

Manual

# **TC3 Wind Framework**

# TwinCAT 3

Version: 1.0 Date: 2017-06-01 Order No.: TF8310



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# 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 the 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.

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

EP1590927, EP1789857, DE102004044764, DE102007017835

with corresponding applications or registrations in various other countries.

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

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### Ether**CAT**

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# 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!<br>Failure to follow the safety instructions associated with this symbol directly endangers the<br>life and health of persons.            |
|------------------|---|
| WARNING          | <b>Risk of injury!</b><br>Failure to follow the safety instructions associated with this symbol endangers the life and health of persons.                         |
|                  | <b>Personal injuries!</b><br>Failure to follow the safety instructions associated with this symbol can lead to injuries to persons.                               |
| Attention        | <b>Damage to the environment or devices</b><br>Failure to follow the instructions associated with this symbol can lead to damage to the environment or equipment. |
| <b>i</b><br>Note | <b>Tip or pointer</b><br>This symbol indicates information that contributes to better understanding.  |

# 2 Product description

The TwinCAT Wind Framework consists of several components, providing essential functionalities for the automation software of wind energy turbines. They are designed to support the development, commissioning and maintenance of a wind turbine control system. The TwinCAT Wind Framework consists of Modules, Libraries and Applications. Modules are providing the essentials functionalities in the real-time context based on the TcCOM-Architecture. By the Libraries API's are provided to access and use the Framework. In addition the Applications are providing tools to interact with the Framework or collaborating systems.



#### **TwinCAT Wind Framework**

This public information is only a limited overview about the TwinCAT Wind Framework. Please, do not hesitate to contact us for a full documentation, support or feedback by email: <u>TcWind@beckhoff.com</u>

| modulos                              |                   |                  |                    |  |
|--------------------------------------|-------------------|------------------|--------------------|--|
| TcWStatus                            | TcWParameter      |                  | TcWCommand         |  |
| Monitoring Settings                  |                   |                  | Remote Commands    |  |
| Supervision                          | Adjustments       |                  | Manual Interaction |  |
| Event-Handling                       | Configurations    |                  | Action Triggering  |  |
| TcWMean                              | TcWCapture        |                  | TcWUser            |  |
| Average Calculation                  | Sampling of Value | es               | User Management    |  |
| Long-Term Evaluation                 | Long-Term Recor   | ding             | Authorization      |  |
|                                      |                   |                  | Credentials        |  |
| TcWConnect TcWDatabase               |                   |                  | TcWTrace           |  |
| ADS Server                           | Database Interfac | e                | Event-Log          |  |
| Diagnostics                          | Storage of Data   |                  | High Resolution    |  |
| Online Monitoring Historical Monitor |                   | ing              | Pre/Post-Trigger   |  |
| Programming                          |                   |                  |                    |  |
| TcWindLib                            |                   | TcWindSDK        |                    |  |
| PLC Library                          |                   | C++ Interface    |                    |  |
| Function and Functionblocks          |                   | Header Files and | Libraries          |  |
| Applications                         |                   |                  |                    |  |
| TcWindView                           |                   | TcWindDatabase   |                    |  |
|                                      |                   |                  |                    |  |

#### **Content overview**

Modulos

| Applications                    |                                  |  |  |
|---------------------------------|----------------------------------|--|--|
| TcWindView                      | TcWindDatabase                   |  |  |
| Engineering Visualization       | SQL Database Application         |  |  |
| Debugging and Comissioning Tool | Tables, Procedures, Views        |  |  |
| TcWindTurbine Template          | TcWind ADS / SQL Client          |  |  |
| Fundamental Project Template    | C#/.NET Client Applications      |  |  |
| Module Wind Turbine Application | Interface Demonstration Projects |  |  |
| TcWindPlcTraining               | TcWindCppTraining                |  |  |
| PLC Demonstration Project       | C++ Demonstration Project        |  |  |
| Modular Cooling Subsystem       | Modular Cooling System           |  |  |

# 3 Installation

### 3.1 System requirements

For first tests with TwinCAT Wind Framework a demonstration setup is available on Beckhoff website.

| Technical data       | TF8310 TwinCAT 3 Wind Framework                   |
|----------------------|---|
| Target system        | Windows 7, Windows 8, Windows 10<br>PC (x86, x64) |
| Min. TwinCAT version | 3.1.4020.0  |
| Min. TwinCAT level   | TC1200 TC3   PLC or TC1300 TC3   C++              |

### 3.2 Installation

Description of the installation procedure of a TwinCAT 3 Function for Windows-based operating Systems.

