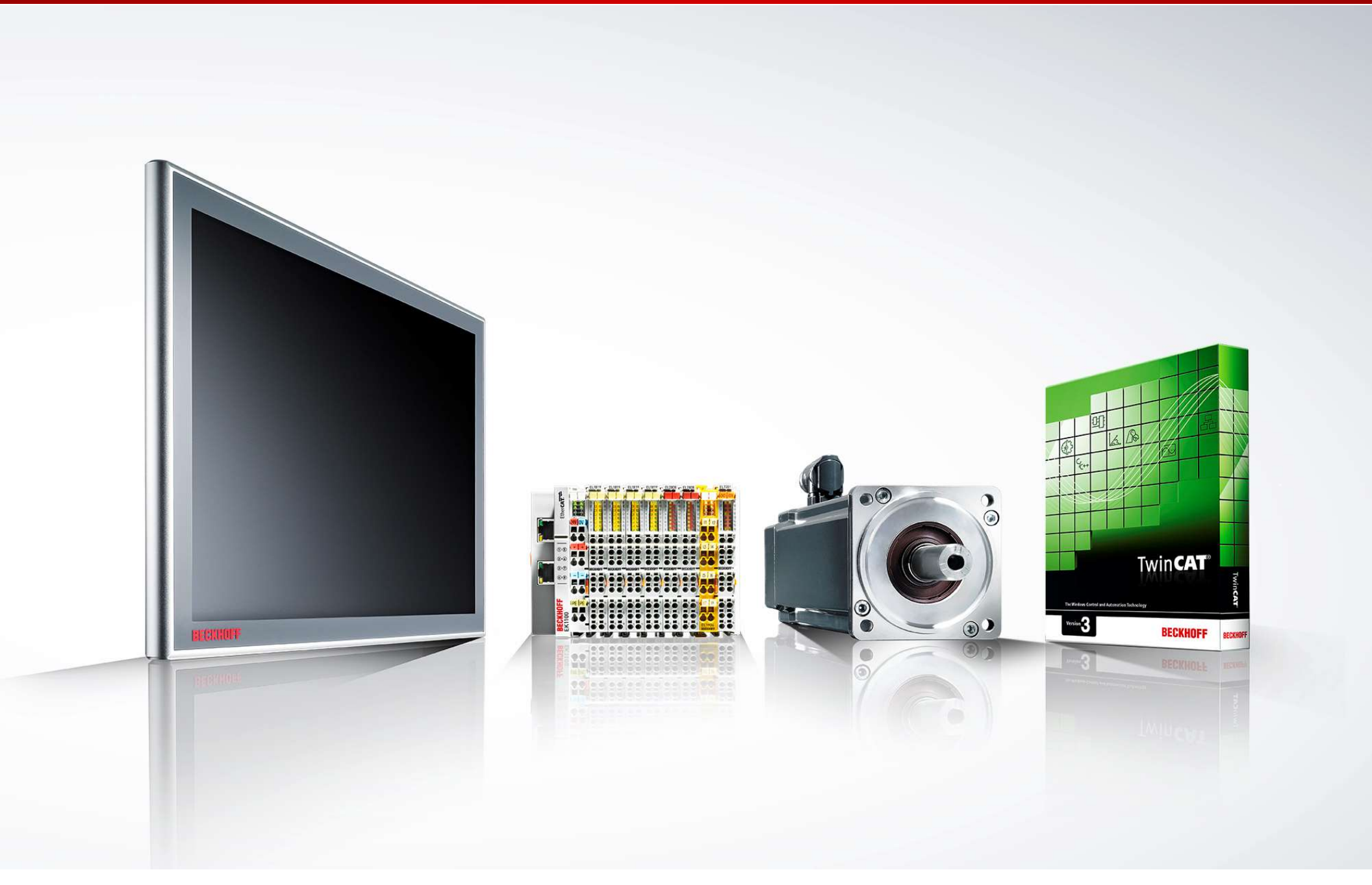
Scope View

BECKHOFF



Overview

BECKHOFF

- A charting and analysis tool for the TwinCAT world
- Variables from the TwinCAT system 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 possible

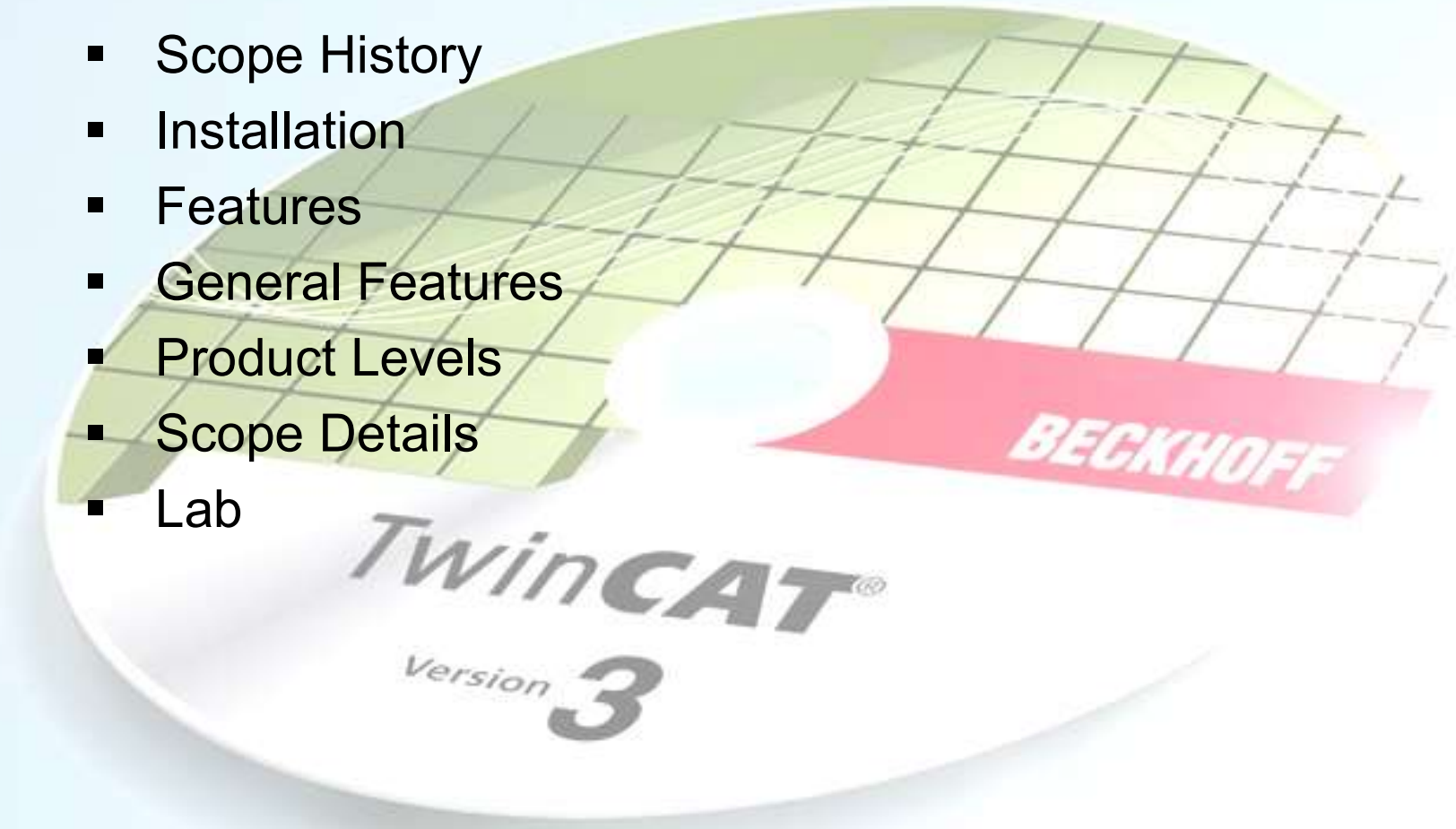
- Scope View for the display of the signals
- Scope Server for the recording of the values
- Possibility to connect to servers distributed in the field from a central View

- Due to its integration into Visual Studio, it is possible to use TwinCAT Projects and Scope View projects in a single solution

Agenda

BECKHOFF

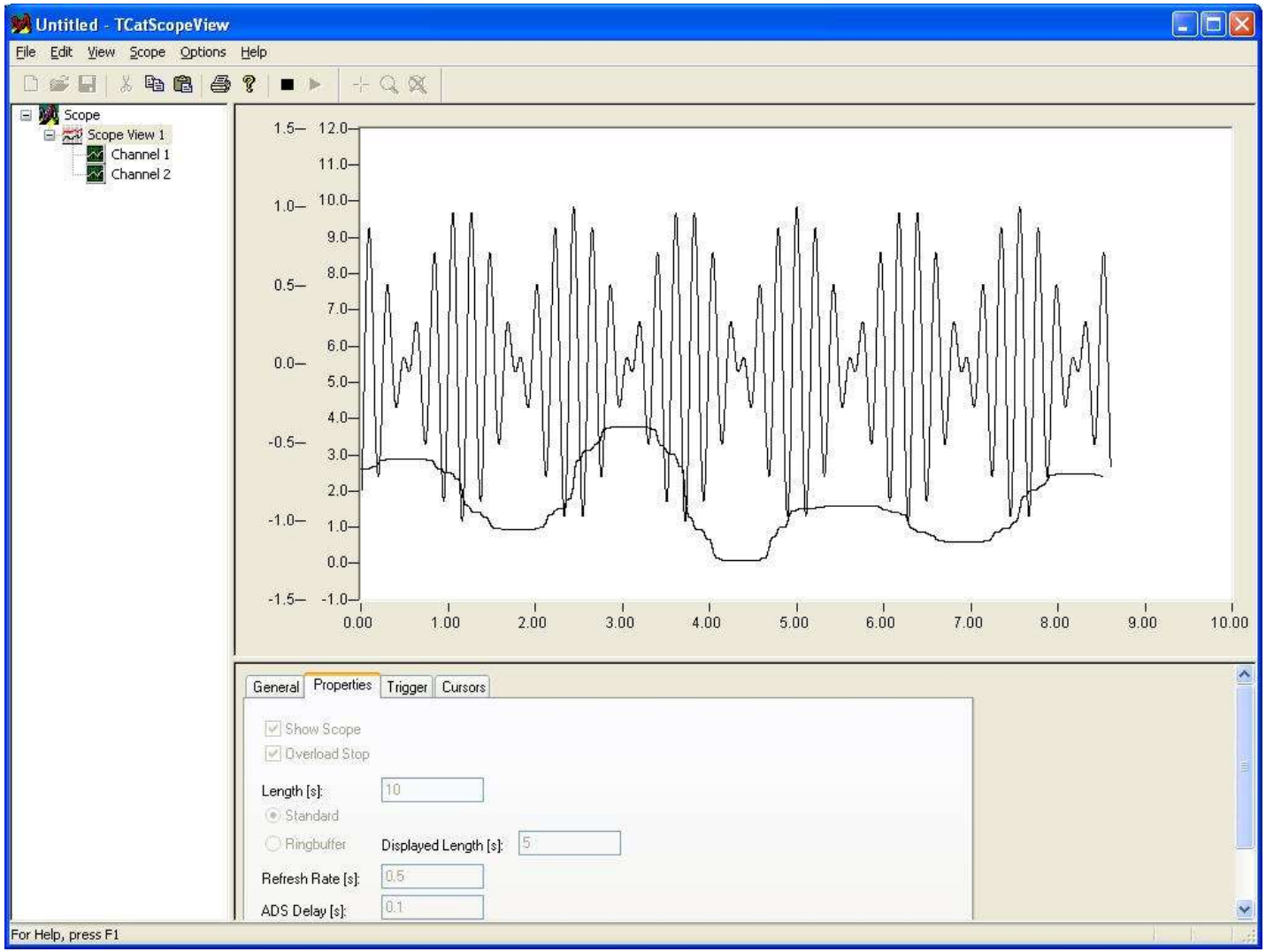
- Scope History
- Installation
- Features
- General Features
- Product Levels
- Scope Details
- Lab



Scope History – Scope 1

BECKHOFF

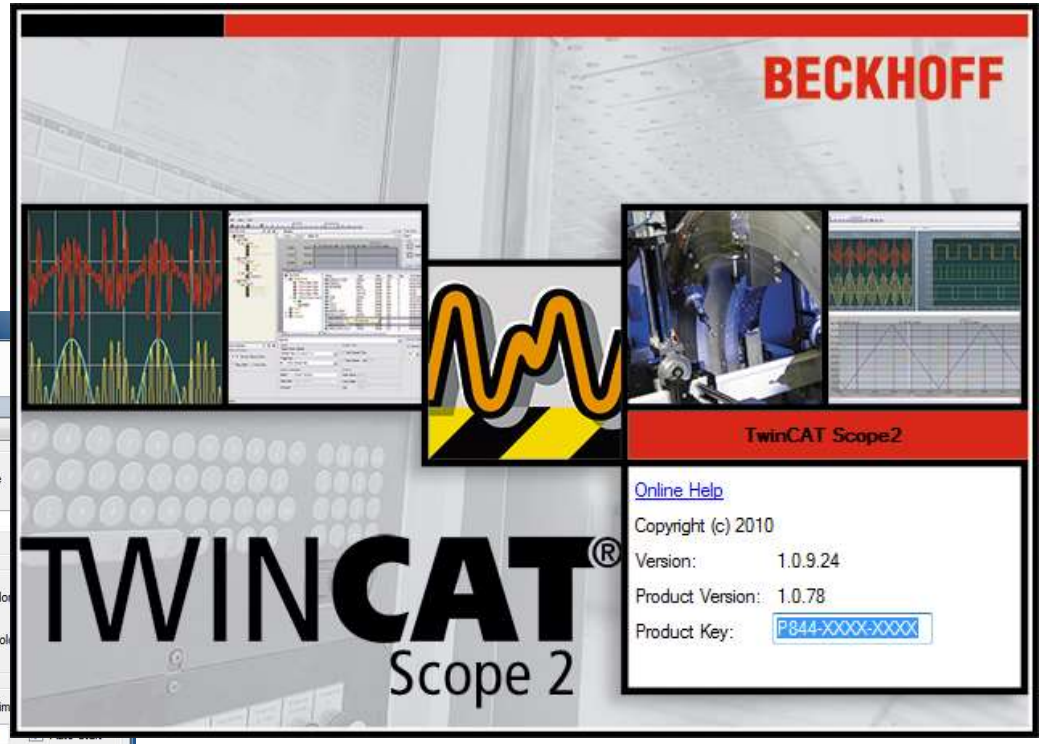
Always installed with TwinCAT 2

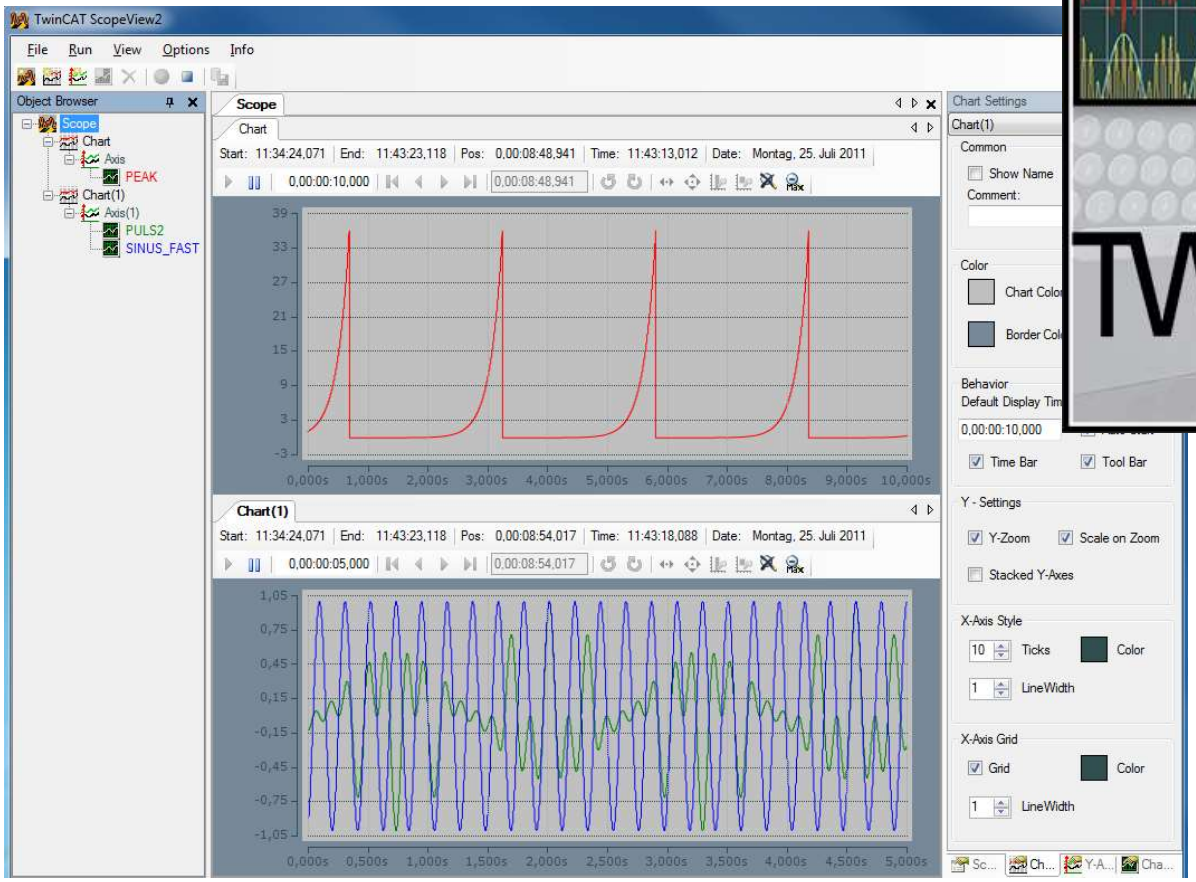


Scope History – Scope 2

BECKHOFF

An approved engineering tool…





- New style
- 2 Components ⇨View and Server
- Long time records
- Auto scaling
- More trigger functionality
- Constant development

Scope History – Scope 2

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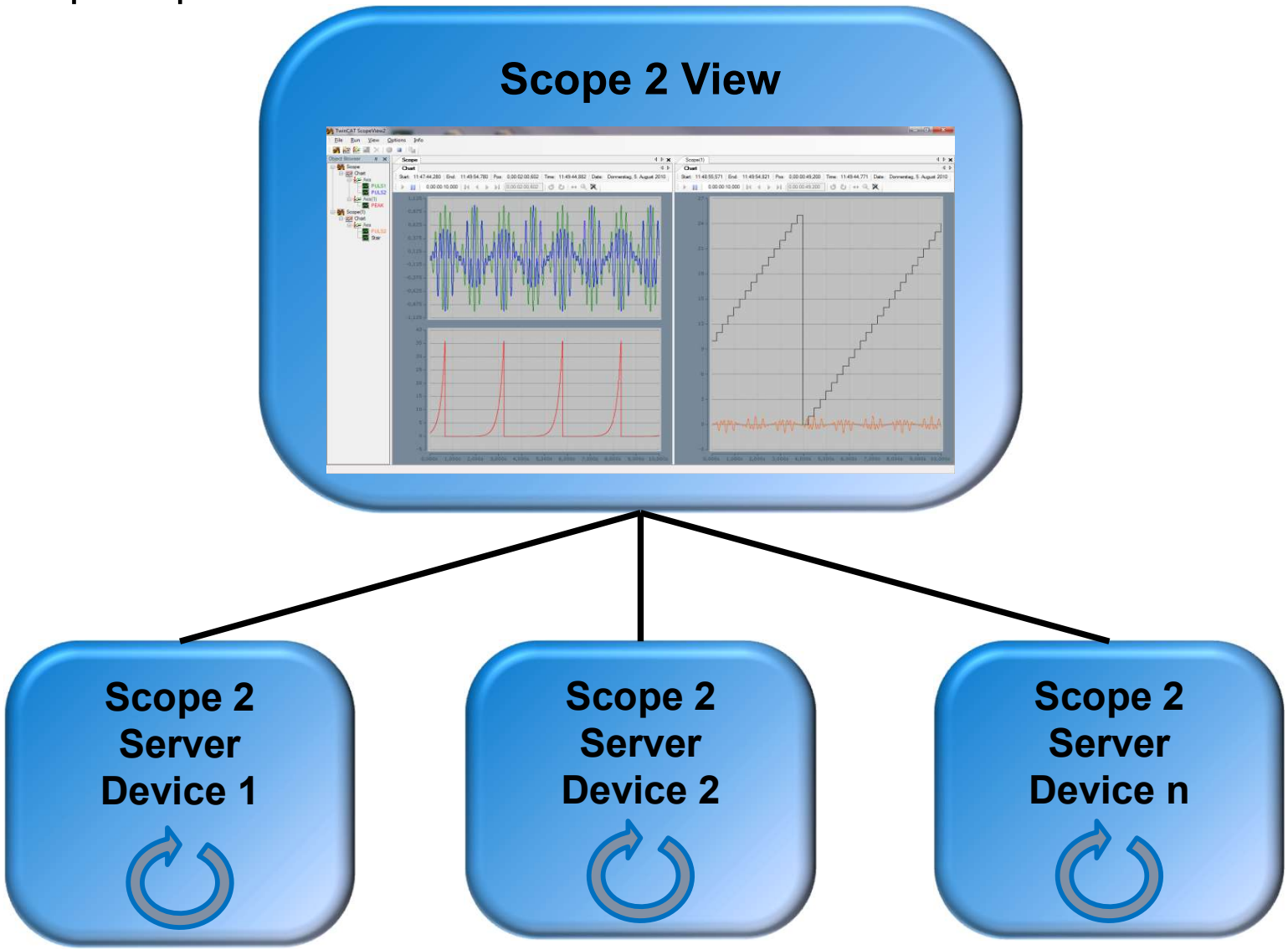
The functional principle



Scope History – TwinCAT 3 Scope

BECKHOFF

A consistent stage of development…

TwinCAT Scope 2

+

Visual Studio + TwinCAT 3

=

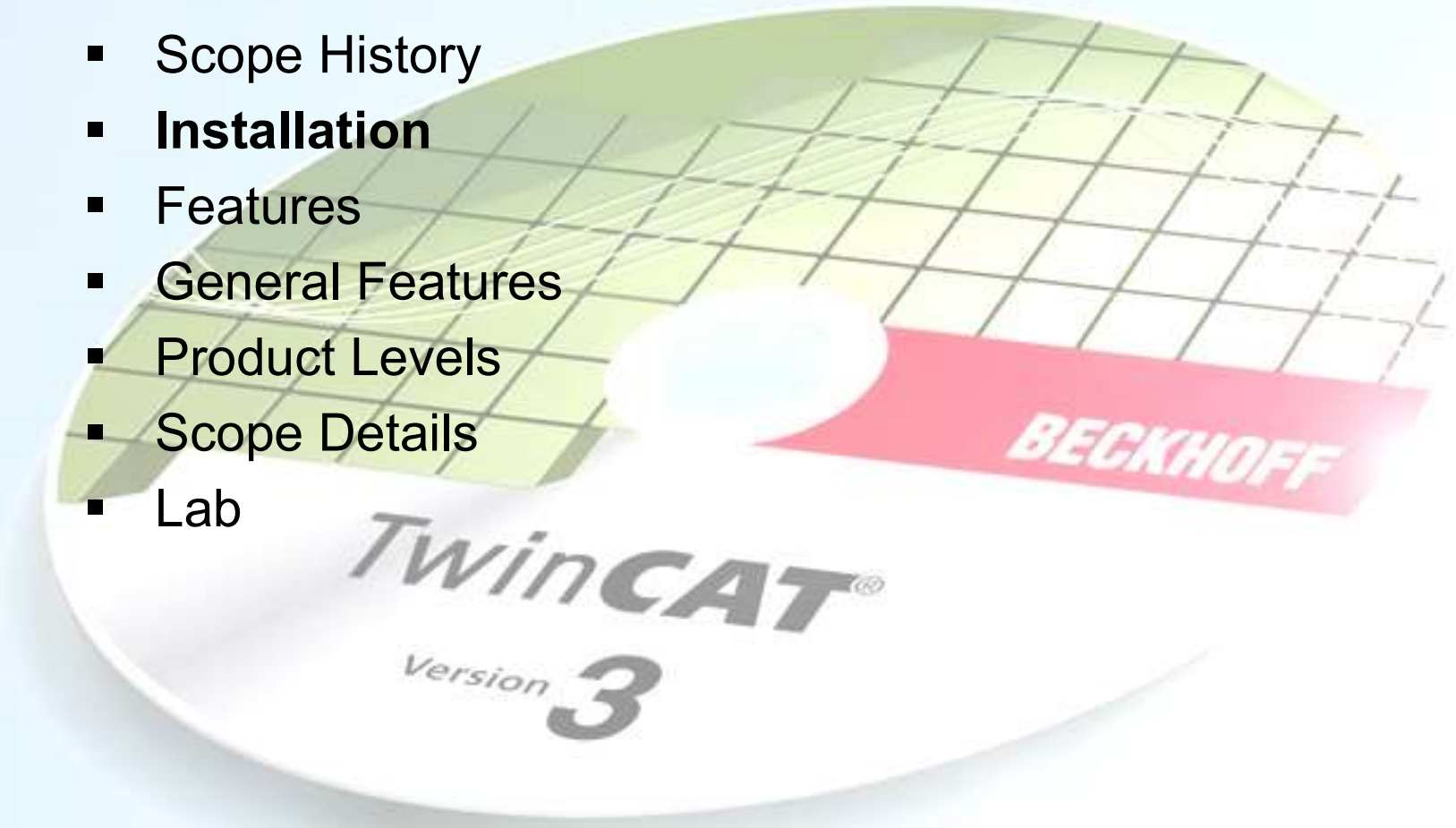
TwinCAT 3 Scope:

Integrated into Microsoft Visual Studio

Agenda

BECKHOFF

- Scope History
- **Installation**
- Features
- General Features
- Product Levels
- Scope Details
- Lab



Installation

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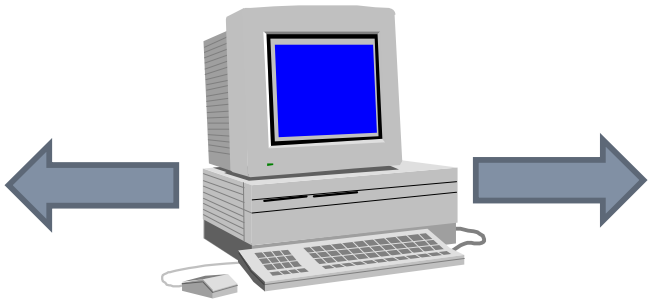
What if you do not have Visual Studio but want to use the Scope?

TwinCAT 3 Scope Installation

Visual Studio 2010 available



No Visual Studio available

- **TwinCAT 3 Scope "Integrated" into VS2010**
- Integration into the Microsoft Visual Studio TwinCAT 3 Scope as new template like C# / C++
- C# /.NET programming for Scope Control applications in the same environment

- **TwinCAT 3 Scope contains royalty free VS2010-Shell**
- Provides Microsoft Visual Studio Shell
- Usable as Standalone Scope

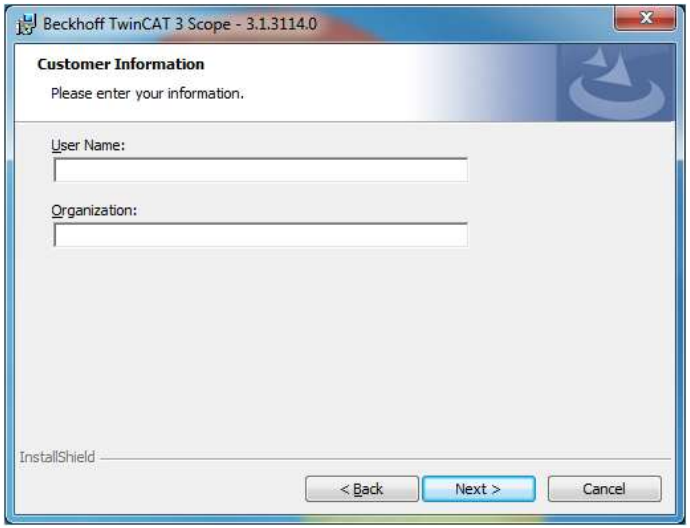
Installation Requirements

- OS
  - Windows XP, Windows XP Embedded, Windows Embedded Standard 2009, Windows 7
- .Net Framework
  - The .NET Framework 4.0 is required
- TwinCAT
  - Minimum is TwinCAT 3 ADS

Installation

BECKHOFF

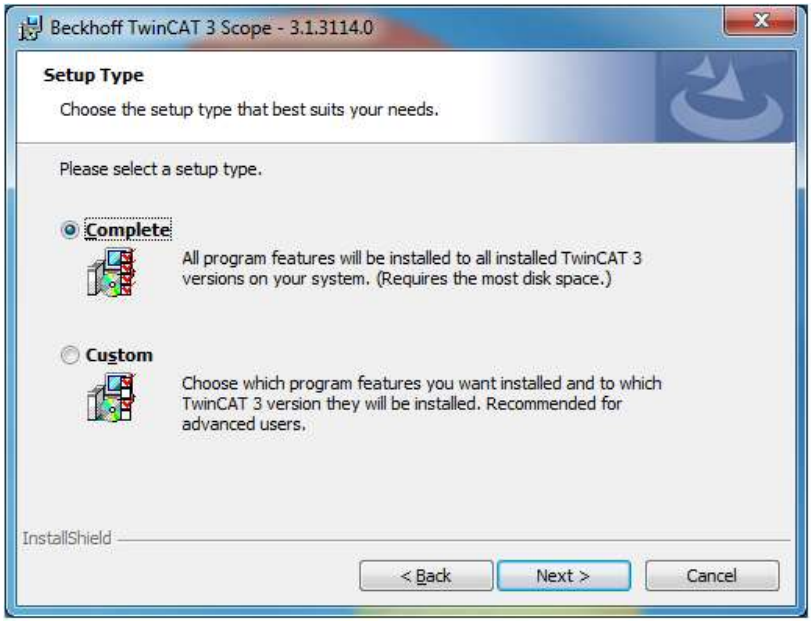
- TwinCAT 3 Scope Base is installed with TwinCAT 3 XAE
- Further product levels and features are enabled by licensing
- Scope can also be downloaded for use outside of TwinCAT 3 Engineering
  - Download Scope View
- Both Full and an Update version are available
- After accepting the license agreement, please provide customer information

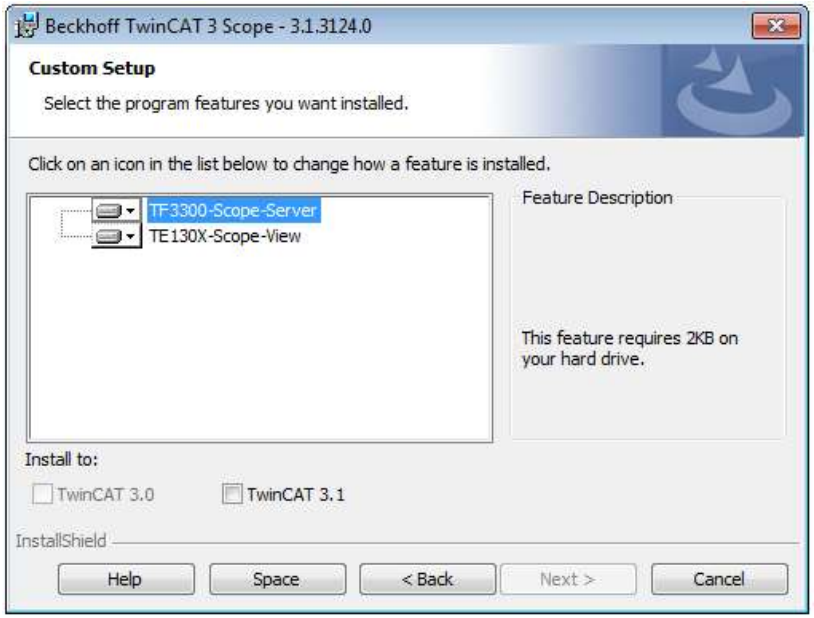


Installation

- Complete – Normal install with both Server and View

- Custom – Options for TF3300 Scope Server (2KB) and/or TE130X Scope View (3KB)

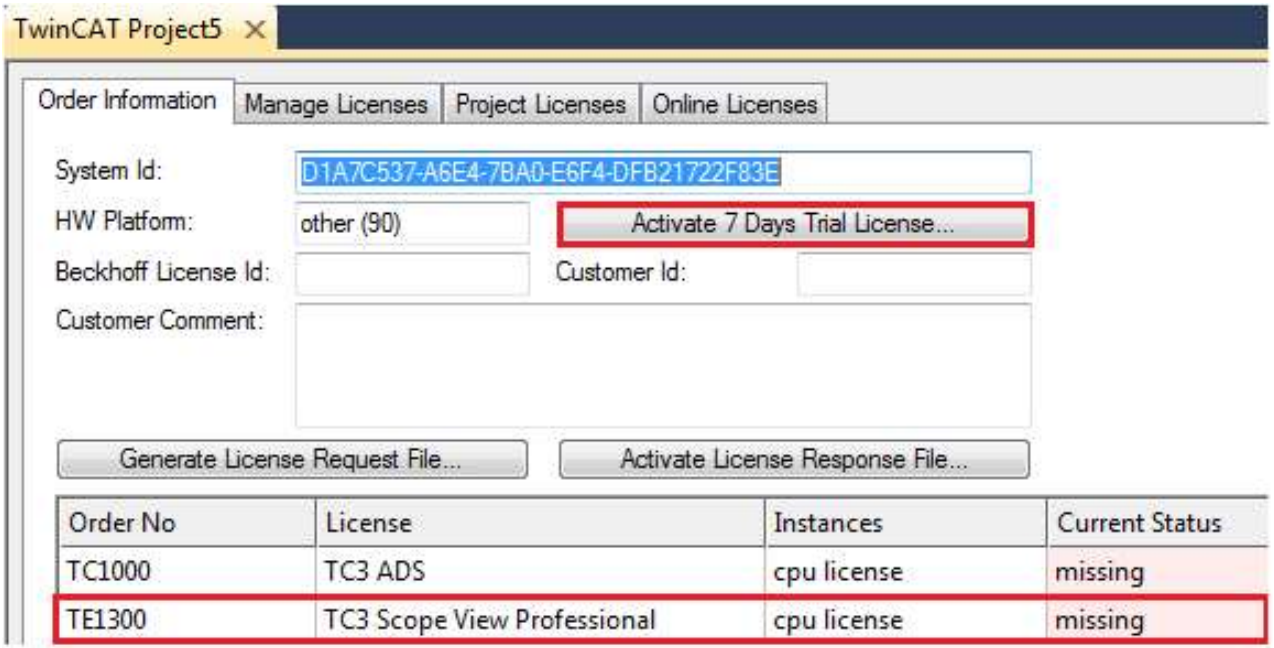




Licensing

BECKHOFF

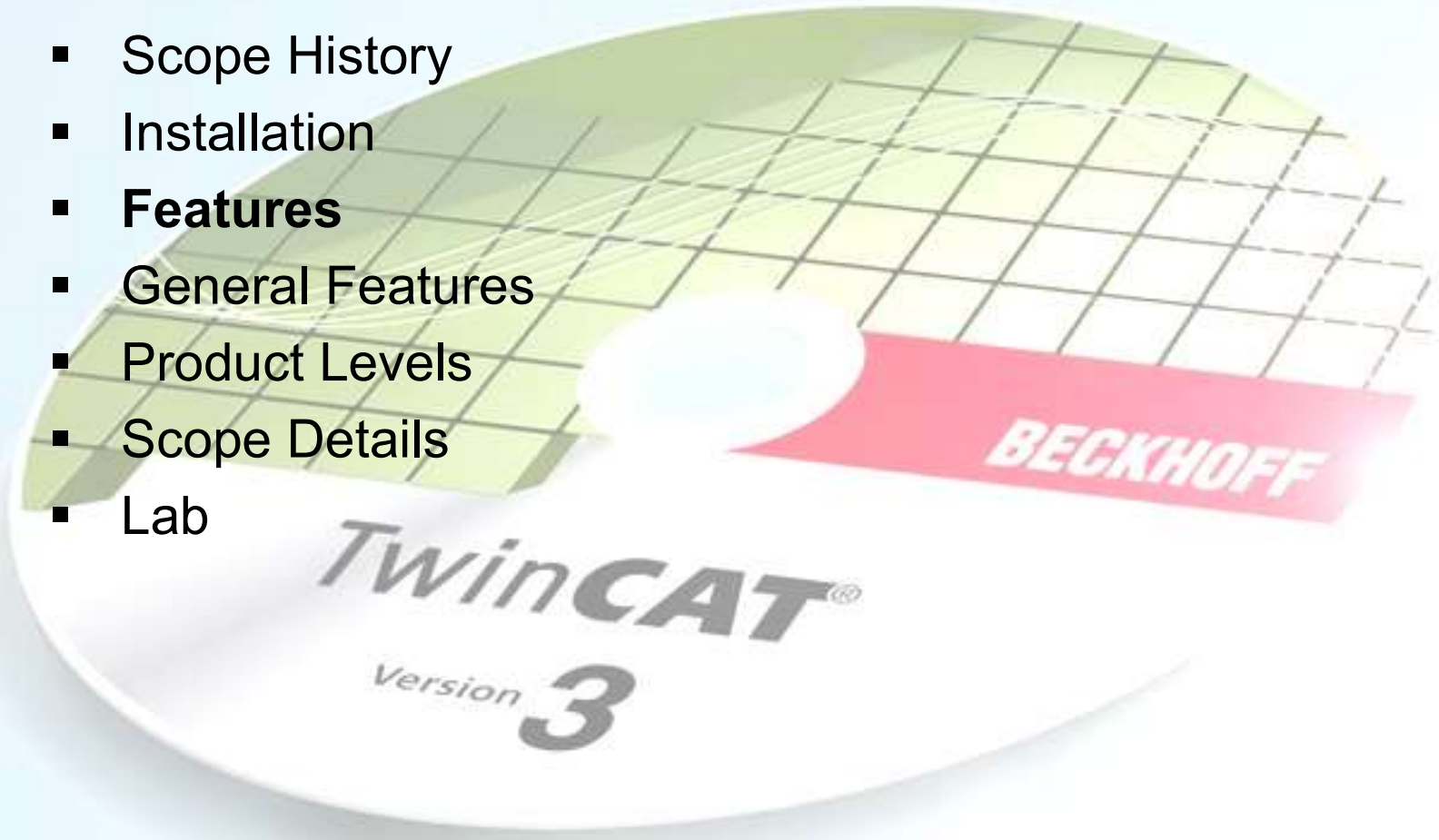
- Licensing for Scope View is the same as all other TC3 Functions



Agenda

BECKHOFF

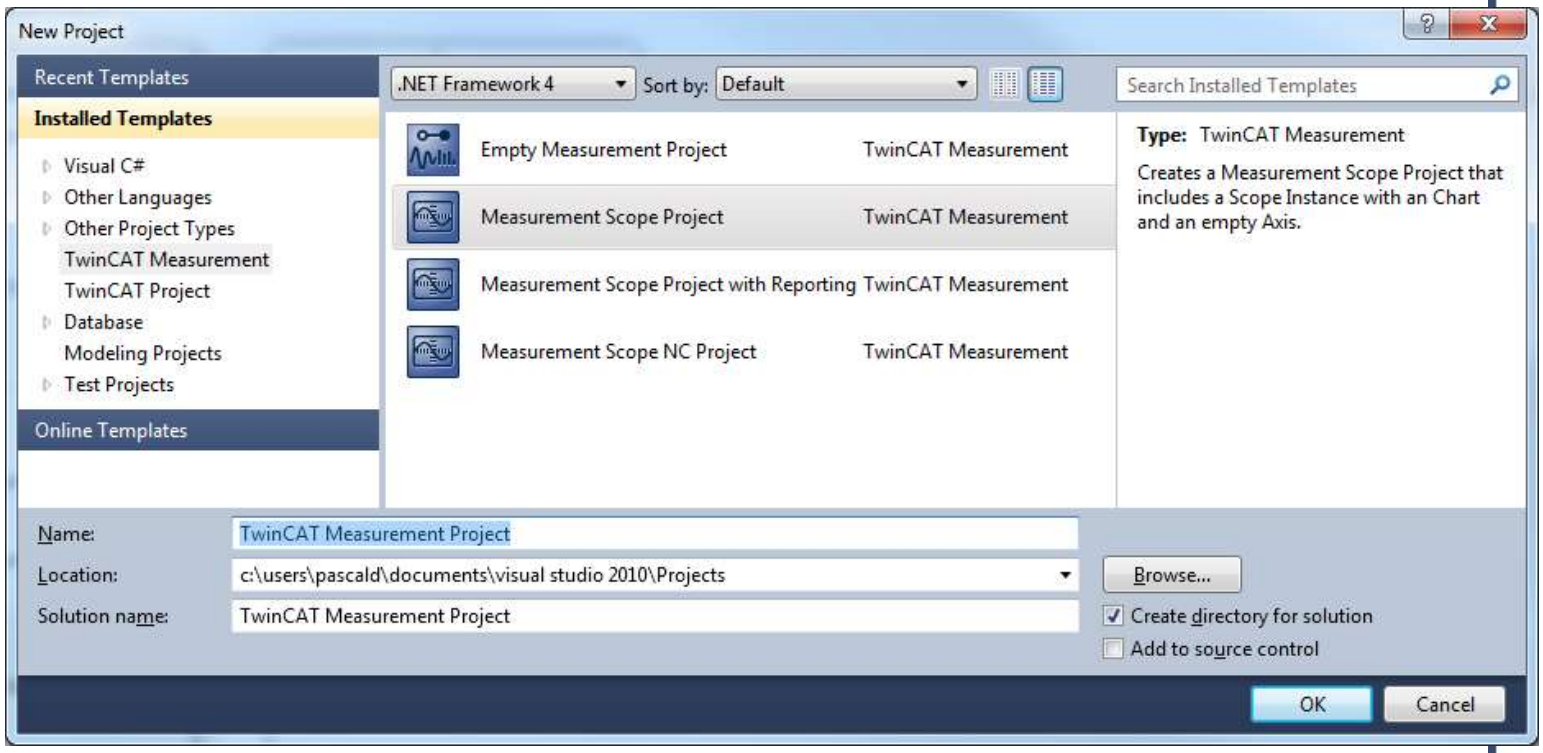
- Scope History
- Installation
- **Features**
- General Features
- Product Levels
- Scope Details
- Lab

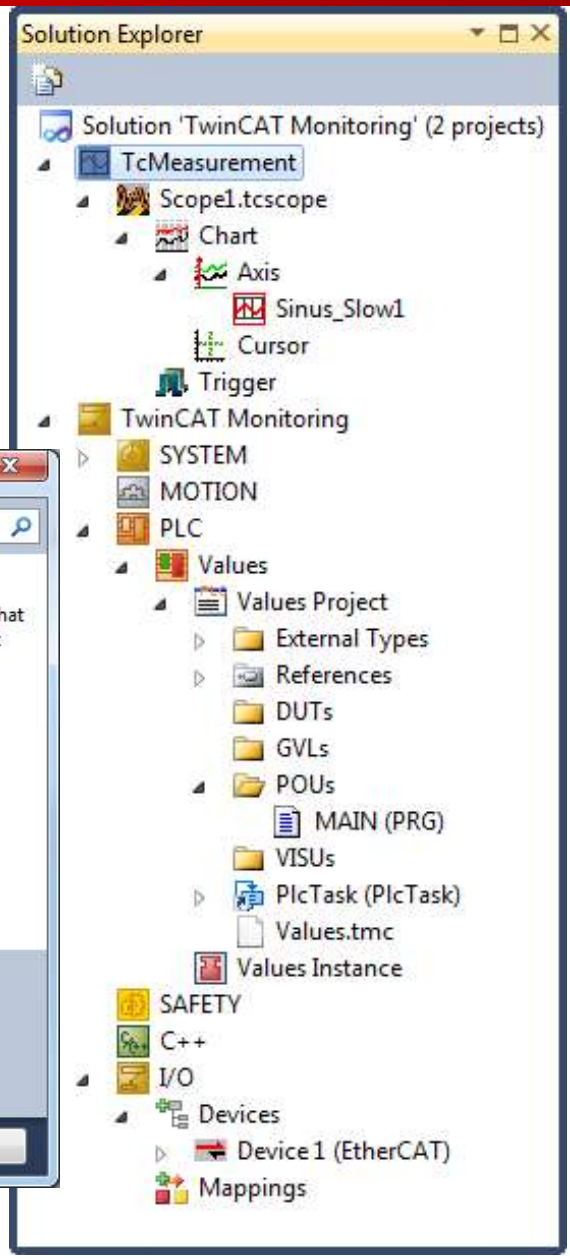


Features

BECKHOFF

- Integration as an individual project
- Can exist in parallel to TwinCAT in one solution
- Creates synergies between the TC-products
- Hierarchy like in TwinCAT Scope 2



