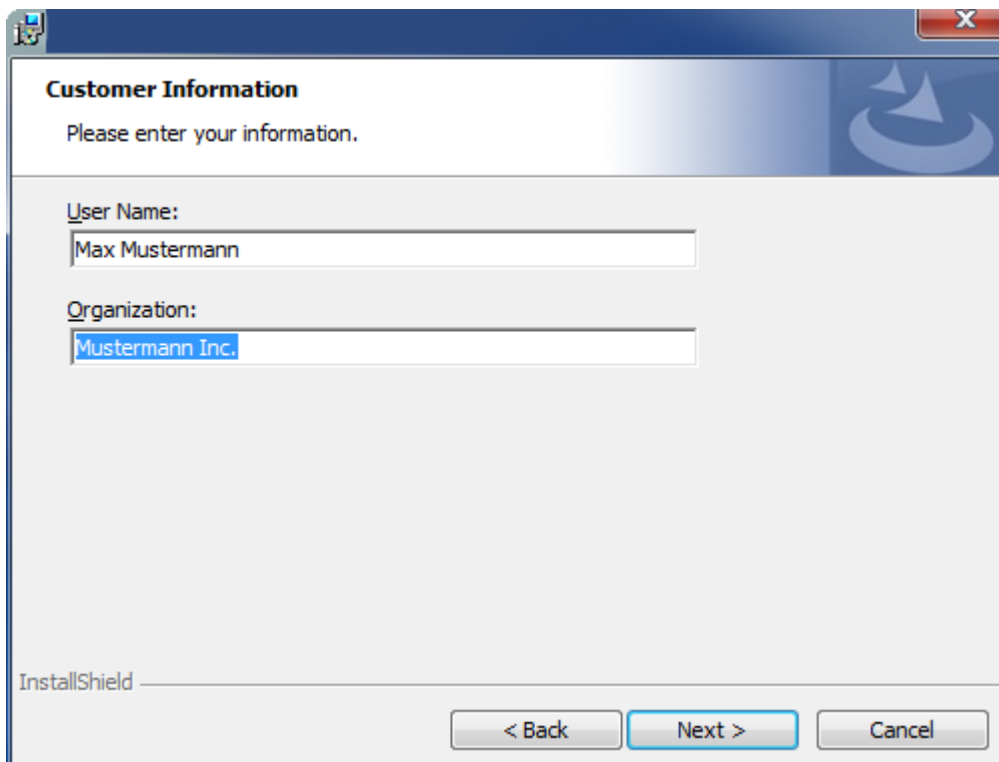
1. Run the setup file as administrator. To do this, select the command **Run as administrator** in the context menu of the file.

⇒ The installation dialog opens.

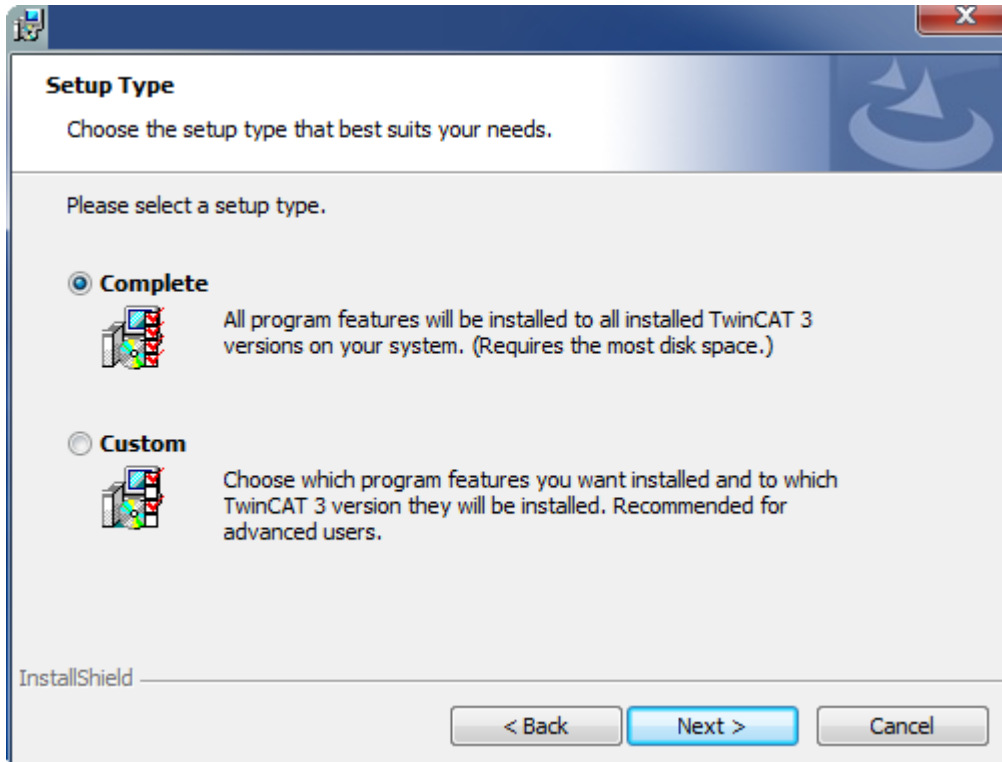
2. Accept the end user licensing agreement and click **Next**.