- 1. Double-click the downloaded setup file *TFxxxx*. Please note: Under Windows 32-bit/64-bit, please start the installation with "Run as Administrator" by right-clicking the setup file and selecting the corresponding option in the context menu.
- 2. Click **Next** and accept the license agreement.

| 🛃 TF4100 Controller Toolbox - 1.00.0000 📃 🔤  |  |
|--|--|
| License Agreement Please read the following license agreement carefully.   |  |
| Software Usage Agreement for Beckhoff Software Products  |  |
| <ul> <li>(1) Licensor grants Licensee a non-transferable, non-exclusive right to use the data processing applications specified in Appendix 1 hereto (hereinafter called "Software") under the conditions specified hereinafter.</li> <li>(2) The Software shall be delivered to Licensee on machine-readable recording media as specified in Appendix 1, on which it is recorded as an object program in an executable status. One copy of the user documentation shall be part of the application and it shall be delivered to Licensee in printed form, or also on a machine-readable recording medium or online. The form the user documentation is delivered in is specified in Appendix 1. The Software and the documentation are hereinafter called "License Materials".</li> </ul> |  |
| I accept the terms in the license agreement     Print     I do not accept the terms in the license agreement   |  |
| InstallShield < Back Next > Cancel   |  |

3. Enter your user information in the specified area.

| FF4100 Controller Toolbox - 1.00.0000                  | ×            |
|--|--------------|
| Customer Information<br>Please enter your information. |              |
| User Name:<br>Max Mustermann                           |              |
| Organization:<br>Mustermann Inc.                       |              |
|  |              |
|  |              |
|  |              |
|  | ext > Cancel |

4. To install the full product, including all sub-components, please choose **Complete** as the Setup Type. Alternatively, you can also install each component separately by choosing **Custom**.

| FF4100 Control               | ller Toolbox - 1.00.0000  | x  |
|------------------------------|---|----|
| Setup Type<br>Choose the set | up type that best suits your needs.   | 5  |
| Please select a              | setup type.   |    |
| Complete                     | All program features will be installed to all installed TwinCAT 3 versions on your system. (Requires the most disk space.)                    |    |
| Custom                       | Choose which program features you want installed and to which<br>TwinCAT 3 version they will be installed. Recommended for<br>advanced users. |    |
| InstallShield                | < Back Next > Cance   | el |

5. Click Next and Install to start the installation.

| 🔁 TF4100 Controller Toolbox - 1.00.0000   | x |
|---|---|
| Ready to Install the Program         The wizard is ready to begin installation.                                 | 5 |
| Click Install to begin the installation.  |   |
| If you want to review or change any of your installation settings, click Back. Click Cancel to exit the wizard. |   |
| InstallShield   |   |
| < Back Install Cancel   |   |

The TwinCAT system must be stopped before proceeding with installation.

6. Confirm the Dialog with **Yes**.

| TwinCAT Server Installation 🛛 🕅   |
|---|
| TwinCAT system has to be stopped before proceeding with installation.<br>Should TwinCAT be stopped? |
| Yes No  |

7. Select **Finish** to end the installation process.

| FF4100 Controller Toolbox - 1.00.0000 |  |      |  |  |
|---------------------------------------|--|------|--|--|
|                                       | Beckhoff Setup Completed   |      |  |  |
| 2                                     | The Beckhoff Setup has successfully installed TF4100<br>Controller Toolbox. Click Finish to exit the wizard. |      |  |  |
|                                       |  |      |  |  |
|                                       |  |      |  |  |
|                                       | Show the Windows Installer log   |      |  |  |
|                                       |  |      |  |  |
|                                       | < Back Finish Can  | icel |  |  |

 $\Rightarrow$  The installation is now complete.