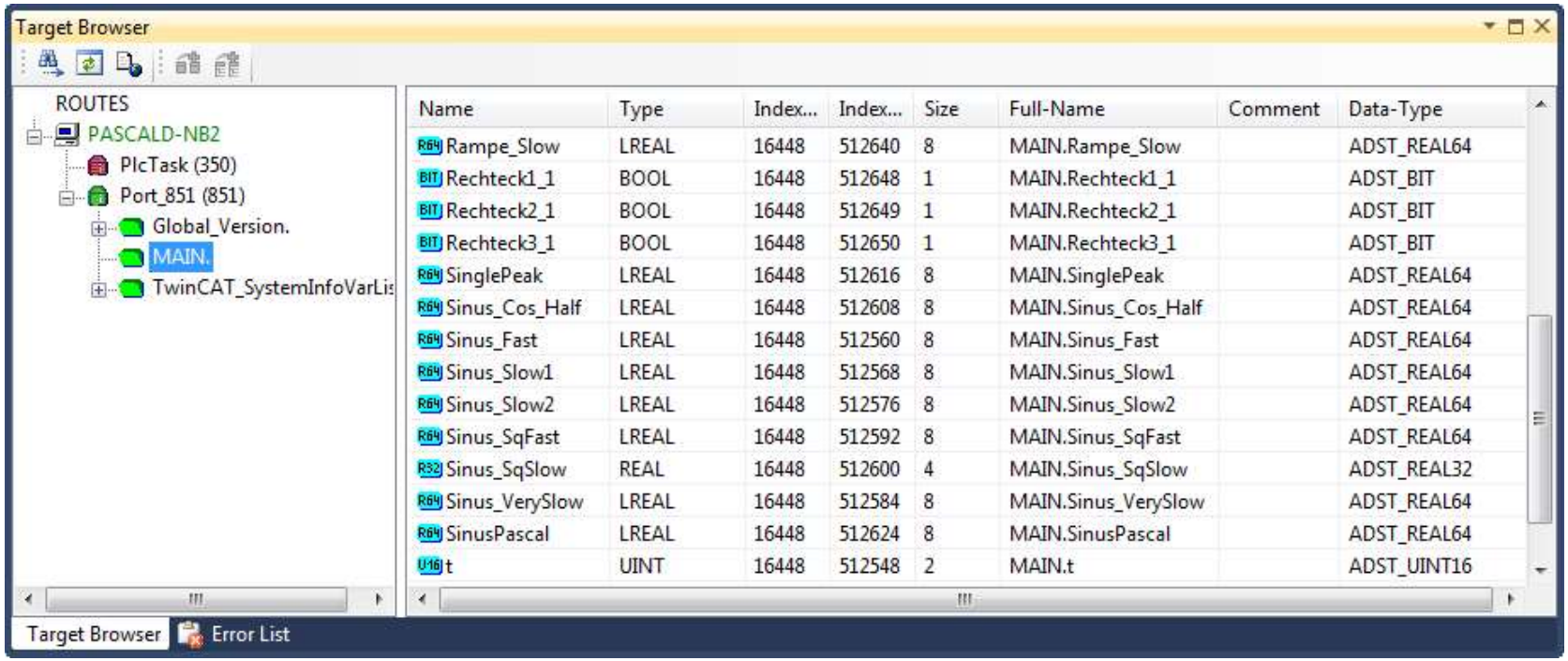


Features

BECKHOFF

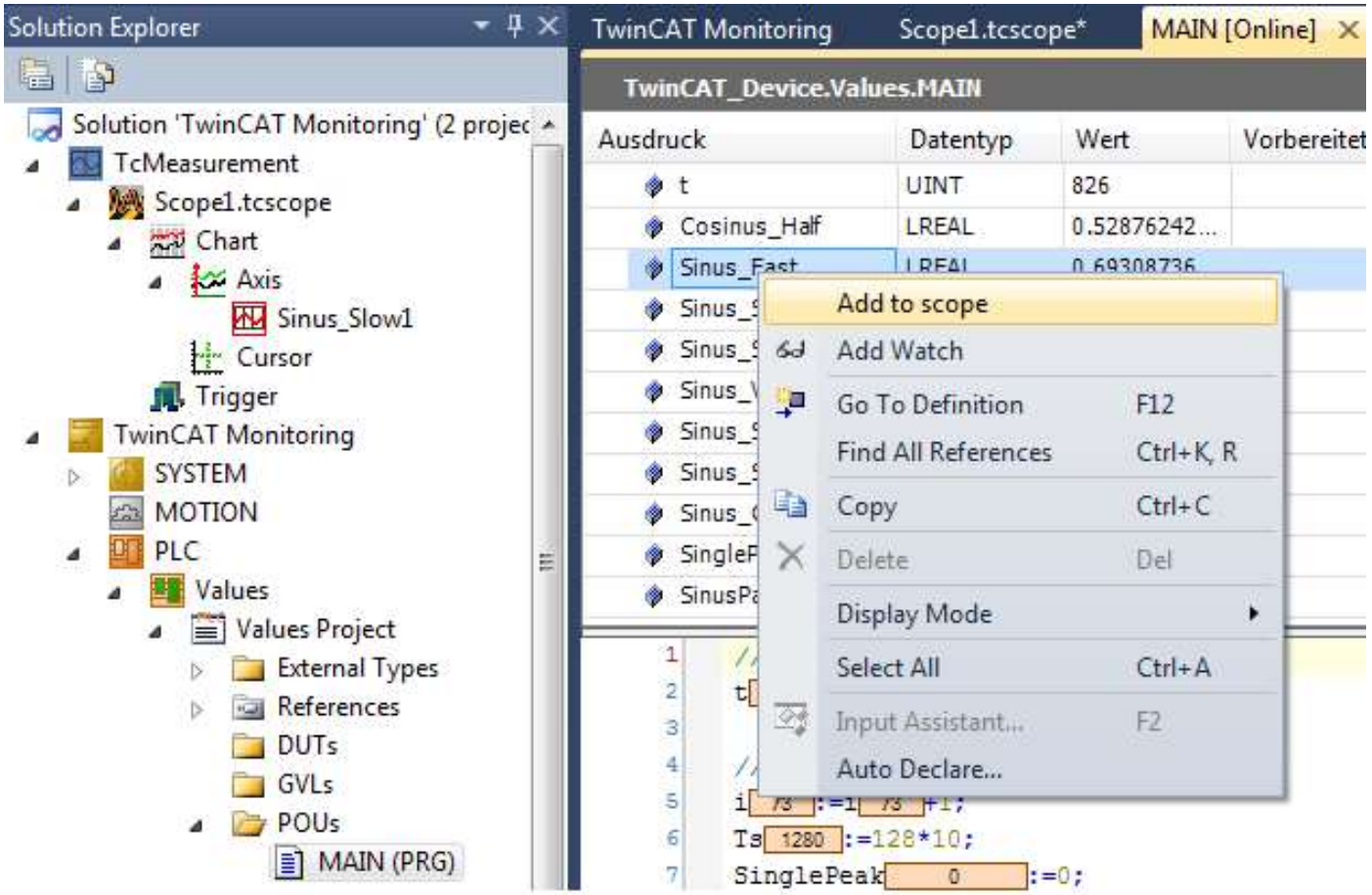
Easy selection of channels with the Target Browser

- Integrated into Visual Studio as an individual Tool-Window
- Multiselect and Drag & Drop are possible
- Filter settings for variables



Name	Type	Index...	Index...	Size	Full-Name	Comment	Data-Type
Rampe_Slow	LREAL	16448	512640	8	MAIN.Rampe_Slow		ADST_REAL64
Rechteck1_1	BOOL	16448	512648	1	MAIN.Rechteck1_1		ADST_BIT
Rechteck2_1	BOOL	16448	512649	1	MAIN.Rechteck2_1		ADST_BIT
Rechteck3_1	BOOL	16448	512650	1	MAIN.Rechteck3_1		ADST_BIT
SinglePeak	LREAL	16448	512616	8	MAIN.SinglePeak		ADST_REAL64
Sinus_Cos_Half	LREAL	16448	512608	8	MAIN.Sinus_Cos_Half		ADST_REAL64
Sinus_Fast	LREAL	16448	512560	8	MAIN.Sinus_Fast		ADST_REAL64
Sinus_Slow1	LREAL	16448	512568	8	MAIN.Sinus_Slow1		ADST_REAL64
Sinus_Slow2	LREAL	16448	512576	8	MAIN.Sinus_Slow2		ADST_REAL64
Sinus_SqFast	LREAL	16448	512592	8	MAIN.Sinus_SqFast		ADST_REAL64
Sinus_SqSlow	REAL	16448	512600	4	MAIN.Sinus_SqSlow		ADST_REAL32
Sinus_VerySlow	LREAL	16448	512584	8	MAIN.Sinus_VerySlow		ADST_REAL64
SinusPascal	LREAL	16448	512624	8	MAIN.SinusPascal		ADST_REAL64
t	UINT	16448	512548	2	MAIN.t		ADST_UINT16

Selection of variables over the variable-declaration in the TwinCAT PLC Control

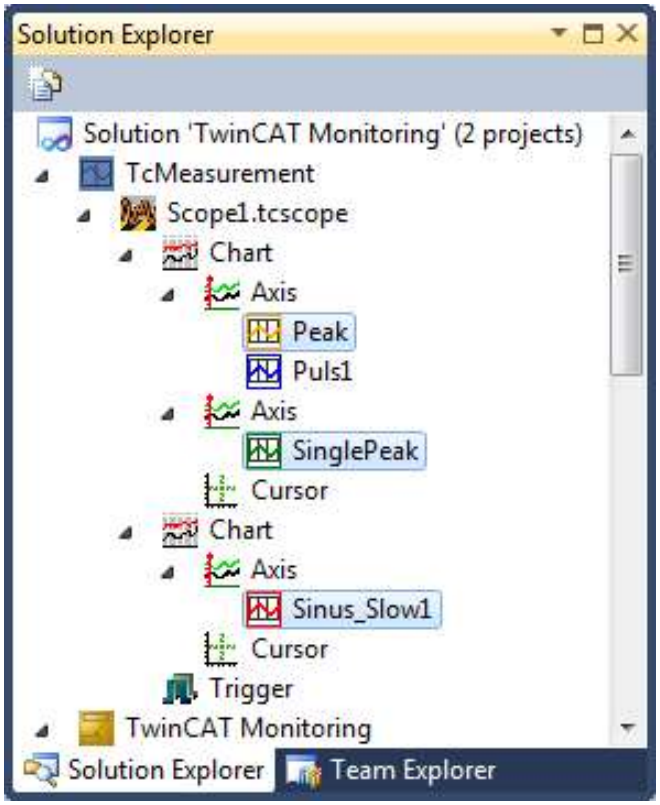


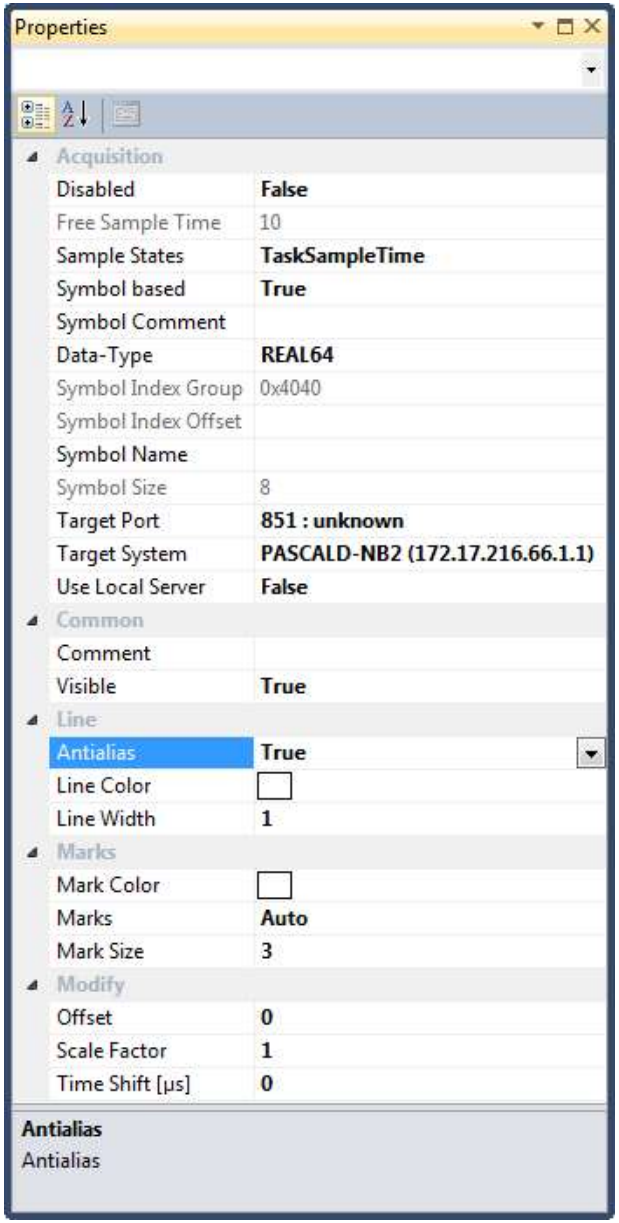
Features

BECKHOFF

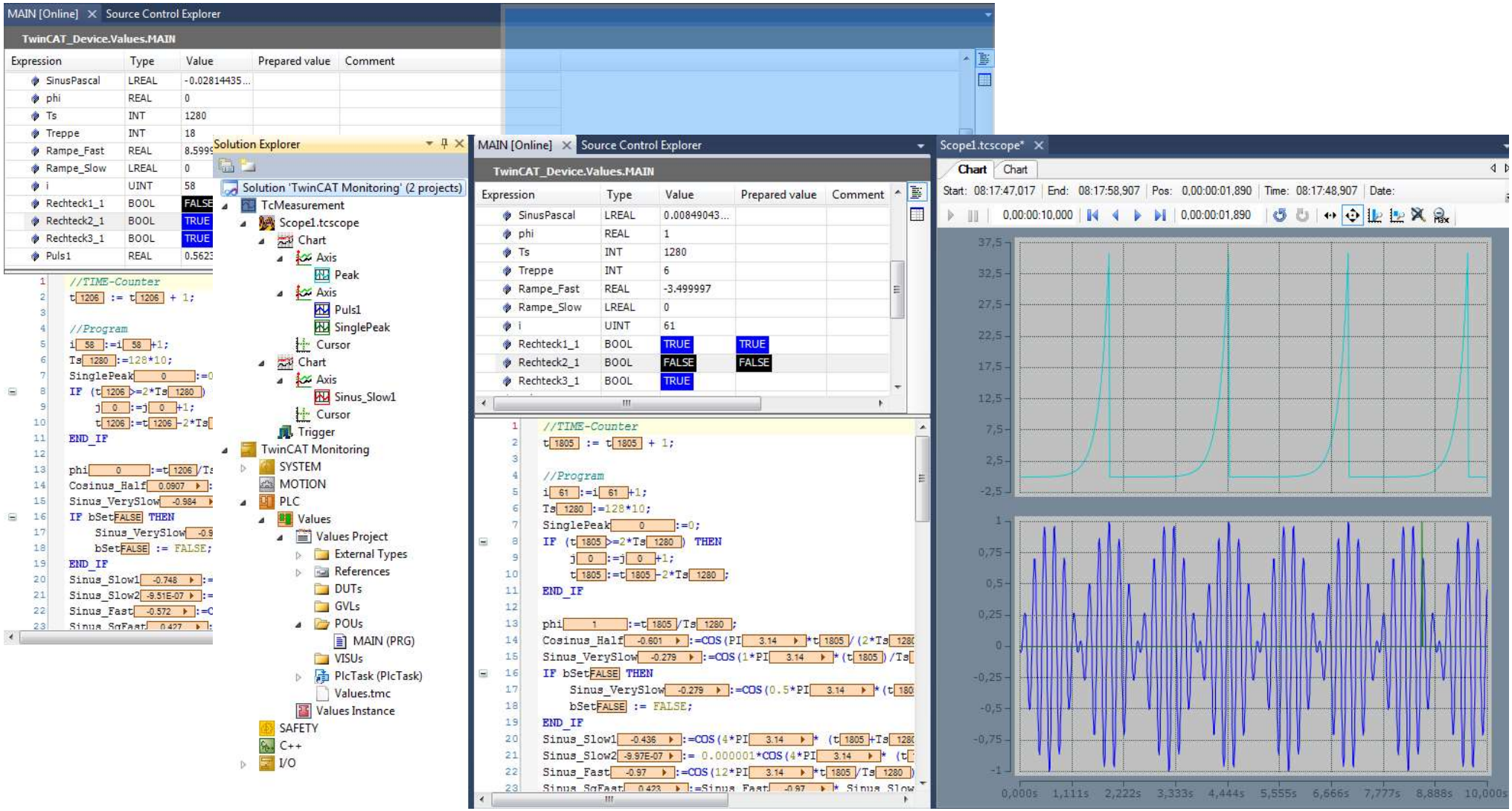
Multiselect in the Solution-Explorer

- Common changes can be implemented faster
- Changes that are not possible are shown grayed out
- Scope-comprehensive





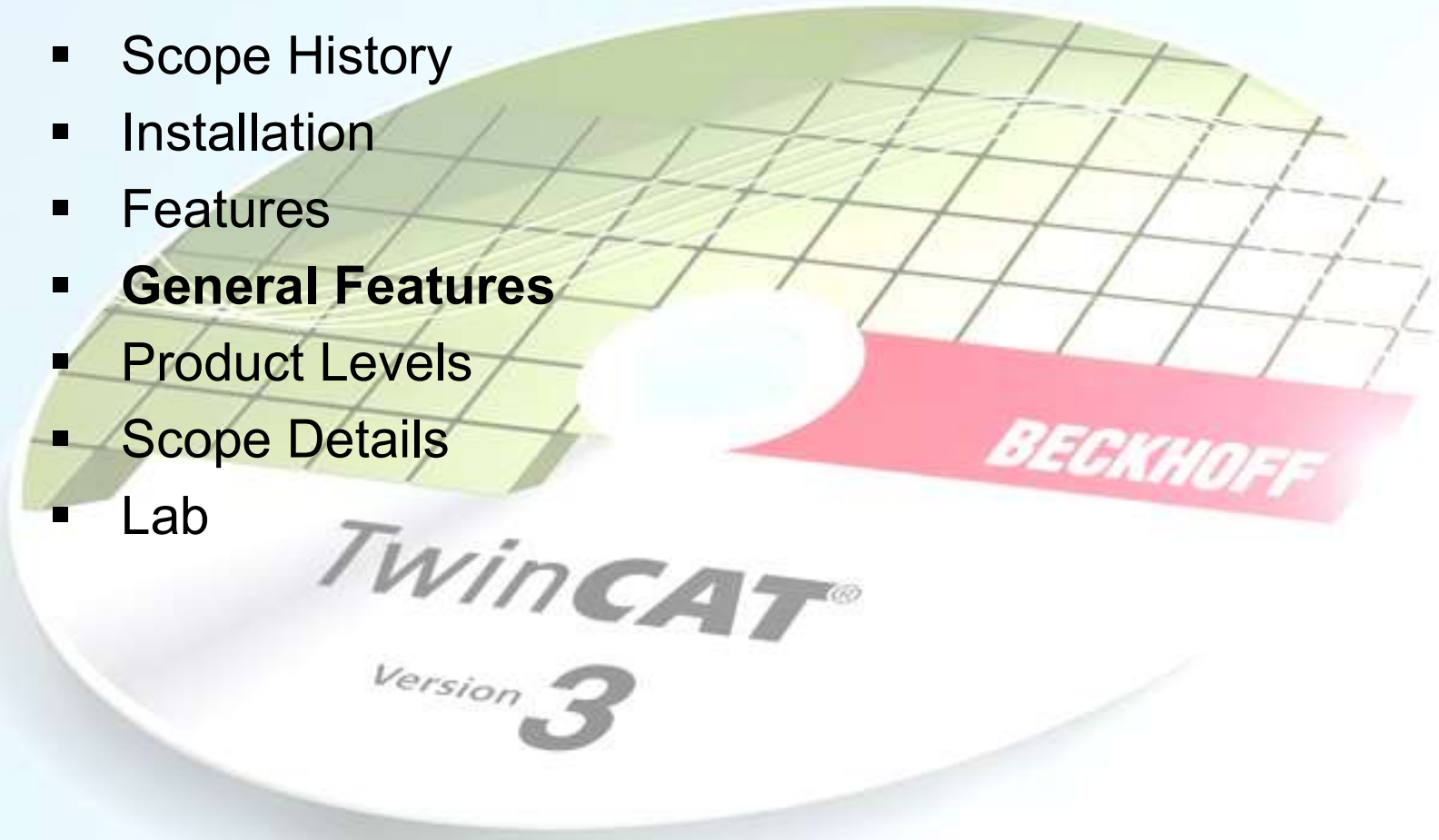
Easy Engineering because of Docking-Windows



Agenda

BECKHOFF

- Scope History
- Installation
- Features
- **General Features**
- Product Levels
- Scope Details
- Lab



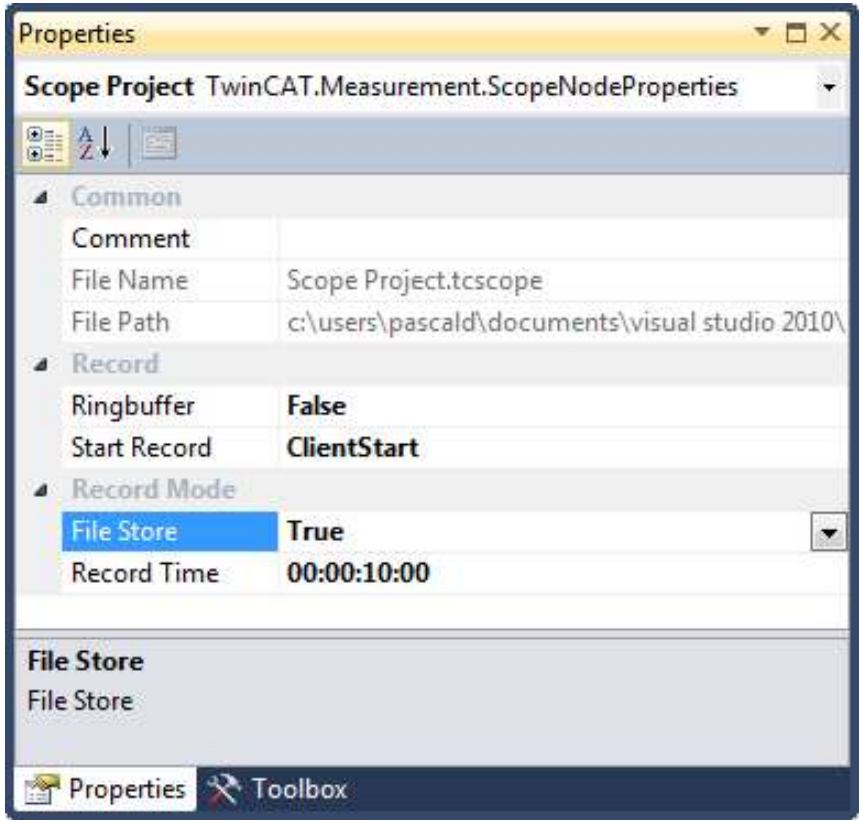
General Scope Features

BECKHOFF

Long time records are possible

- File store option in Scope properties
- Depending on system resources
- Depending on the amount of channels, sampling rate and record time

Solid data after storing as .svd file

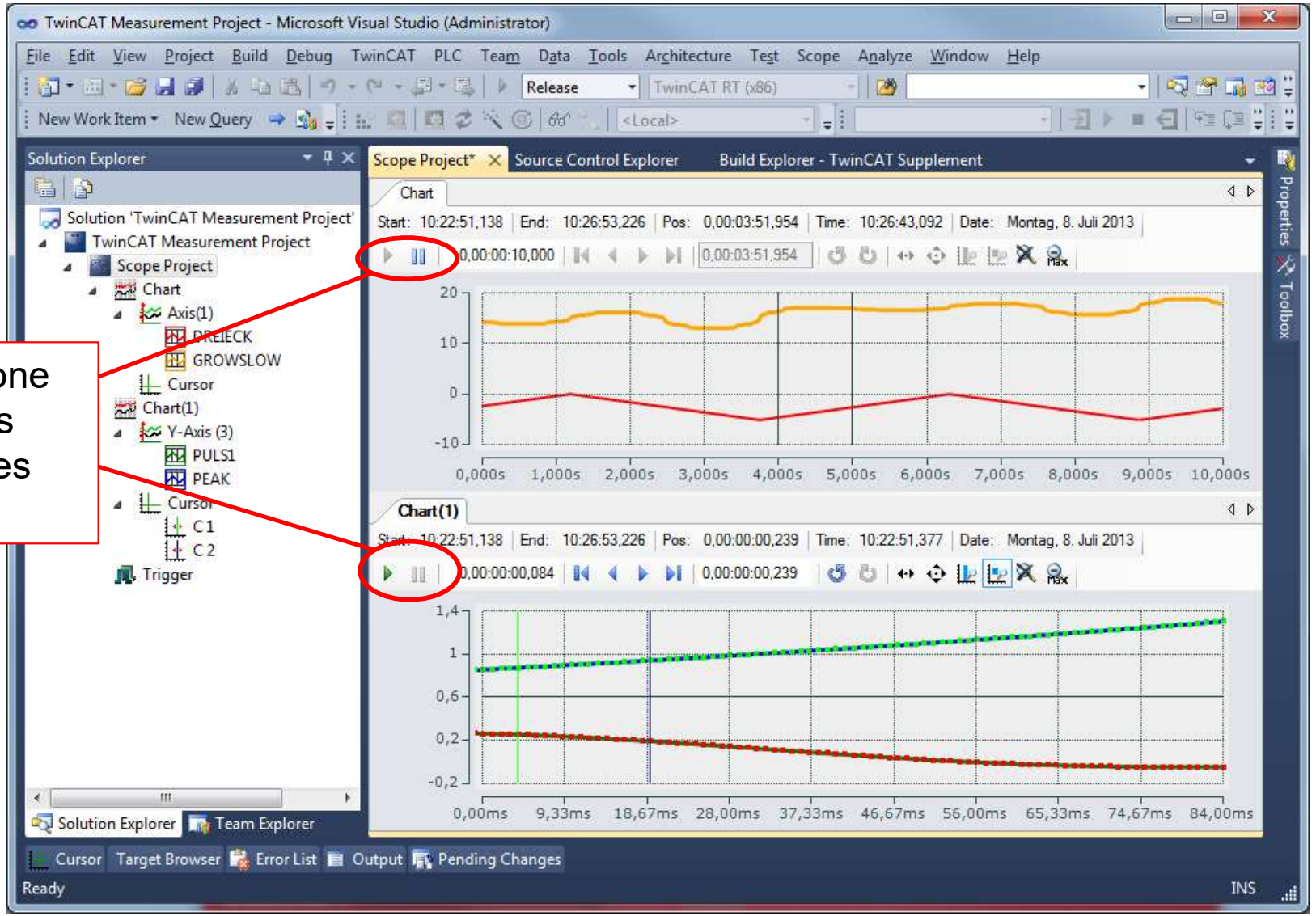


General Scope Features

BECKHOFF

Analysis during the record

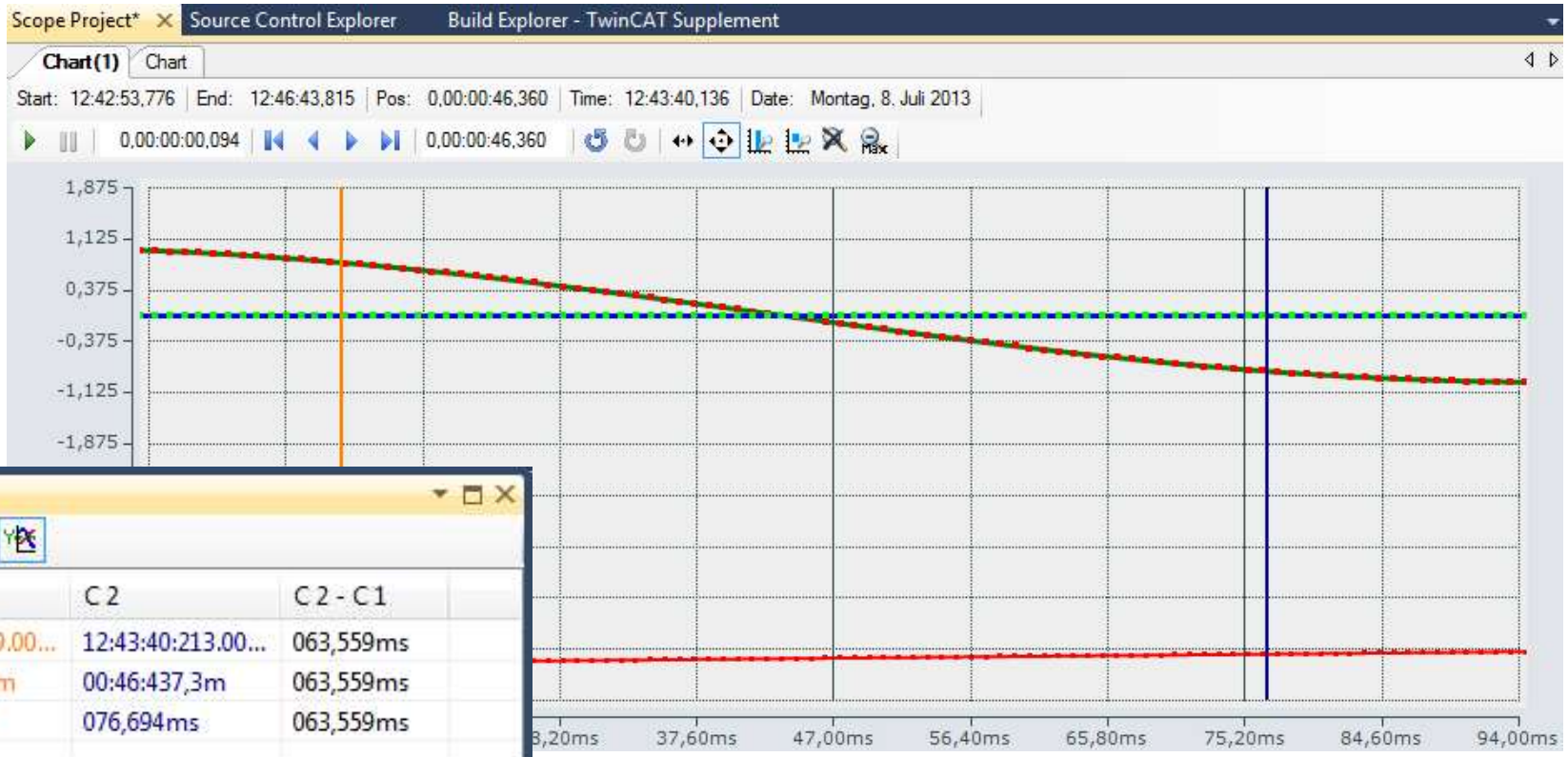
It is possible to stop one chart for your analysis and the recording goes on!

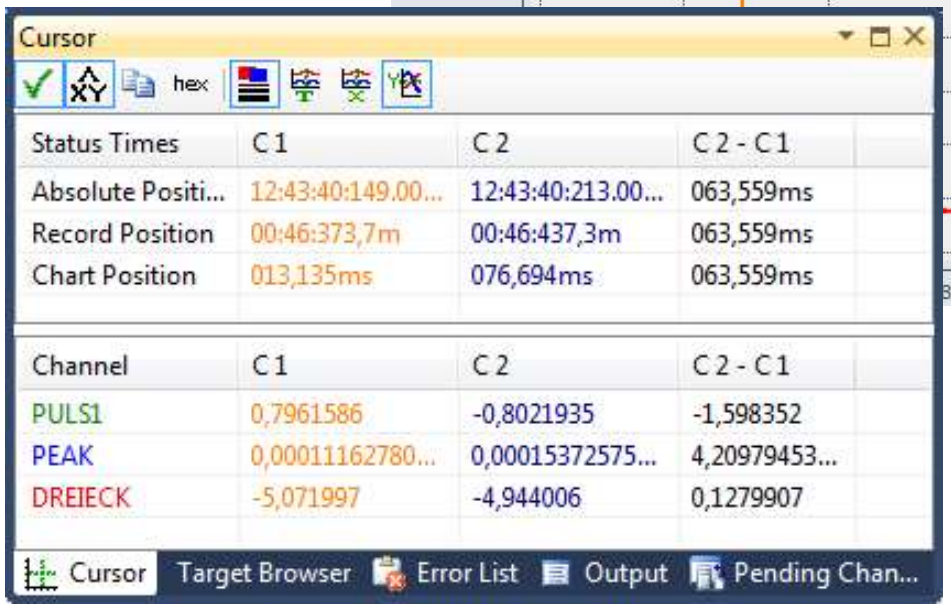


General Scope Features

BECKHOFF

Cursor and Marks



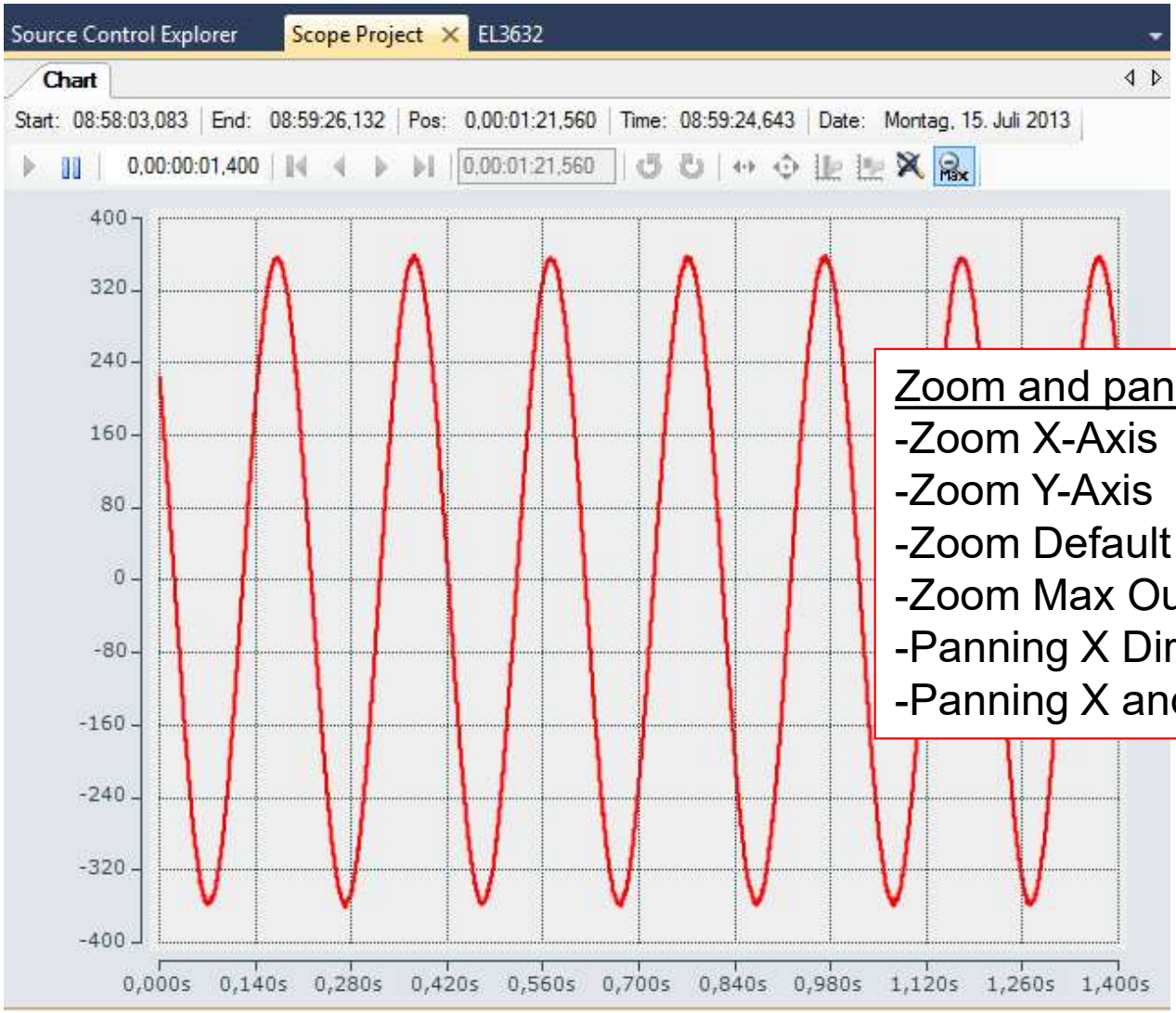


Activation of X- and Y- Cursors during the recording

General Scope Features

BECKHOFF

Different zoom and panning functions

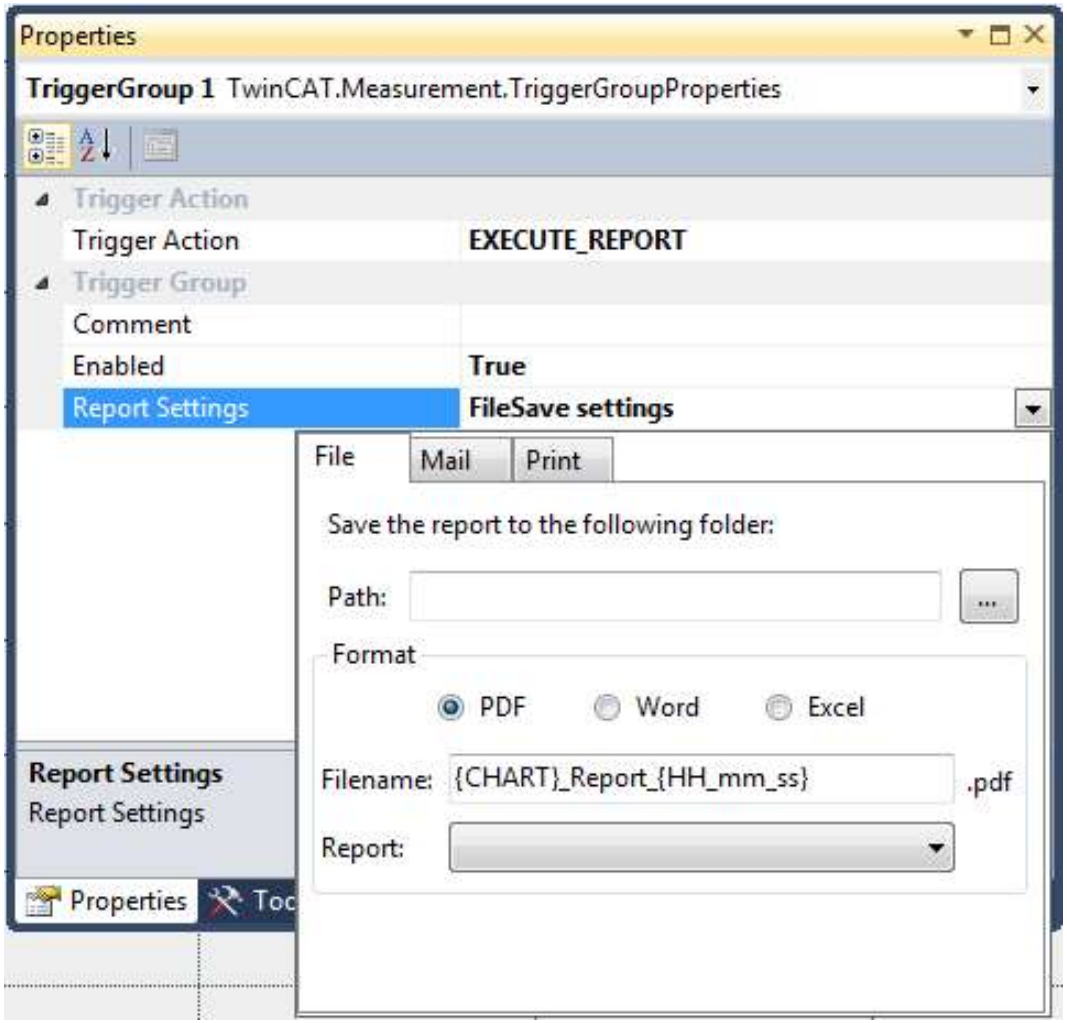


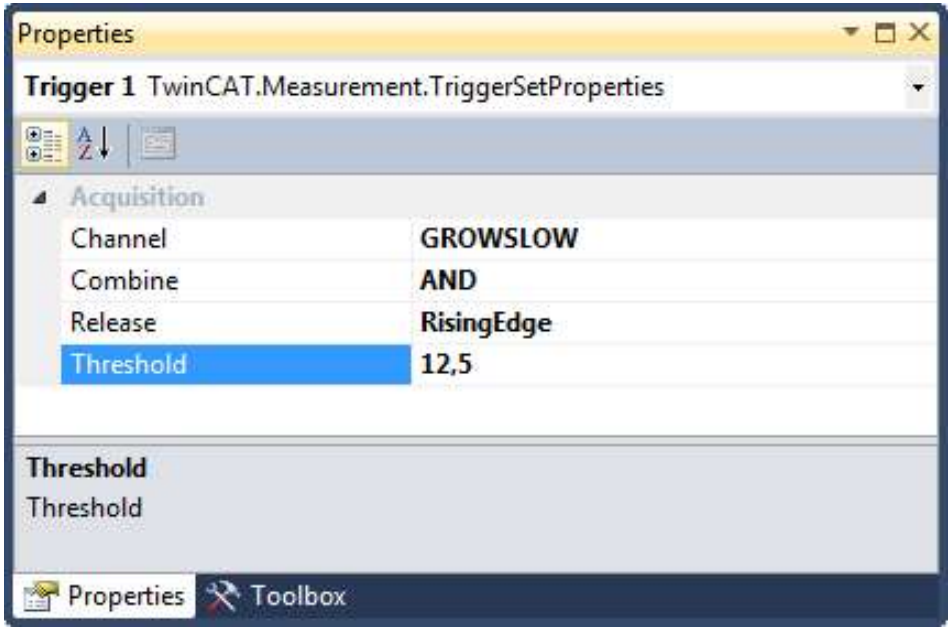
Zoom and panning functions:
-Zoom X-Axis
-Zoom Y-Axis
-Zoom Default Display Width
-Zoom Max Out
-Panning X Direction
-Panning X and Y Direction

General Scope Features

BECKHOFF

Trigger controlled records





- Start Record
- Stop Record
- Stop Display
- Restart Display
- Start Subsave
- Stop Subsave
- Execute Report

Agenda

BECKHOFF

- Scope History
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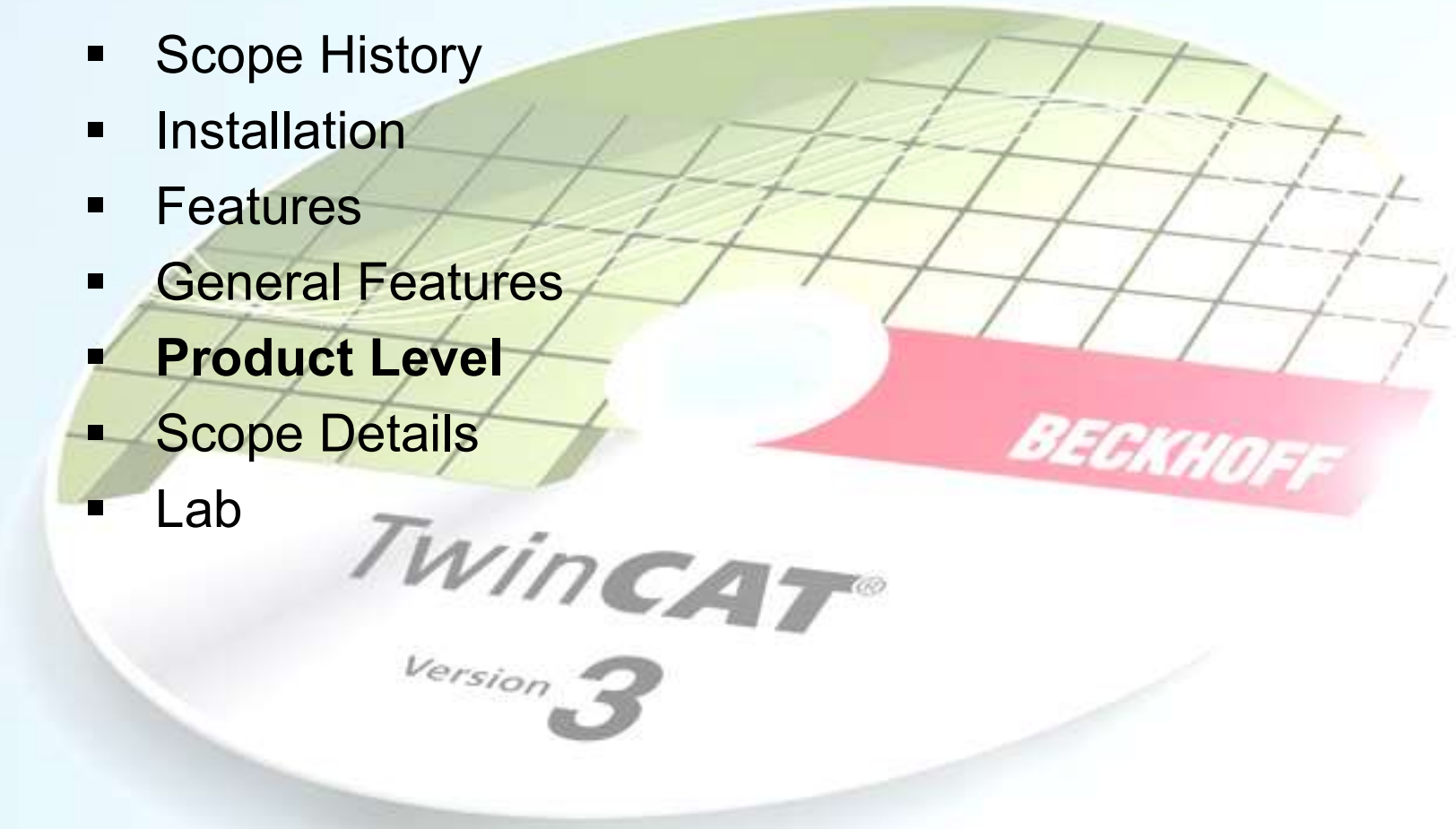
- Scope Details
- Lab



Product Level

BECKHOFF

TwinCAT 3 Scope Base

- Integrated into TwinCAT Engineering (TE1000) Setup
- View and local Server
- Machine start-up
- No license required

TwinCAT 3 Scope View Professional

- TE1300 with extended functions: long term records, Subsaves, .NET Control Integration
- Process control
- Subject to license terms

TwinCAT 3 Scope Server

- Remote Server
- Activates the extended functions of Professional
- Subject to license terms

View vs Server

- Scope View
  - is a TwinCAT 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, Base and Professional

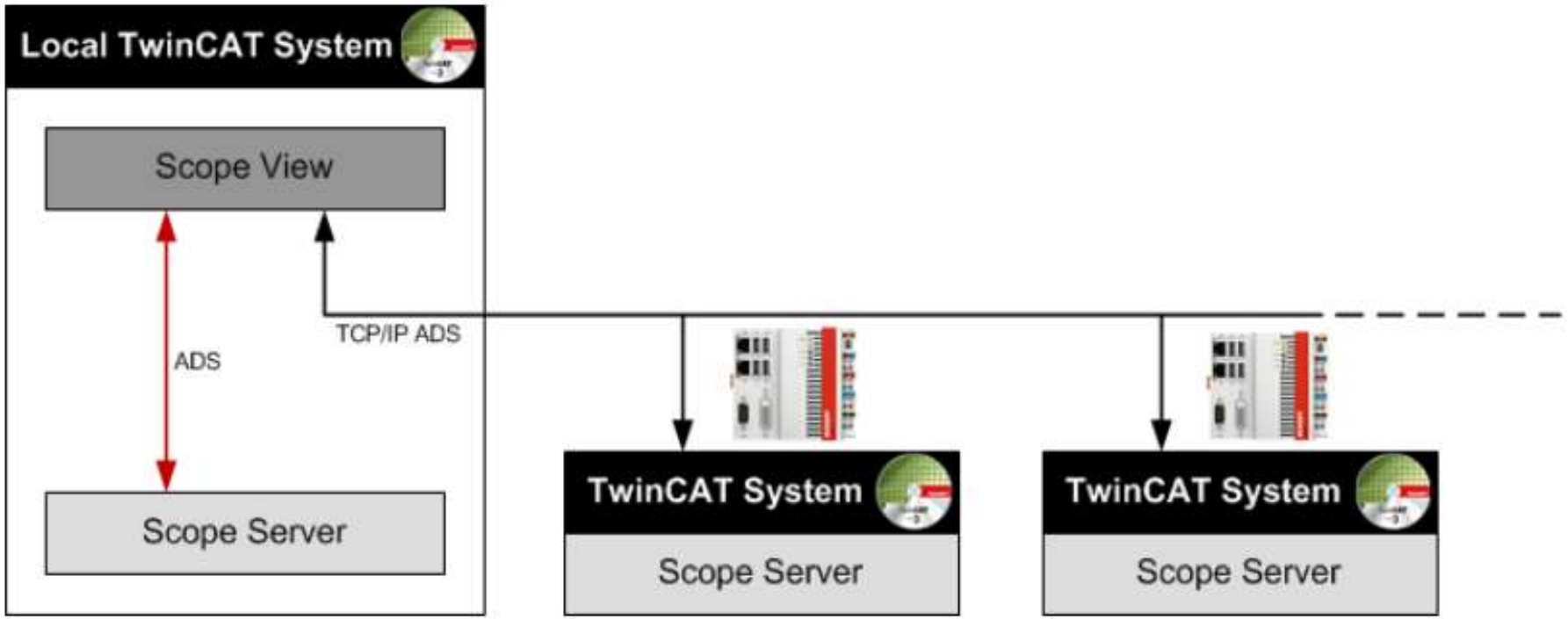
- Scope Server
  - is a TwinCAT 3 function and supplies the software for the data recording, which is installed on distributed target devices or on the local target device. The Server sends the recorded data to the View

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

View vs Server

BECKHOFF

- The TwinCAT Scope View communicates over ADS with the Scope Servers distributed in the system. The local Server, which is located with the View on a system, can be used for the recording of local variables. However, it is also used whenever saved Scope data files are opened in the View. The View displays the signal curves and is used for the configuration of recordings.