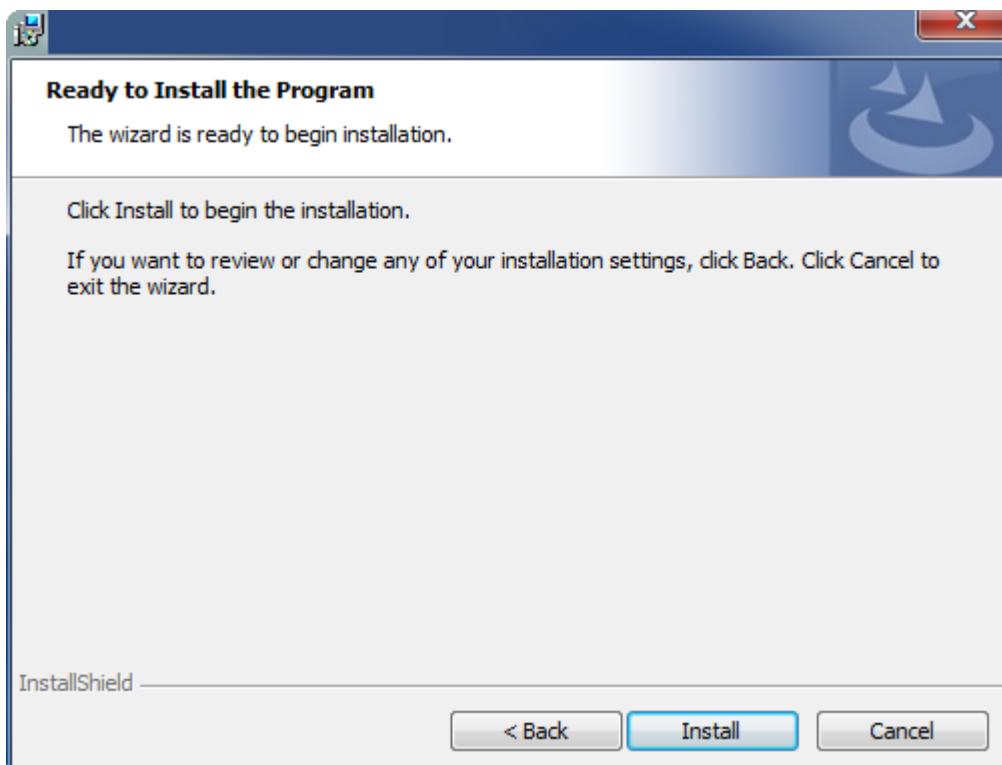
3. Enter your user data.



- If you want to install the full version of the TwinCAT 3 Function, select **Complete** as installation type. If you want to install the TwinCAT 3 Function components separately, select **Custom**.