After a successful installation, the TC 3 Function needs to be licensed. [> 11]

# 3.3 Licensing

The TwinCAT 3 functions are available both as a full and as a 7-Day trial version. Both license types can be activated via TwinCAT XAE.For more information about TwinCAT 3 licensing, please consult the TwinCAT 3 Help System.The following document describes both licensing scenarios for a TwinCAT 3 function on TwinCAT 3 and is divided into the following sections:

- Licensing a 7-Day trial version [> 11]
- Licensing a full version [▶ 12]

#### Licensing a 7-Day trial version

- 1. Start TwinCAT XAE
- 2. Open an existing TwinCAT 3 project or create a new project
- 3. In Solution Explorer, please navigate to the entry System\License



4. Open the tab **Manage Licenses** and add a **Runtime License** for your product (in this screenshot **TE1300: TC3 Scope View Professional**)

| TwinCAT Project5 ×   |                                  |                     |  |  |
|--|----------------------------------|---------------------|--|--|
| Order Information Manage Licenses Project Licenses Online Licenses |                                  |                     |  |  |
| Order No   | License                          | Add Runtime License |  |  |
| TC1000   | TC3 ADS                          | 🗹 cpu license       |  |  |
| TC1100   | TC3 10                           | Cpu license         |  |  |
| TC1200   | TC3 PLC                          | Cpu license         |  |  |
| TC1210   | TC3 PLC / C++                    | Cpu license         |  |  |
| TC1220   | TC3 PLC / C++ / MatSim           | Cpu license         |  |  |
| TC1250   | TC3 PLC / NC PTP 10              | Cpu license         |  |  |
| TC1260   | TC3 PLC / NC PTP 10 / NC I       | Cpu license         |  |  |
| TC1270   | TC3 PLC / NC PTP 10 / NC I / CNC | Cpu license         |  |  |
| TC1300   | TC3 C++                          | Cpu license         |  |  |
| TC1320   | TC3 C++ / MatSim                 | Cpu license         |  |  |
| TE1300   | TC3 Scope View Professional      | 🗸 cpu license       |  |  |
| TE1400   | TC3 Target For Matlab Simulink   | Cpu license         |  |  |

5. **Optional**: If you would like to add a license for a remote device, you first need to connect to the remote device via TwinCAT XAE toolbar

| i 🔛 💶 🖉 🔨 🎯 🔐 🛼 🛙 | <local></local>              |  |  |  |
|-------------------|------------------------------|--|--|--|
|                   | <local></local>              |  |  |  |
| orer              | CX-08A38E (10.1.128.204.1.1) |  |  |  |
|                   | Choose Target System         |  |  |  |

6. Switch to the tab **Order Information** and click the button **Activate 7 Days Trial License...** to activate a test version

| TwinCAT Project4 ×   |  |                               | _                |         |                                  | • |
|--|--|-------------------------------|------------------|---------|----------------------------------|---|
| Order Information Manag  | je Licenses   Proje<br>897F769-B69C-78                       | ect Licenses   Online License | S Trial Linearce | ]       |                                  |   |
| HW Platform:     other (90)     Activate / Days Inal License       Beckhoff License Id:     Customer Id: |  |                               |                  |         |                                  |   |
| Customer Comment.  |  |                               |                  |         |                                  | : |
| Generate License   | Generate License Request File Activate License Response File |                               |                  |         |                                  |   |
| Order No   | Licer  | nse                           | Insta            | inces   | Current Status                   |   |
| TC1200   | TC3  | TC3 PLC                       |                  | license | expires on Mar 29, 2012 (trial I |   |
| TF6420   | TC3 Database-Server  |                               |                  | license | expires on Mar 29, 2012 (trial I |   |