Agenda

- Scope History
- Installation
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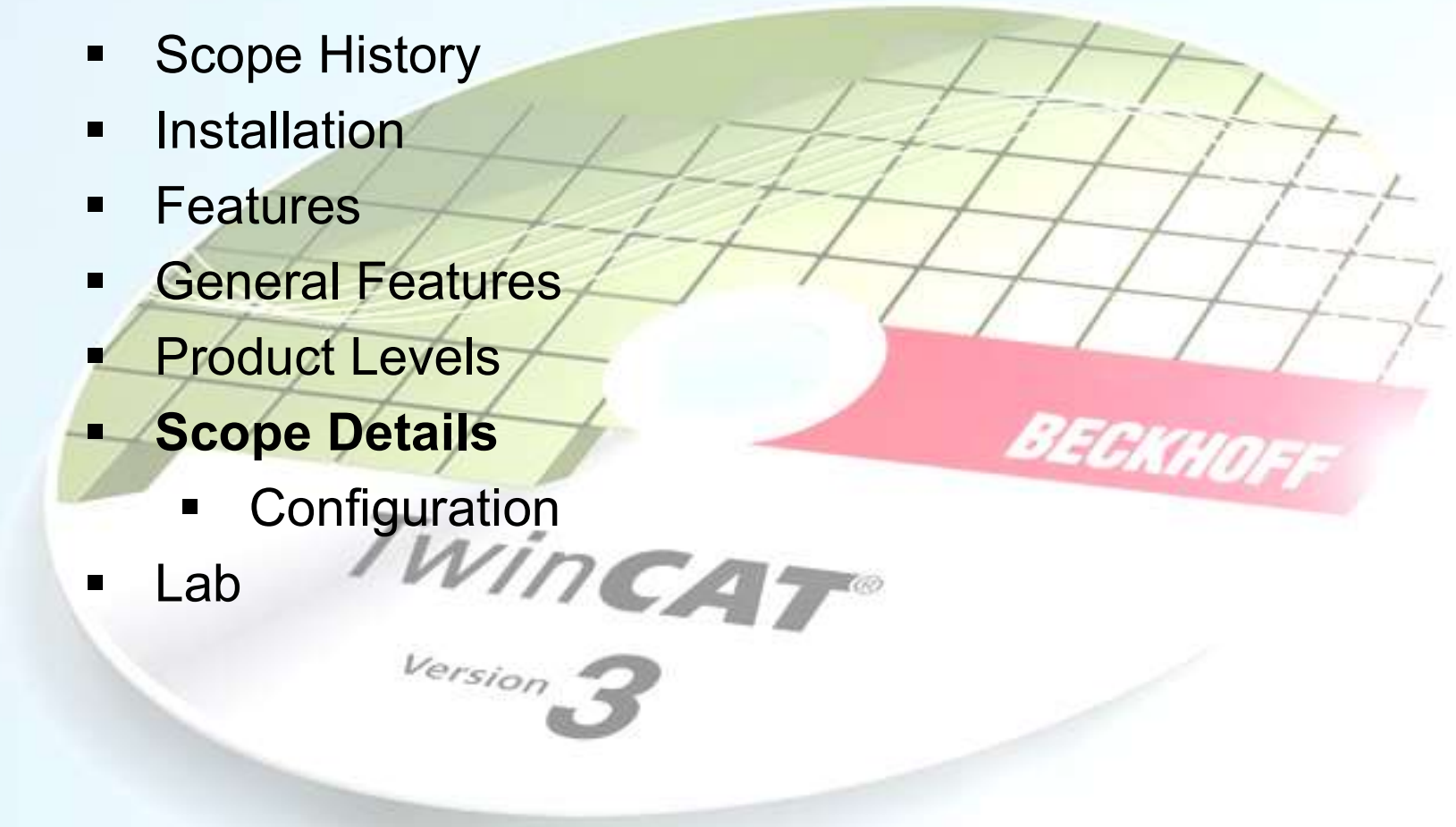
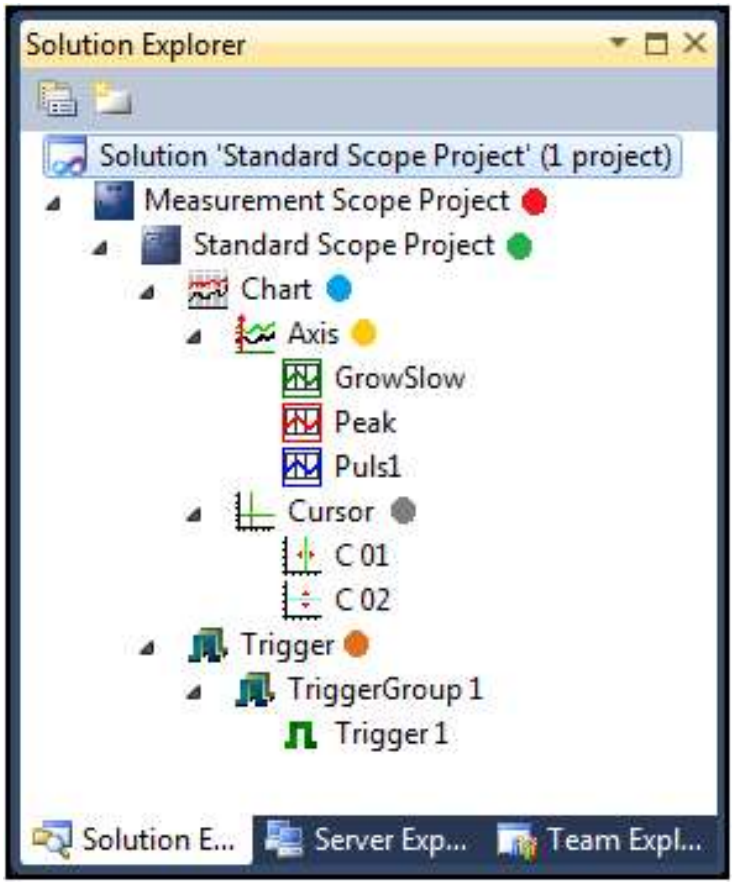
- **Scope Details**
  - Configuration
- Lab



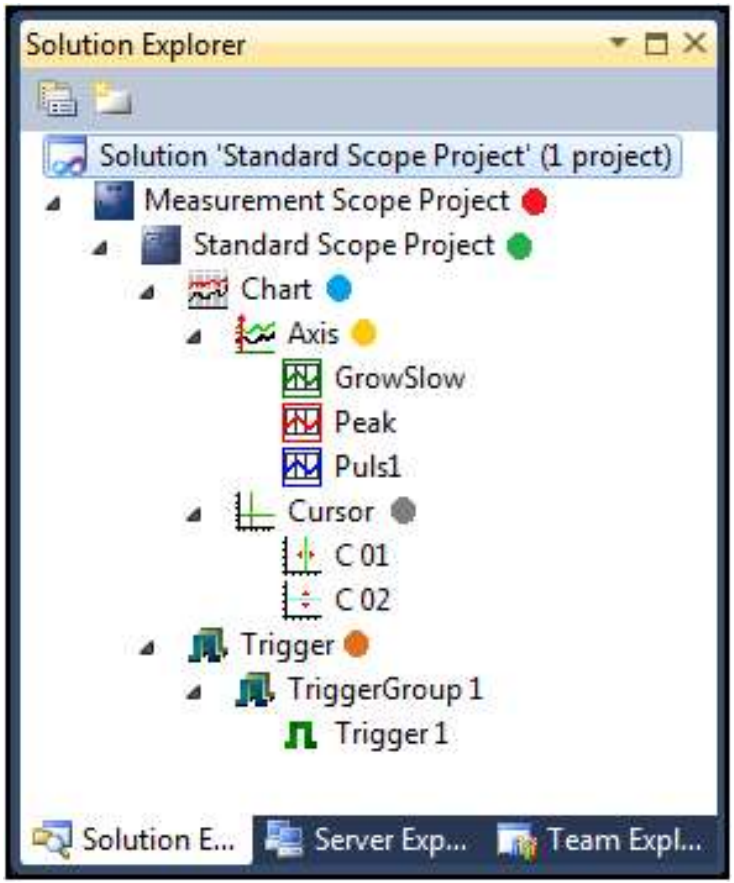
Configuration

- Not only are signal curves represented in the TwinCAT Scope View; recording configurations are also created. The architecture is reflected in the tree structure within the *Measurement Project* in the Solution Explorer.



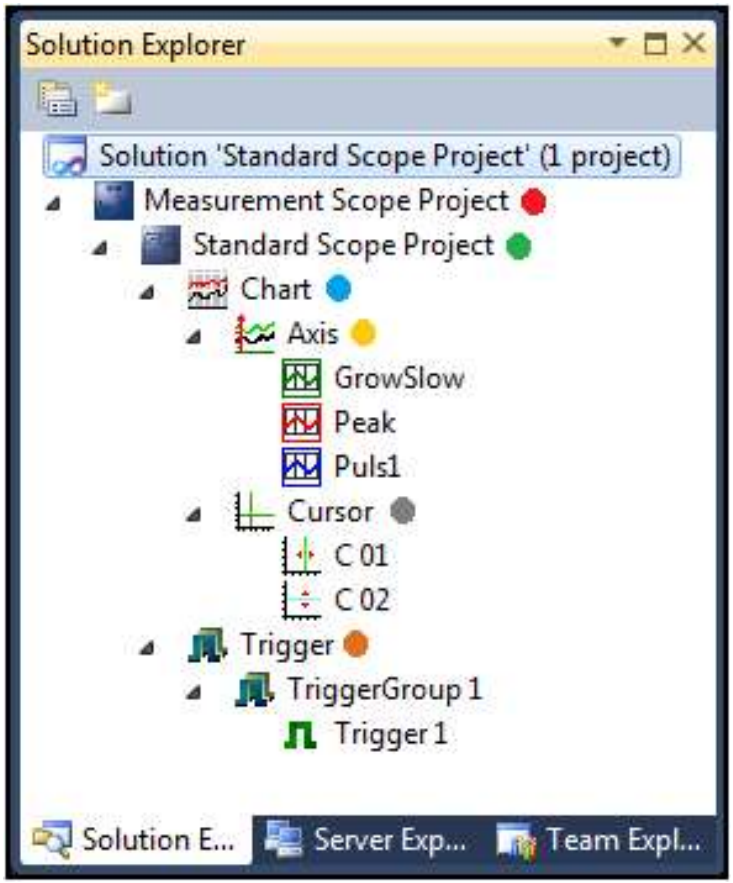
- **Measurement Scope Project**:
  The main level, in which several Scopes can be inserted. The Scopes within a project can be controlled independently of one another.
- **Standard Scope Project**:
  A Scope always stands for a recording configuration. This means that all elements inserted below it are subject to the same recording settings. If you click on a Scope, the setting options such as recording duration and ring buffer are displayed in the Visual Studio Property window.

- **Chart**:
  Several charts can exist in parallel in a Scope. They are the actual display area in the view and provide the time base. Each chart has its own toolbar for changing the display. The color and axis settings can be made in the Property window.



- **Axis**:
  A chart can have several axes. An axis provides the range of values for the connected channels. Amongst others, the automatic or free scaling can be set in the Property window.
- **Cursor**:
  Cursors are hierarchically assigned to the charts. X and Y cursors can be added within a chart. In the Cursor Tool window you can see amongst other things the current values of the signal/cursor interface and also differences to other cursors.

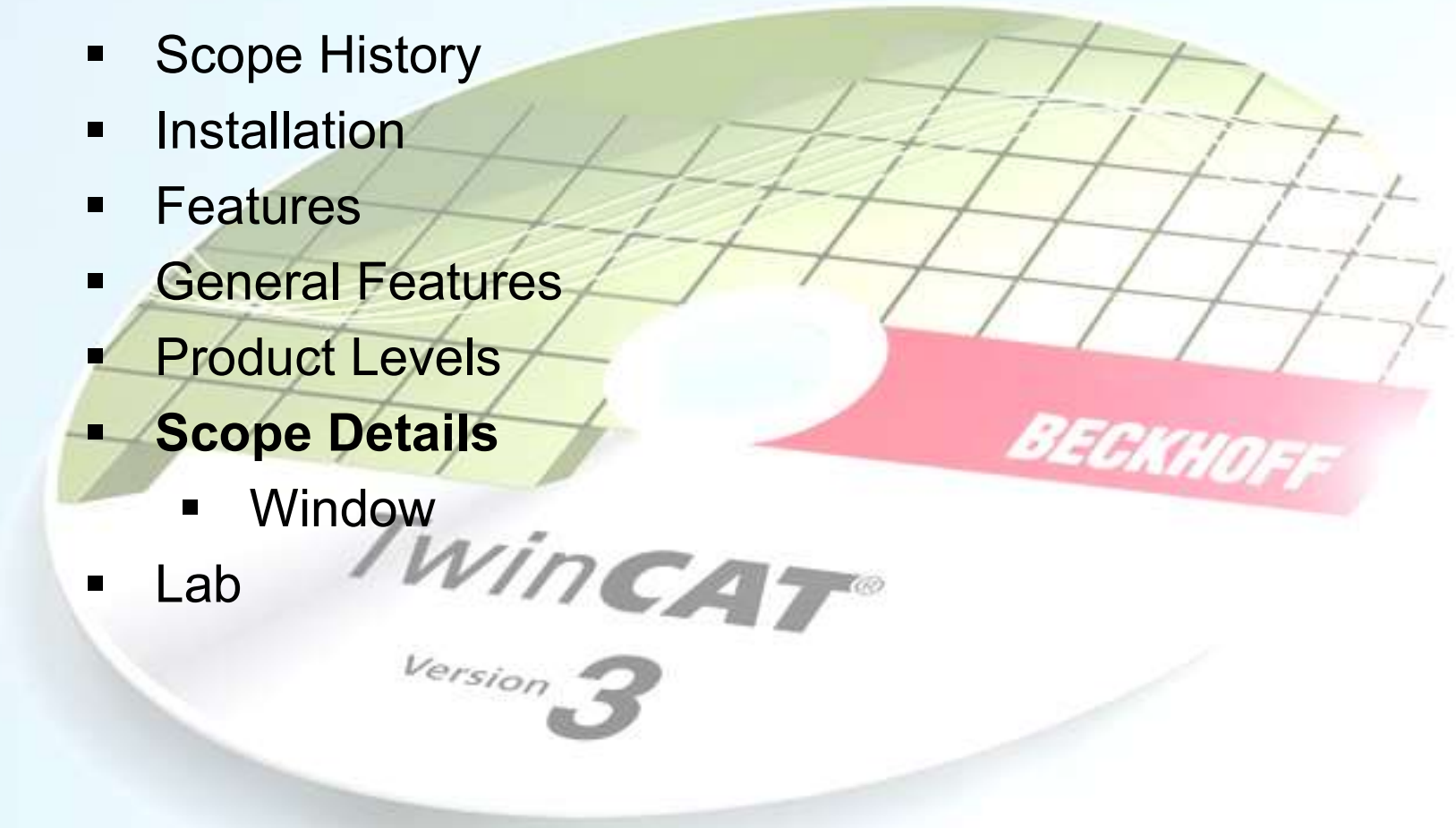
- **Trigger**:
  Triggers are assigned to the Scopes in the tree structure of the Scope View. The trigger action, e.g. Stop Record, can be set in the Property window of the trigger group. The underlying triggers can be logically linked to a trigger condition. The variable selection also takes place here in the Property window.



Agenda

BECKHOFF

- Scope History
- Installation
- Features
- General Features
- Product Levels
- **Scope Details**
  - Window
- Lab

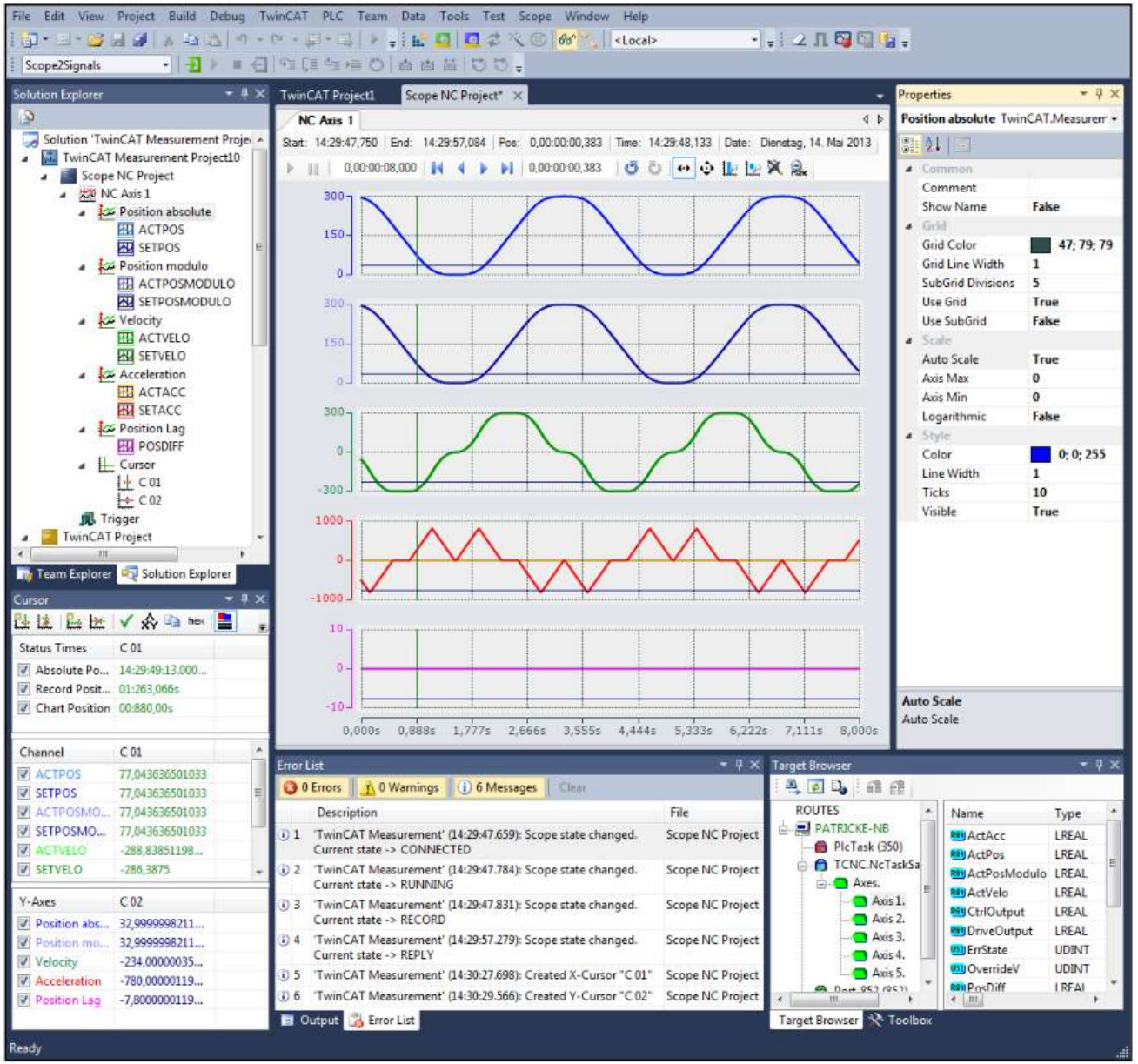


Window

BECKHOFF

- The interfaces for the control of the Scope View are divided into several individual windows (Tool windows) and their position and size are freely configurable.

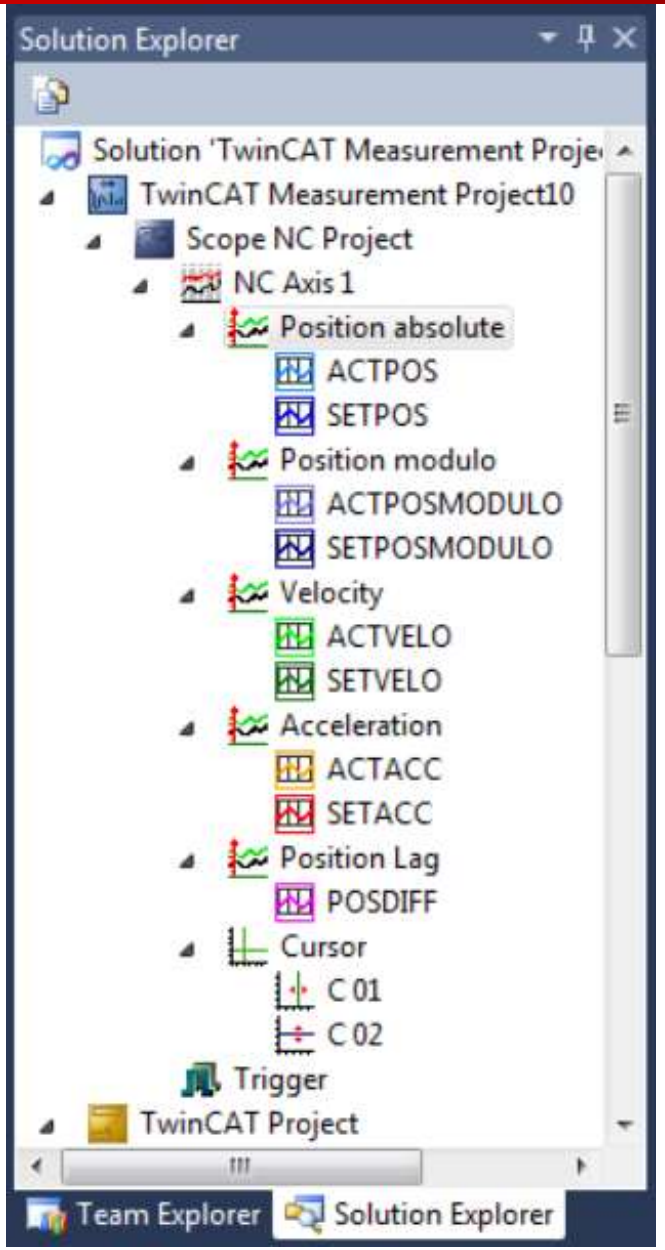
Note: To reset the window layout from the ‘Window’ menu select ‘Reset Window Layout’



Window

BECKHOFF

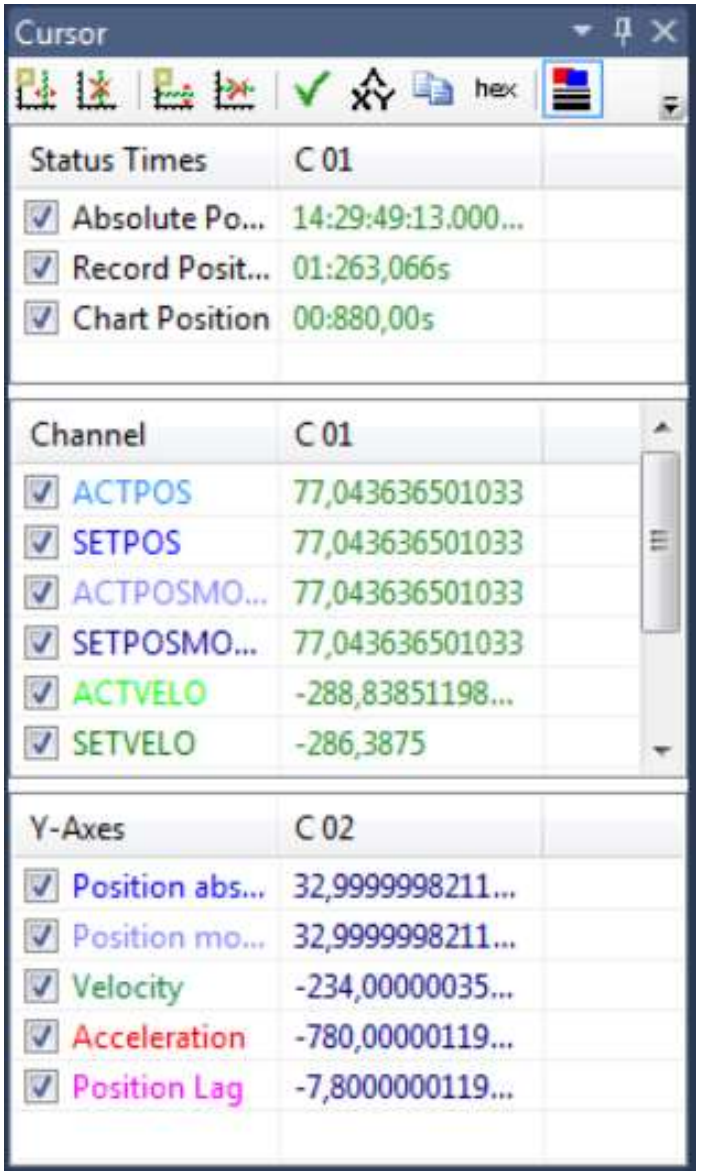
- Solution Explorer
  - Display of the project structure within a solution.



Window

BECKHOFF

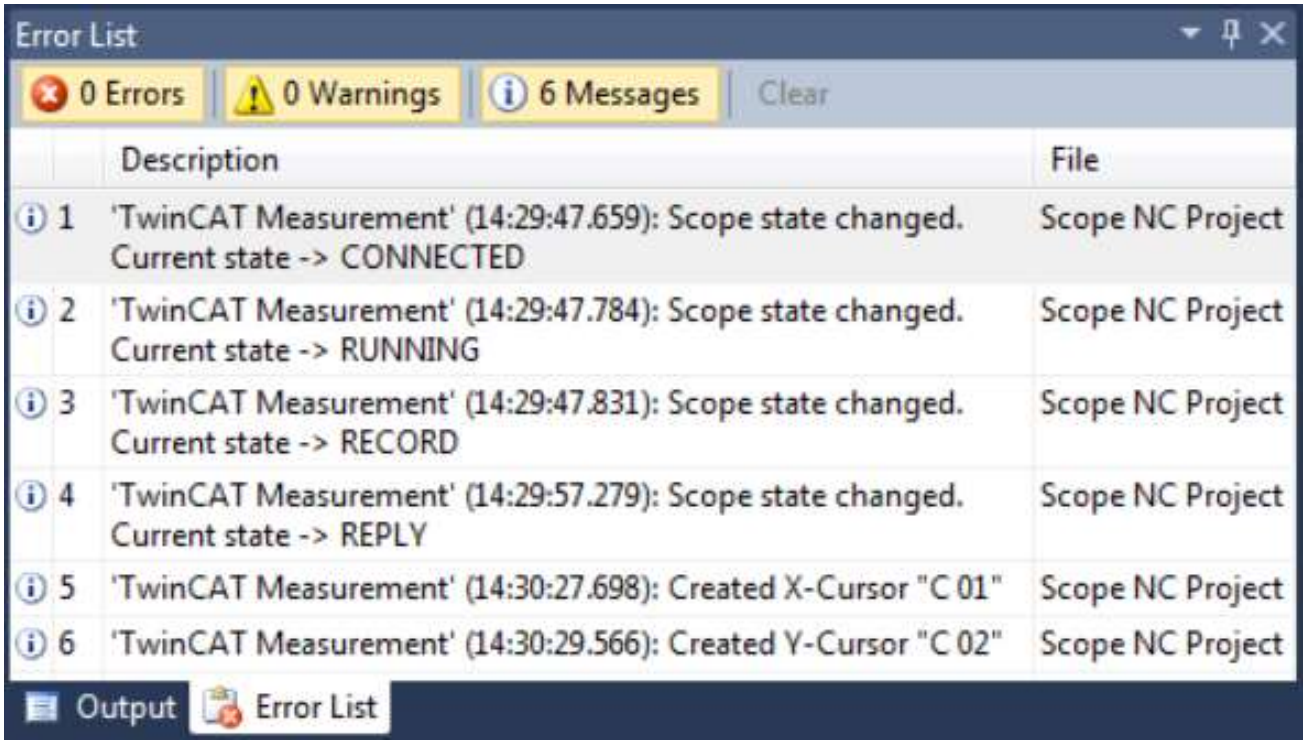
- Cursor
  - Display of the values present at the X/Y-cursor.



Window

BECKHOFF

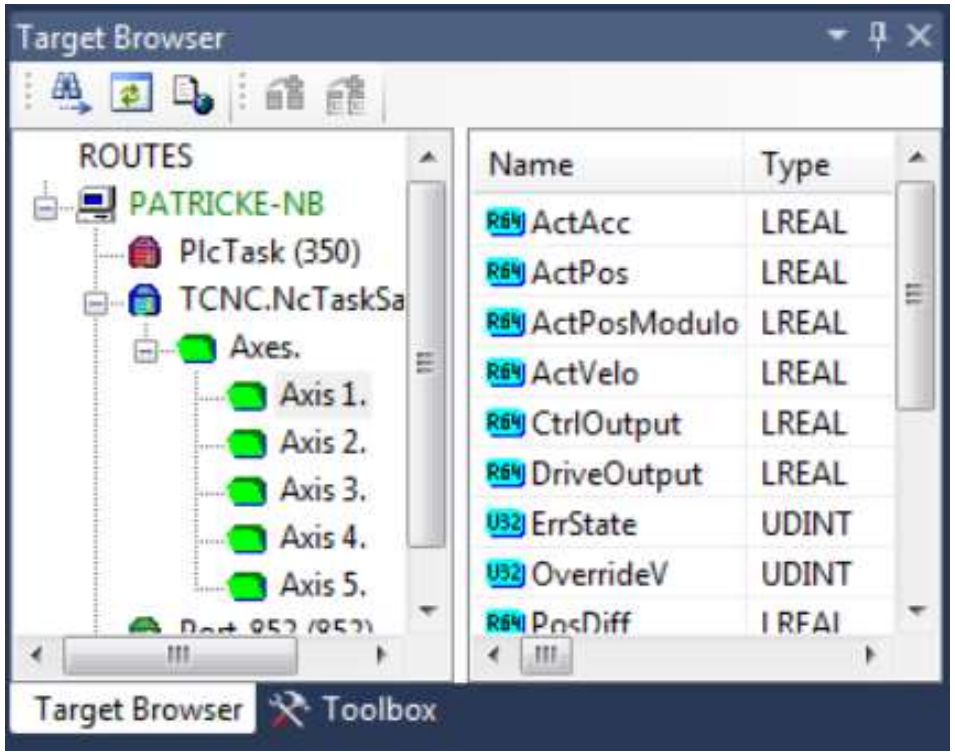
- Error List
  - List of errors, warnings and messages. Each scope project lists the generated messages independently here. The messages for the respectively selected Scope can be deleted via the context menu item "Clear Error List".



Window

BECKHOFF

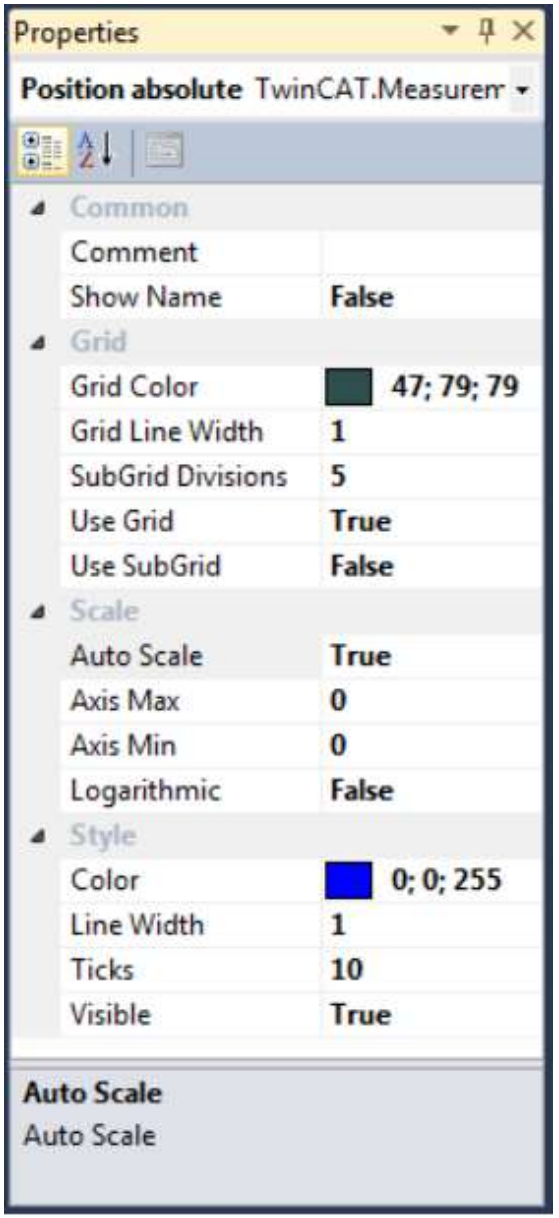
- Target Browser
  - With the target browser you can be add Scope configuration channels via their symbol names.



Window

BECKHOFF

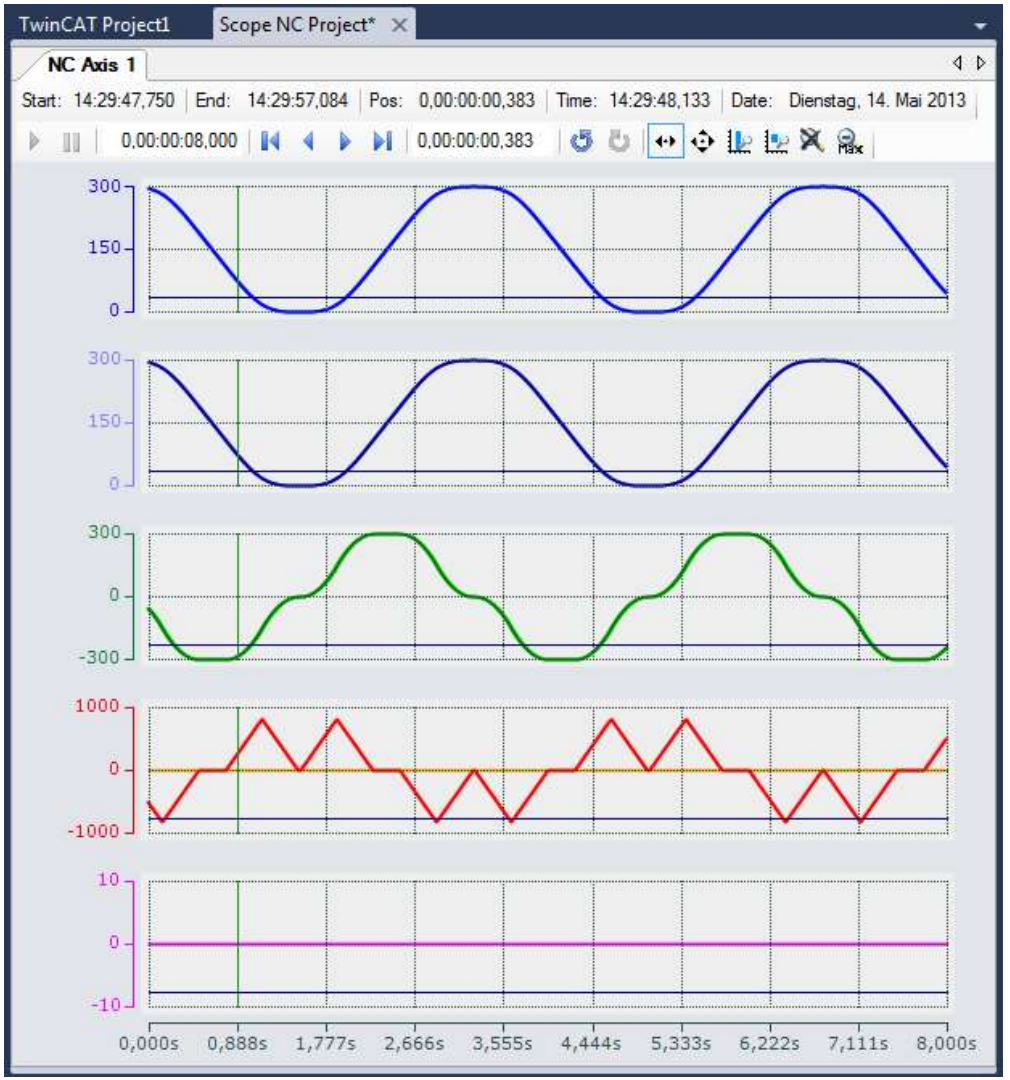
- Properties
  - The settings of the respective element that is marked in the Solution Explorer can be modified here.



Window

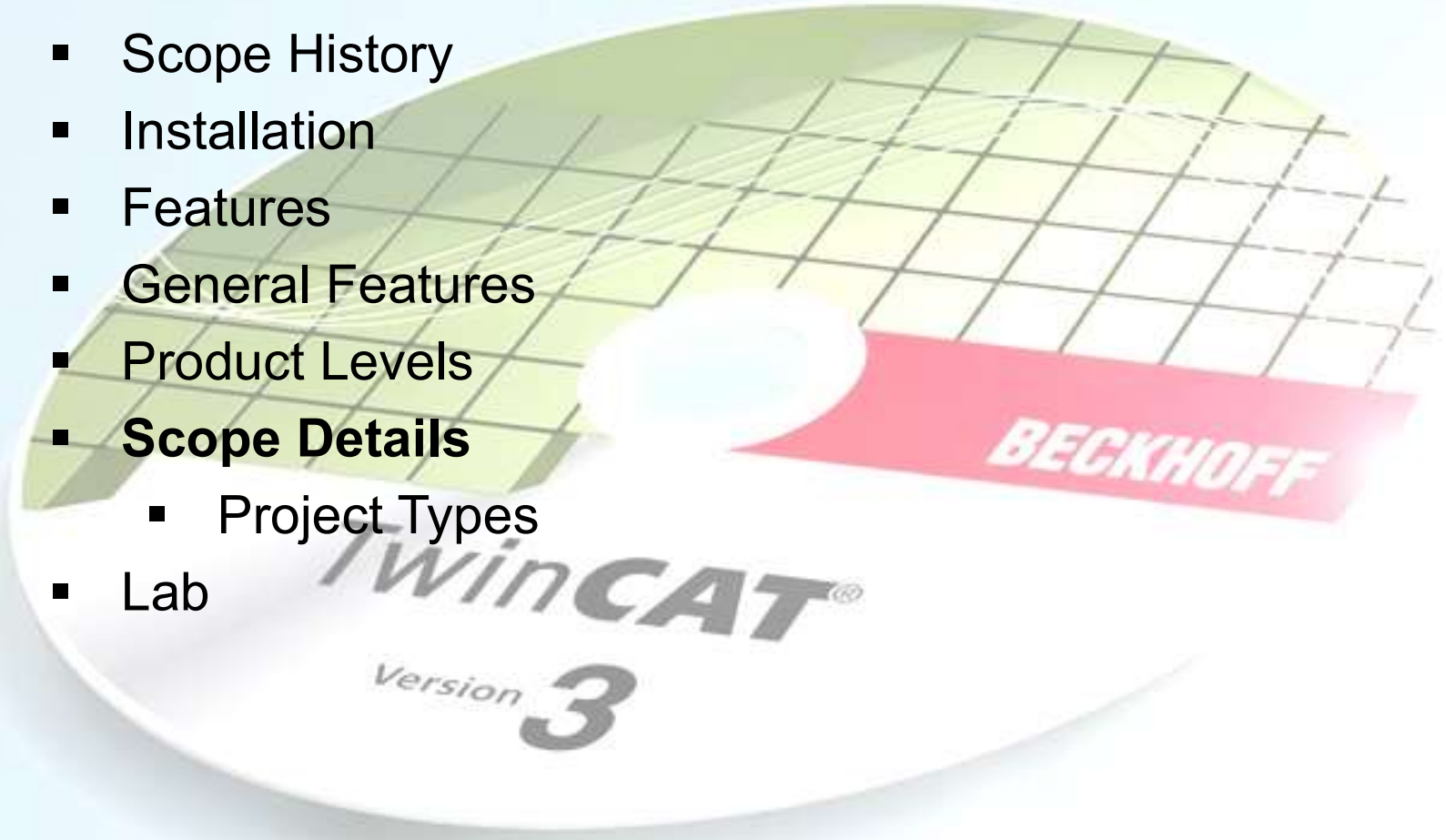
BECKHOFF

- Scope View Control
  - Display of the individual charts. The charts can be displayed next to each other or in overlapping tabs within the control, exactly like all other windows.



Agenda

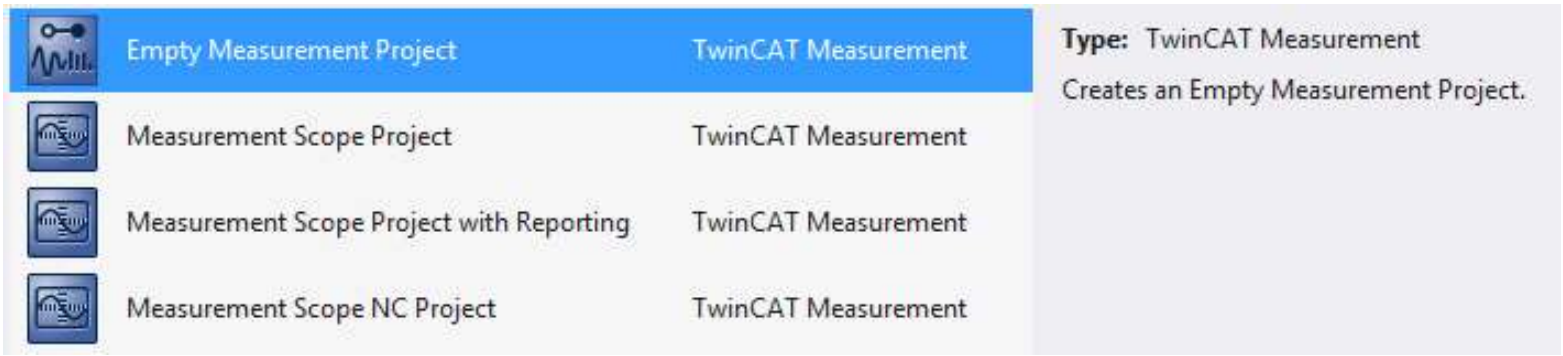
- Scope History
- Installation
- Features
- General Features
- Product Levels
- **Scope Details**
  - Project Types
- Lab



Project Types

BECKHOFF

- Empty Measurement Project
  - Scope configurations (.sv2 | .tcscope) or scope data (.svd) can subsequently be inserted here.

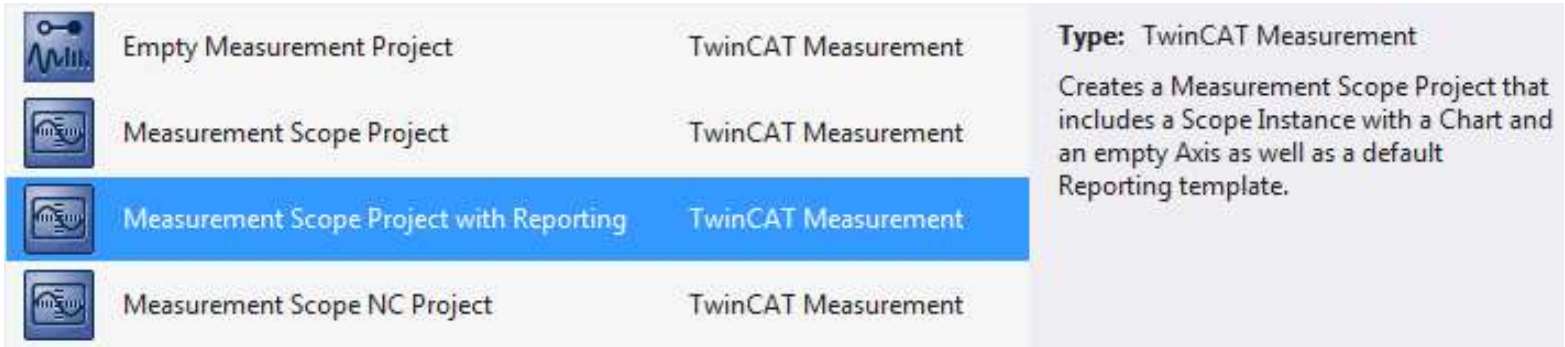


Project Types

- Measurement Scope Project
  - Contains a Scope instance as well as a pre-configured chart and an axis.

Project Types

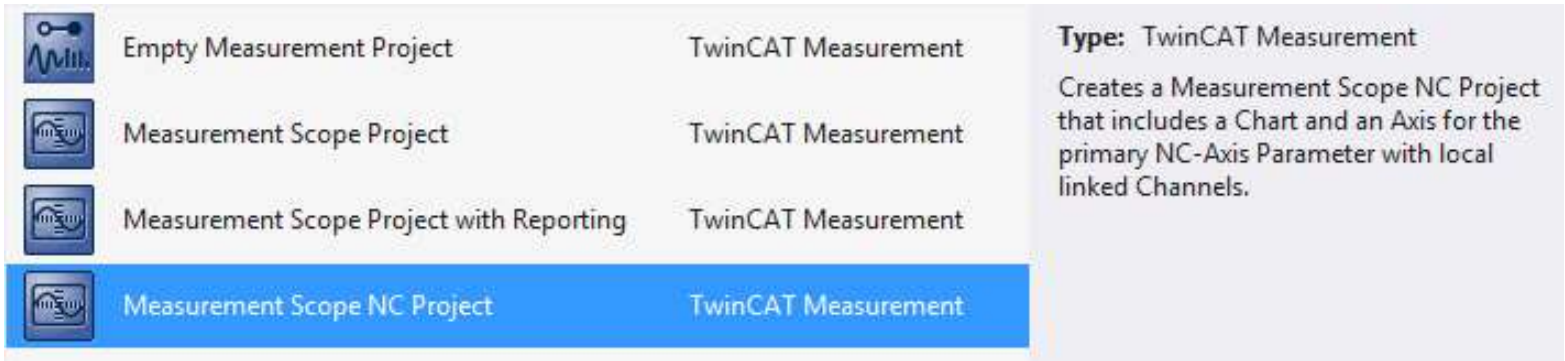
- Measurement Scope Project with Reporting
  - See "Measurement Scope Project" + a ready-made printing template for printing charts.



Project Types

BECKHOFF

- Measurement Scope NC Project
  - Contains a Scope instance that has been specially pre-configured for working with axes.