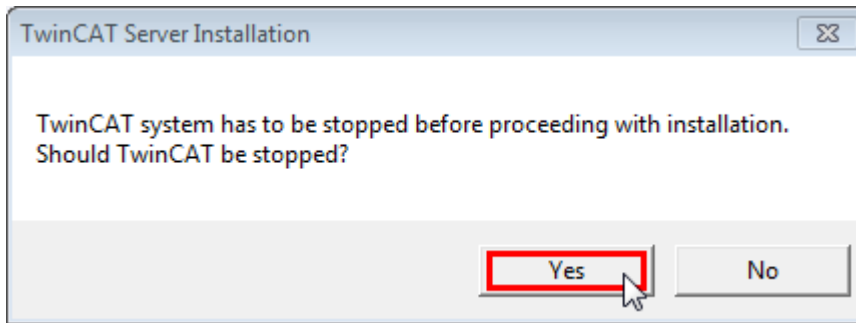


- Select **Next**, then **Install** to start the installation.

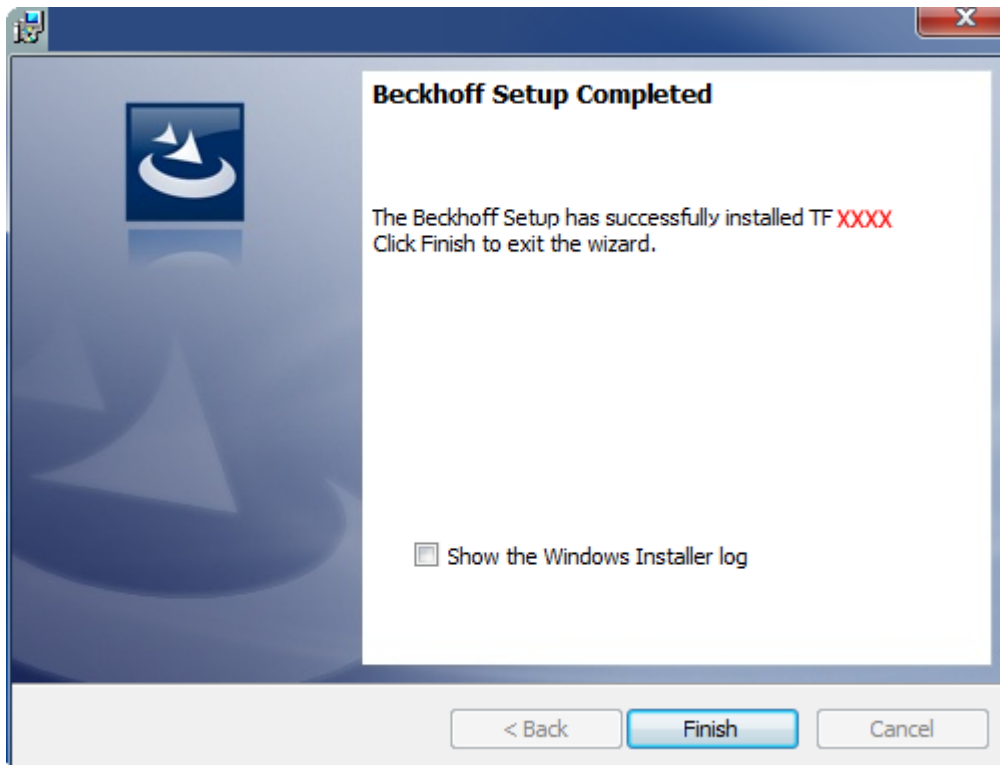


⇒ A dialog box informs you that the TwinCAT system must be stopped to proceed with the installation.

6. Confirm the dialog with **Yes**.



7. Select **Finish** to exit the setup.



⇒ The TwinCAT 3 Function has been successfully installed and can be licensed (see [Licensing](#) [▶ 16]).

3.4 After the Installation

The next step after successful installation is licensing of the products “TE130x Scope View” and/or “TF3300 Scope Server”. By default the product level “Base” is active, which is available without a license. The advanced functionality can be enabled through corresponding licensing, e.g. for the product level “Professional”. Further steps then are:

- First steps with TwinCAT 3 Scope
- Detailed documentation of the individual functions
- The integration of TwinCAT 3 Scope View Control into your own .NET-based visualization

3.5 Licensing

The TwinCAT 3 function can be activated as a full version or as a 7-day test version. Both license types can be activated via the TwinCAT 3 development environment (XAE).