7. Please restart TwinCAT 3 afterwards.

#### Licensing a full version

- 8. Start TwinCAT XAE
- 9. Open an existing TwinCAT 3 project or create a new project

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10. In Solution Explorer, please navigate to the entry SYSTEM\License



11. Open the tab **Manage Licenses** and add a **Runtime License** for your product (in this screenshot **TE1300: TC3 Scope View Professional**).

| T | iwinCAT Project5 ×                                     |                                  |                     |  |  |  |  |  |  |
|---|--|----------------------------------|---------------------|--|--|--|--|--|--|
|   | Order Information Manage Licenses Project Licenses Onl | ine Licenses                     |                     |  |  |  |  |  |  |
|   | Order No   | License                          | Add Runtime License |  |  |  |  |  |  |
|   | TC1000   | TC3 ADS                          | 🔽 cpu license       |  |  |  |  |  |  |
|   | TC1100   | TC3 I0                           | cpu license         |  |  |  |  |  |  |
|   | TC1200   | TC3 PLC                          | cpu license         |  |  |  |  |  |  |
|   | TC1210   | TC3 PLC / C++                    | cpu license         |  |  |  |  |  |  |
|   | TC1220   | TC3 PLC / C++ / MatSim           | cpu license         |  |  |  |  |  |  |
|   | TC1250   | TC3 PLC / NC PTP 10              | cpu license         |  |  |  |  |  |  |
|   | TC1260   | TC3 PLC / NC PTP 10 / NC I       | cpu license         |  |  |  |  |  |  |
|   | TC1270   | TC3 PLC / NC PTP 10 / NC I / CNC | cpu license         |  |  |  |  |  |  |
|   | TC1300   | TC3 C++                          | Cpu license         |  |  |  |  |  |  |
|   | TC1320   | TC3 C++ / MatSim                 | cpu license         |  |  |  |  |  |  |
|   | TE1300   | TC3 Scope View Professional      | 🗸 cpu license       |  |  |  |  |  |  |
|   | TE1400   | TC3 Target For Matlab Simulink   | cpu license         |  |  |  |  |  |  |

12. **Optional:** If you would like to add a license for a remote device, you first need to connect to the remote device via TwinCAT XAE toolbar

| i 🔝 🖪   🖪 🥩 🔨 🎯   🔐 🛼 | <local> 🗾 🚽</local>          |  |  |  |  |
|-----------------------|------------------------------|--|--|--|--|
|                       | <local></local>              |  |  |  |  |
| orer                  | CX-08A38E (10.1.128.204.1.1) |  |  |  |  |
|                       | Choose Target System         |  |  |  |  |

13. Navigate to the Order Information tab The fields System-ID and HW Platform cannot be changed and just describe the platform for the licensing process in general a TwinCAT 3 license is always bound to these two identifiers: the System-ID uniquely identifies your system.

The HW Platform is an indicator for the performance of the device.

14. Optionally, you may also enter an own order number and description for your convenience

| TwinCAT Project4 ×         |  |                       |                 |             |                |  |  |
|----------------------------|--|-----------------------|-----------------|-------------|----------------|--|--|
| Order Information Man      | age Licenses Project   | Licenses Online Licen | ses             |             |                |  |  |
| System Id:                 | System Id: 3897F769-B69C-788A-6450-9EE7DAD97C1B              |                       |                 |             |                |  |  |
| HW Platform:               | other (90)   | Activate 7 Day        | s Trial License |             |                |  |  |
| Beckhoff License Id:       | VA0815   | Customer Id:          |                 |             |                |  |  |
| Customer Comment:          | Customer Comment:  |                       |                 |             |                |  |  |
|                            |  |                       |                 |             |                |  |  |
| Generate Licens            | Generate License Request File Activate License Response File |                       |                 |             |                |  |  |
| Order No                   | Order No License   |                       |                 | Instances   | Current Status |  |  |
| TC1200                     | TC1200 TC3 PLC   |                       |                 | cpu license | missing        |  |  |
| TF6420 TC3 Database-Server |  |                       |                 | cpu license | missing        |  |  |