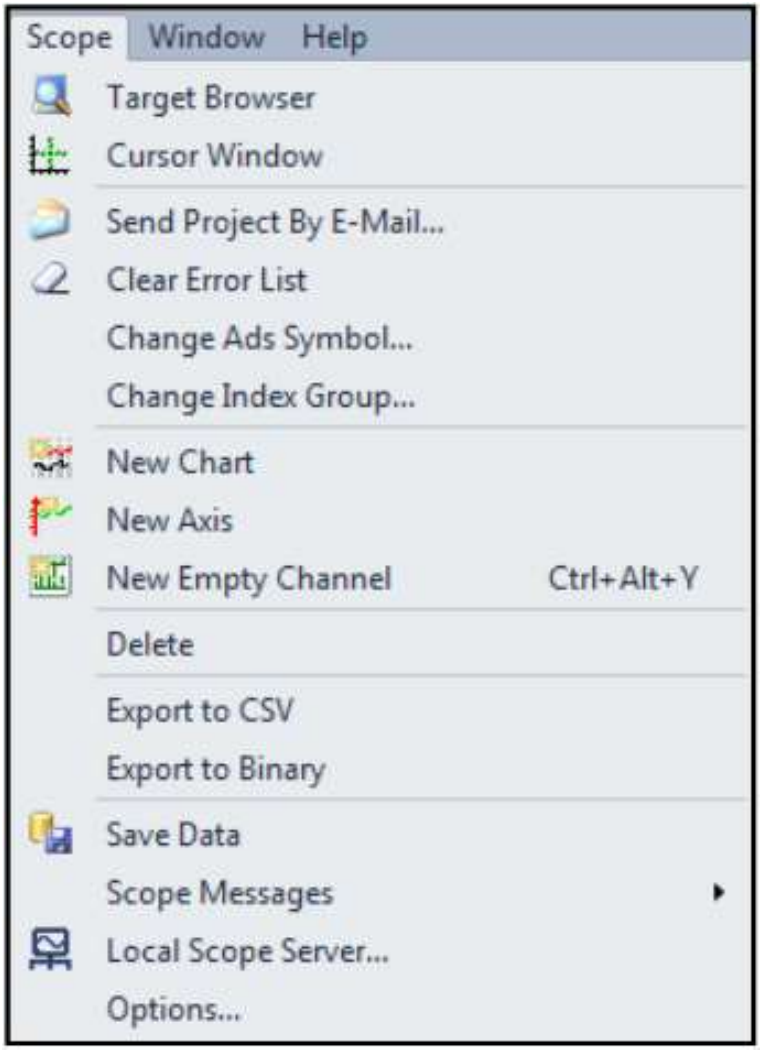
Agenda

BECKHOFF

- Scope History
- Installation
- Features
- General Features
- Product Levels
- **Scope Details**
  - Scope Menu
- Lab

Scope Menu

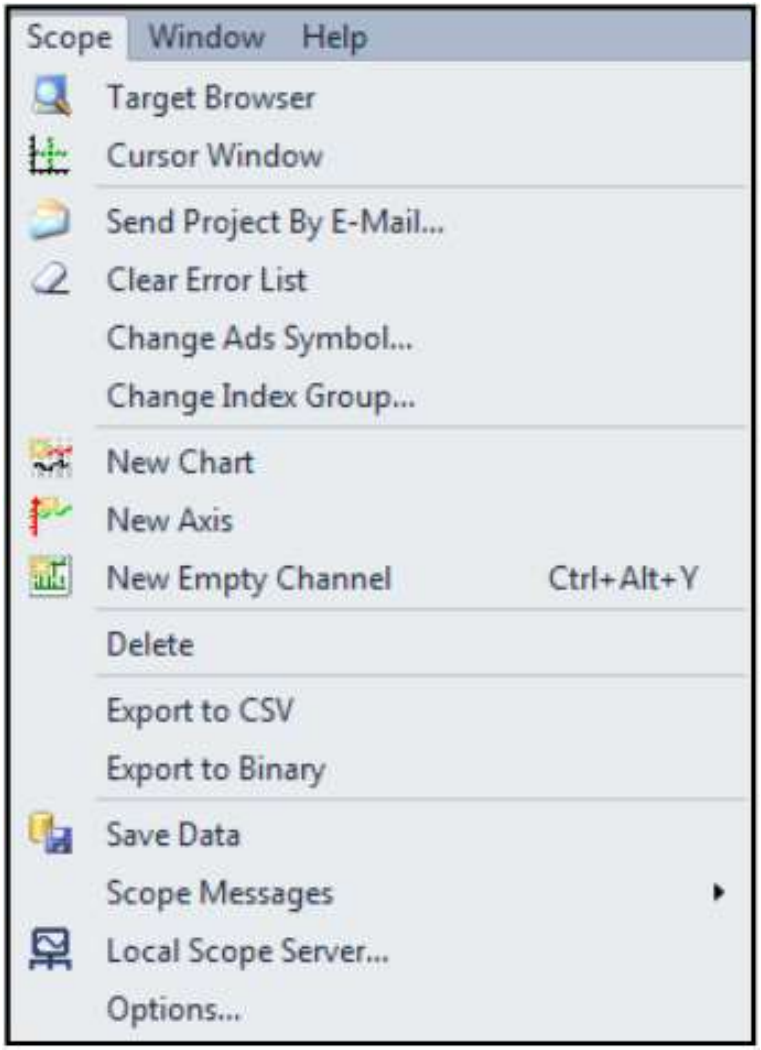
- Target Browser
  - Opens the target browser for variable selection from local or remote servers
- Cursor Window
  - Opens the cursor window.



Scope Menu

- Send Project By E-Mail...
  - Context menu of the Scope instance to be sent - > Send Project By Email
    If the Scope is to contain data (Scope State: Reply), then you can select whether the data should also be sent.

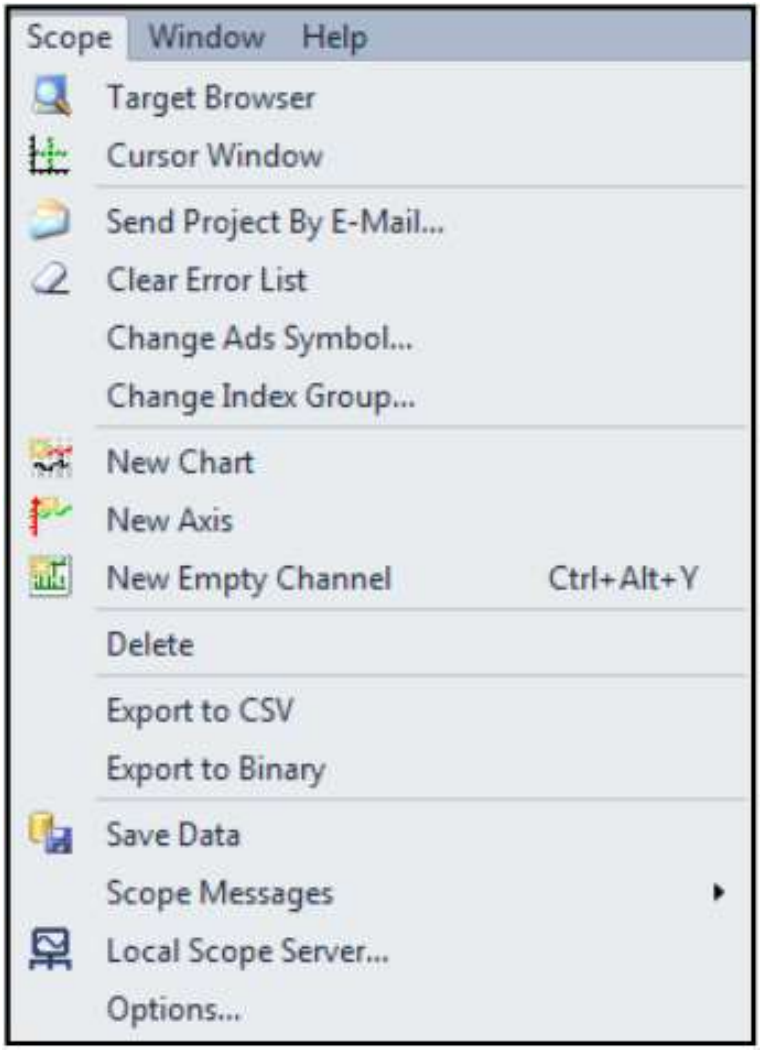
- Clear Error List
  - Deletes all entries (Error | Warning | Message) of the currently active Scope from the error list.



Scope Menu

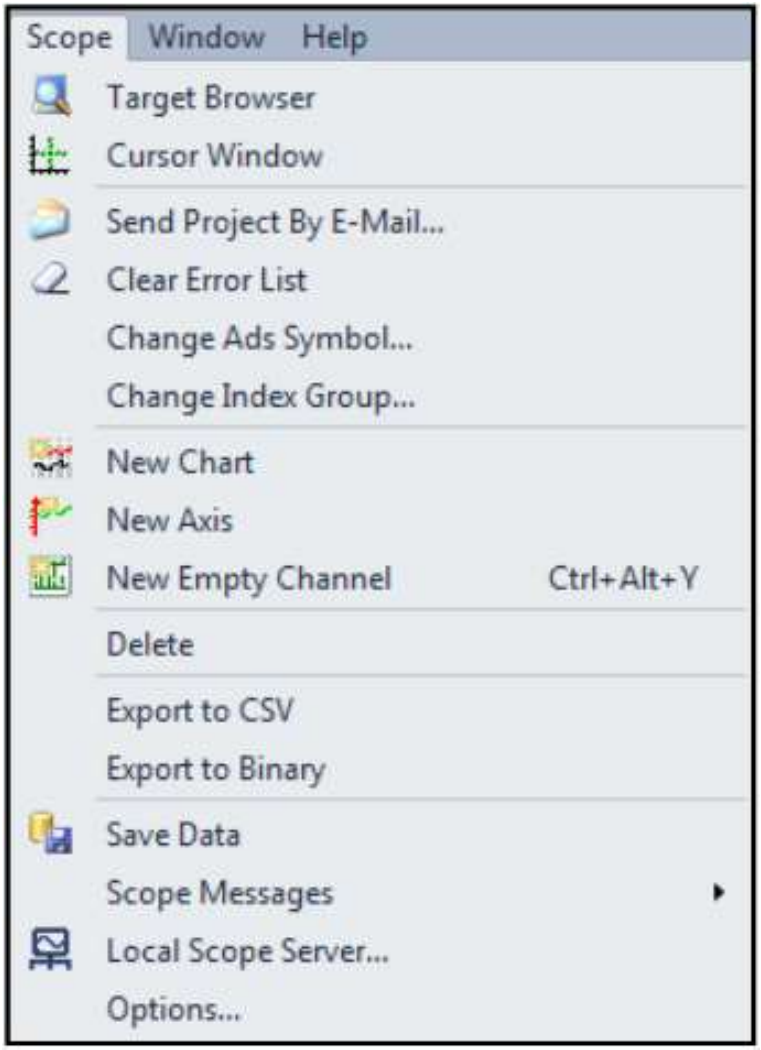
- Change Ads Symbol...
  - Dialog for the replacement of character strings. The symbol names of all channels located below the selected element are edited.

- Change Index Group...
  - Dialog for incrementing / decrementing the Index Group / Index Offset. The acquisitions of all channels located below the selected element are edited.



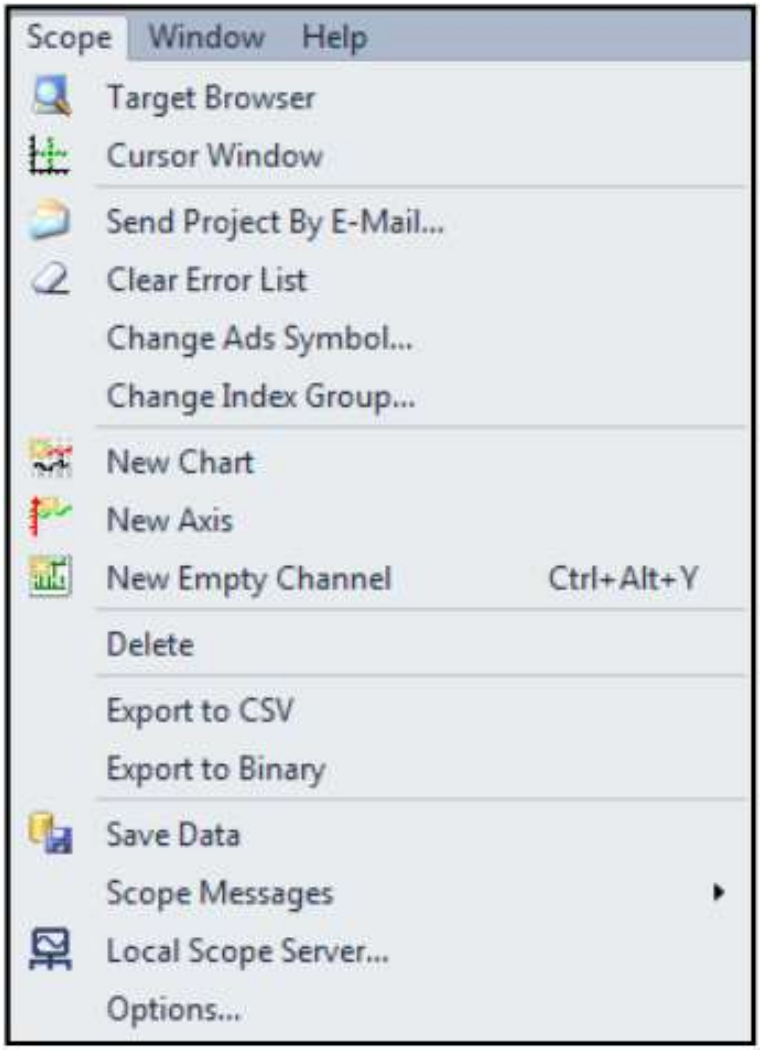
Scope Menu

- New Chart
  - Creates a new chart within the Scope.
- New Axis
  - Creates a new axis within the chart. If the selected element is not a chart, then a new chart is additionally created.
- New Empty Channel
  - Creates a new channel within the axis. If no axis is selected, then a new axis is additionally created.



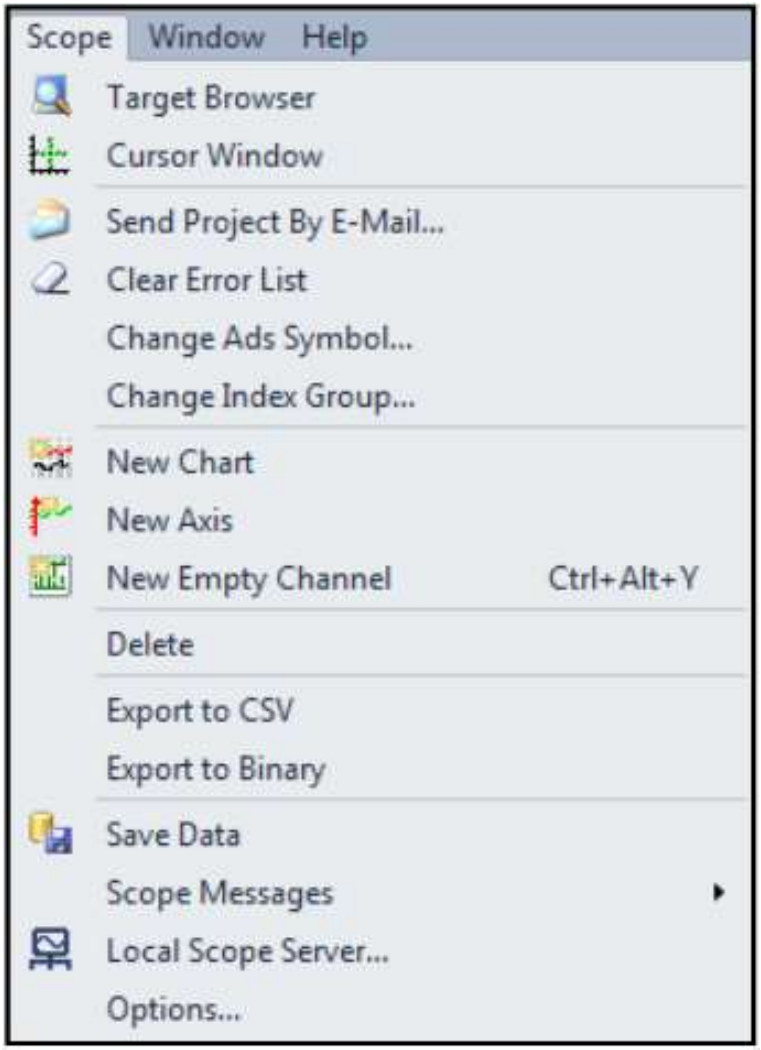
Scope Menu

- Delete
  - Deletes the element currently selected in the Solution Explorer.



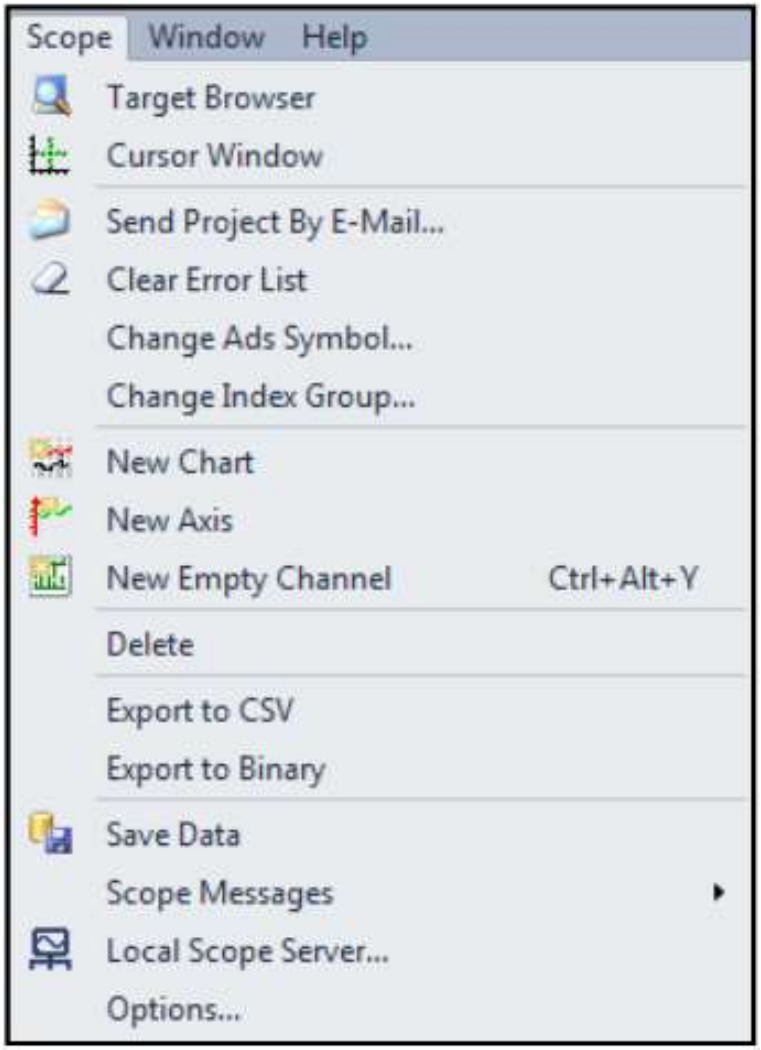
Scope Menu

- Export to CSV
  - Export data to a CSV file
- Export to Binary
  - Export data to a Binary file



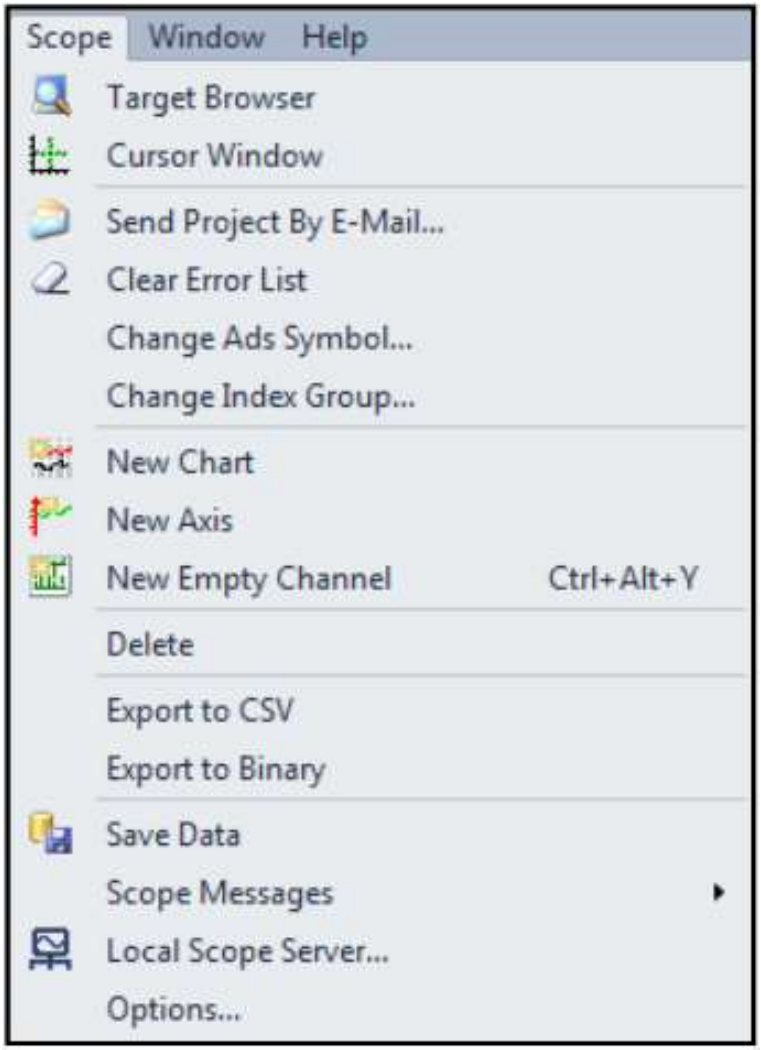
Scope Menu

- Save Data
  - After stopping the recording, the current data including the configuration can be saved in a .svd file.
  - The generated Scope data file (.svd) can be added directly to the Measurement Project or saved in a directory of your choice via the directory selection dialog.



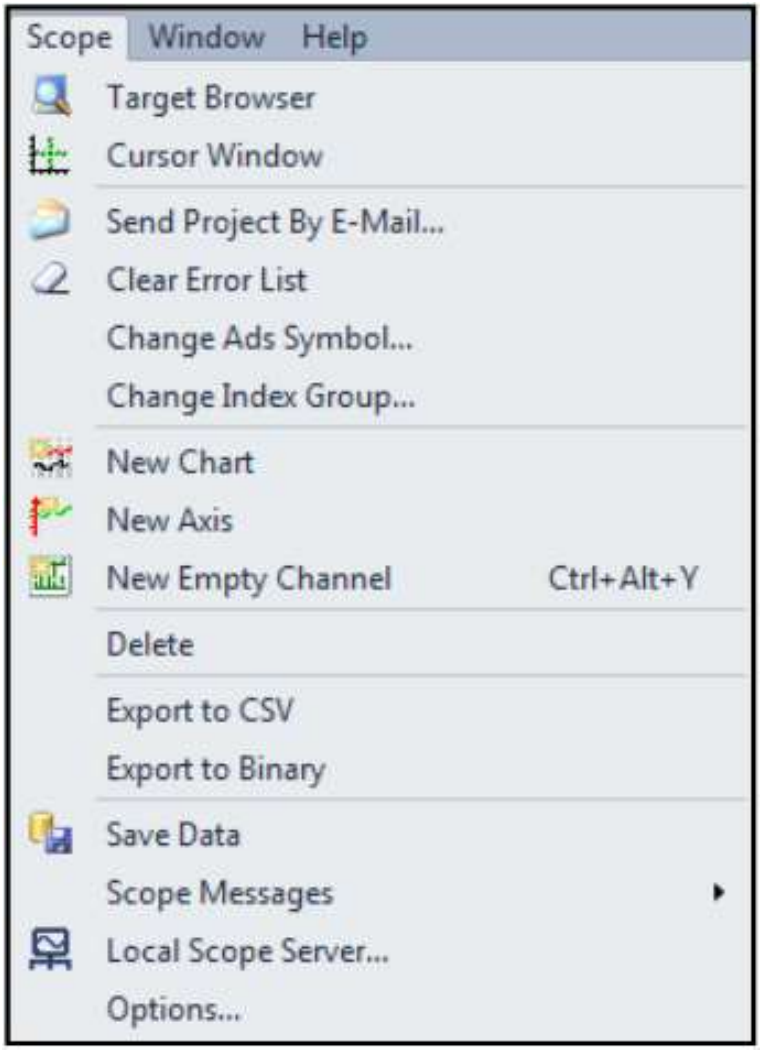
Scope Menu

- Scope Messages
  - Some frequently occurring message boxes in the scope are equipped with a checkbox "Remember my answer and don't ask again!" so that the question is not repeated the next time. This makes the handling of the program individually adjustable for each user. If a message box has been deactivated, it can be activated again here.



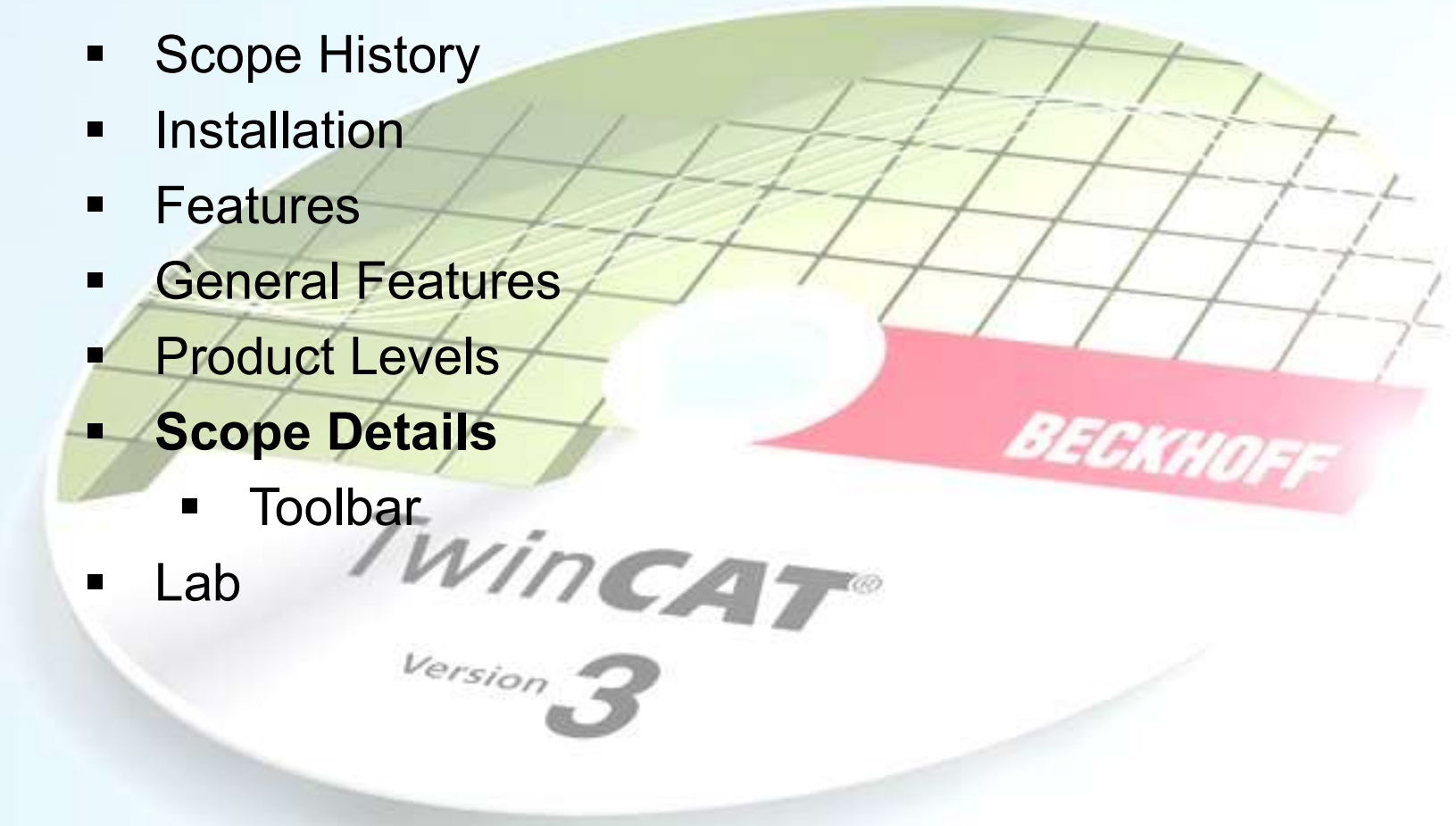
Scope Menu

- Local Scope Server...
  - Opens the configuration interface of the Scope Server.
- Options...
  - Opens the Visual Studio Options window and selects the Scope entry.



Agenda

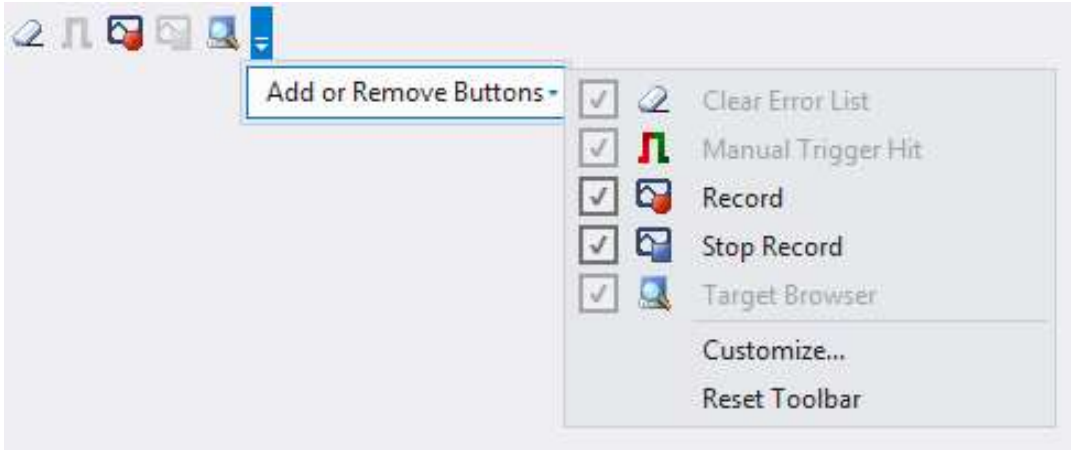
- Scope History
- Installation
- Features
- General Features
- Product Levels
- **Scope Details**
  - Toolbar
- Lab



Toolbar

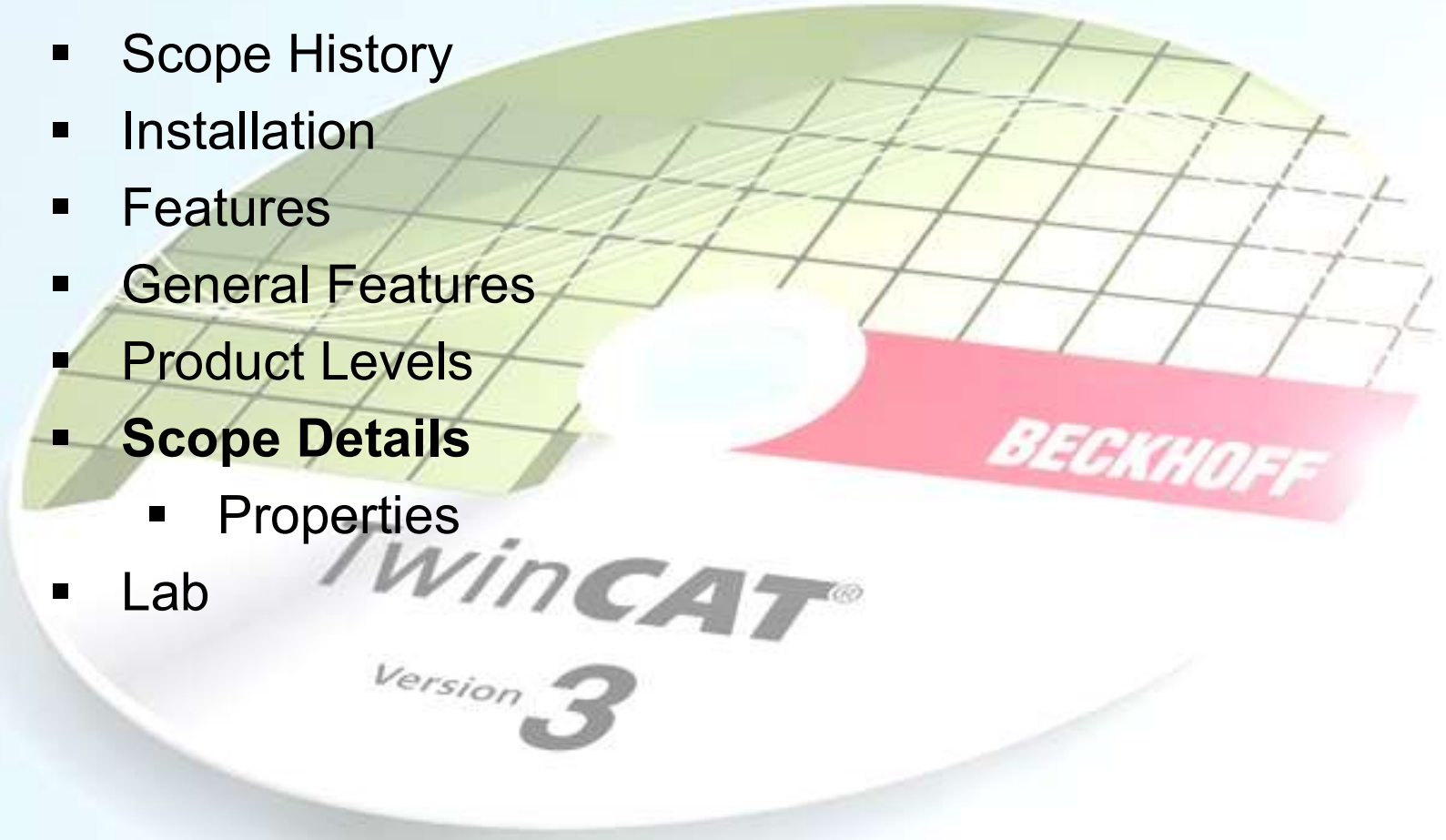
BECKHOFF

- The default Measurement toolbar includes commands to Start and Stop recording.
- Other commands can be added by selecting the down arrow and then customize.



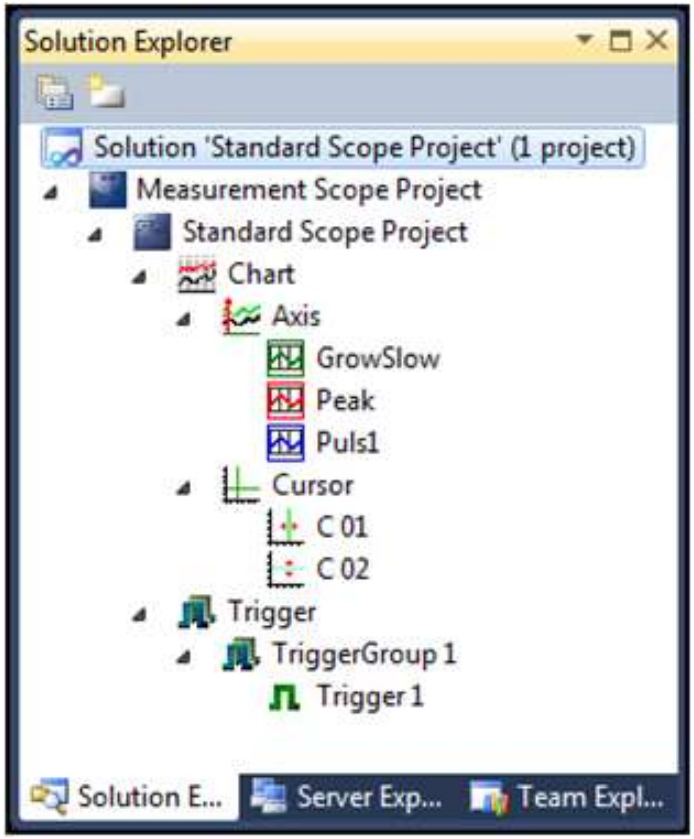
Agenda

- Scope History
- Installation
- Features
- General Features
- Product Levels
- **Scope Details**
  - Properties
- Lab



Properties

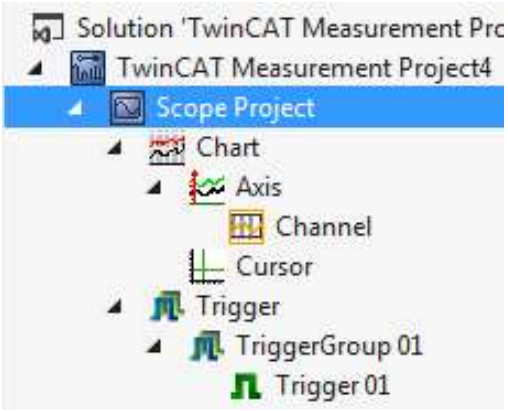
- Each item in the Solution Explorer (Scope, Chart, Axis, and Channel) has it's own properties window.

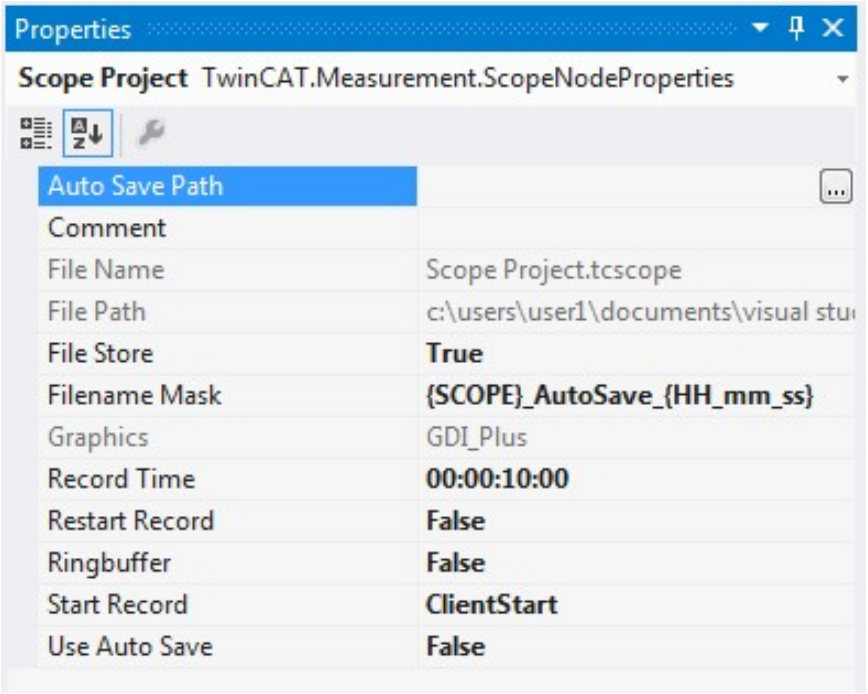


Properties

BECKHOFF

- Project properties include:
  - **File Name** and **File Path**
  - **Record Time** Days:Hours:Minutes:Seconds

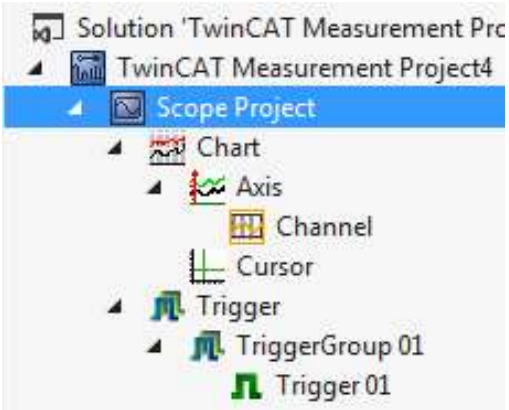


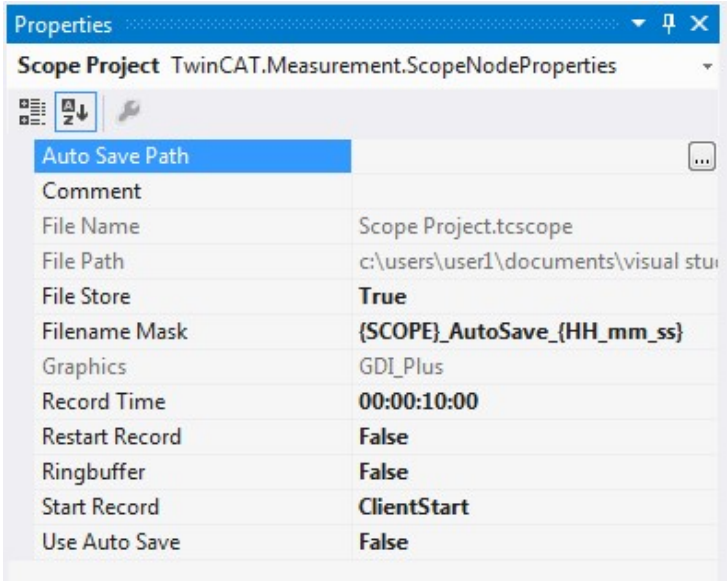


Properties

BECKHOFF

- Project properties include:
  - **File Store** specifies whether the server should temporarily save the data in a local file or whether it should keep the data only in the RAM. The selection should be selected depending on the amount of the data to be recorded and the recording device. That way the access time is better if only the RAM is used. In case of larger quantities of data, however, it is usually necessary to use the file store.

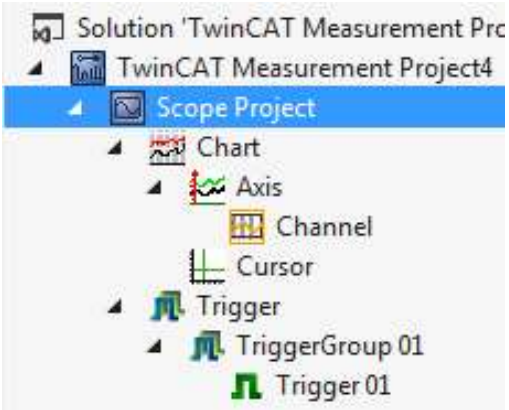


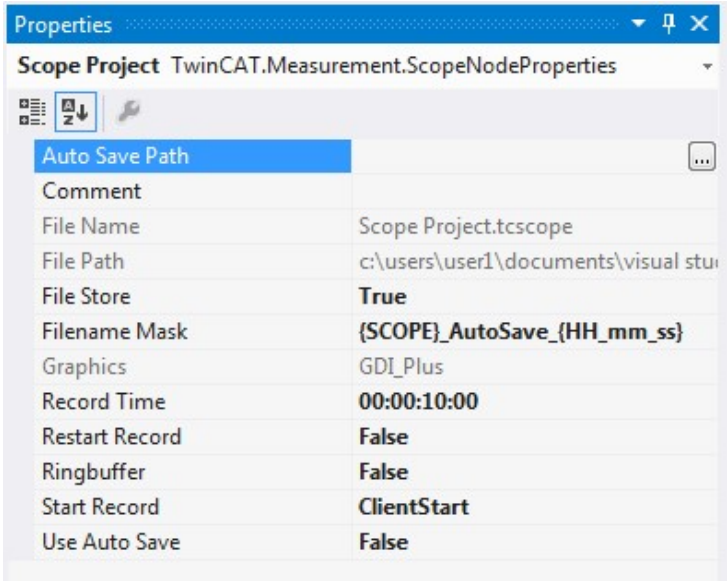


Properties

BECKHOFF

- Project properties include:
  - **Start Record** selects whether the recording should start on actuation of the recording button (client start) or on receipt of a trigger event (trigger start).

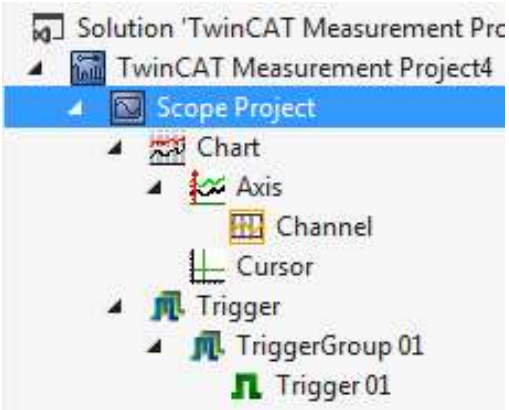


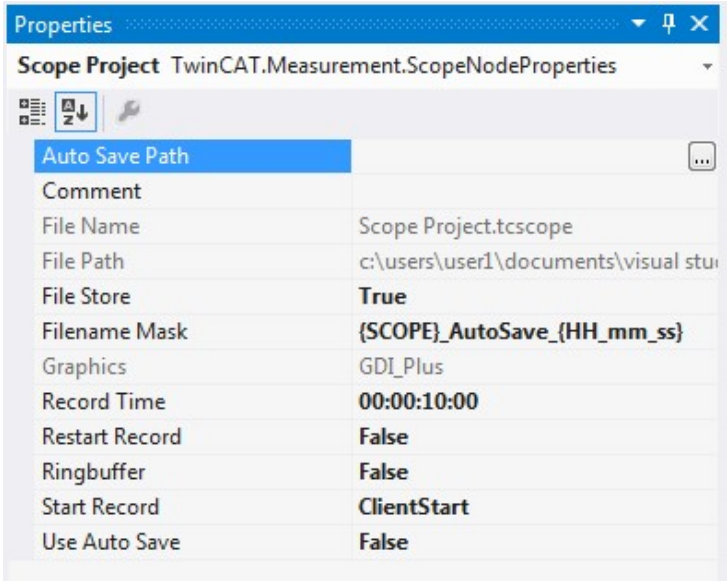


Properties

BECKHOFF

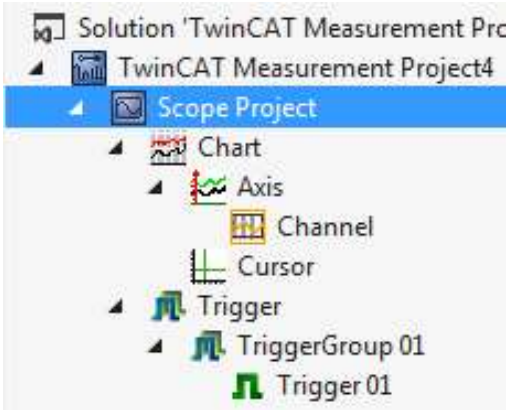
- Project properties include:
  - **Ring Buffer** defines how a server is to react on reaching the end of the recording time.

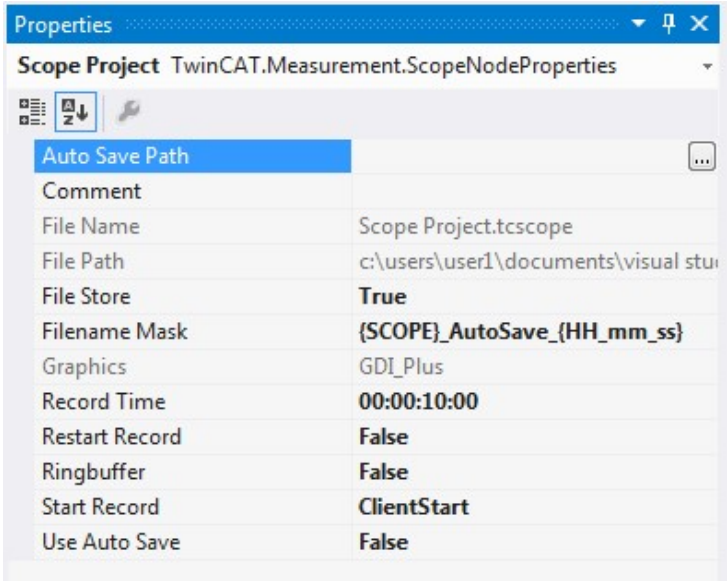




Properties

- **Ring Buffer active**: the recording is not stopped; instead, the oldest data in the memory are overwritten. The consequence is that the start time of the recording increases. The recording is only stopped when the stop button is actuated.
- **Ring Buffer inactive**: the recording is stopped on reaching the end of the recording time. The recording can be terminated prematurely via the stop button.