Licensing the full version of a TwinCAT 3 Function

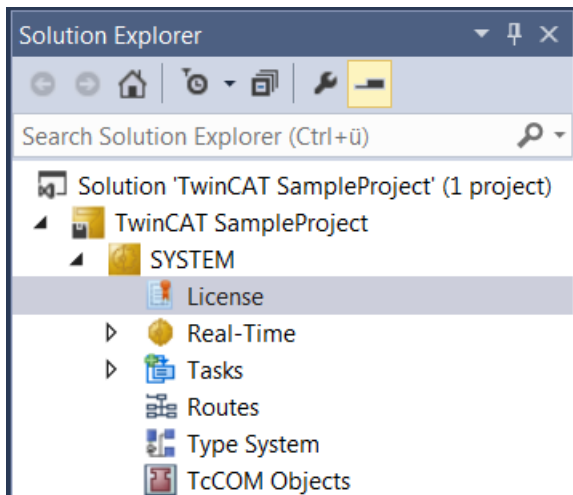
A description of the procedure to license a full version can be found in the Beckhoff Information System in the documentation "[TwinCAT 3 Licensing](#)".

Licensing the 7-day test version of a TwinCAT 3 Function



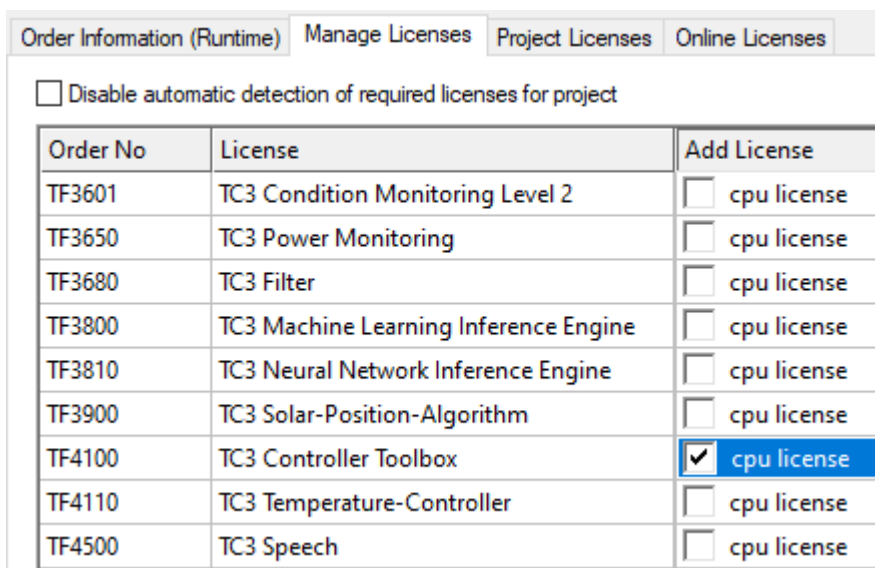
A 7-day test version cannot be enabled for a [TwinCAT 3 license dongle](#).

1. Start the TwinCAT 3 development environment (XAE).
2. Open an existing TwinCAT 3 project or create a new project.
3. If you want to activate the license for a remote device, set the desired target system. To do this, select the target system from the **Choose Target System** drop-down list in the toolbar.
 - ⇒ The licensing settings always refer to the selected target system. When the project is activated on the target system, the corresponding TwinCAT 3 licenses are automatically copied to this system.
4. In the **Solution Explorer**, double-click **License** in the **SYSTEM** subtree.



⇒ The TwinCAT 3 license manager opens.

5. Open the **Manage Licenses** tab. In the **Add License** column, check the check box for the license you want to add to your project (e.g. "TF4100 TC3 Controller Toolbox").



6. Open the **Order Information (Runtime)** tab.

⇒ In the tabular overview of licenses, the previously selected license is displayed with the status “missing”.

7. Click **7-Day Trial License...** to activate the 7-day trial license.

The screenshot shows the 'License Management' window with several sections:

- Order Information (Runtime)**: Includes tabs for 'Manage Licenses', 'Project Licenses', and 'Online Licenses'.
- License Device**: A dropdown menu set to 'Target (Hardware Id)' with an 'Add...' button.
- System Id**: A text field containing '2DB25408-B4CD-81DF-5488-6A3D9B49EF19'.
- Platform**: A dropdown menu set to 'other (91)'.
- License Request**: Includes a 'Provider' dropdown set to 'Beckhoff Automation', a 'Generate File...' button, and fields for 'License Id', 'Customer Id', and 'Comment'.
- License Activation**: This section is highlighted with a red box and contains two buttons: '7 Days Trial License...' (also highlighted with a red box) and 'License Response File...'.