- 15. enter the **Beckhoff License ID** and click on **Generate License Request File...**. If you are not aware of your **Beckhoff License ID** please contact your local sales representative.
- 16. After the license request file has been saved, the system asks whether to send this file via E-Mail to the Beckhoff Activation Server

| TwinCAT XAE                      | 83 |
|----------------------------------|----|
| Send license request to Beckhoff |    |
| Yes No                           |    |

- 17. After clicking **Yes**, the standard E-Mail client opens and creates a new E-Mail message to <u>"tclicense@beckhoff.com"</u> which contains the "License Request File"
- 18. Send this Activation Request to Beckhoff

**I** NOTE! The License Response File will be sent to the same E-Mail address used for sending out the License Request File

19. After receiving the activation file, please click on the button **Activate License Response File...** in the TwinCAT XAE license Interface.

| winCAT Project4 🗙     |                      |                             |             |                |  |  |  |
|-----------------------|----------------------|-----------------------------|-------------|----------------|--|--|--|
| Order Information Mar | nage Licenses Projec | ct Licenses Online Licenses |             |                |  |  |  |
| System Id:            | 3897F769-B69C-788    | 3A-6450-9EE7DAD97C1B        |             |                |  |  |  |
| HW Platform:          | other (90)           | Activate 7 Days Trial Licen | se          |                |  |  |  |
| Beckhoff License Id:  | VA0815               | Customer Id:                |             |                |  |  |  |
| Customer Comment:     |                      |                             |             |                |  |  |  |
|                       |                      |                             |             |                |  |  |  |
|                       |                      |                             |             |                |  |  |  |
| Generate Licens       | e Request File       | Activate License Response   | File        |                |  |  |  |
| Order No              | Licen                | se                          | Instances   | Current Status |  |  |  |
| TC1200                | TC3 P                | LC                          | cpu license | missing        |  |  |  |
| TF6420                | ТСЗ [                | Database-Server             | cpu license | missing        |  |  |  |



20. Select the received License response file and click on Open

| 🕶 Open          |           | Der | under all                 | (  | Constant Download | _          | X       |
|-----------------|-----------|-----|---------------------------|----|-------------------|------------|---------|
|                 | iputer 🕨  | DO  | whioads                   | *7 | Search Download   | 5          | Q       |
| Organize 👻 New  | folder    |     |                           |    | :==               | •          | 0       |
| 🔆 Favorites     | -         | •   | Name                      | Â  |                   |            | Date m  |
| 🧾 Desktop       |           | Ξ   | LicenseResponseFile.tclrs |    |                   |            | 21.03.2 |
| 鷆 Downloads     | l         |     |                           |    |                   |            |         |
| 📃 Recent Places |           |     |                           |    |                   |            |         |
| Pictures        |           |     |                           |    |                   |            |         |
|                 |           |     |                           |    |                   |            |         |
| 🥽 Libraries     |           |     |                           |    |                   |            |         |
| Application     |           |     |                           |    |                   |            |         |
| Documents       |           |     |                           |    |                   |            |         |
| 🁌 Music         |           |     |                           |    |                   |            |         |
| Pictures        |           |     |                           |    |                   |            |         |
| न Public        |           | Ŧ   | •                         |    |                   |            | +       |
| F               | ile name: | Lic | censeResponseFile.tclrs   | -  | TwinCAT License R | lesponse F | ile 🔻   |
|                 |           |     |                           |    | Open              | Cance      |         |

- 21. The License Response File will be imported and all included licenses will be activated. If there have been any trial licenses, these will be removed accordingly.
- 22. Please restart TwinCAT to activate licenses.

| TwinCAT > | (AE  | X |
|-----------|--|---|
| i         | License response file 'LicenseResponseFile.tclrs' registered<br>'TrialLicense.tclrs' removed<br>Restart TwinCAT to activate licenses |   |
|           | ОК   |   |

**I** NOTE! The license file will be automatically copied to...\TwinCAT\3.1\Target\License on the local device.