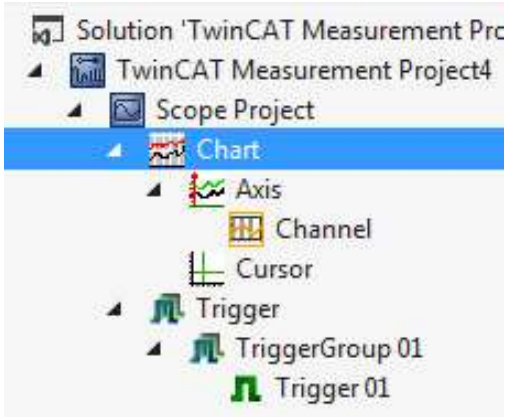


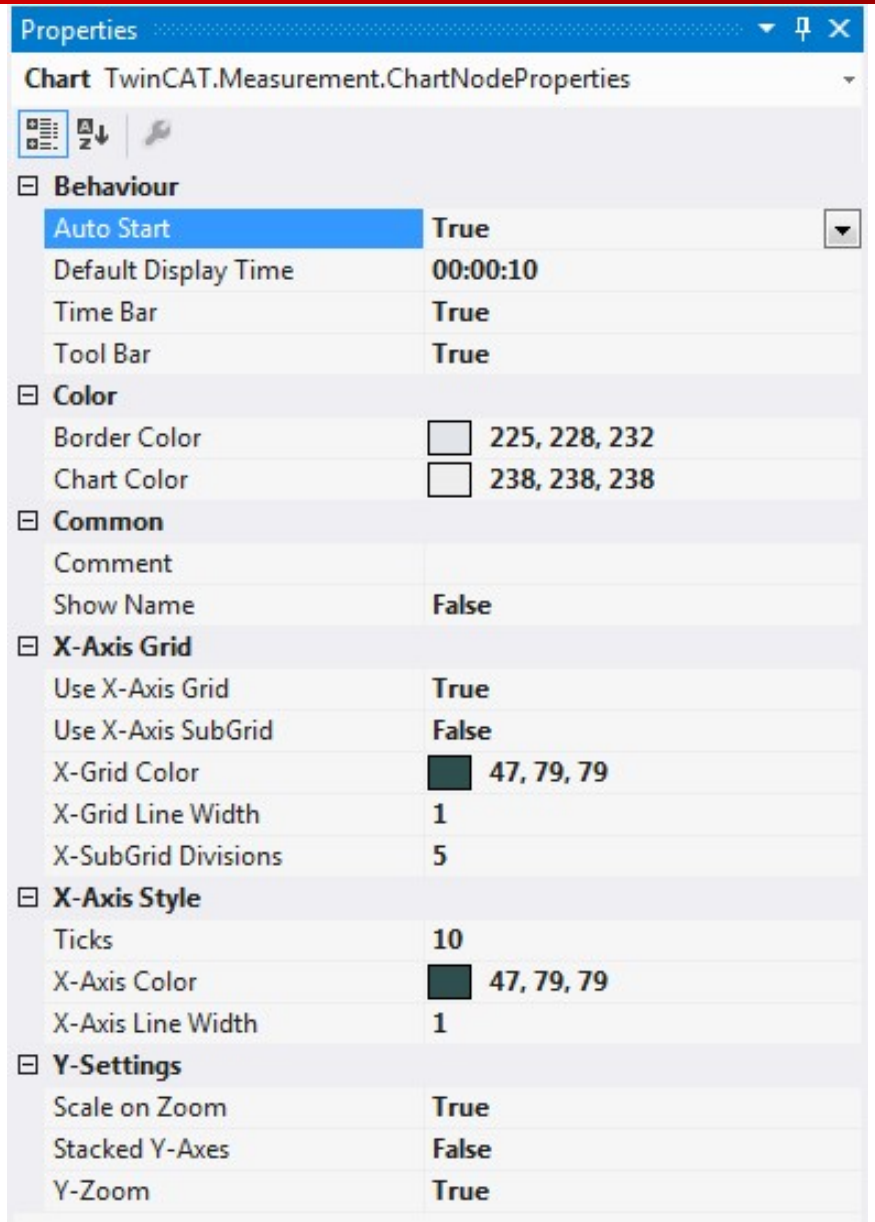


Properties

BECKHOFF

- Chart properties include:
  - **Auto Start** – Live display when recording is started
  - **Default Display Time** – Width of time to display on the chart
  - **Time Bar** – Displays the time values across the bottom of the chart

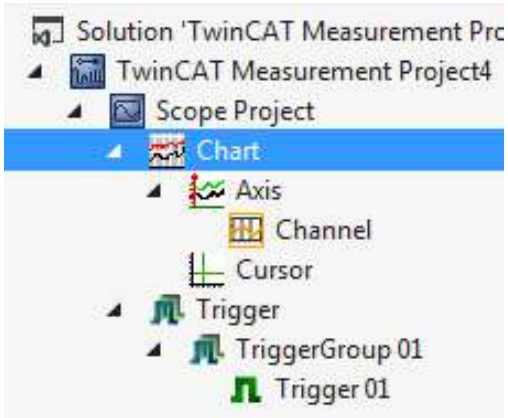


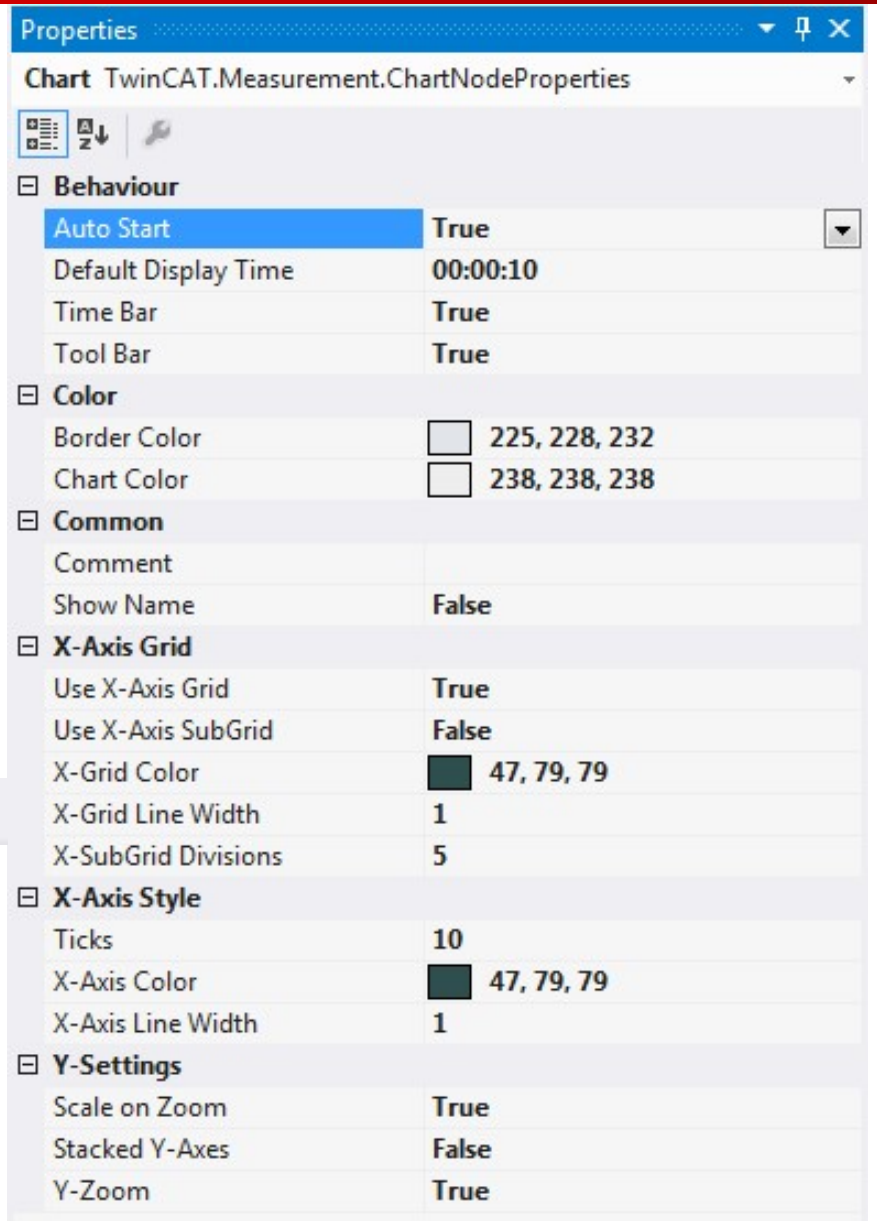


Properties

BECKHOFF

- Chart properties include:
  - **Tool Bar** – Toggles the chart tool bar which provides display controls for viewing specific time periods and zooming.
  - It is also possible to start and stop the display, which does not affect the recording of the data.

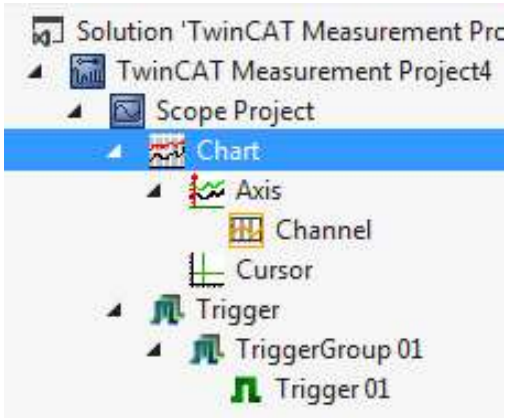


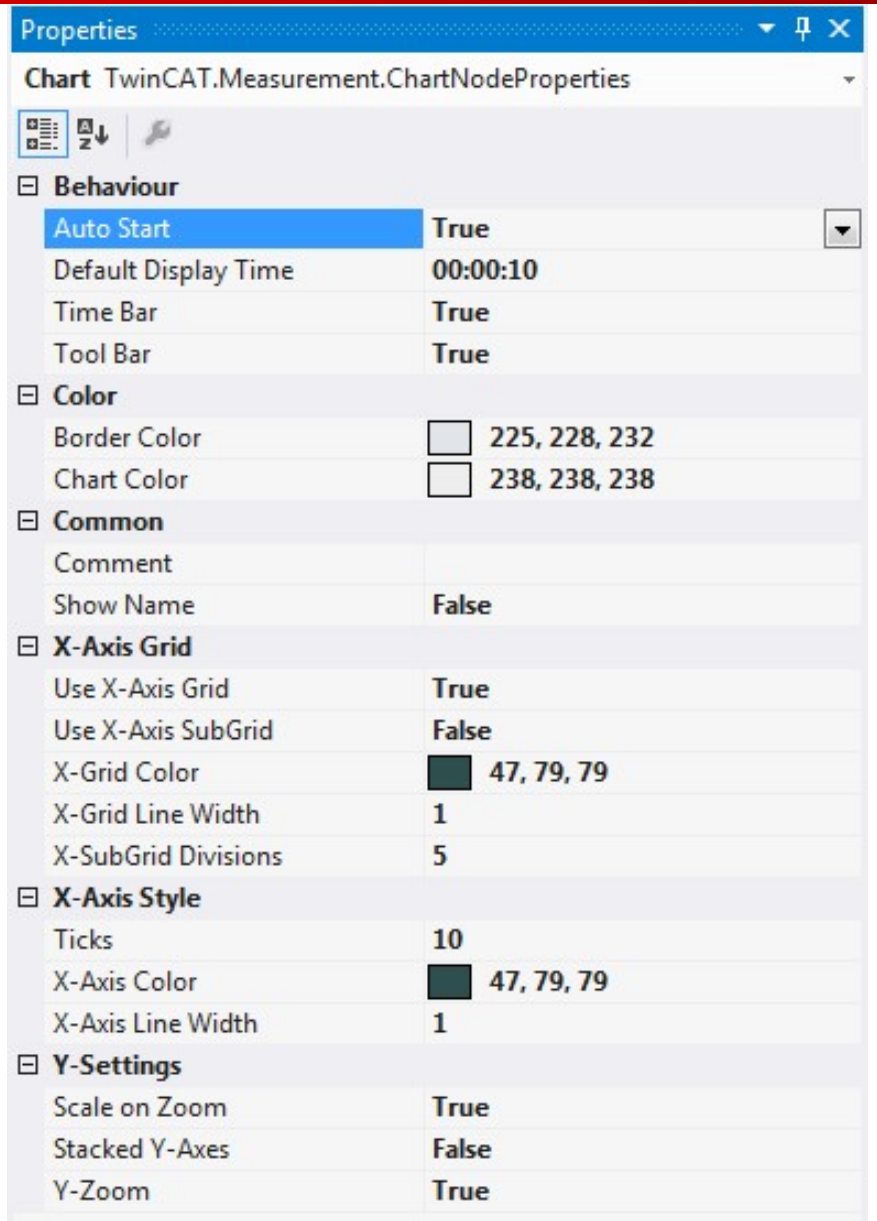


Properties

BECKHOFF

- Chart properties include:
  - **Border** and **Chart** colors selections can be made from either the color pallet tool or directly with an RGB value

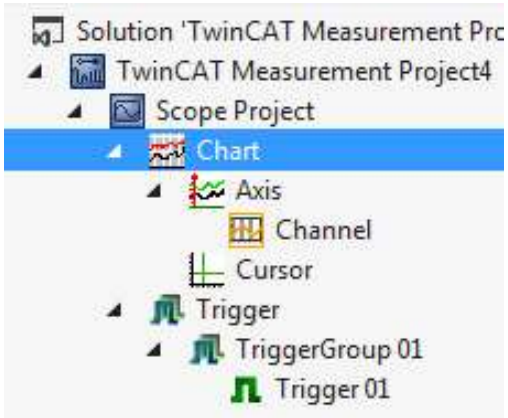


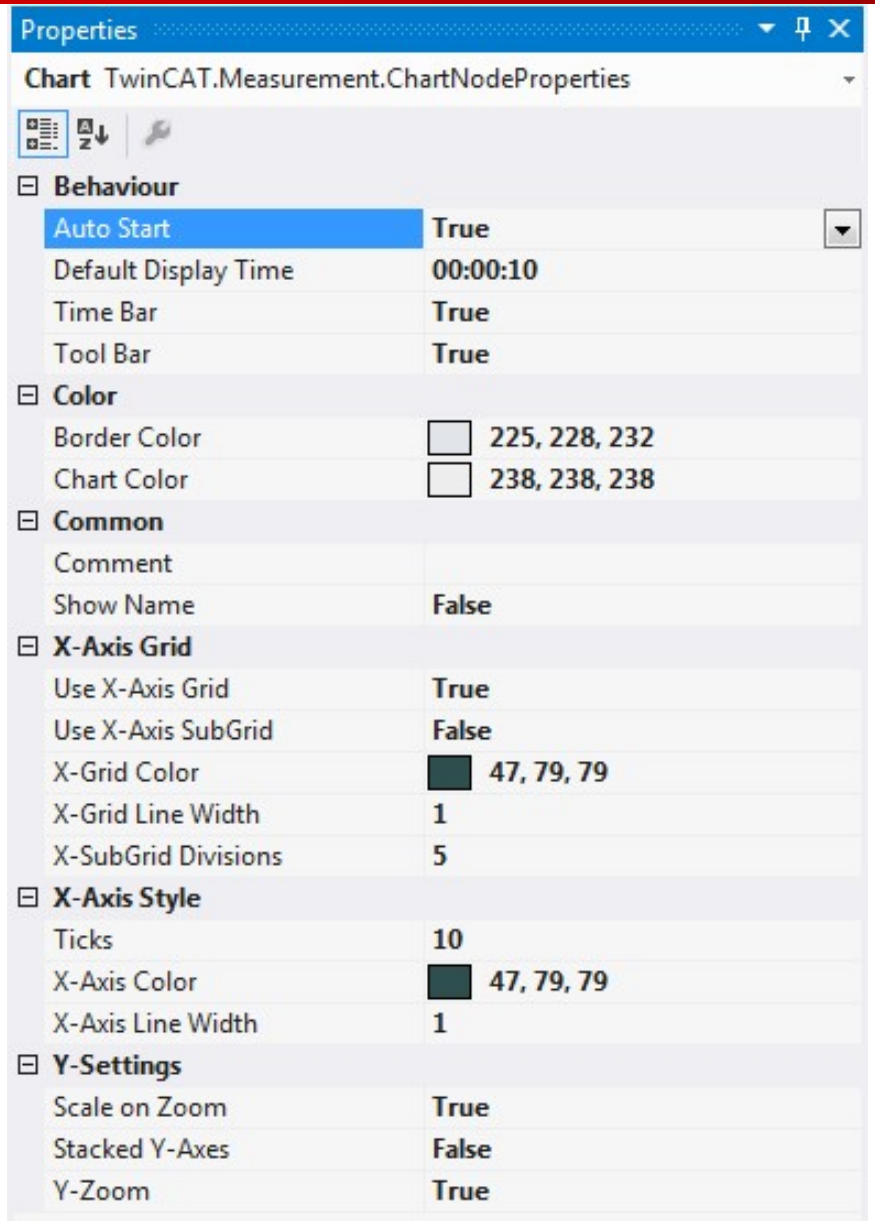


Properties

BECKHOFF

- Chart properties include:
  - **Use X-Axis Grid**: The X-subdivisions in the chart can be switched on or off here.
  - **Use X-Axis SubGrid**: Auxiliary lines for the finer X-subdivision of the main grid can be shown or hidden here.

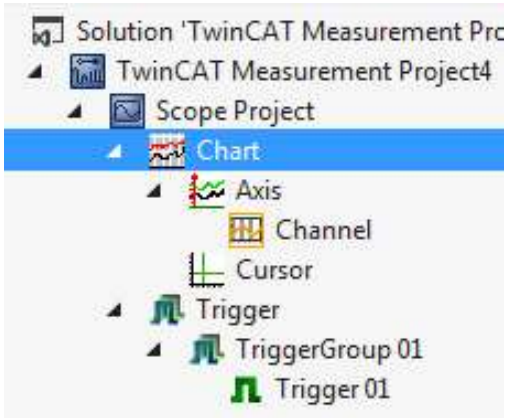


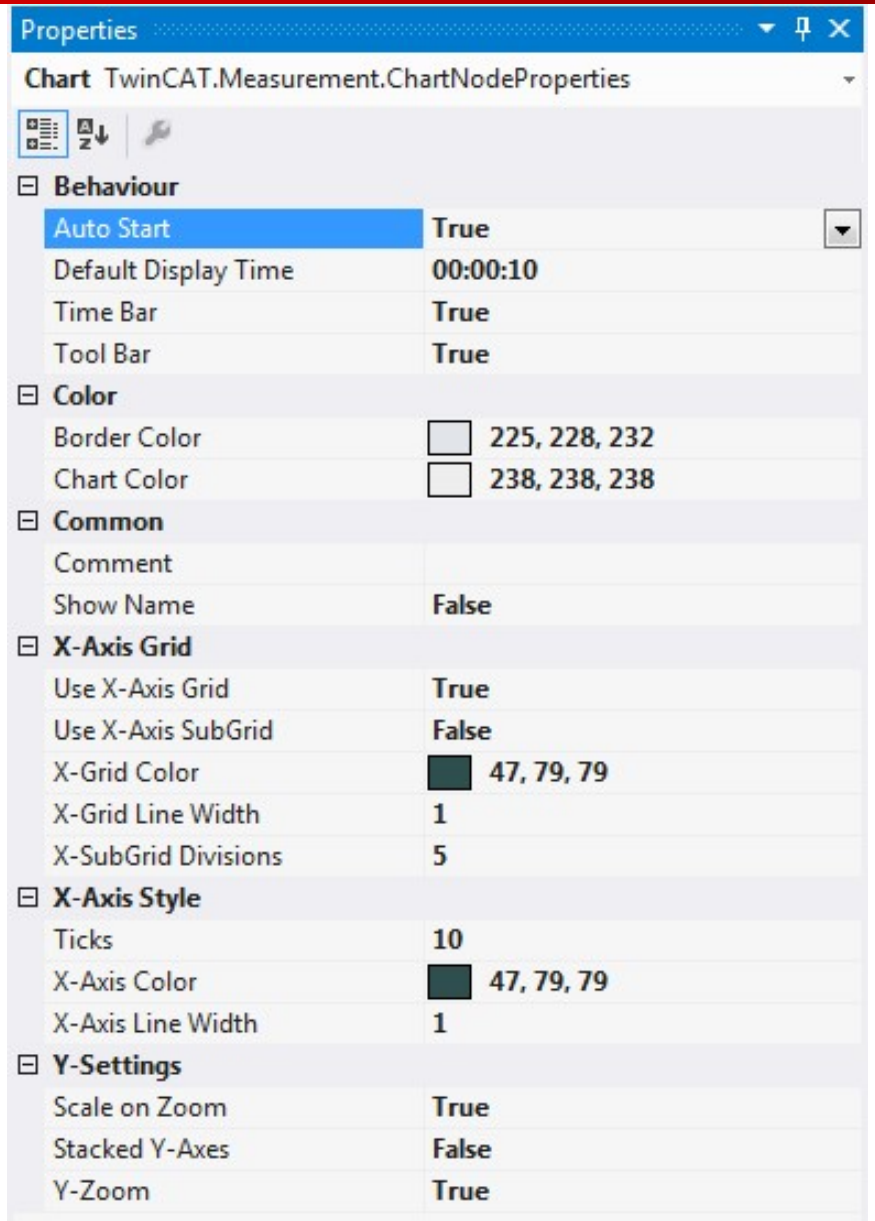


Properties

BECKHOFF

- Chart properties include:
  - **X-Grid Color**: The color of the grid.
  - **X-Grind Line Width**: Line width of the grid in pixels.
  - **X-SubGrid Divisions**: Number of areas into which the main grid is subdivided by auxiliary lines.

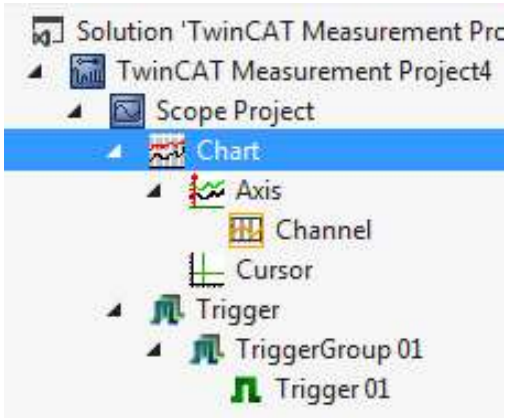


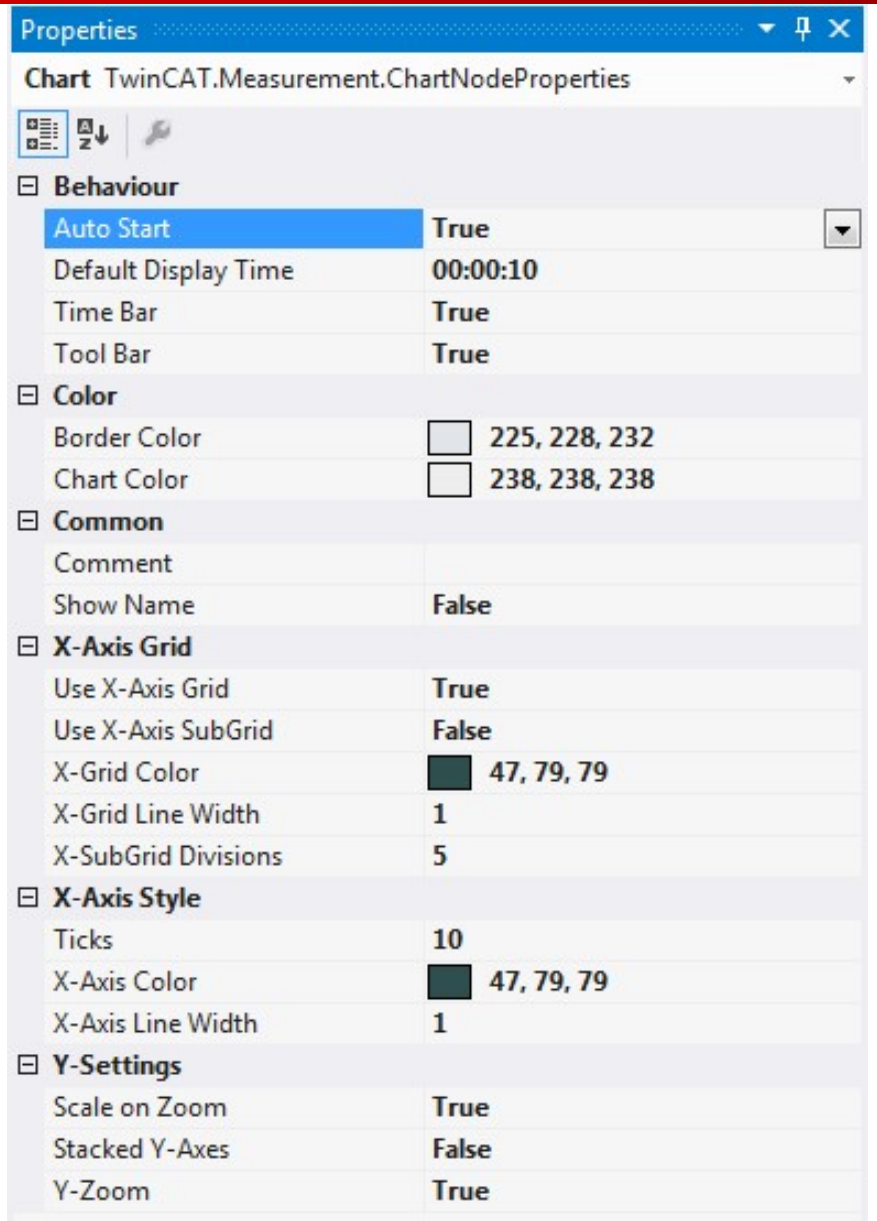


Properties

BECKHOFF

- Chart properties include:
  - **Ticks**: The number of subdivisions.
  - **X-Axis Color**: The color of the X-axis.
  - **X-Axis Line Width**: Line width of the axis in pixels.

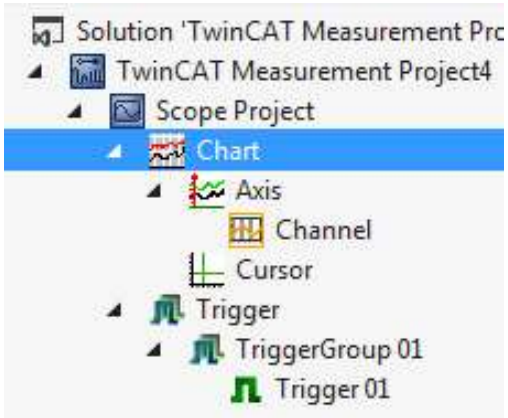


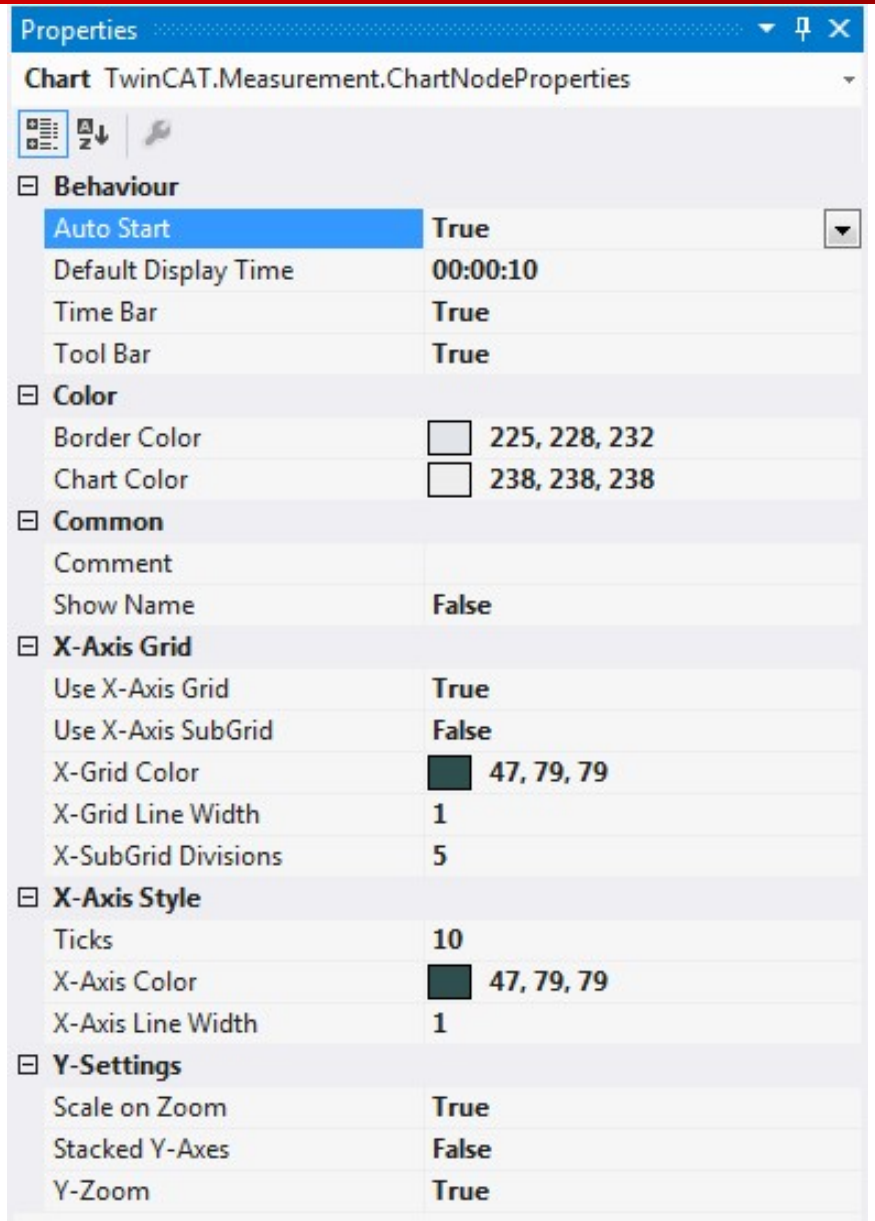


Properties

BECKHOFF

- Chart properties include:
  - **Scale on Zoom**: If this option is selected, the chart instructs all axes (X and Y) to perform auto scaling after a zoom or panning action. As a result the selected range may be expanded.

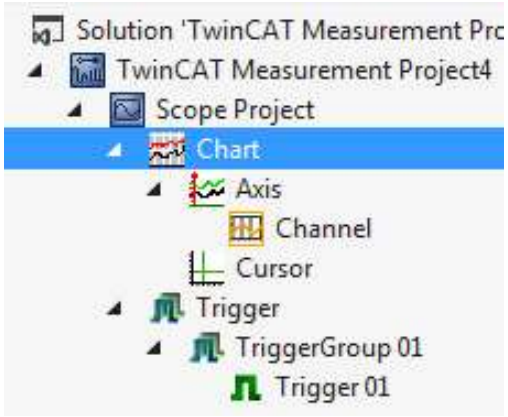


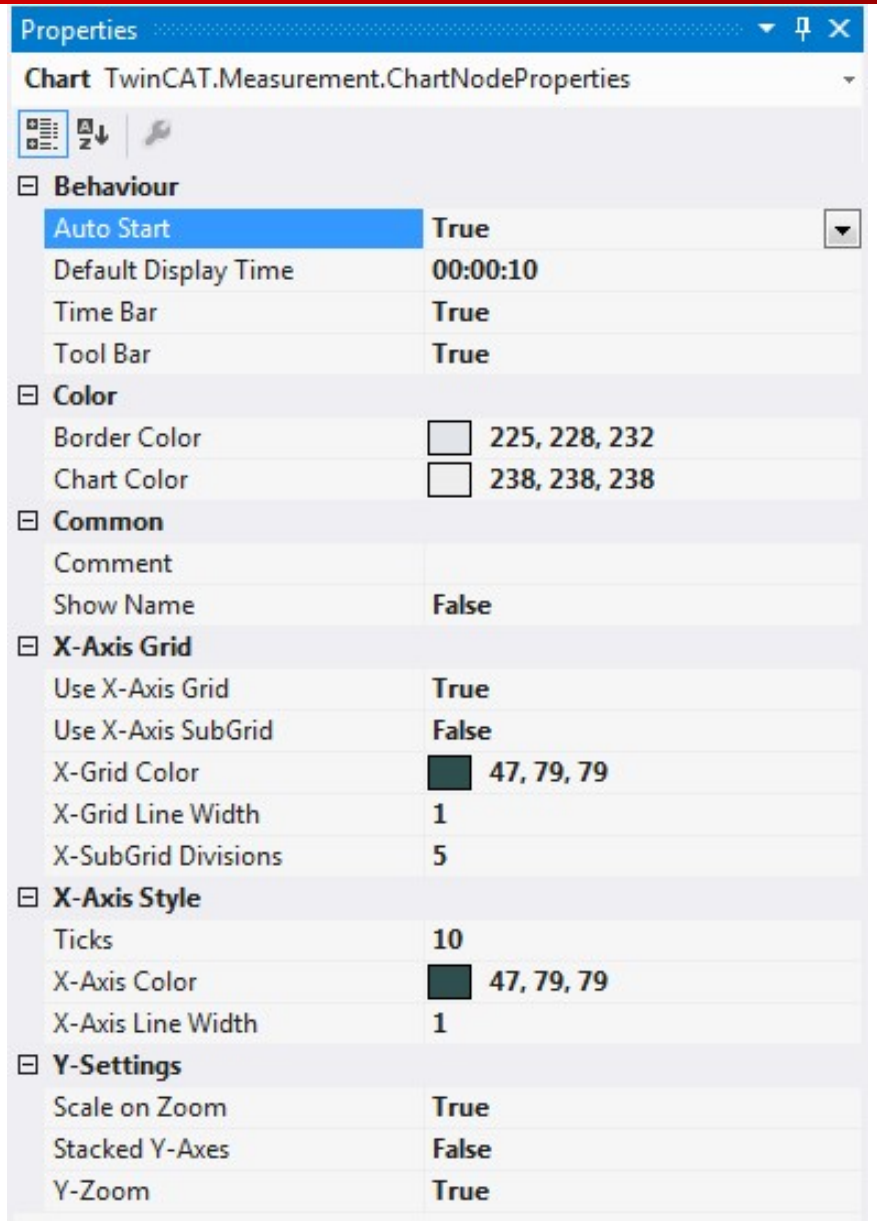


Properties

BECKHOFF

- Chart properties include:
  - **Stacked Y-axes**: With this setting you can select whether the axes of a chart are to be positioned next to each other in order to display the values of the added channels within the same area or whether the axes are to be displayed above one another in order to obtain a separate display area for each.

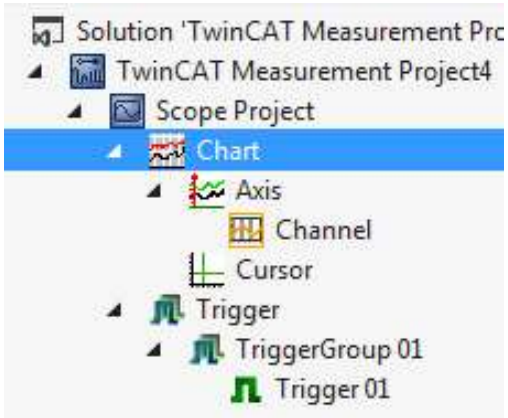


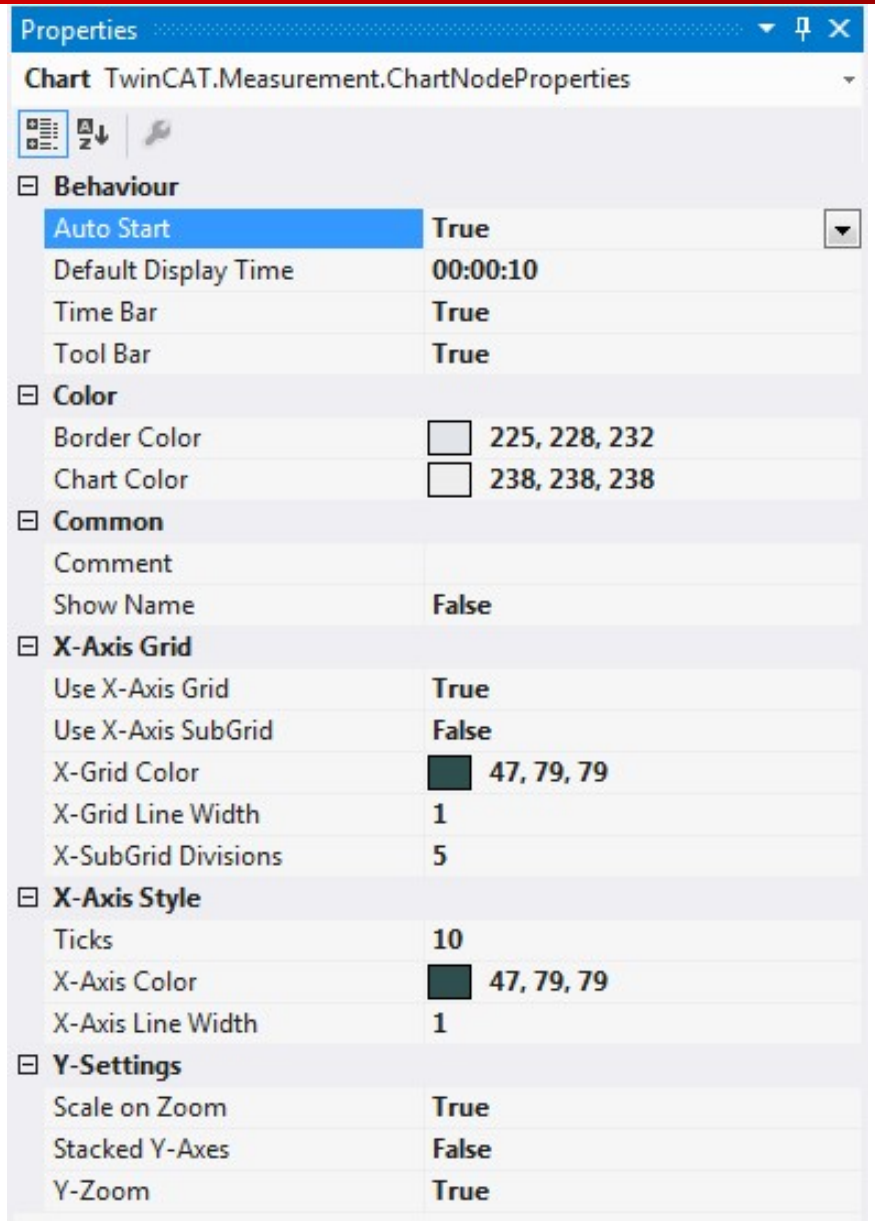


Properties

BECKHOFF

- Chart properties include:
  - **Y-Zoom**: The behavior of a chart when zooming can be set via the Y-Zoom. If the option is set, you can navigate in the data of a chart in the Y-direction as well. This includes both zooming and panning (shifting the display with the mouse).

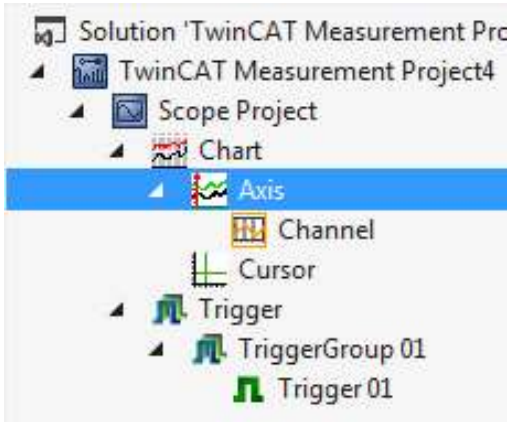


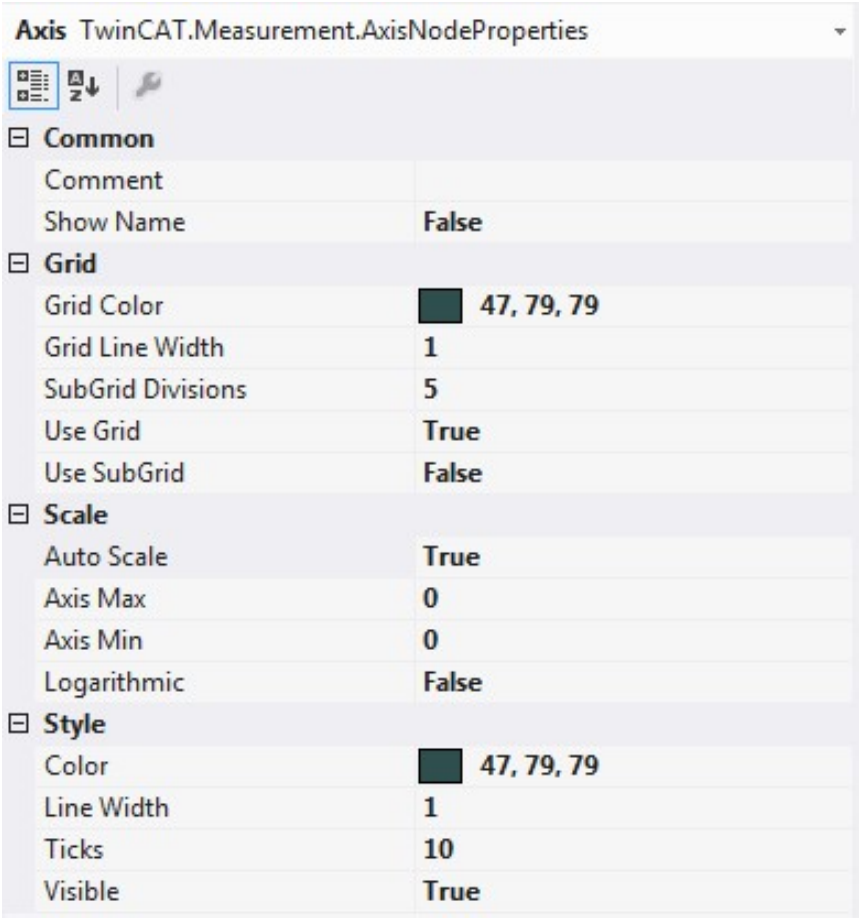


Properties

BECKHOFF

- Axis properties include:
  - **Comment**: A free comment can be saved here.
  - **Show Name**: Defines whether the name of the chart is shown in the graph.

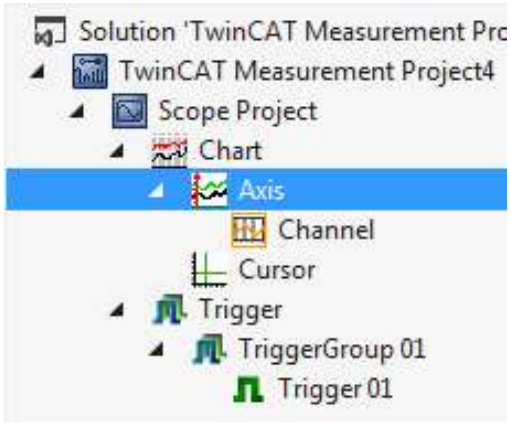


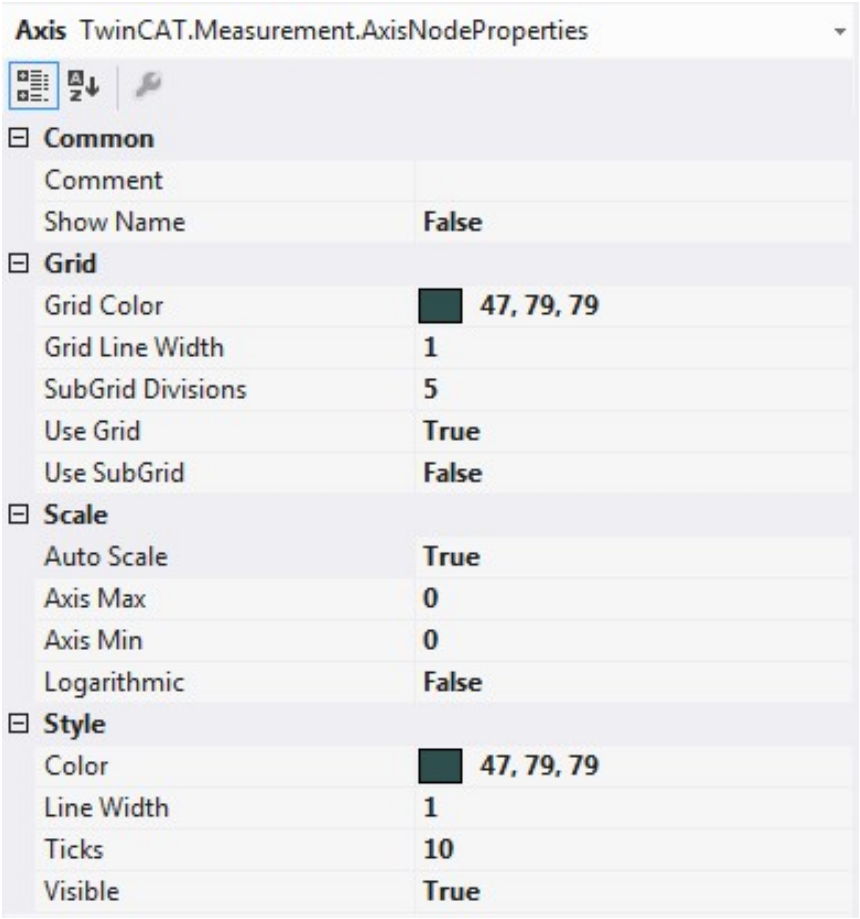


Properties

BECKHOFF

- Axis properties include:
  - **Grid Color**: The color of the grid.
  - **Grid Line Width**: Line width of the grid in pixels.

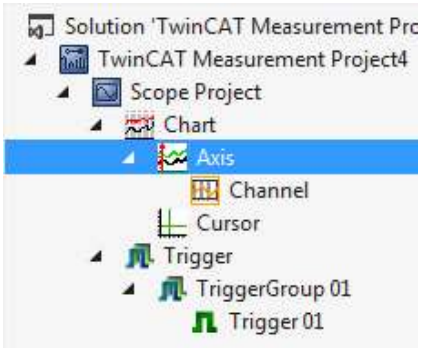


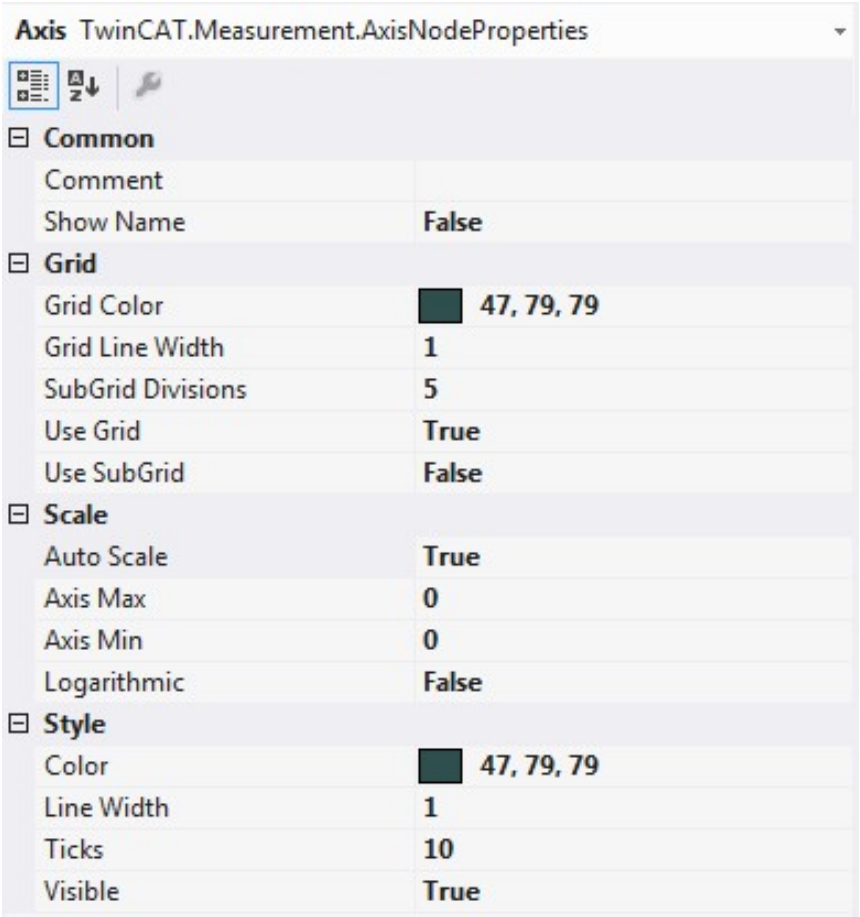


Properties

BECKHOFF

- Axis properties include:
  - **SubGrid Divisions**: Number of areas into which the main grid is subdivided by auxiliary lines.
    In the case of logarithmic scaling the auxiliary lines for subdivision are shown only in the set number if the range of values per tick is precisely one decade. Otherwise the displayed auxiliary line shows the decades not displayed in the main grid.