⇒ A dialog box opens, prompting you to enter the security code displayed in the dialog.

The 'Enter Security Code' dialog box contains the following elements:

- Title bar: 'Enter Security Code' with a close button (X).
- Text: 'Please type the following 5 characters:'.
- Text field: Contains the security code 'Kg8T4'.
- Input field: A two-character input field with a red border, currently empty.
- Buttons: 'OK' (highlighted with a red box) and 'Cancel'.

8. Enter the code exactly as it is displayed and confirm the entry.

9. Confirm the subsequent dialog, which indicates the successful activation.

⇒ In the tabular overview of licenses, the license status now indicates the expiry date of the license.

10. Restart the TwinCAT system.

⇒ The 7-day trial version is enabled.

4 Configuration

4.1 Scope Server configuration

The TwinCAT 3 Scope Server is responsible for the recording of process variables, which it communicates to the TwinCAT 3 Scope View via ADS. The Scope View informs the Scope Server what it has to record in the form of a configuration. The Server can run on a device with the View, but it may also run autonomously on another system without View. In this case the View communicates with the server from an external device (e.g. service notebook).

As a Windows service the TwinCAT 3 Scope Server is dependent on the TwinCAT 3 System Service. A GUI is available for the configuration of the Server. This is described below. The GUI can be found under *Windows Start Menu / Beckhoff / TF3300 Scope Server*.

TwinCAT 3 Scope Server Tracing:



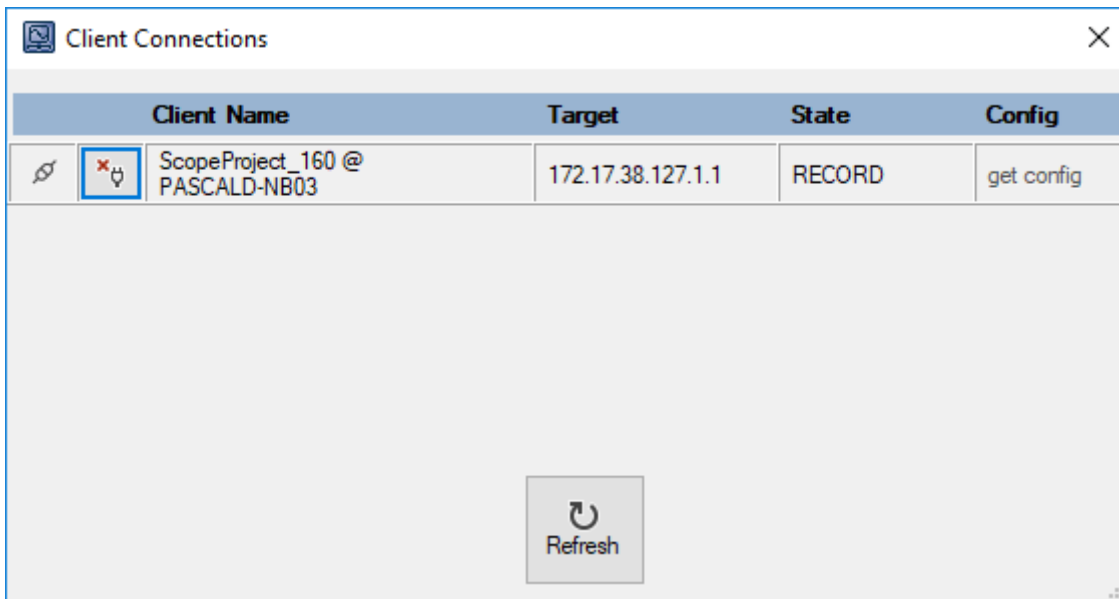
A Scope Server log can be switched on under **Tracing**. This can supply insightful information in cases of support. However, you are advised against activating logging by default.

TwinCAT 3 Scope Server Workfolder:

The **workfolder** for the swap file of the Scope Server for long-term recordings can be specified here. Swapping takes place by activating the **File Store Option** in the **Scope Properties** of the View. In cases of service an external medium (e.g. USB stick) can also be selected as the swap location with devices having a limited memory.