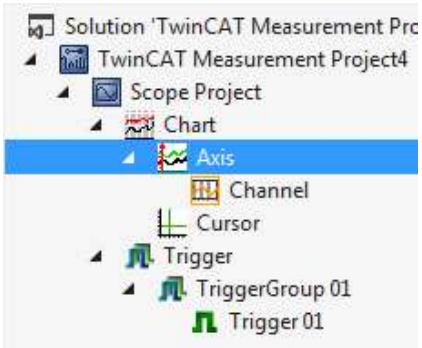


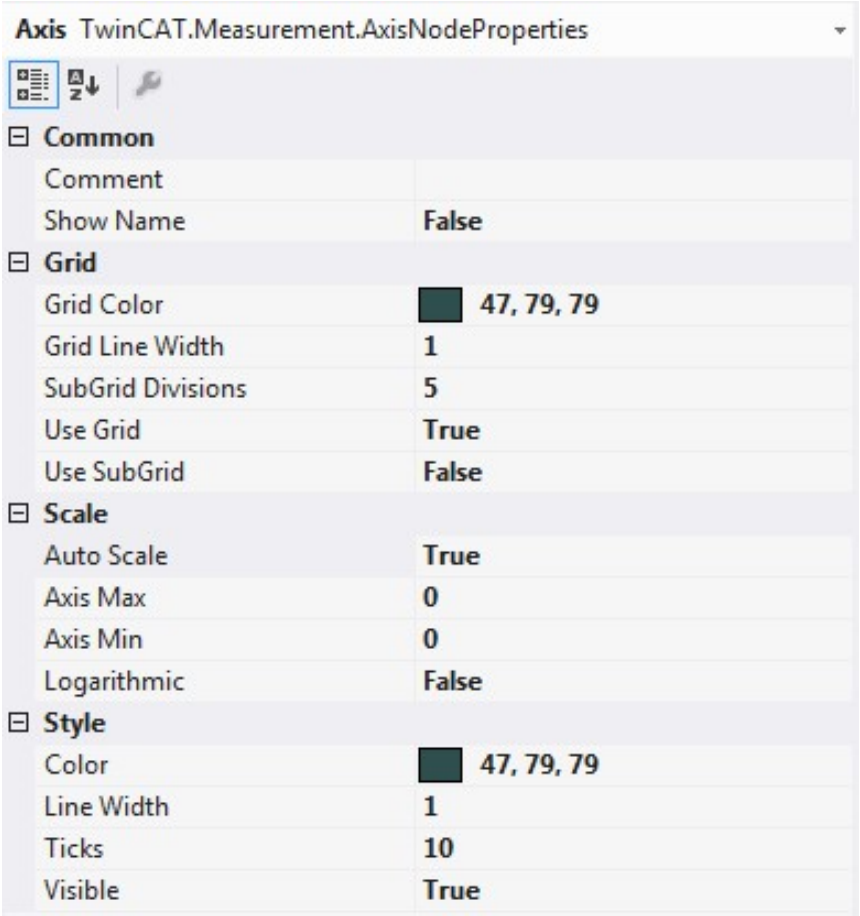


Properties

BECKHOFF

- Axis properties include:
  - **Use Grid**: The Y-subdivisions of the axis can be shown or hidden here.
  - **Use SubGrid**: Auxiliary lines for the finer Y-subdivision of the main grid can be shown or hidden here. Auxiliary lines have no axis labelling.

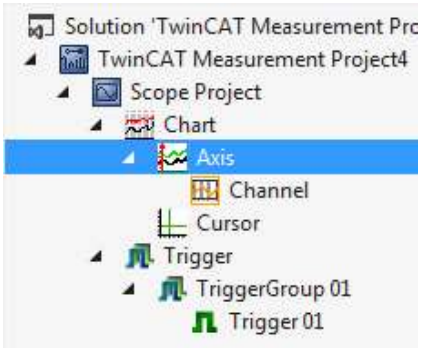


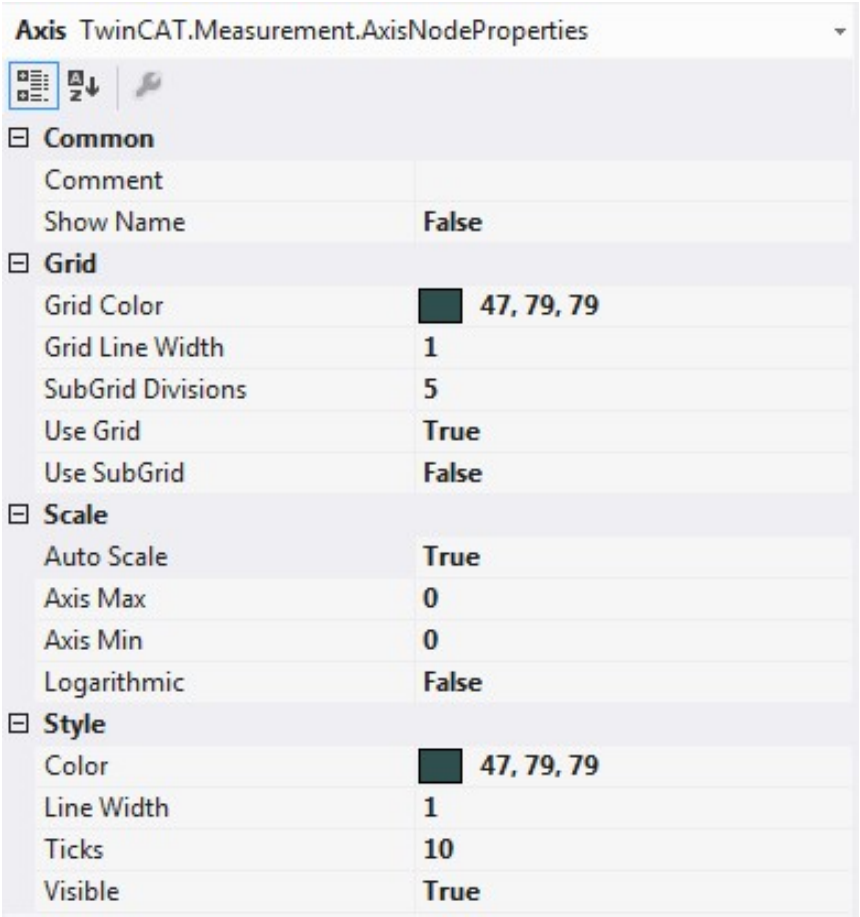


Properties

BECKHOFF

- Axis properties include:
  - **Auto Scale**: If Auto Scale is active, each axis is scaled such that the last-known minimum and maximum of all connected channels lie within the display range.

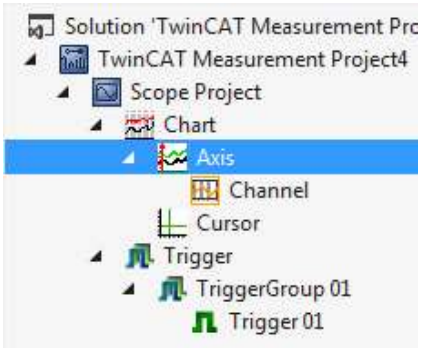


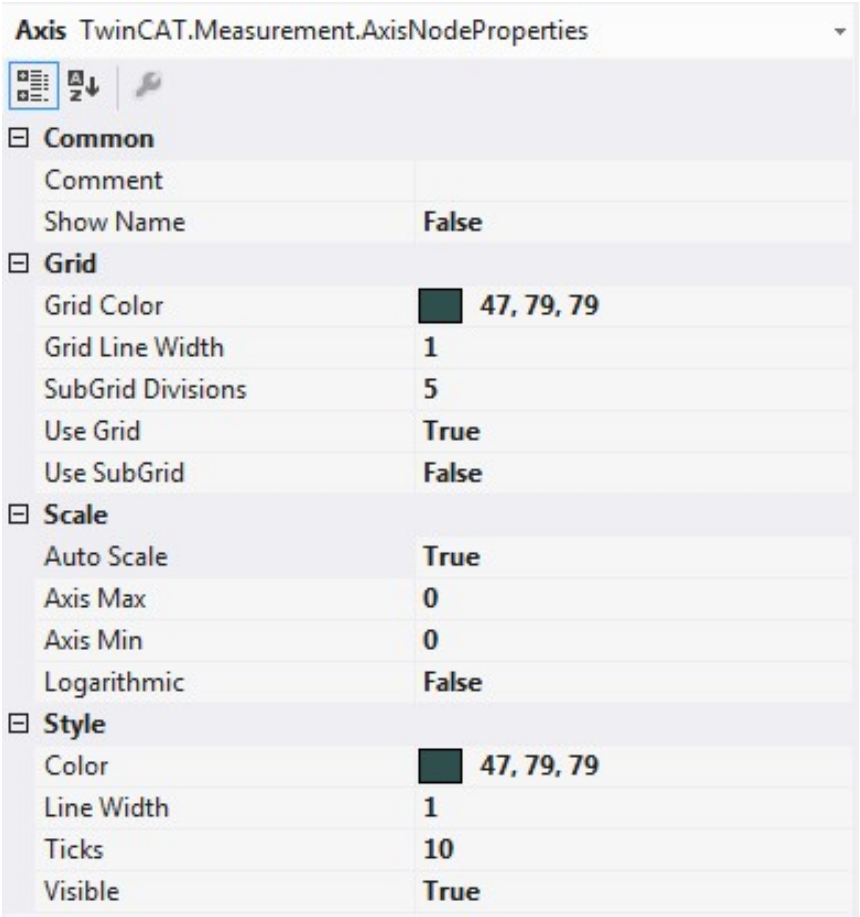


Properties

BECKHOFF

- Axis properties include:
  - **Axis Max**: If Auto Scale is inactive, the maximum value can be edited directly.
  - **Axis Min**: If Auto Scale is inactive, the minimum value can be edited directly.
  - **Logarithmic**: Switches between logarithmic and linear scaling of the axes.

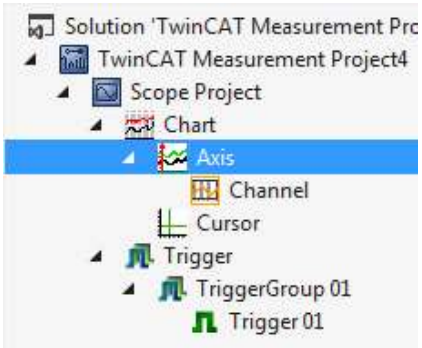


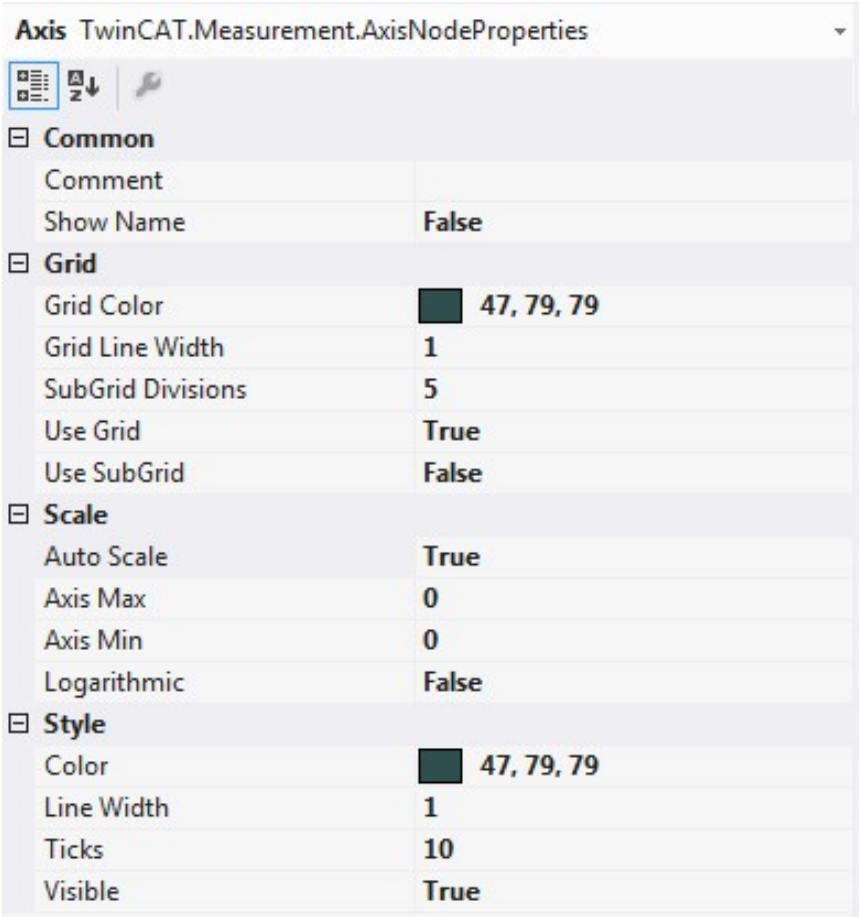


Properties

BECKHOFF

- Axis properties include:
  - **Color**: The color of the axis.
  - **Line Width**: The line width in pixels.

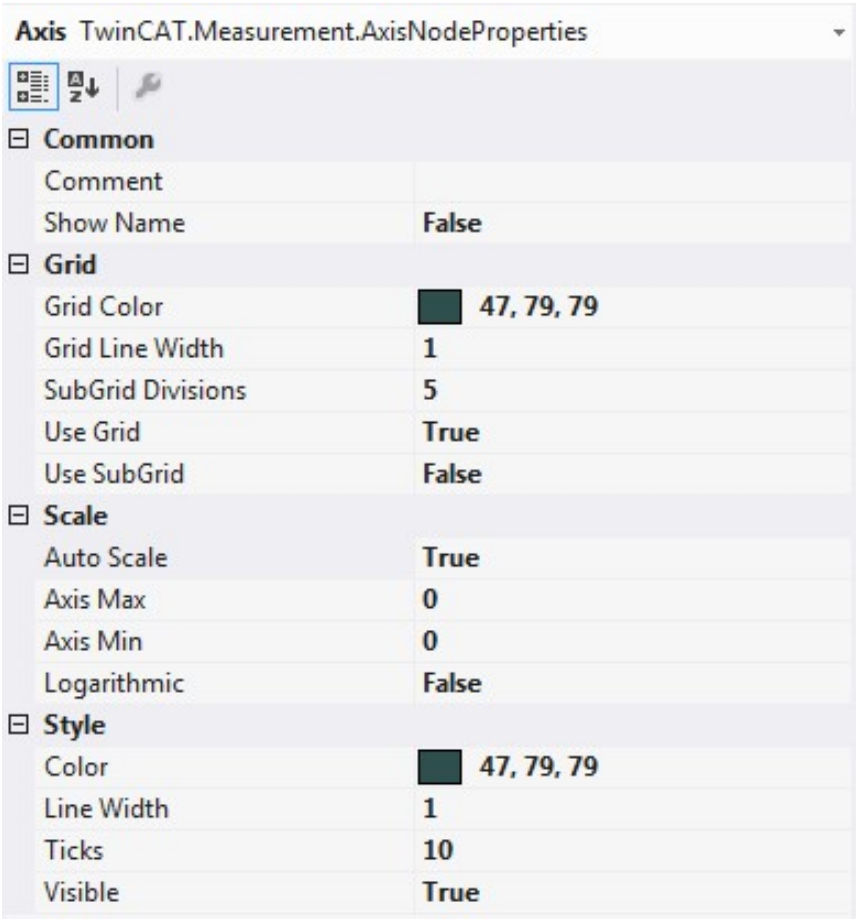


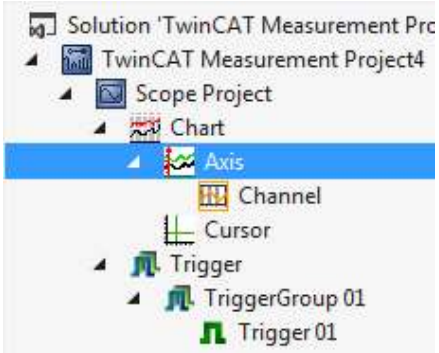


Properties

BECKHOFF

- Axis properties include:
  - **Ticks**: Maximum number of subdivisions. If there is not enough space for the selected number of ticks, these are automatically reduced in the chart.
    In the case of logarithmic scaling the number of ticks depends on the displayed range of values and can thus deviate from the settings.
  - **Visible**: Specifies whether the axis is shown or hidden in the chart.

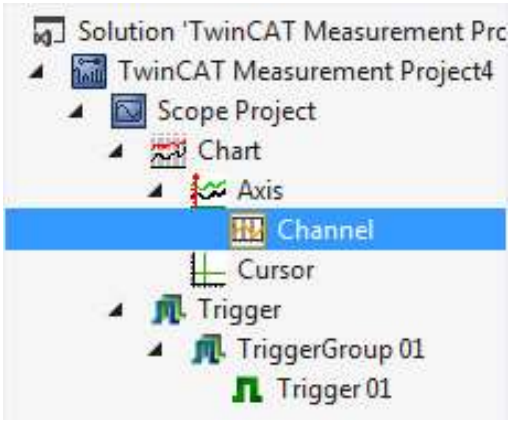


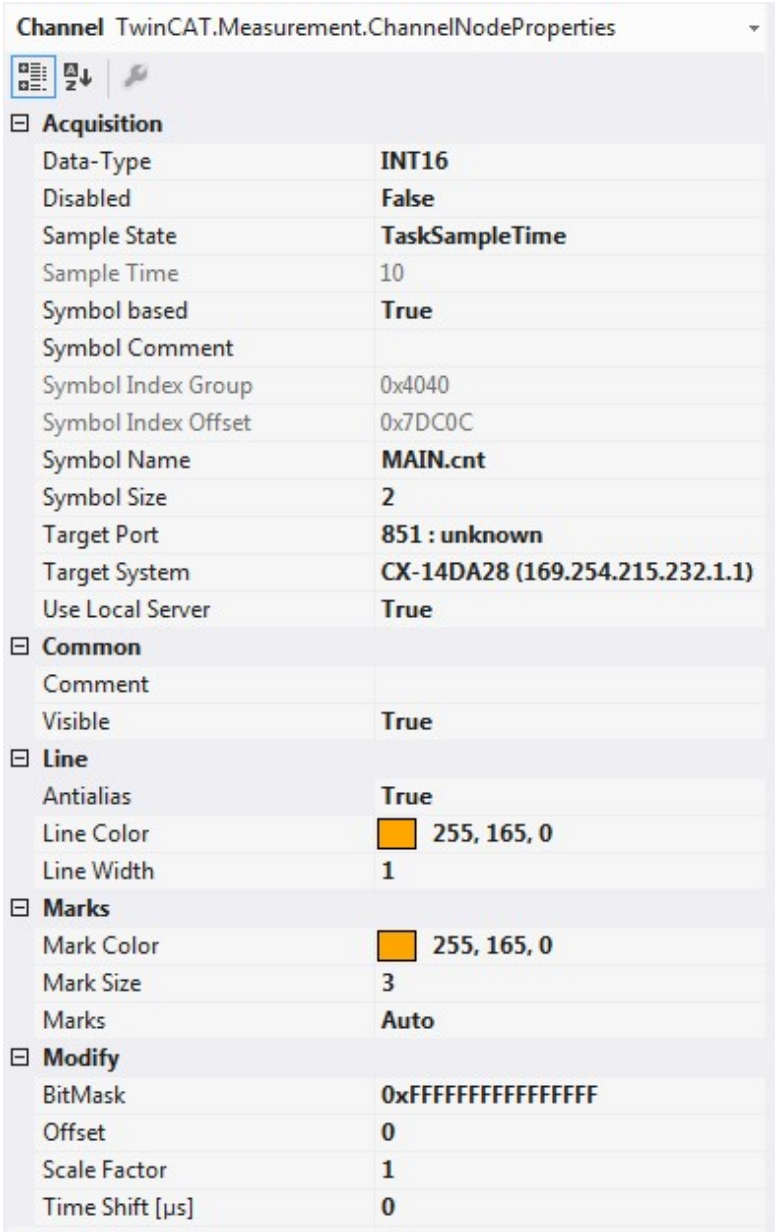


Properties

BECKHOFF

- Channel properties include:
  - **Array Length**: If the connected symbol is an array type, then the length of the array is displayed here.
  - **Data-Type**: The Data Type field sets the data type of the signal. The Symbol Size field is filled in accordingly.

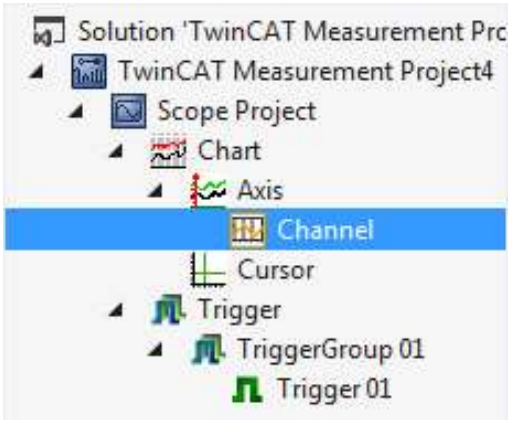


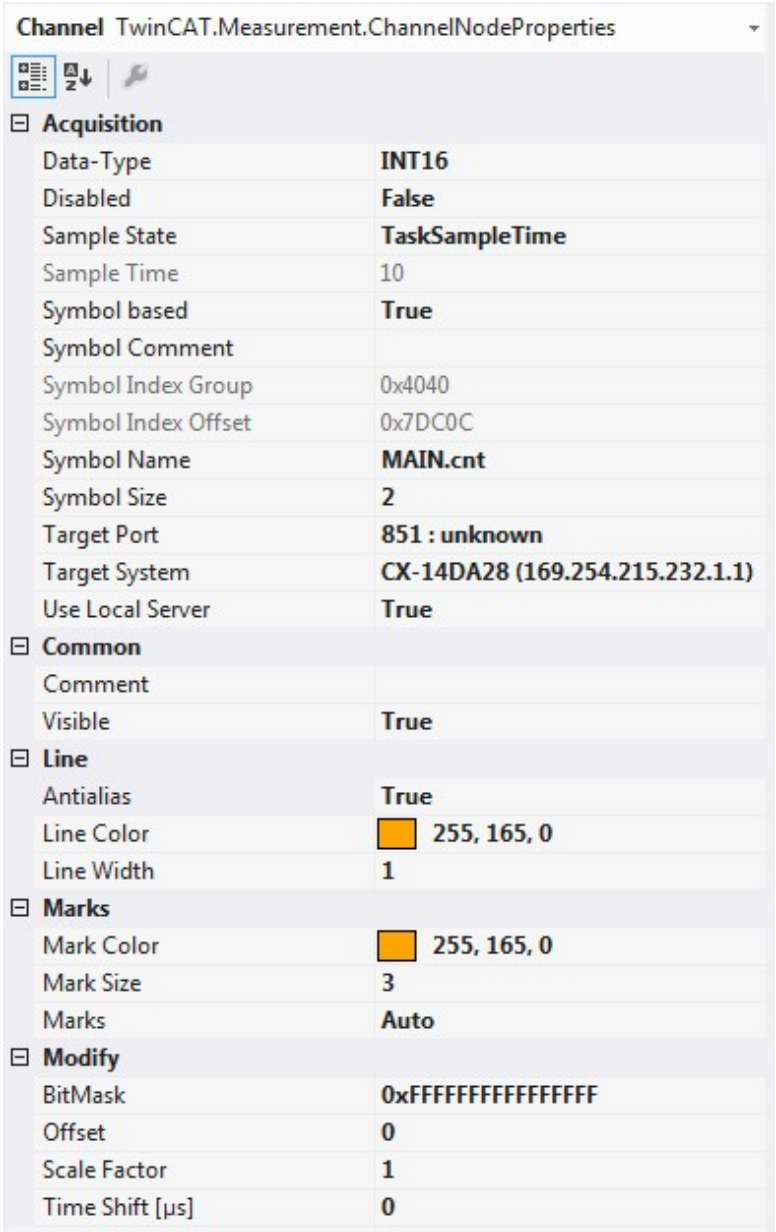


Properties

BECKHOFF

- Channel properties include:
  - **Disabled**: The channel can be deactivated in order to prevent it being recorded. However, it is retained when saving the configuration.

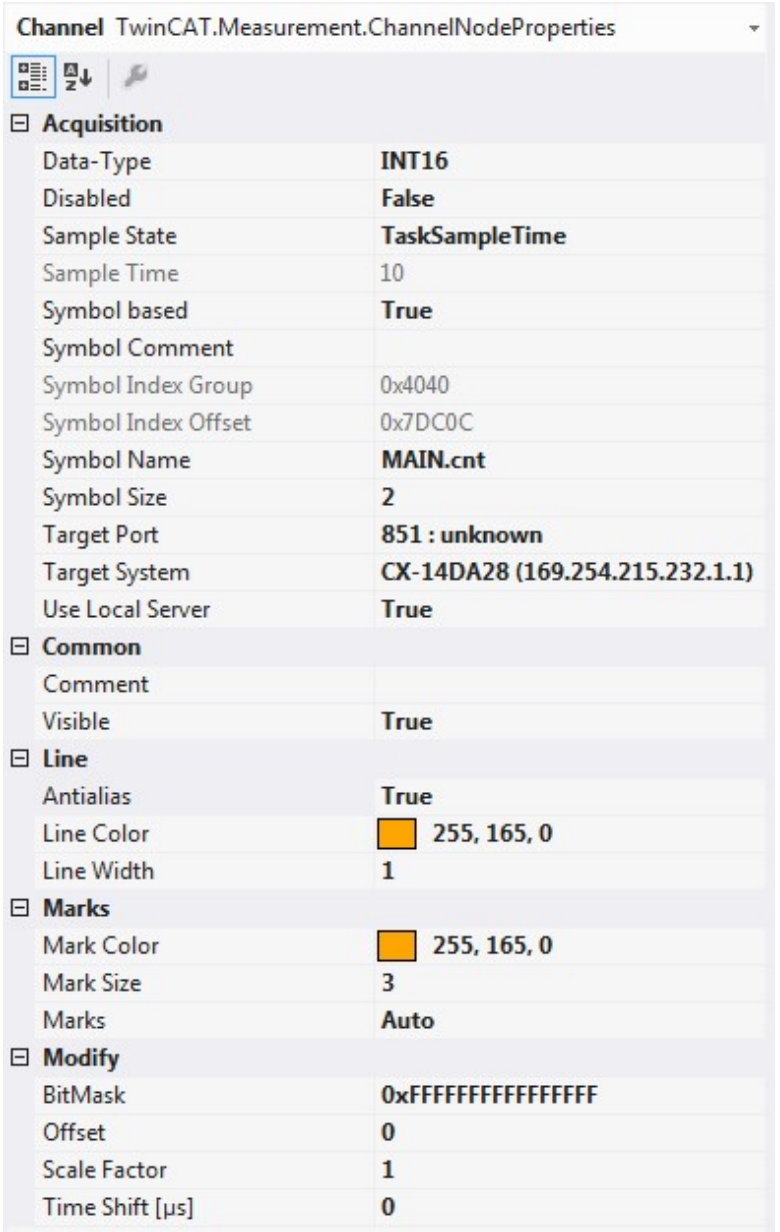




Properties

BECKHOFF

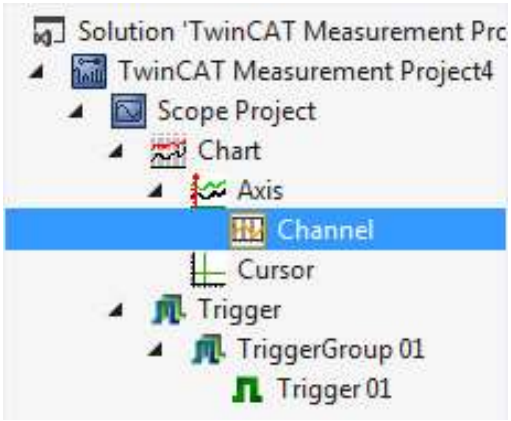
- Channel properties include:
  - **Sample State**: The signal to be recorded can be sampled at the most with the speed of the task to which it is connected, (TaskSampleTime). However, a free (larger) sample rate can also be set (Free Sample). The maximum provided for here is 5000 ms.
  - **Sample Time**: If Free Sample is selected the sample time can be entered here.

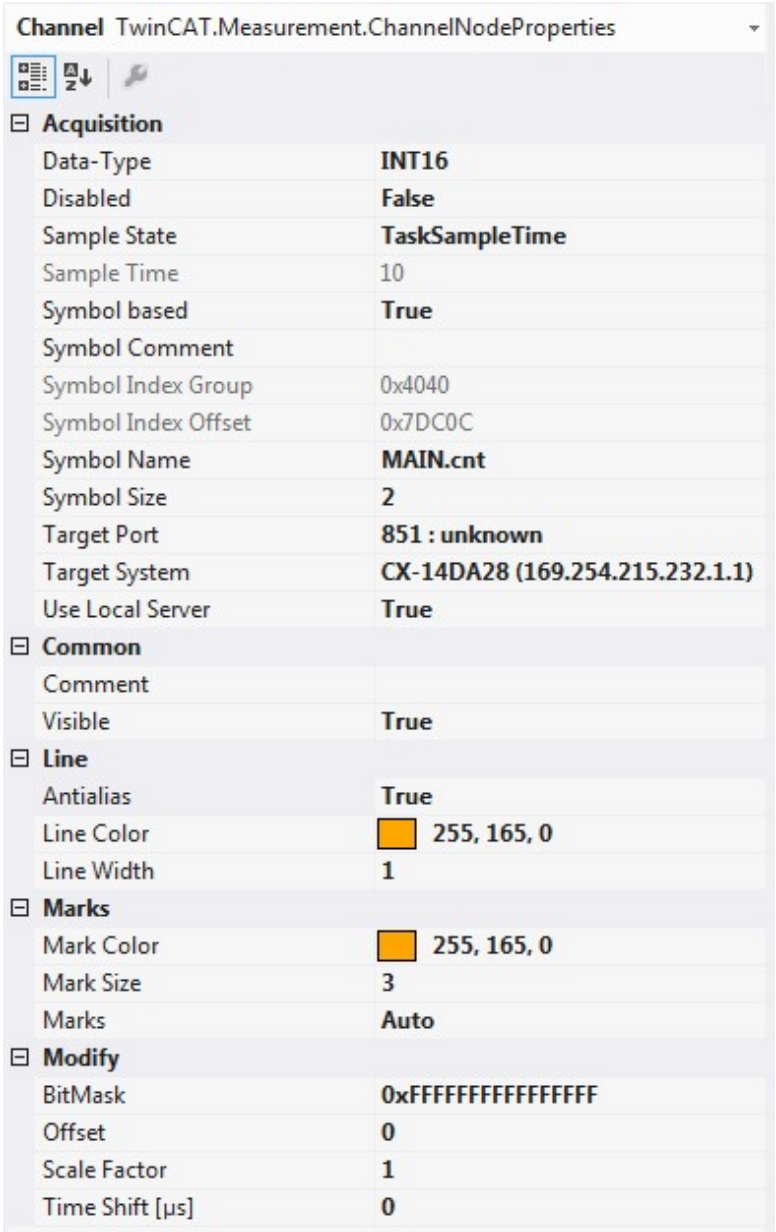


Properties

BECKHOFF

- Channel properties include:
  - **Symbol based**: Via the "symbol based" option you can set whether a channel is to be created via its symbol name or with free acquisition.

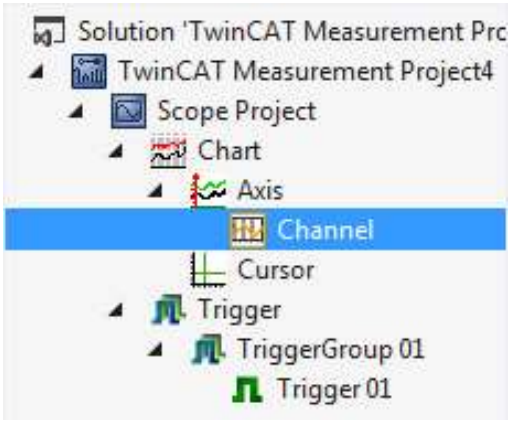


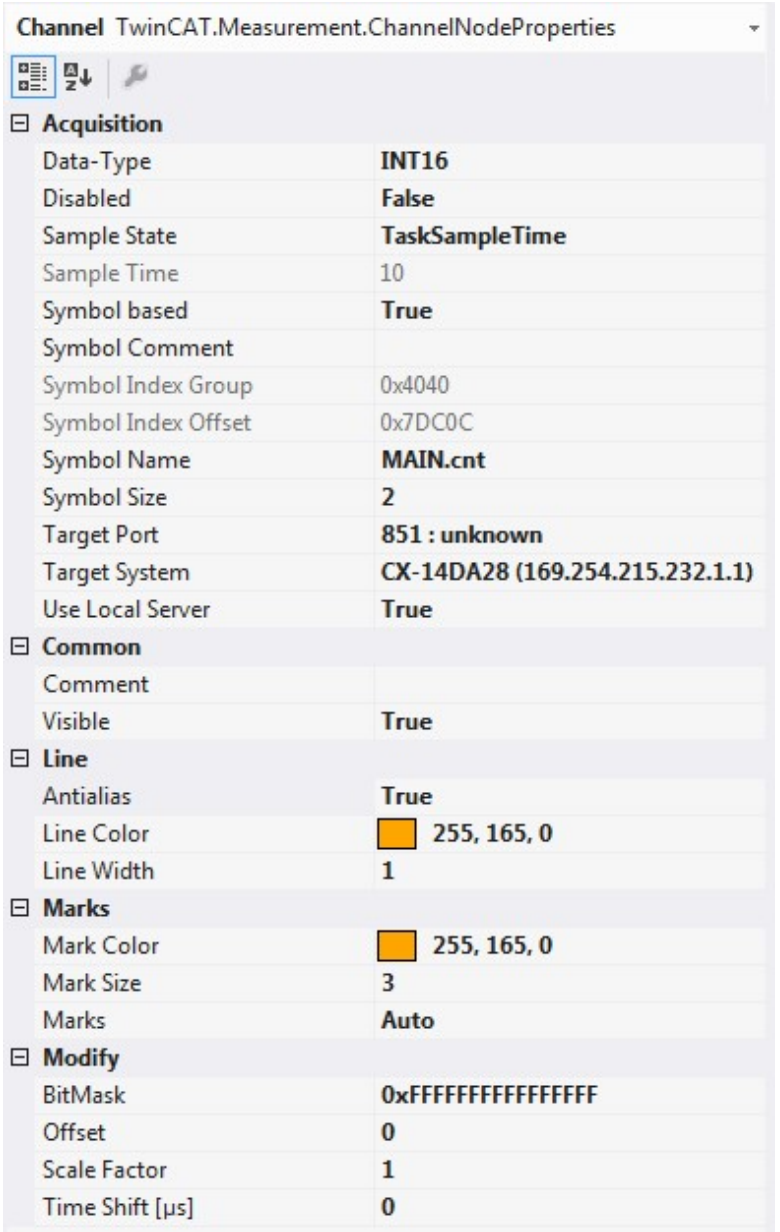


Properties

BECKHOFF

- Channel properties include:
  - **Symbol Index Group / Offset**: The Index Group and the Index Offset clearly define the position of the signal in the task. They can be edited by adding the prefix "0x" in hexadecimal notation or without a prefix in decimal notation. The display is always in hexadecimal.

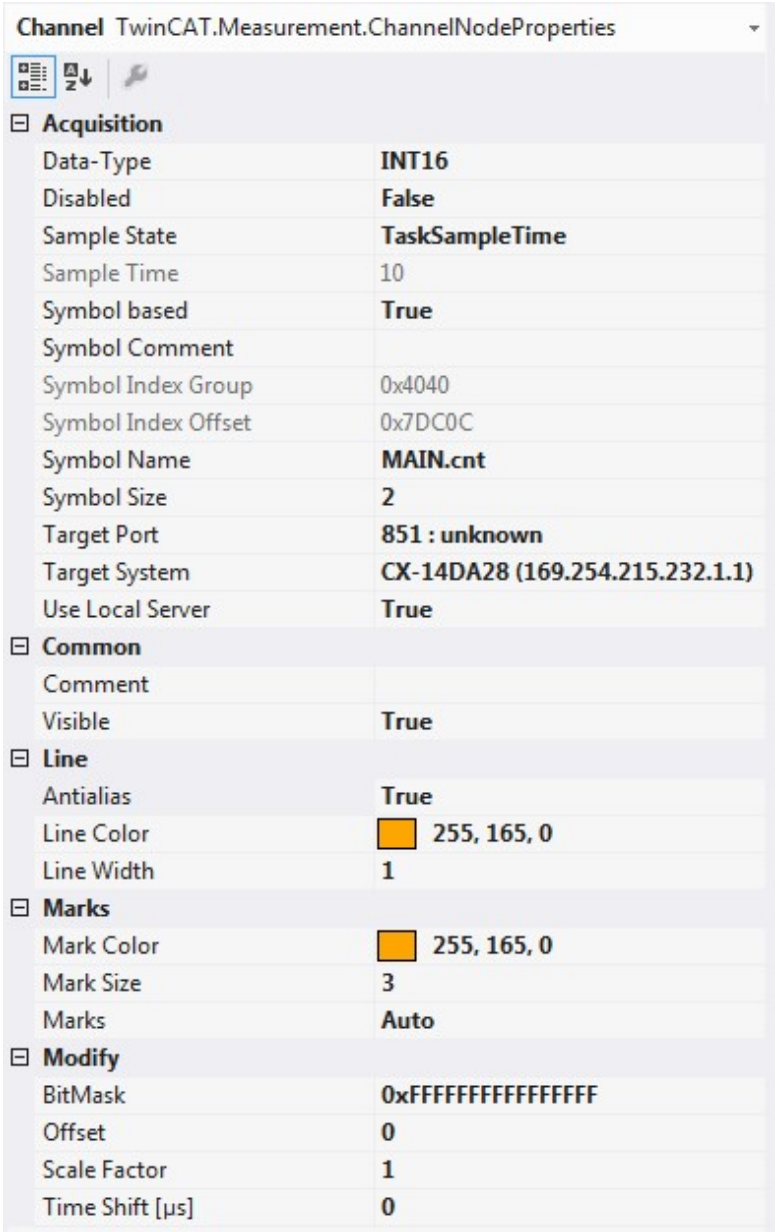




Properties

BECKHOFF

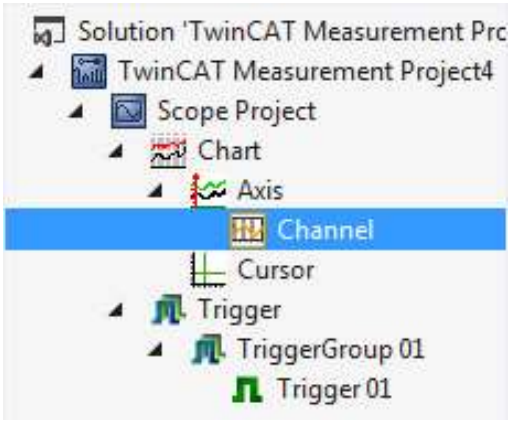
- Channel properties include:
  - **Symbol Name**: If a symbol name is assigned for a signal, this can be entered here. If "Symbol based" is inactive, the connection parameters can be entered manually.
  - **Symbol Size**: Shows the size of the variables in bytes. It depends on the data type and therefore cannot be edited.

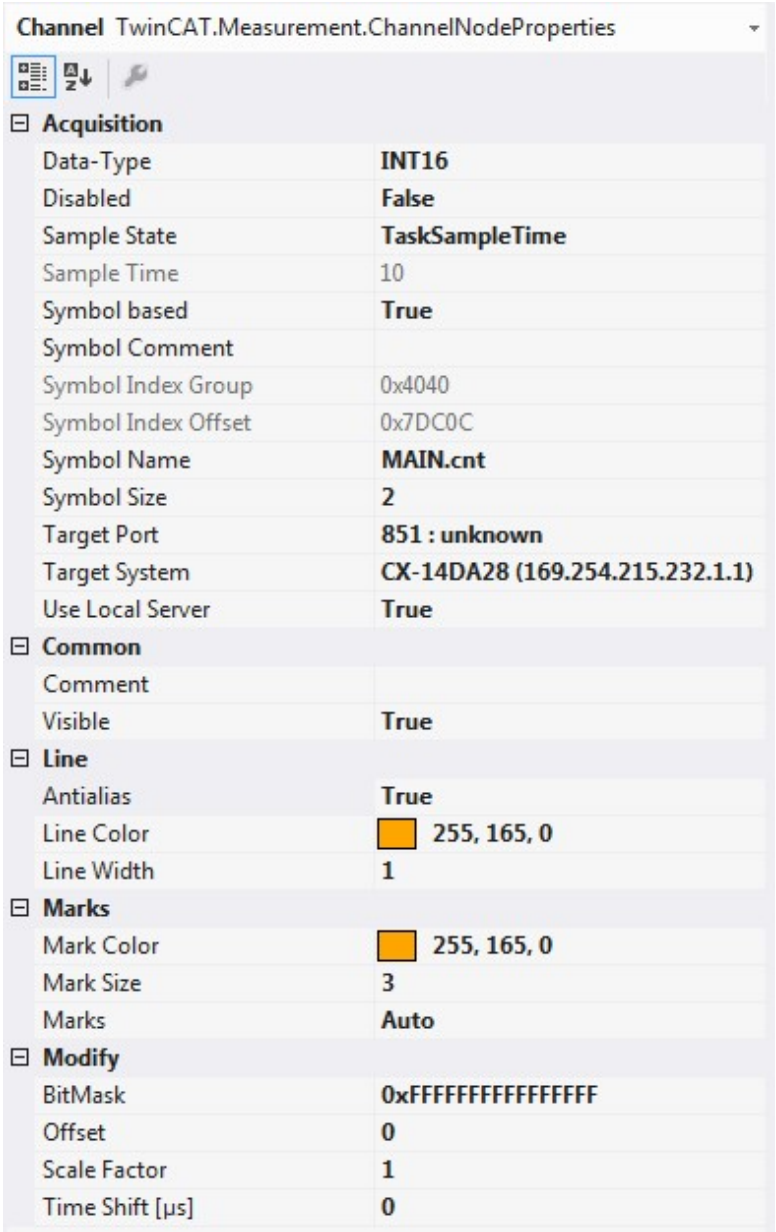


Properties

BECKHOFF

- Channel properties include:
  - **Target Port**: The port of the task to be connected.
  - **Target System**: The routes entered in the System Manager can be selected from the target system list.

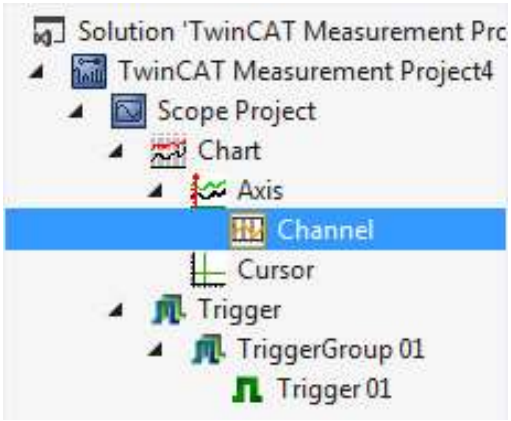


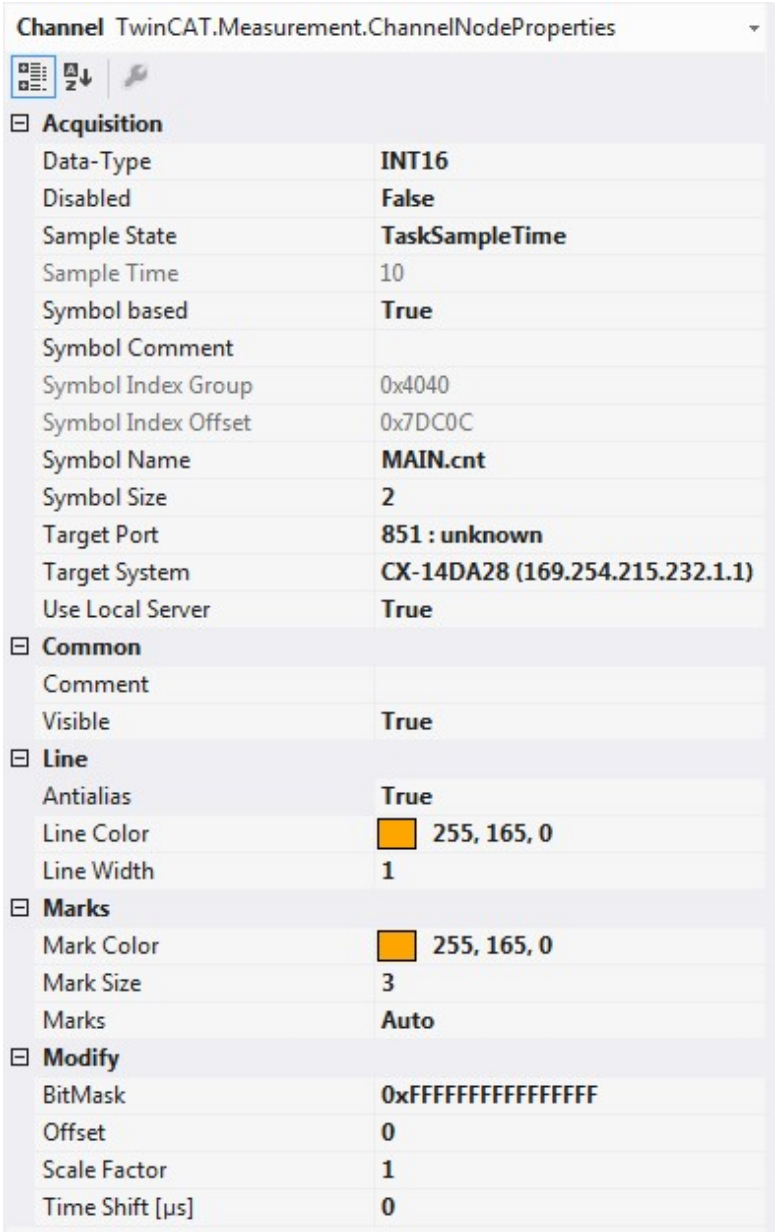


Properties

BECKHOFF

- Channel properties include:
  - **Use Local Server**: The "Use local server" option enables data to be recorded from systems on which no Scope Server is installed. In this case the local server takes over the task of the remote server.