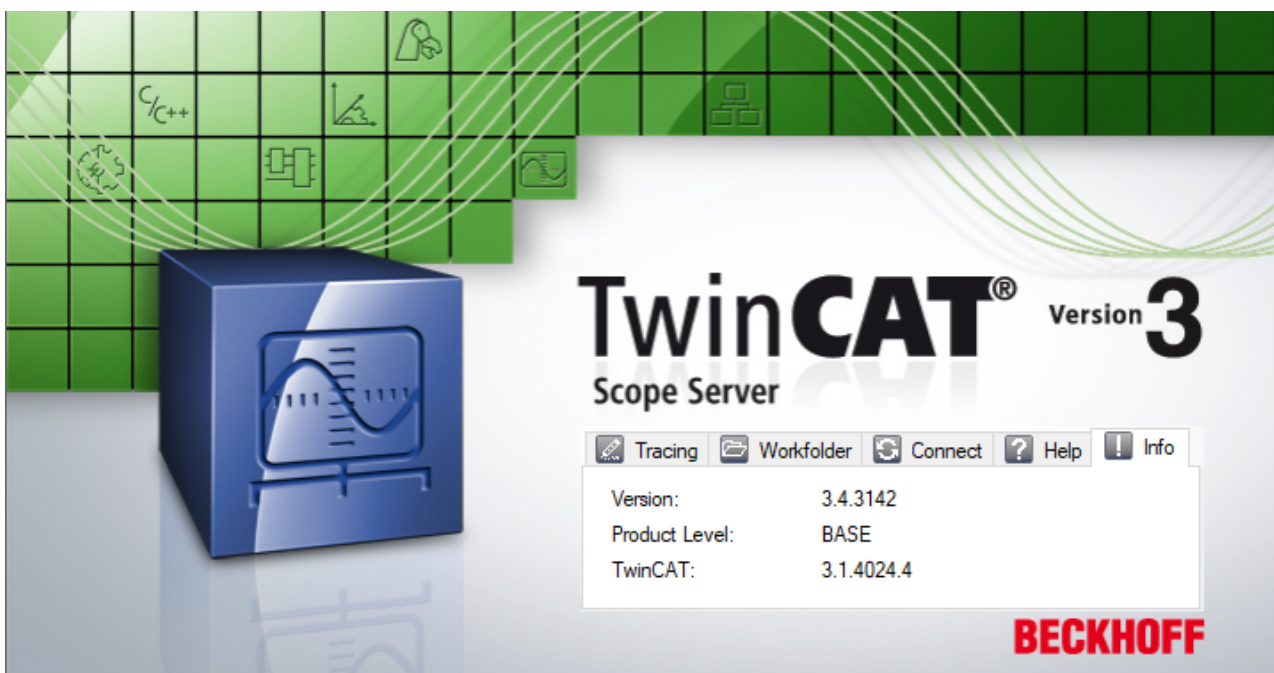
TwinCAT 3 Scope Server Connect:

Click the **Connections ...** button in the **Connect** tab to view the remote systems and the corresponding recordings that are currently active on the Scope server.



The Scope server can be restarted with the **Reset Server** button, if required.

TwinCAT 3 Scope Server Info:



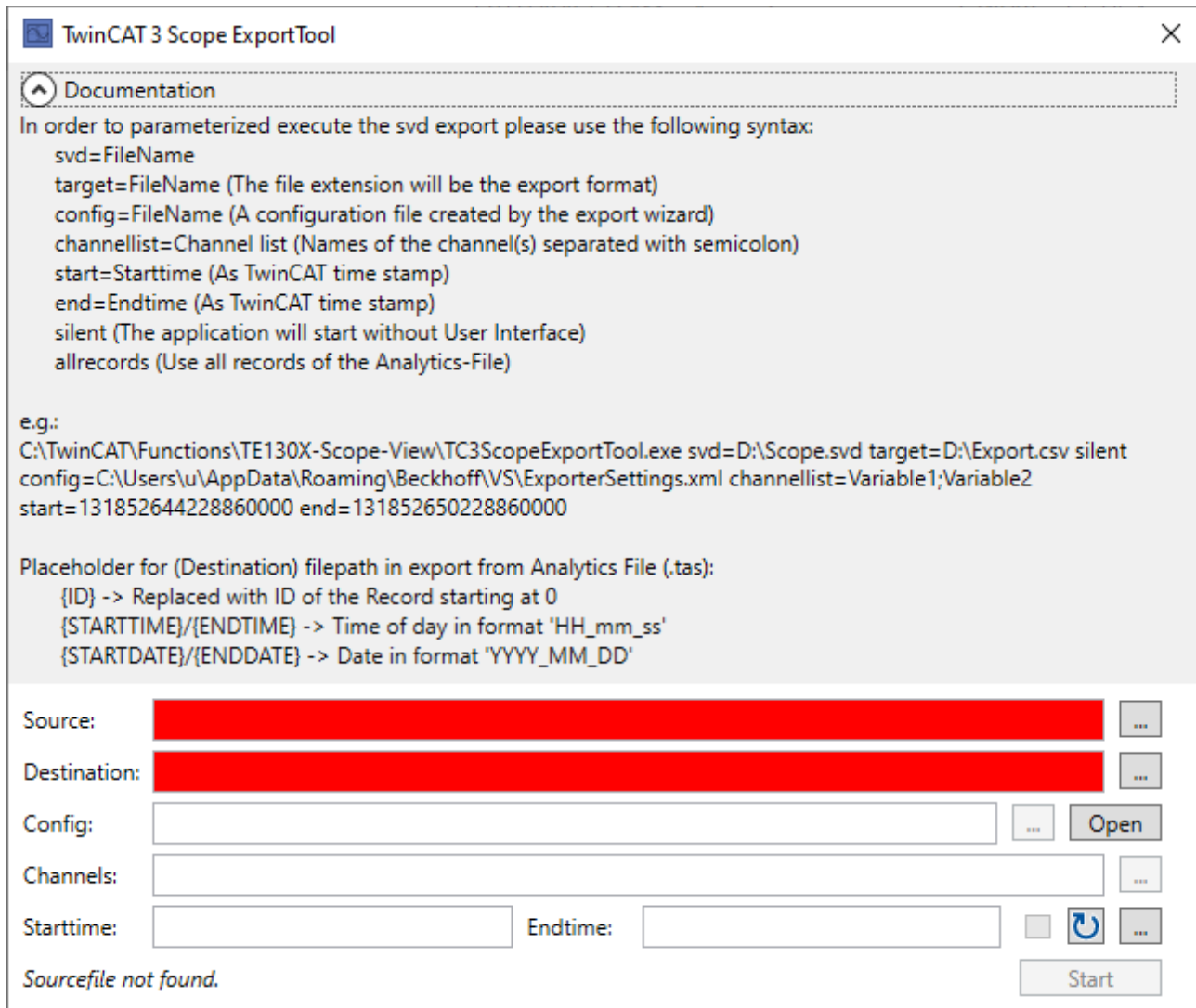
The current version data for the Scope Server and the installed TwinCAT version are available on the **Info** tab. Beyond that the product level information can also be found here. It can adopt the values BASE, TC3_SERVER_TRIAL or TC3_SERVER. The product levels of the Scope Server are independent of the product levels of the TwinCAT 3 Scope View.

4.2 Exporting data

With the TwinCAT 3 Scope Export Tool, the Scope Server offers a possibility to export data into other file formats. This does not require an installed Scope View or Visual Studio®. The tool is described below.

4.2.1 Automated export

Along with the Scope, the **TwinCAT 3 Scope Export Tool** is additionally installed in the TE130X Scope View and in the TF3300 Scope Server directory. This can be used to subsequently convert contents of svdx files into the supported export formats - without Visual Studio. The tool comes complete with its documentation. For the tdms and dat formats a full View or server license is required.



The TwinCAT 3 Scope ExportTool can also be used for export via a command line call, based on specified parameters. The interface shown here can be suppressed by entering the keyword "silent" in the command line. In this case the export is executed in the background.

To automate the export, the tool can be called from the PLC via `NT_StartProcess`. Code sample with fixed strings and `fbStartExport` as instance of `NT_StartProcess`:

```
fbStartExport (
  NETID:= '',
  PATHSTR:= 'C:\TwinCAT\Functions\TE130X-Scope-View\TC3ScopeExportTool.exe',
  DIRNAME:= 'C:\TwinCAT\Functions\TE130X-Scope-View',
  COMNDLINE:= '"svd=c:\Scope Project.svd" target=c:\TestExport.csv silent',
  START:= bStart,
  TMOUT:= T#20S,
  BUSY=> ,
  ERR=> ,
  ERRID=> );
```

Export IoT File Arrays as Oversampling Symbols to CSV

To export an array symbol from an IoT file as an oversampling signal to a CSV file, only the array signal is selected in the signal selection.

When exporting, the oversampling signals are now saved in addition to the other signals and time stamps. Here, all signals which have the same oversampling rate and thus a new identical sampling rate are grouped and stored with the same time series.

Export IoT File Arrays as Oversampling Symbols to CSV

To export an array symbol from an IoT file as an oversampling signal to a CSV file, only the array signal is selected in the signal selection.

Separate tables are created for the different sampling rates of the selected signals. All signals with the same array length are thus grouped in a table. This means that all signals in a table have a value at any time.

If several signals with different sampling rates are selected during the export, the table name, which can be set in the configuration ("Config"), serves as the base name for the new tables. The sampling rate is appended after the base name (e.g. ExportTable_200_ms).

5 Appendix

5.1 FAQ – frequently asked questions and answers

Frequently asked questions are answered in this section in order to make it easier for you to work with TwinCAT 3 Scope.

If you have any further questions, please contact our support (-157).

1. Is it true that "TwinCAT 3 Scope" in the TwinCAT 3 world is not a product, but a generic term for various products? [▶ 24]
2. Why are there different product levels for the TwinCAT 3 Scope? [▶ 24]
3. Can the Scope View Professional be operated with the Scope Server Base? What are the restrictions? [▶ 24]
4. Why should the TF3300 Scope Server be used, when the "Use local Server" option can also be enabled? [▶ 24]
5. Can the TwinCAT Scope View be integrated into an own visualization? [▶ 24]
6. Are open source software components used in TwinCAT Measurement? [▶ 24]

Is it true that "TwinCAT 3 Scope" in the TwinCAT 3 world is not a product, but a generic term for various products?

Yes, "TwinCAT 3 Scope" is a generic term. The TwinCAT 3 Scope is subdivided into the Scope View and Scope Server products. This means that a TwinCAT 3 Scope always consists of the View and Server products. Beyond that there are also different product levels.

Why are there different product levels for the TwinCAT 3 Scope?

The Scope is a constantly growing tool for data logging and analysis; however, not every Scope user requires the full range of functions for his purposes. Therefore, we offer product levels tailored as far as possible to the application. The currently available product levels are Base and Professional. Base is free of license costs and can be used for machine commissioning. Professional is very well suited for process monitoring in addition to machine commissioning.

Can the Scope View Professional be operated with the Scope Server Base? What are the restrictions?

Yes, the Professional View can also be operated with the Base Server. Only the restrictions of the Base Server version need to be observed. It is also possible, for example, to scope a remote device with the local Base Server. To do this the "Use local server" option must be set in the channel settings.

Why should the TF3300 Scope Server be used, when the "Use local Server" option can also be enabled?

As soon as a Scope Server is to run autonomously on a remote device, the TwinCAT function TF3300 Scope Server is required. The server can thus be controlled from the PLC or operated in Headless mode, for example, without a view being connected.

Can the TwinCAT Scope View be integrated into an own visualization?

Yes, you can integrate the Scope Control into your own .NET based visualization application. The license model remains identical. Details and examples can be found [here](#).

Are open source software components used in TwinCAT Measurement products?

Yes, various open source components are used.

Please see the information on the page [Third-party components](#) [▶ 25].

5.2 Third-party components

This software contains third-party components.

Please refer to the license file provided in the following folder for further information:

...\TwinCAT\Functions\TwinCAT Measurement\Legal

More Information:
www.beckhoff.com/tf3300

Beckhoff Automation GmbH & Co. KG
Hülshorstweg 20
33415 Verl
Germany
Phone: +49 5246 9630
info@beckhoff.com
www.beckhoff.com