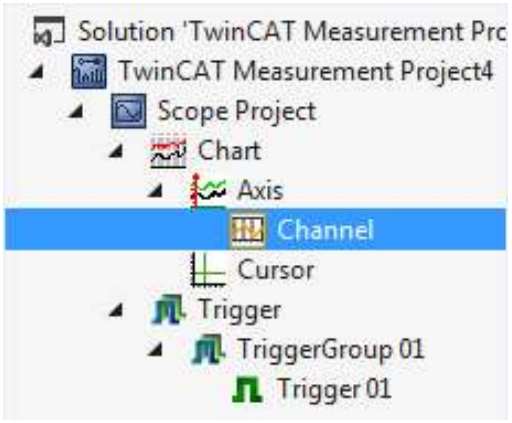


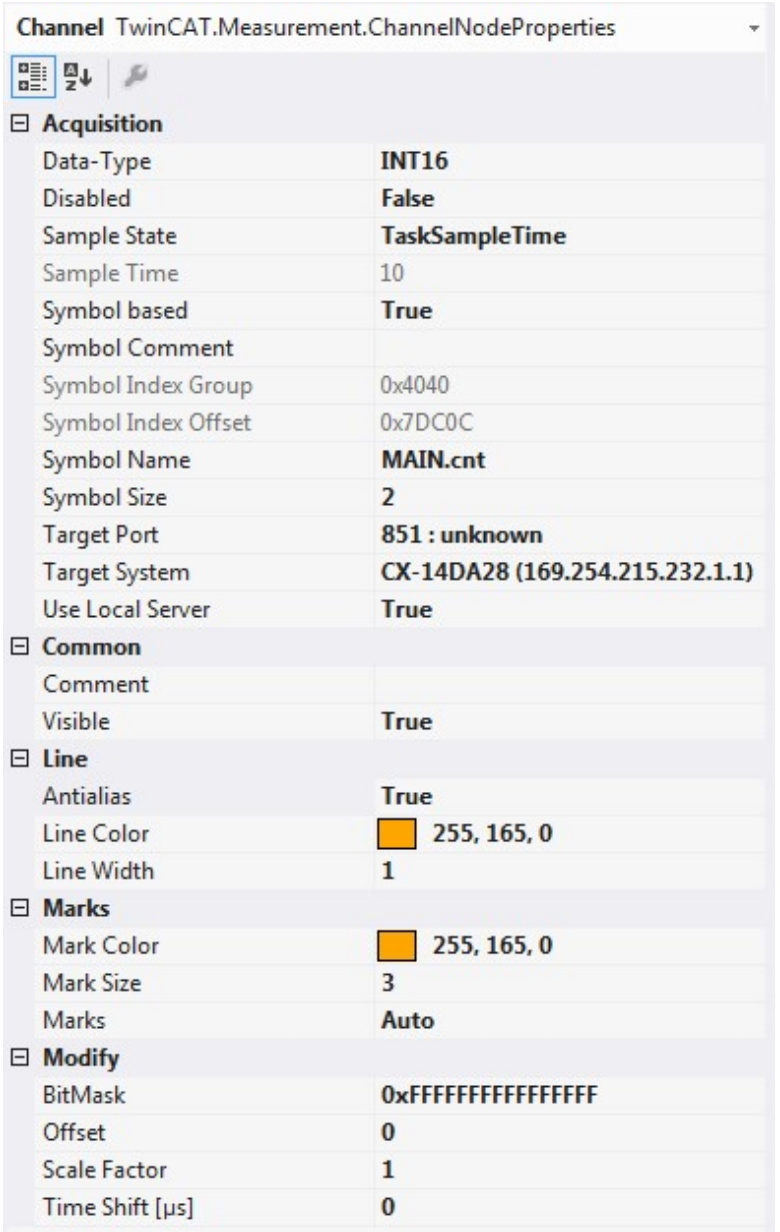


Properties

BECKHOFF

- Channel properties include:
  - **Comment**: A free comment can be saved here. If applicable the comment will be adopted from the connected ADS symbol.
  - **Visible**: Here you can set whether the channel should be displayed in the chart.

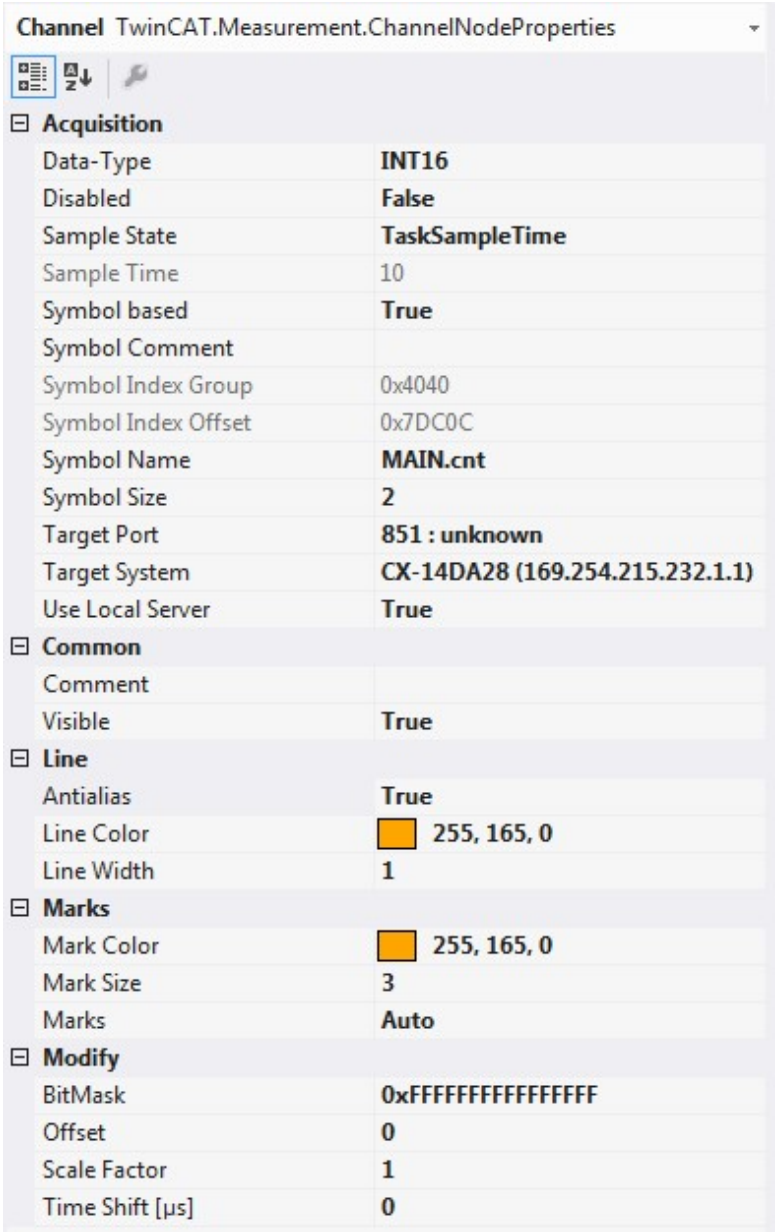




Properties

BECKHOFF

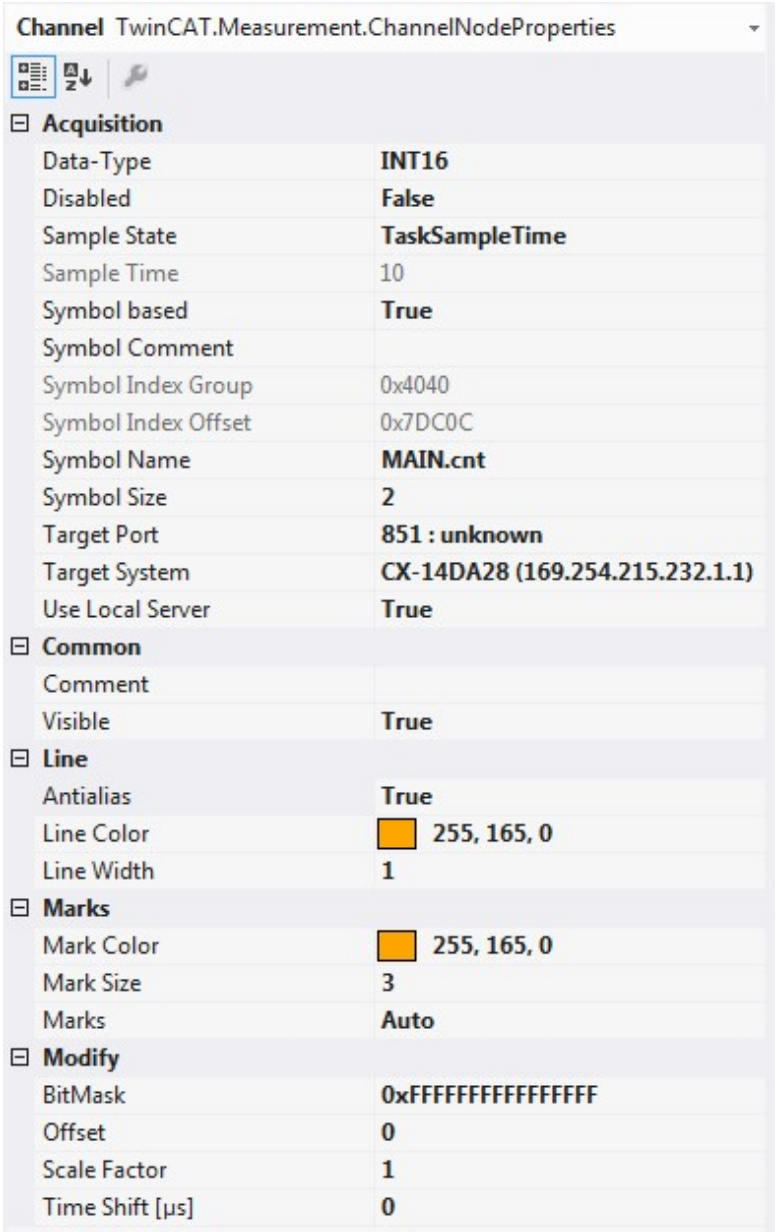
- Channel properties include:
  - **Antialias**: This option decides how the lines will be drawn. Antialias is "nicer" but requires considerably more computing. This has an effect in particular if there are many channels with large movements.
  - **Line Color**: The color of the graph.
  - **Line Width**: The line width of the graph. The line width 1 requires least computing.



Properties

BECKHOFF

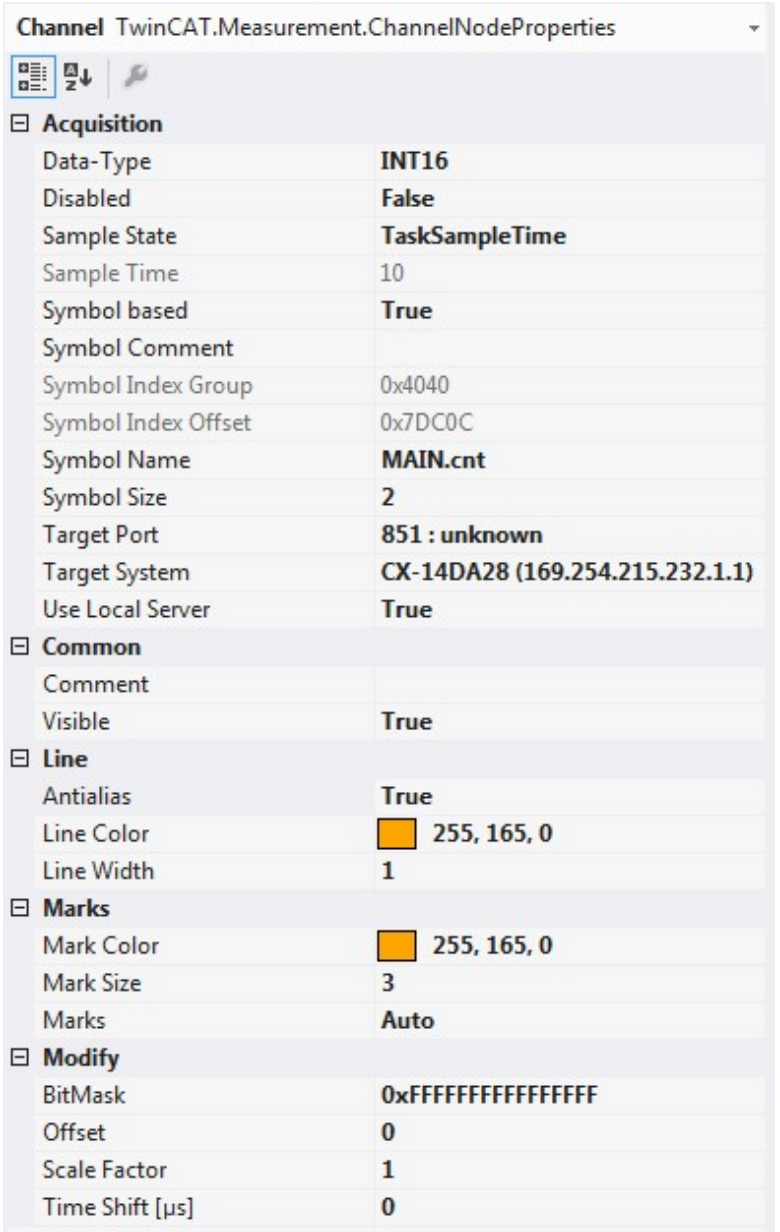
- Channel properties include:
  - **Mark Color**: The color of the base markings.
  - **Marks**: Selection of the visibility of markings -> On (permanently visible) | Auto (dependent on the zoom level) | Off (markings switched off).
  - **Mark Size**: The size of the base markings.



Properties

BECKHOFF

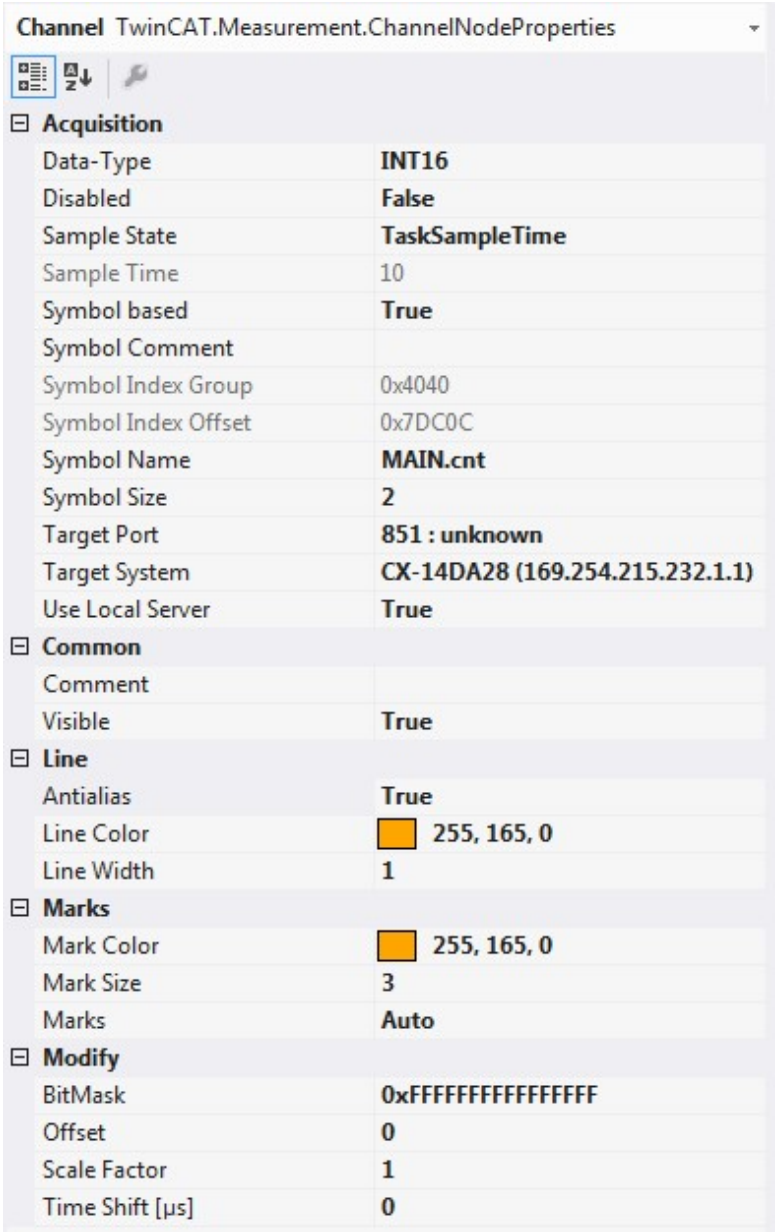
- Channel properties include:
  - **Bit Mask**: In the Bit Mask field a value can be entered with which the display value is masked, provided it is not of the type floating point. This means that the value of the channel is ANDed with the binary value of the mask. This helps you, for example, to observe individual bits of a status byte.
  - **Offset**: A free offset can be added to the function value of the channel in the offset field.



Properties

BECKHOFF

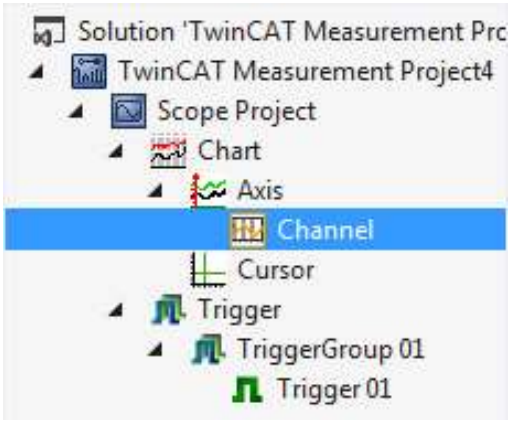
- Channel properties include:
  - **Scale Factor:** The display value of a channel can be changed with the scale factor. This is useful, for example, if you wish to display angle signals in degrees instead of radians. With a scaling factor of k = 360 / (2*Pi) = 57.296, therefore, degrees would be displayed instead of radians.

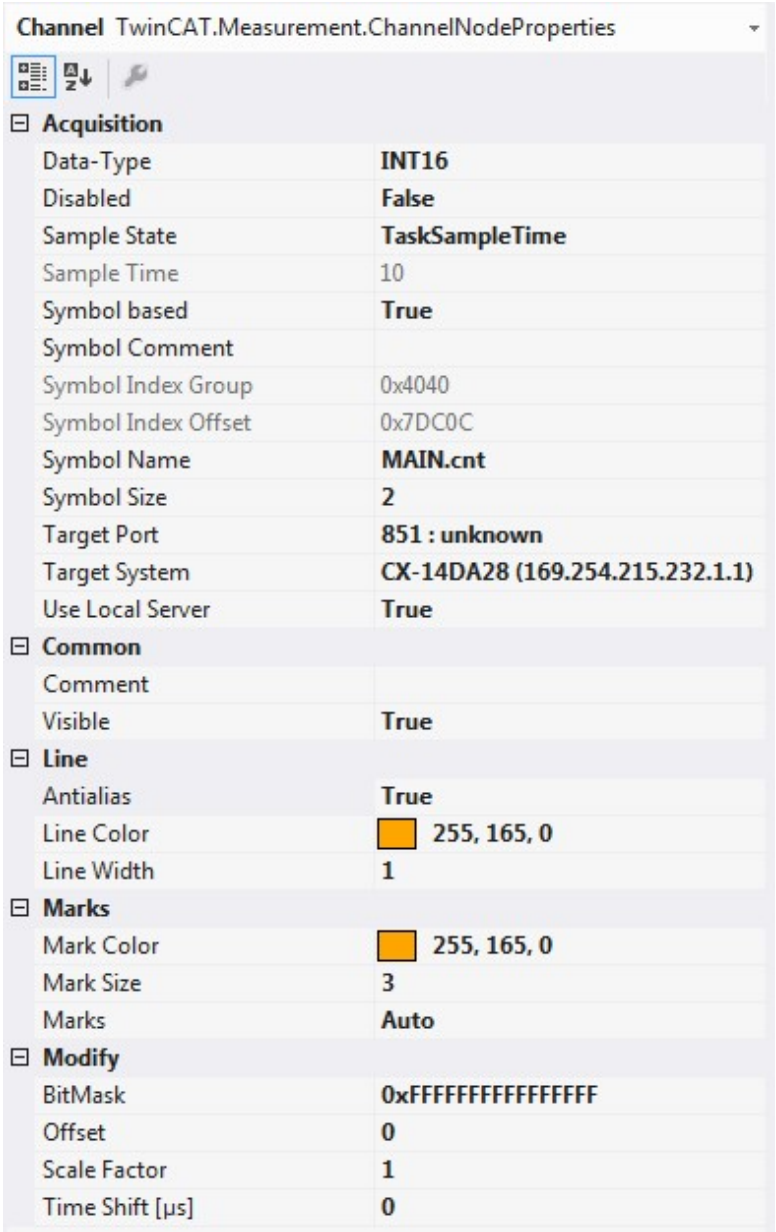


Properties

BECKHOFF

- Channel properties include:
  - **Time Shift:** The Time shift option enables you to shift the graph along the time axis. This can be useful, for example, if you wish to compensate a known bus runtime.

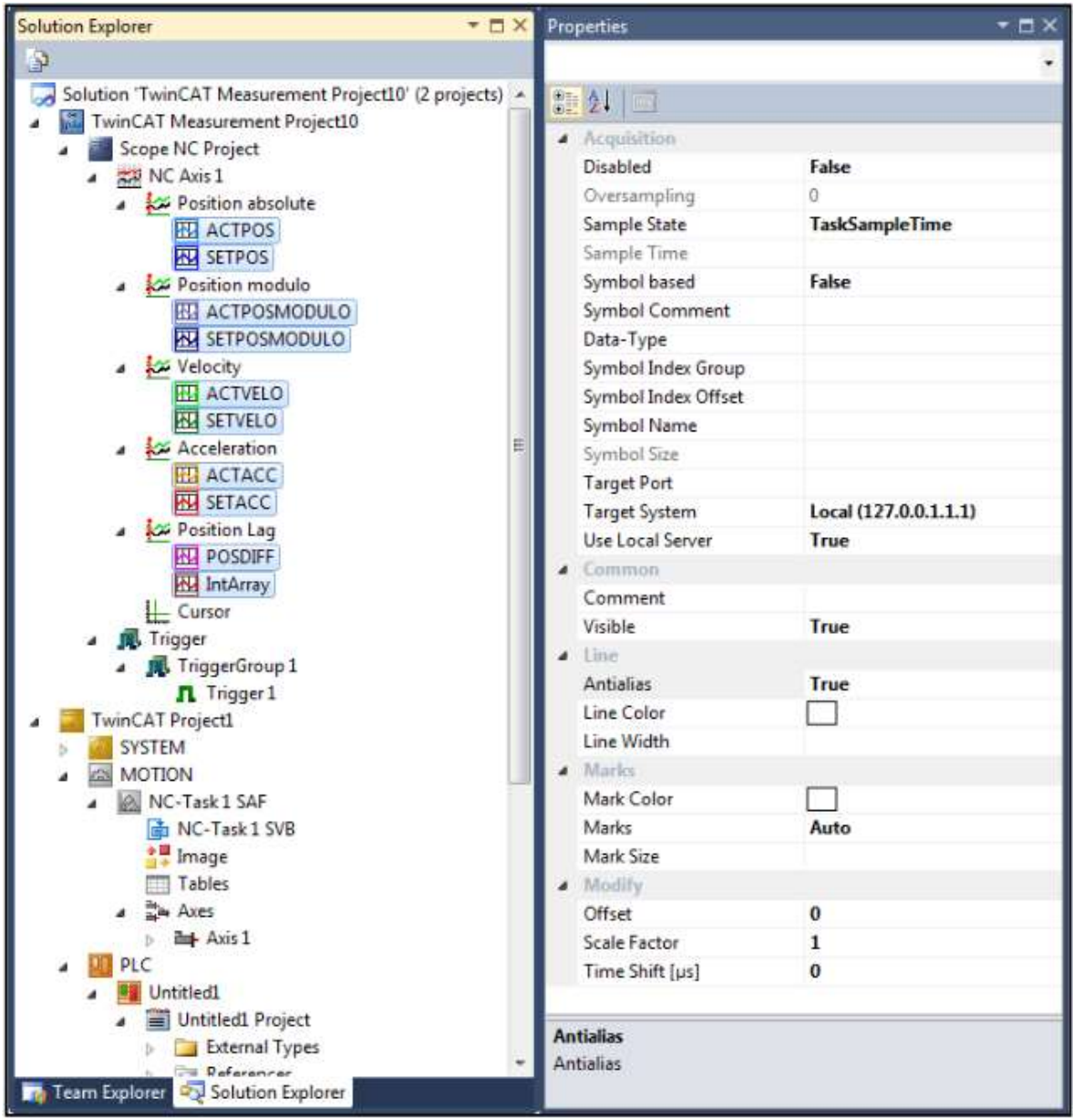




Properties

BECKHOFF

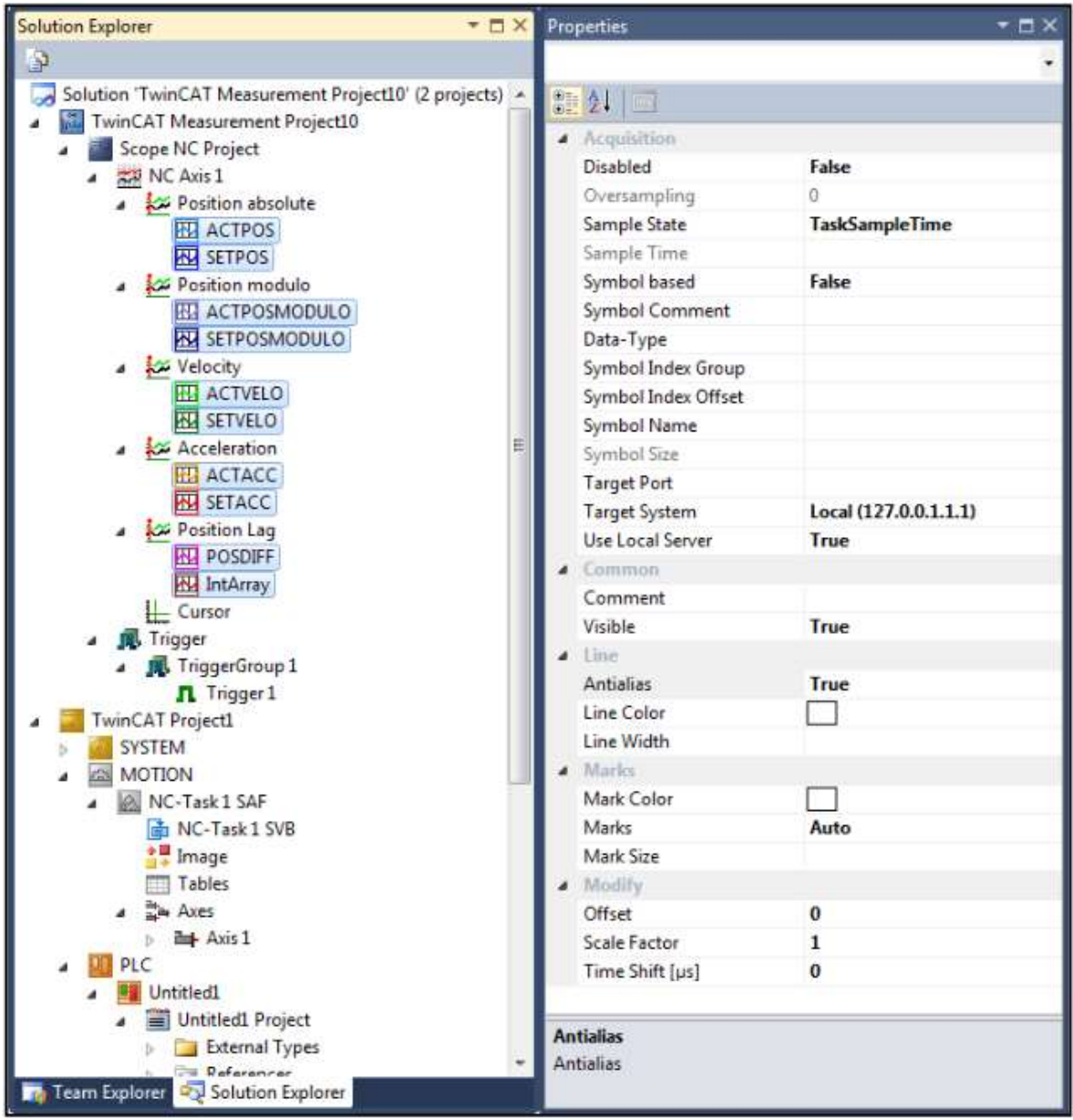
- **Multiple Selection**
- Some parameters are often modified for several or all elements. To do this you can mark several elements via the Solution Explorer and edit the settings of all marked elements at the same time. Data that differ between the selected elements are represented as empty fields.



Properties

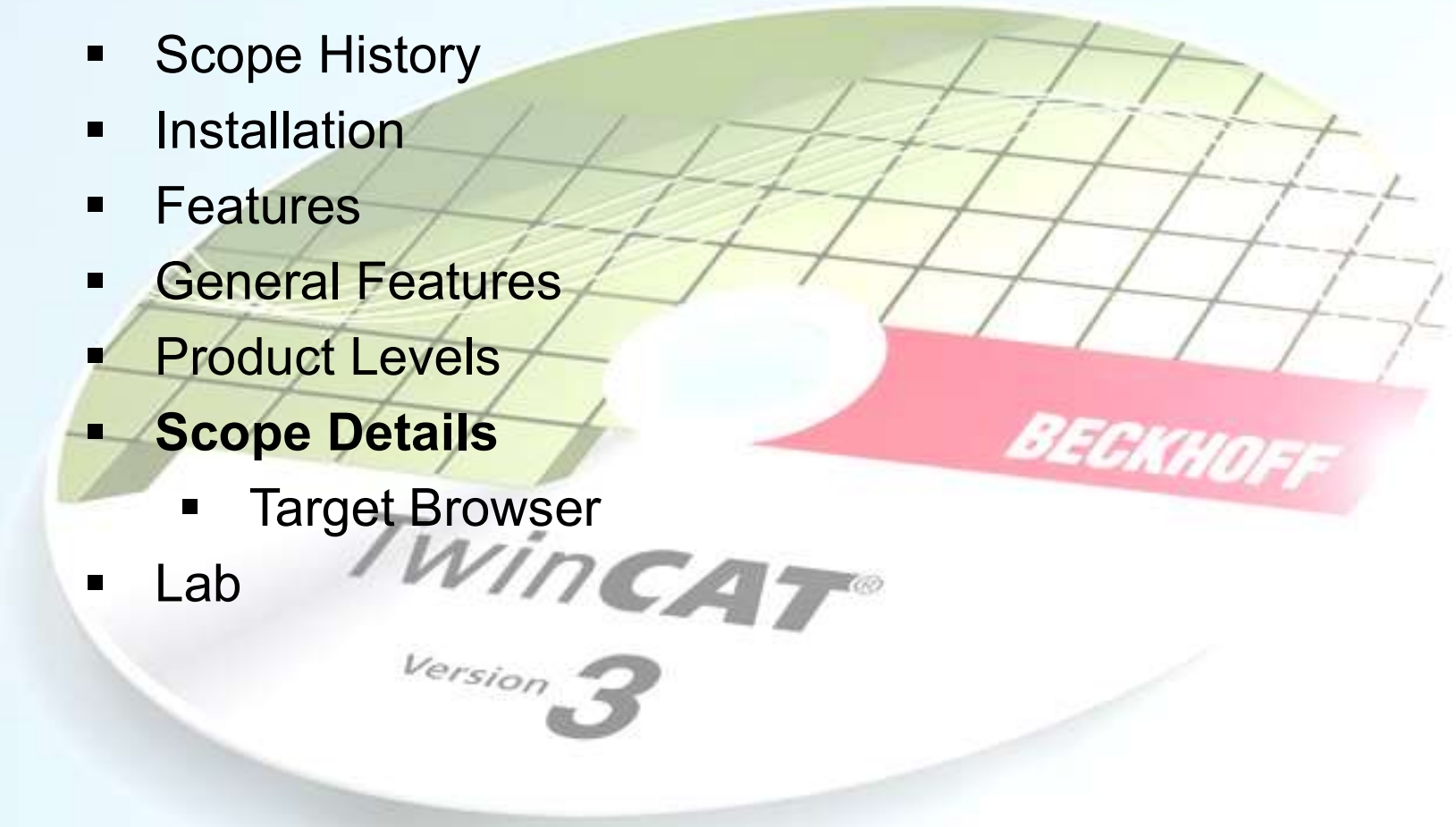
BECKHOFF

- **Multiple Selection**
- To make multiple selections, keep the <Ctrl> key pressed during the selection. In the case of successive elements you can select the first element, keep the <Shift> key pressed and then select the last element in order to mark all elements in between.



Agenda

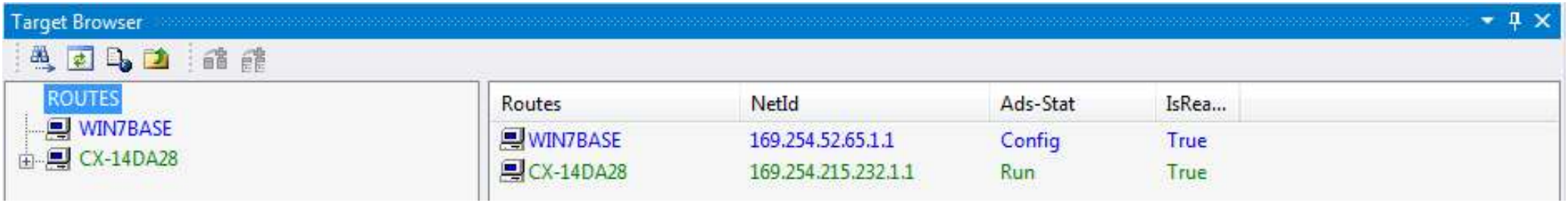
- Scope History
- Installation
- Features
- General Features
- Product Levels
- **Scope Details**
  - Target Browser
- Lab



Target Browser

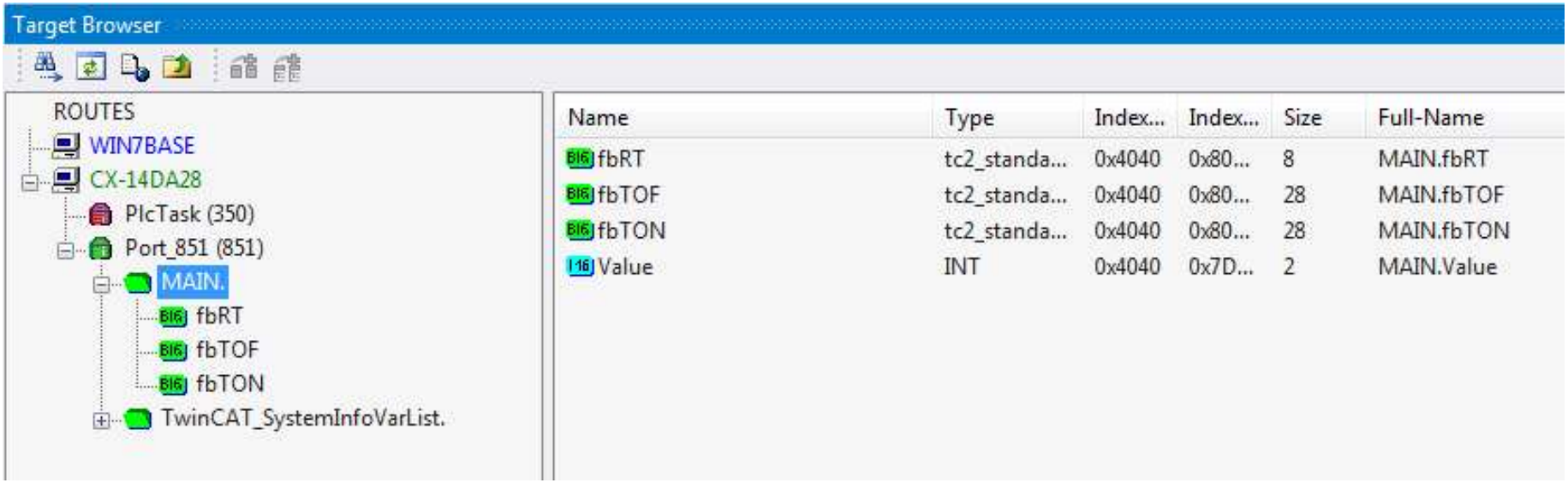
BECKHOFF

- With the target browser you can add Scope configuration channels via their symbol names. The target browser is divided into two halves. The first shows a tree with the first entry: ROUTES. Below that all devices registered in the System Manager are shown. The color of the target indicates the system state: red = not reachable (stop mode), blue = config. mode, green = system in run mode.



Target Browser

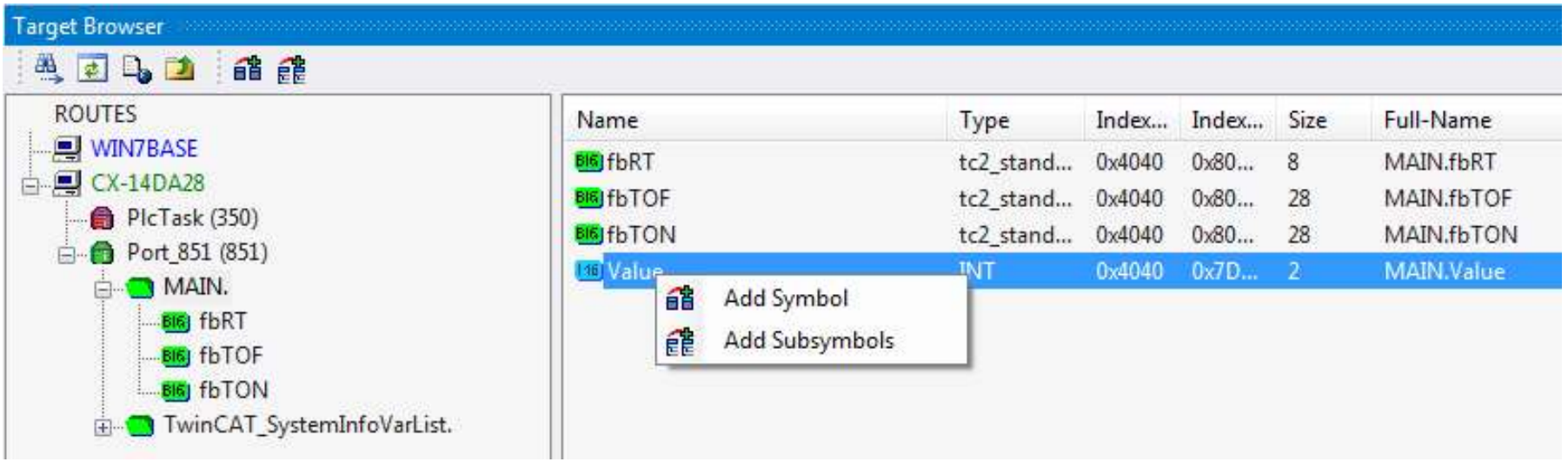
- The second half shows a detailed list of the sub items of the selected element of the tree structure.



Target Browser

BECKHOFF

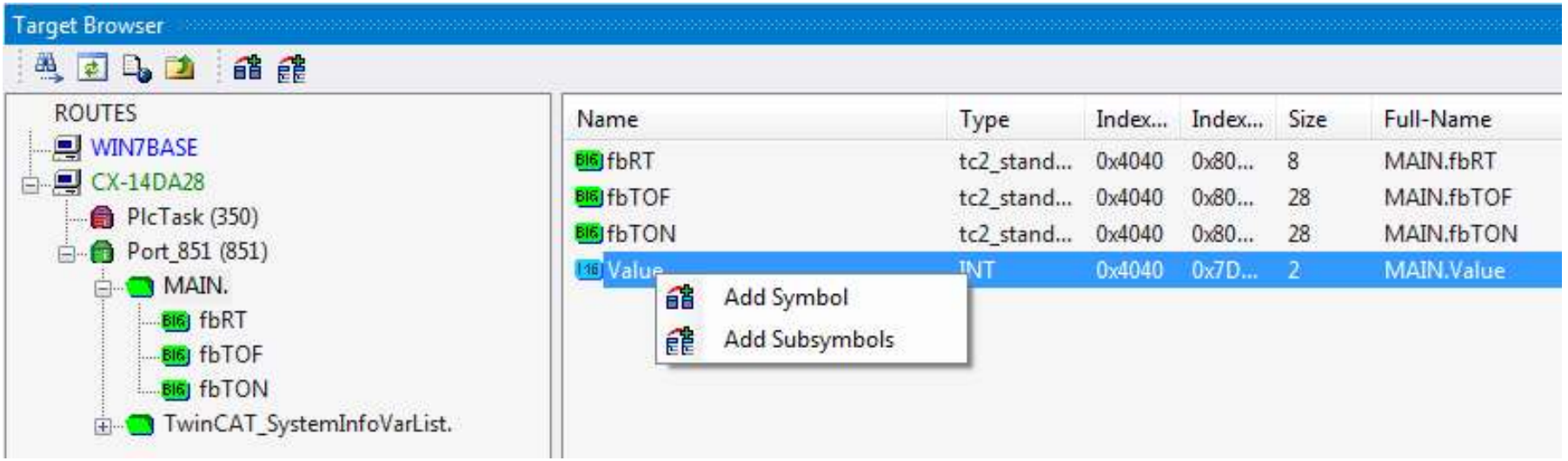
- In the list structure one or more channels can now be selected and added to the configuration with a double click or by a right mouse click-> "Add symbol" ("Add Subsymbols") or by one of the buttons in the toolbar.



Target Browser

BECKHOFF

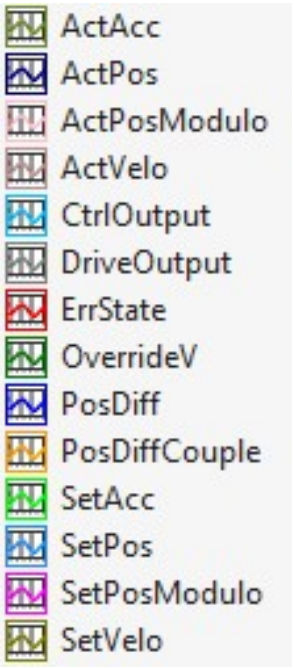
- In addition, selected elements can be inserted by drag & drop to any place within the configuration.
- If a folder, an Ads Bigtype or an array is selected that contains sub-symbols, the "Add Subsymbols" option adds a channel for each sub symbol. The "Add symbol" option inserts only one channel with the information of the selected symbol.

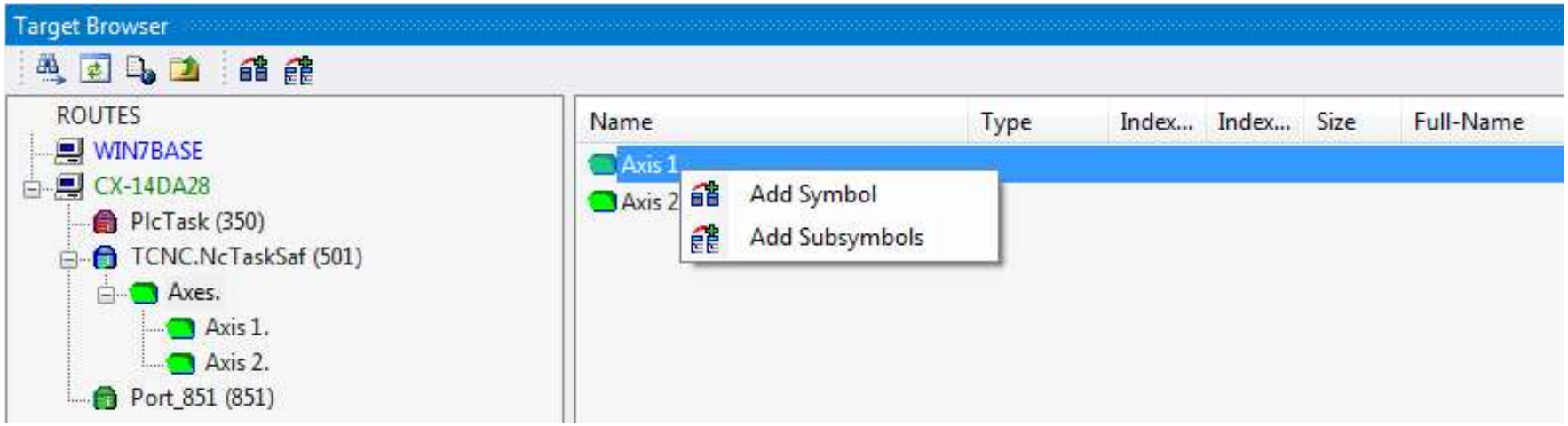


Target Browser

BECKHOFF

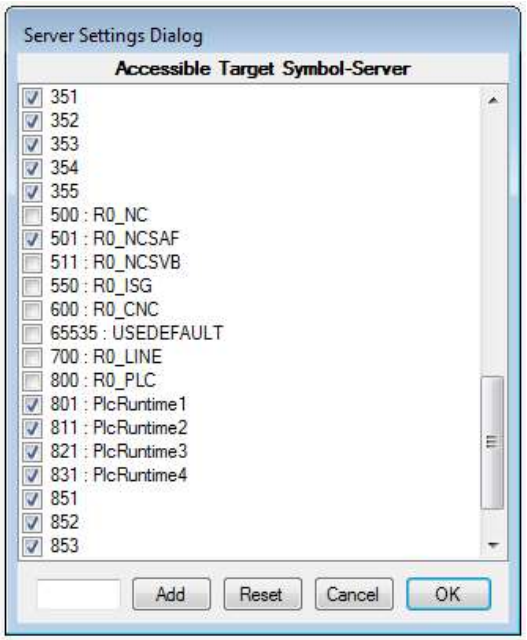
- When selecting ‘Add Subsymbols’ for an NC Axis, a predefined list of variables for that axis will be added to the Scope





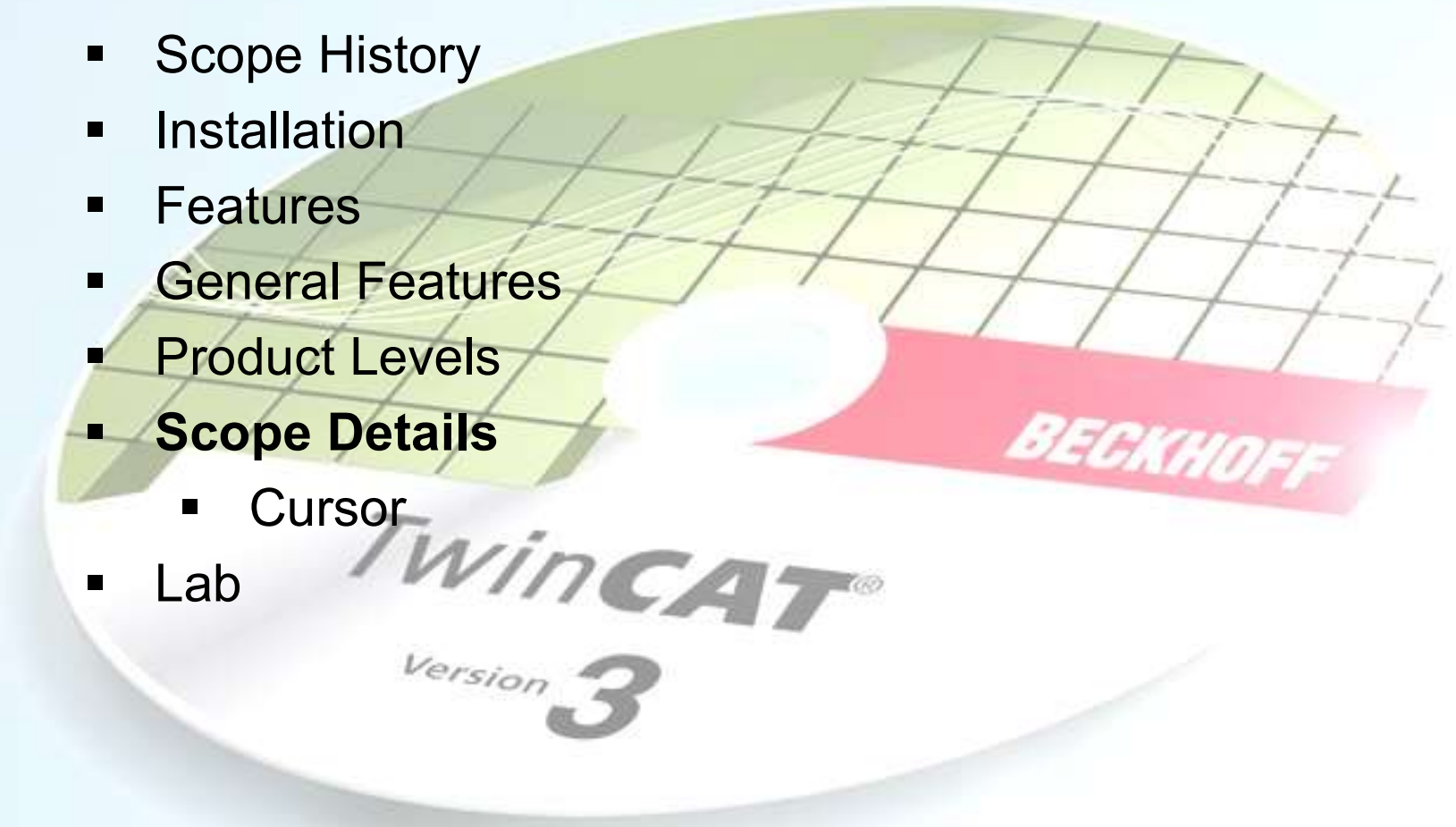
Target Browser

- If a target computer is selected in the tree or list structure, the connected tasks become visible. These are marked in color: green = PLC task, blue = NC task, red = other.
- If a task is not displayed, then a selection menu can be called using the Enable Server Ports option that displays the limitation to certain tasks.



Agenda

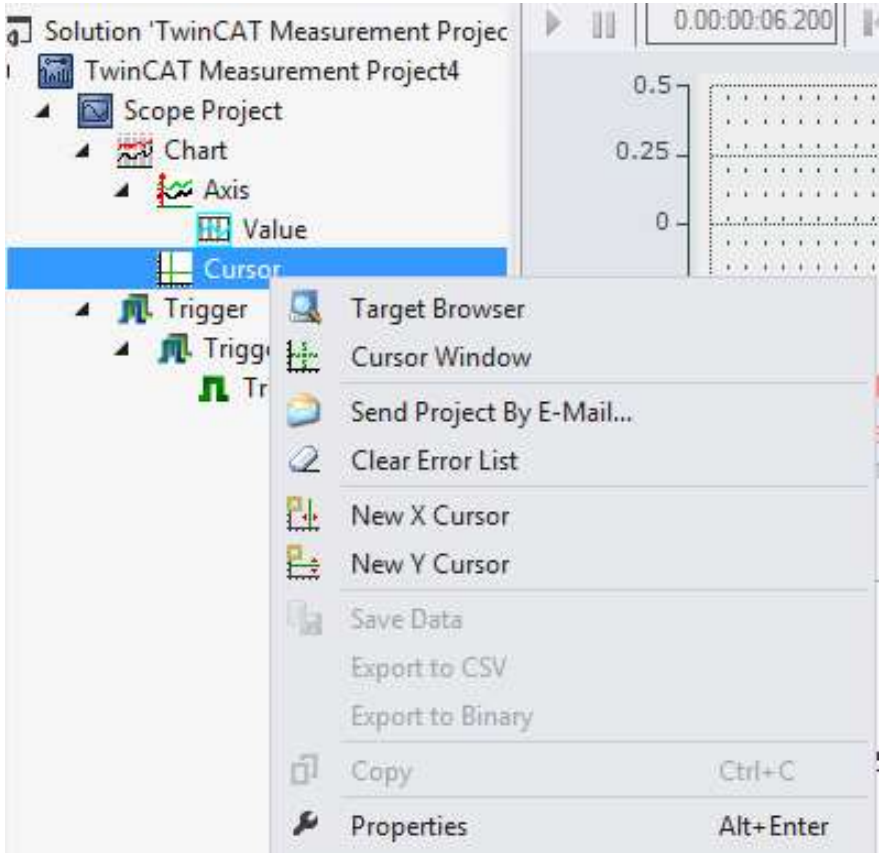
- Scope History
- Installation
- Features
- General Features
- Product Levels
- **Scope Details**
  - Cursor
- Lab



Cursor

BECKHOFF

- Cursor
  - A chart cursor can be added and changed via the cursor module.

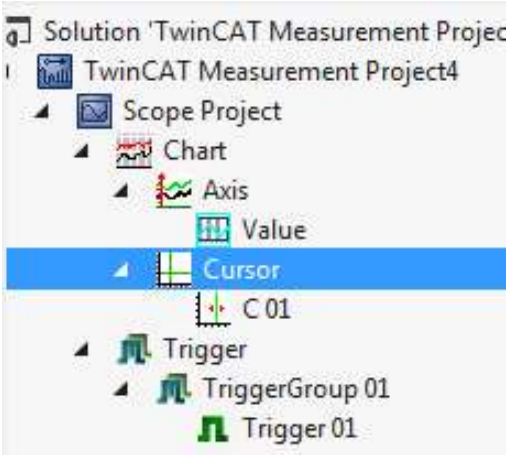


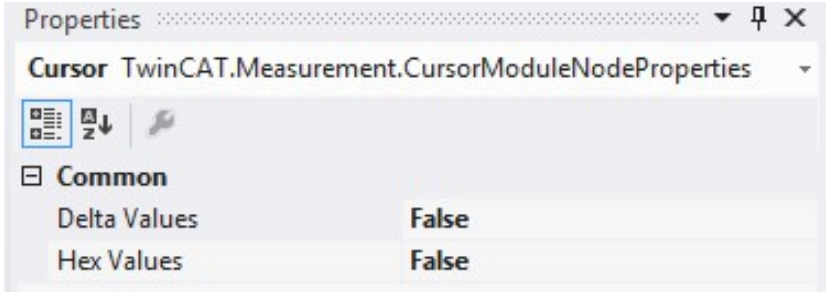
Cursor

BECKHOFF

- The cursor module (listed in each chart element as "cursor") offers the following setting options:

- **Delta Values:** If several cursors are used in one direction the differences can be displayed if Delta Types is activated.
- **Hex Values:** Hexadecimal notation of the average values of the individual channels.

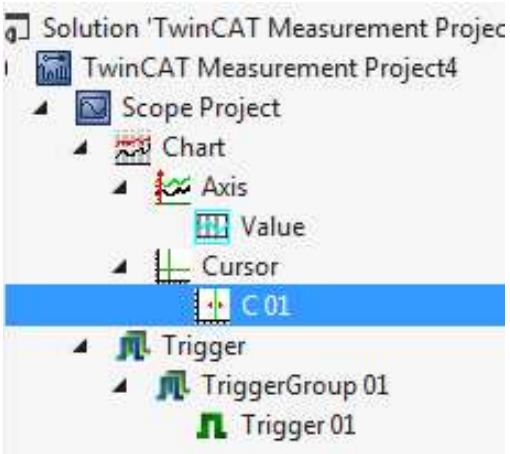


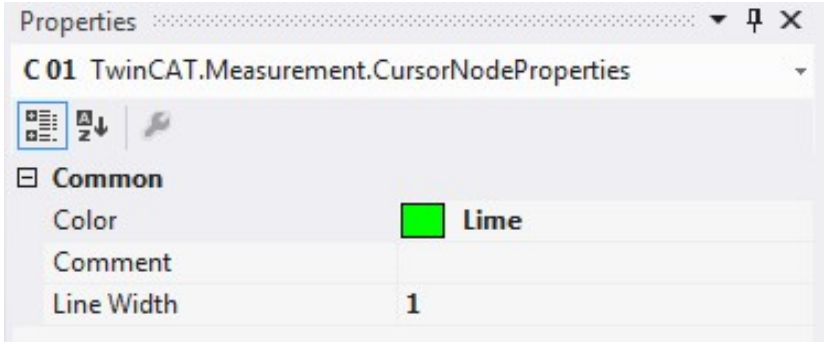


Cursor

BECKHOFF

- Each X/Y-cursor within the cursor module offers its own setting options
- **Color:** Color of the cursor.
- **Comment:** A comment can be saved here.
- **Line Width:** Line width of the cursor in pixels.

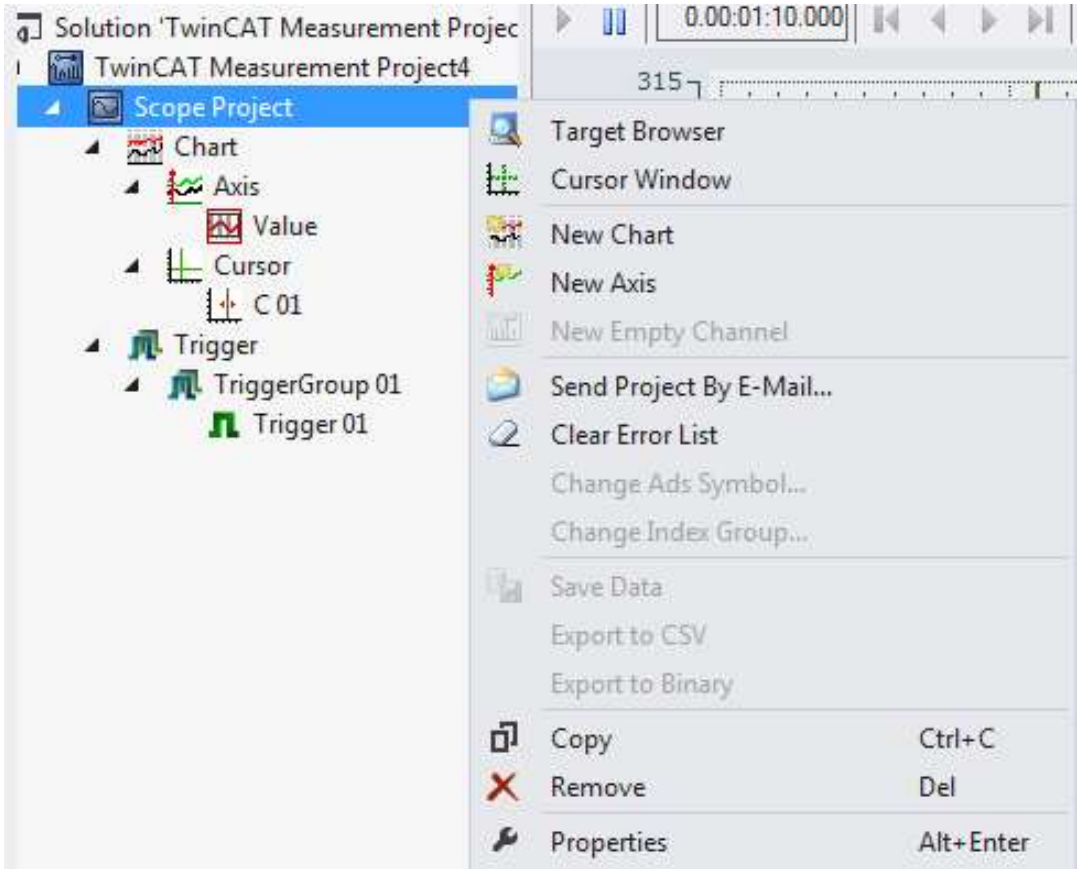




Cursor

BECKHOFF

- The values are displayed in the cursor window
  - Right-Click on ‘Scope Project’ and select ‘Cursor Window’



Cursor

BECKHOFF

- **Status Times**
  - The times belonging to an added X-cursor are displayed here in three formats.
  - **Absolute Position:** Corresponds to the actually registered time.
  - **Record Position:** Time value of the cursor since the beginning of the recording.
  - **Chart Position:** Time value of the cursor within the recording.

Cursor

BECKHOFF

- **Channel**
  - The average values of the individual channels are displayed with the respective X-cursor in the Channel field. The displayed average values are, like the display, compromised to pixel width. You can zoom into the recording in order to indicate the intermediate values.

Cursor

BECKHOFF

- **Axis**
  - The values of the Y-cursors on the respective axes are indicated in the lowest field.

Agenda

- Scope History
- Installation
- Features
- General Features
- Product Levels
- **Scope Details**
  - Trigger
- Lab

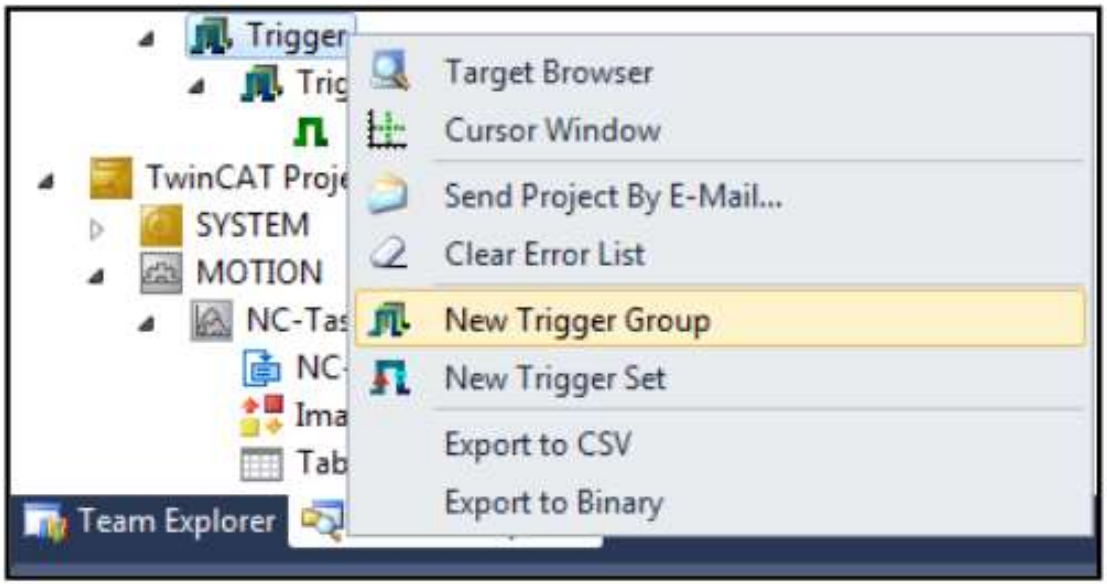
Trigger

- Different trigger functions can be added to the Scope configuration.
- In order to enable the simplest possible and free combination of individual trigger conditions and actions, these are combined into trigger groups.

Trigger

BECKHOFF

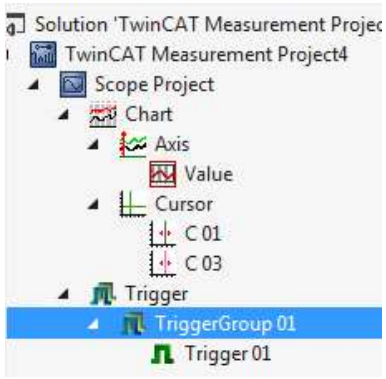
- Trigger groups and trigger sets can be added via the trigger context menu.
- Right-Click on ‘Trigger’ and select ‘New Trigger Group’

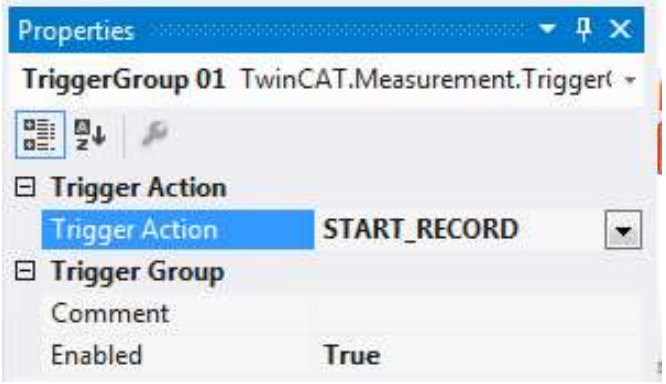


Trigger

BECKHOFF

- Trigger Action
- **Start Record:** If this option is selected, the start record condition in the Scope settings should be set to trigger start. Otherwise the Scope would start recording as usual. With setting this action, therefore, a question box appears that carries out this setting if necessary. If you actuate the record button in the menu bar, the Scope connects itself as usual to the servers involved and starts to sift through the connected channels, but without starting the actual recording. The recording begins with the trigger time of the last trigger set condition.

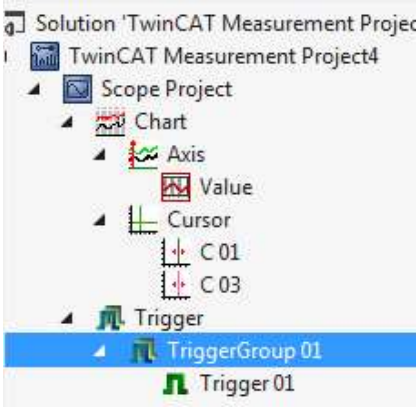


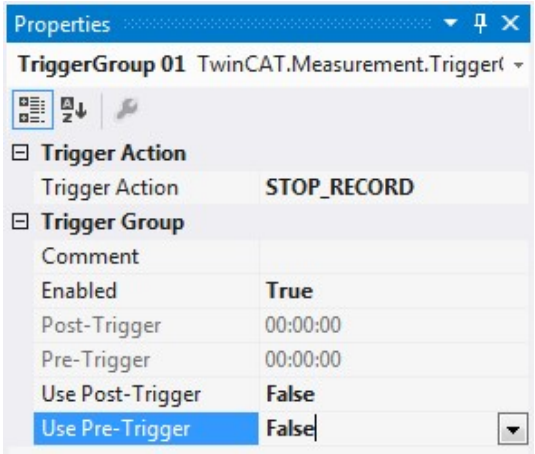


Trigger

BECKHOFF

- Trigger Action
- **Stop Record:** If the stop action is selected, the Scope should be operated in the ring buffer mode. With setting this action, therefore, a question box appears that carries out this setting if necessary. In the field below you can specify whether a fixed time range should appear in the recording before and/or after the trigger event. If pre-trigger is selected, trigger events before the expiry of this time are ignored. If post-trigger is active, the recording runs for the specified time after receipt of the trigger event.

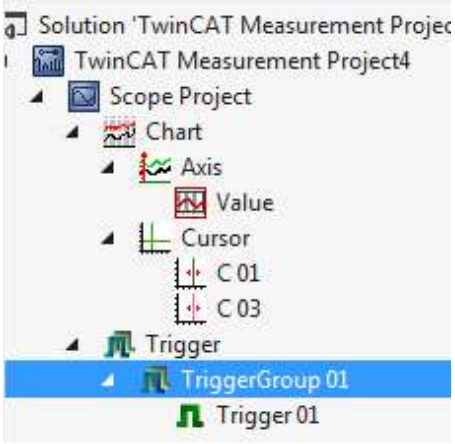


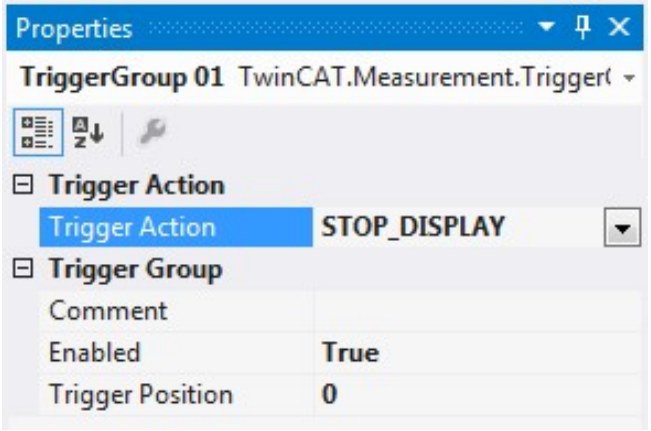


Trigger

BECKHOFF

- Trigger Action
- **Stop Display:** The stop display action stops all Scope charts that are in live mode at the point of triggering. With the trigger position you can select how many percent of the display shown (display width) are to be located before or behind the trigger event (in the example: positive 0-crossing of the green signal at 10% of 2.5 s = 0.25 s). If the trigger condition is fulfilled again, the display jumps to this new event. Pause can be actuated in the chart in order to prevent this retriggering.

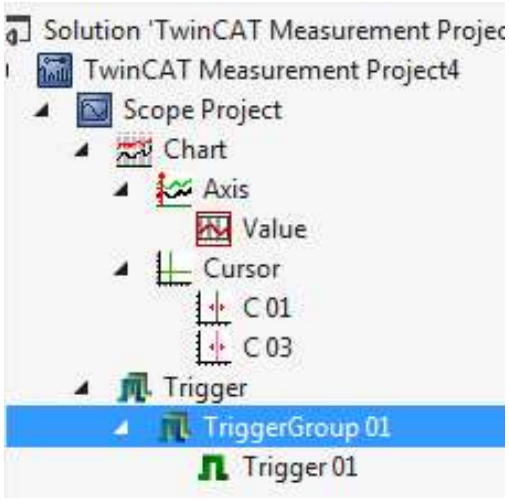


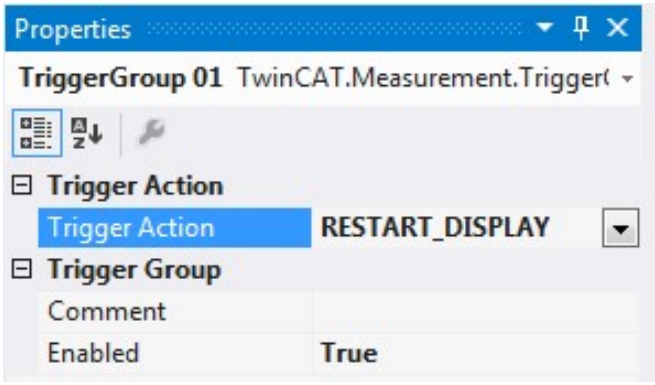


Trigger

BECKHOFF

- Trigger Action
- **Restart Display:** All charts paused due to a Stop Display trigger are resumed on fulfilment of the trigger condition.

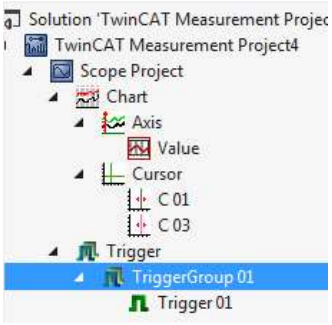


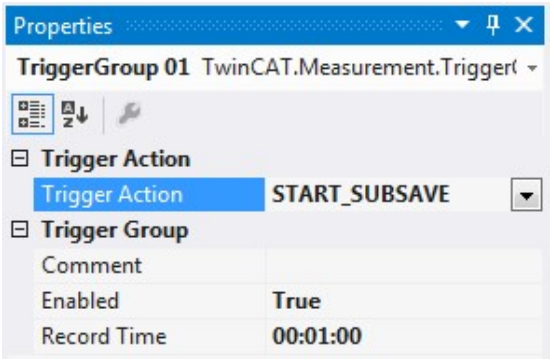


Trigger

BECKHOFF

- Trigger Action
- **Start Subsave:** On the occurrence of this trigger event a background recording is started with the current configuration. This sub save always runs in the ring buffer mode (independent of the settings in the Scope settings). It is possible to start up to 5 sub saves simultaneously (via one or more trigger events). The maximum memory capacity of the sub save can be specified in the 'Record Time' field. This recording duration may also be longer than the recording duration of the basic configuration (in this case ring buffer operation should also be selected).

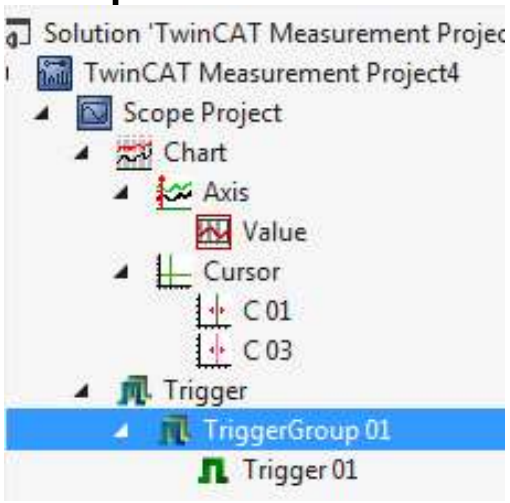


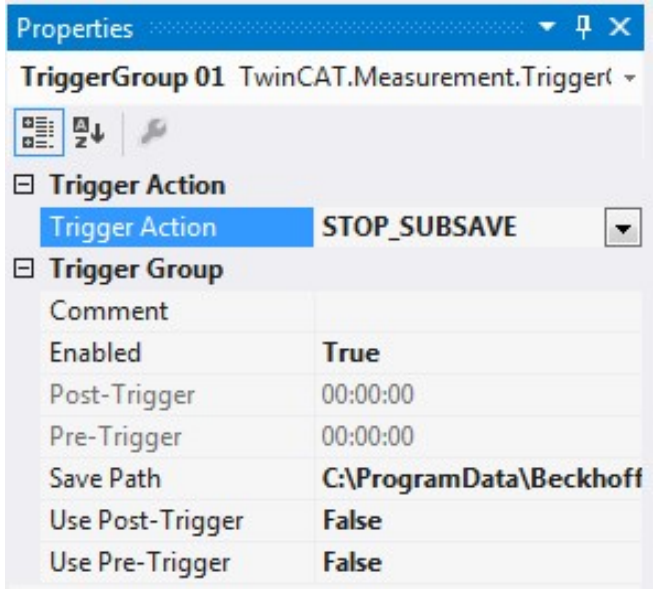


Trigger

BECKHOFF

- Trigger Action
- **Stop Subsave:** Following the Stop Subsave trigger event, the oldest sub save is stopped and transferred to the View in the background. From here it is saved in a .svd file via the specified path. The generated file name consists of the name of the Scope in the basic configuration and an ID composed of the date and time, in alphanumeric order.

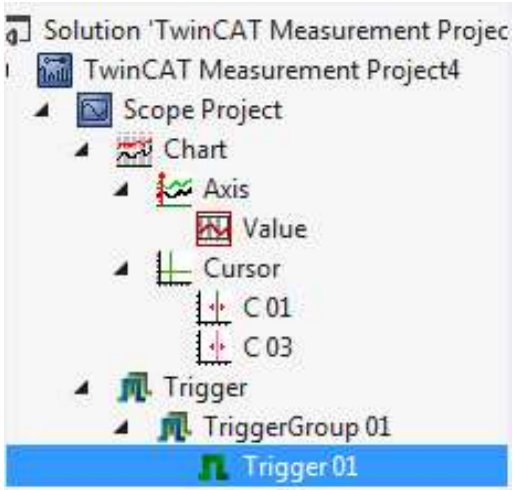


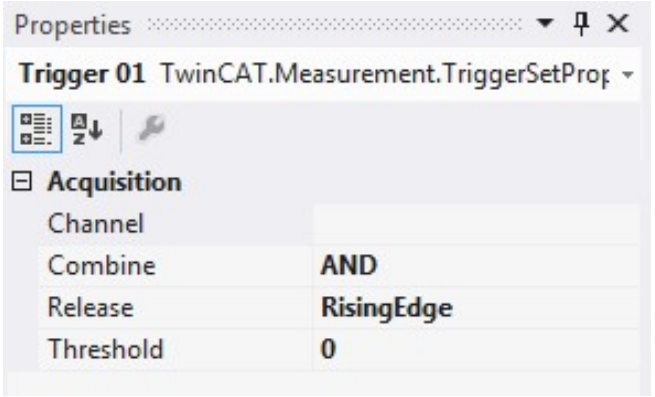


Trigger

BECKHOFF

- Each trigger set can be regarded as an independent trigger condition.
- The action report of the trigger group defines what happens when a trigger group is triggered.

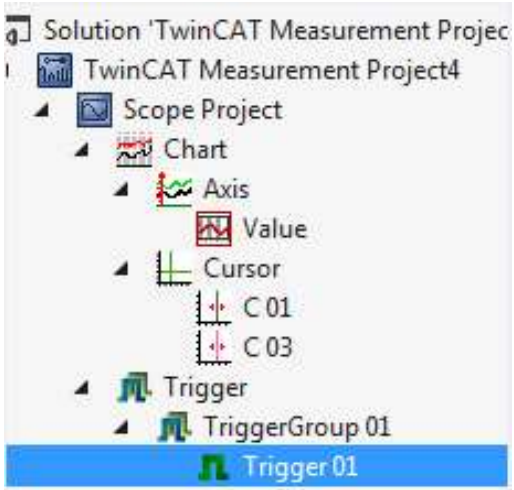


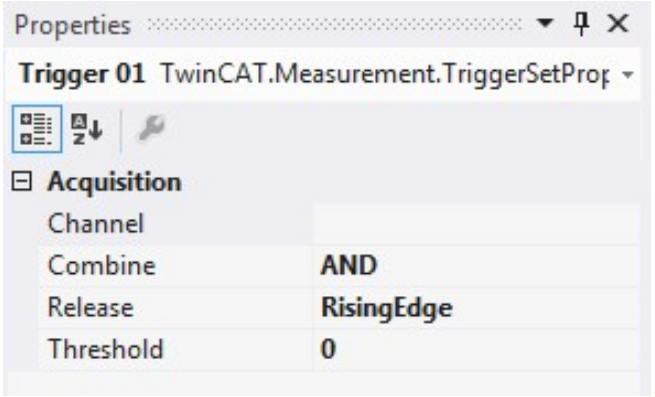


Trigger

BECKHOFF

- The trigger set offers the following setting options:
- **Channel:** A channel is assigned to each set whose state is to be checked for the selected trigger condition
- **Combine:** By selecting a logic operation these individual conditions can be placed in relation to one another. Note here that AND operations are handled before OR operations.

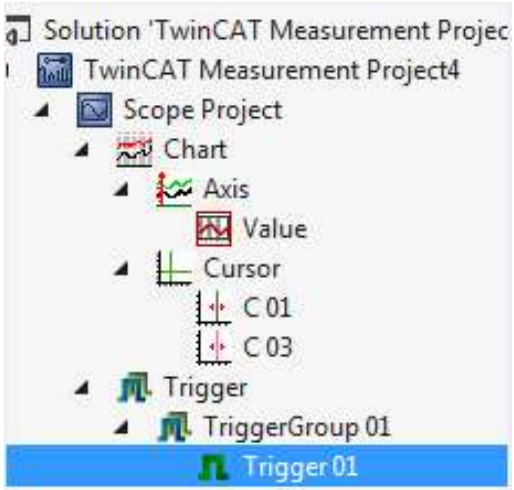


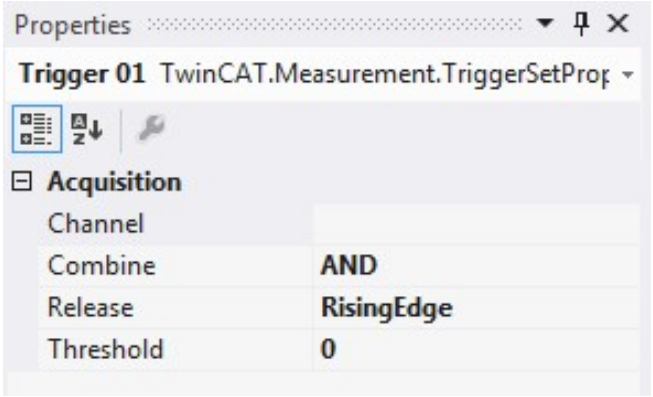


Trigger

BECKHOFF

- The trigger set offers the following setting options:
- **Hit:** indicates whether the trigger set has been triggered ( ) or not ( ).
- **Release:** The release condition can be either a rising or falling edge.
- **Threshold:** The associated limit value.

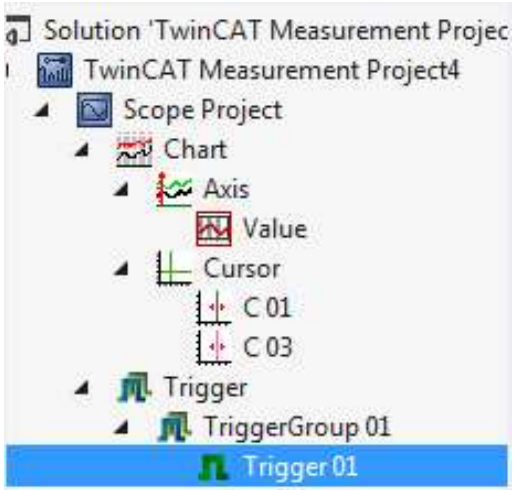


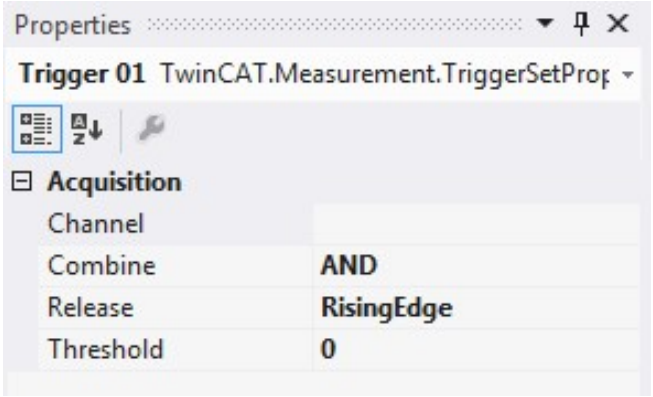


Trigger

BECKHOFF

- As soon as a trigger set is triggered, the icon in the Solution Explorer changes from to
- All trigger sets remain set until the entire trigger group has triggered.

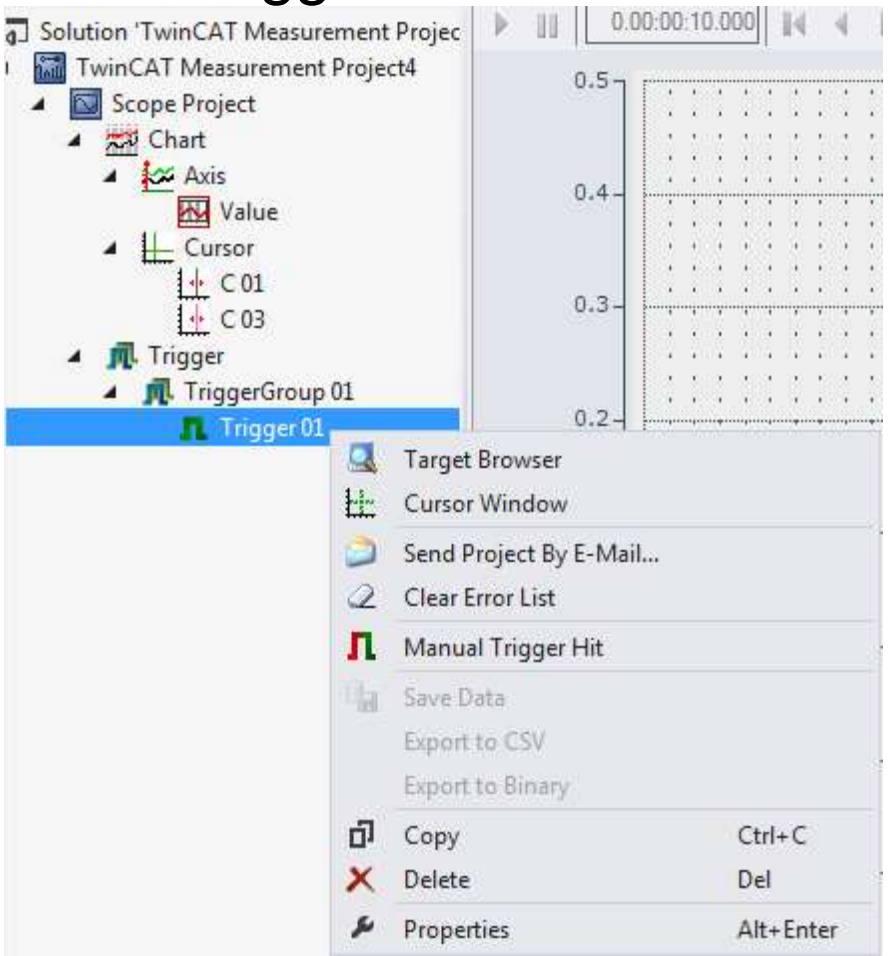




Trigger

BECKHOFF

- **Manual triggering of trigger set**
- Triggers can be manually triggered for test purposes via the trigger set context menu item "Manual Trigger Hit".



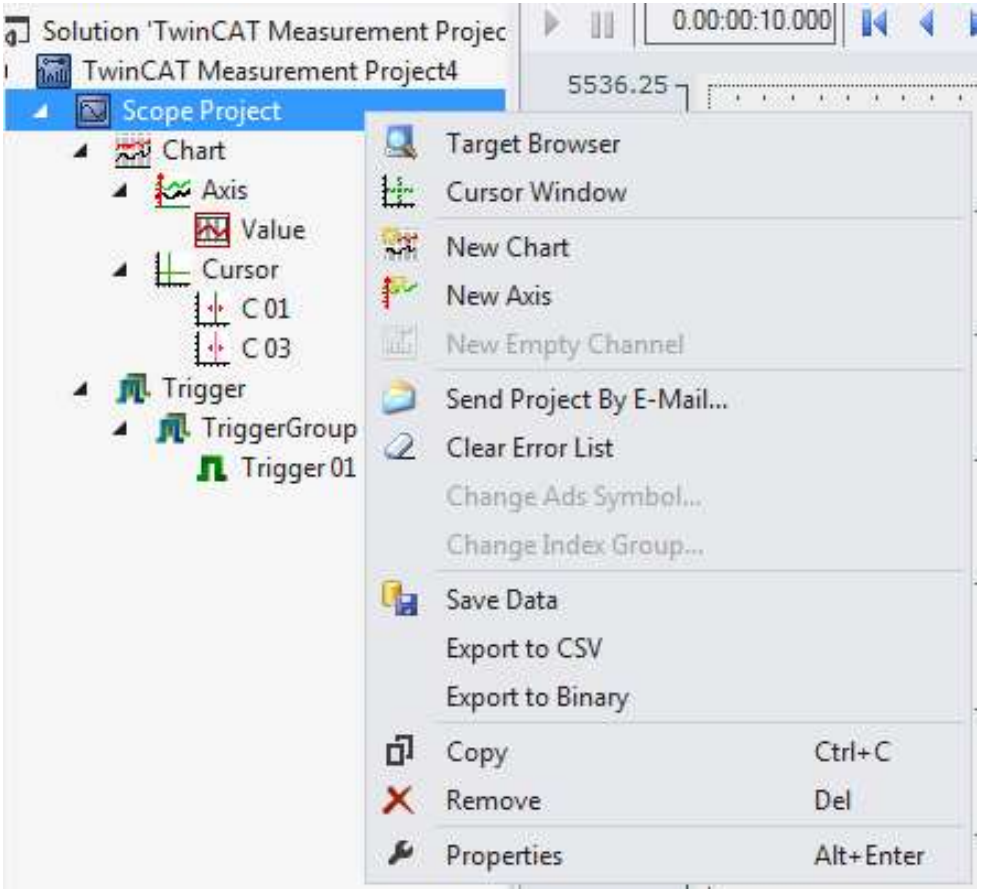
Agenda

- Scope History
- Installation
- Features
- General Features
- Product Levels
- **Scope Details**
  - Exporting Data
- Lab

Exporting Data

BECKHOFF

- Recorded data can be saved in a scope data file (.svd). Alternatively data can be exported in .csv, .txt or a binary format after stopping the current recording.
- Right-Click on ‘Scope’ and select ‘Export to CSV’ or ‘Export to Binary’



Exporting Data

- **Export to CSV:**
  Text export in order to be able to use the Scope data in other programs as well. The generated file is held in the table format. The rows are separated by lines and the columns by tabulators. The first rows contain information about the recording, such as Scope name or start and the end time of the recording.

Name	Scope01		
File			
StartRecord	128783093223690000	Thursday, 5 February 2009	13:08:42
EndRecord	128783093339880000	Thursday, 5 February 2009	13:08:53

Exporting Data

- Afterwards a definition range with the acquisition data follows for each channel.

Name	TRIANGLE
NetId	172.16.8.205.1.1
Port	801
SampleTime[ms]	1
SymbolBased	TRUE
SymbolName	MAIN.DREIECK
SymbolComment	
IndexGroup	16448
IndexOffset	608
Data-Type	ADST_REAL32
VariableSize	4

Exporting Data

- Finally a list with the recorded data follows for each channel. First the time value as an offset of the start record time, then the corresponding data value.

0	-1.03799391
1	-1.03599393
2	-1.033994
3	-1.031994
4	-1.029994
5	-1.027994
6	-1.02599406
7	-1.02399409
8	-1.02199411
9	-1.01999414
10	-1.01799417
11	-1.01599419
12	-1.01399422
13	-1.01199424
...	...

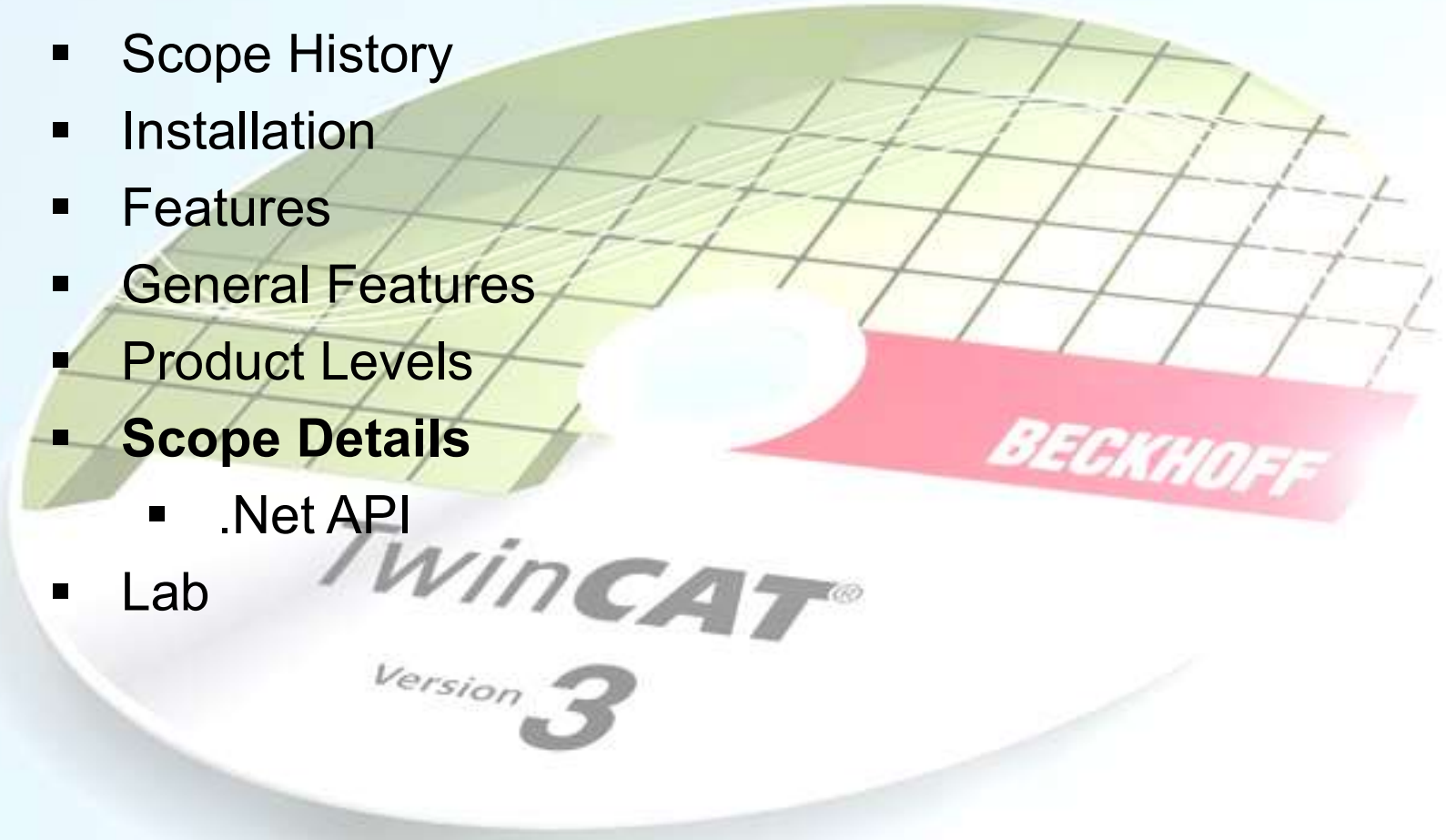
Exporting Data

- **Export to Binary:**
  The binary data format is based on the text format, but contains no separators. Instead the byte lengths of all variable data types (such as character strings) are contained in the corresponding headers. All times are specified in the file time format: 1tick = 100ns; origin is 1/1/1601 0h.

Variable	*Size (Bytes)*	*DataType*
MAIN-HEADER		
HeaderSize	8	Int64
NameSize	4	Int32
Name	NameSize	Array of Char (1Byte)
StartTime	8	Int64
EndTime	8	Int64
ChannelCount	4	Int32

Agenda

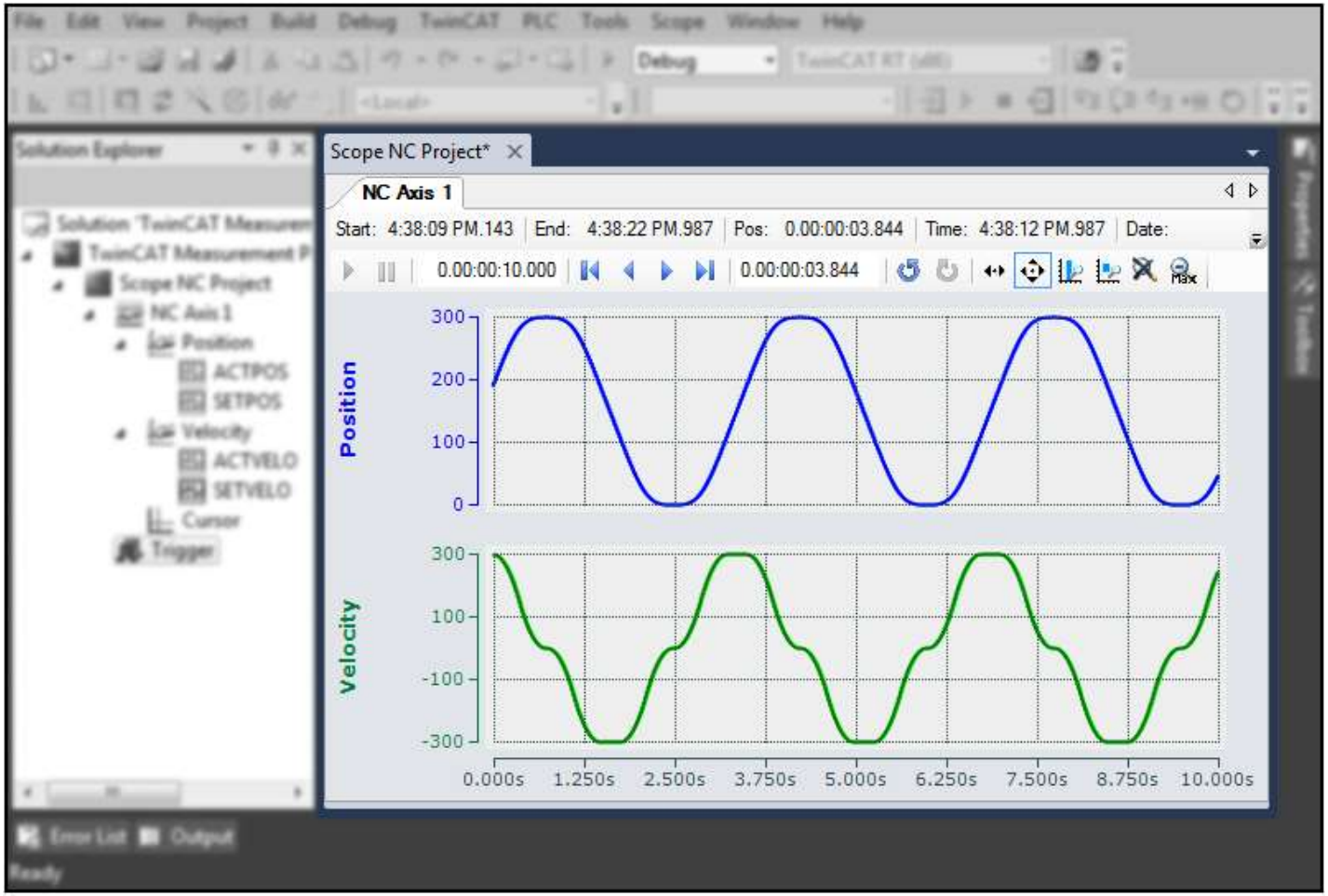
- Scope History
- Installation
- Features
- General Features
- Product Levels
- **Scope Details**
  - .Net API
- Lab



.Net API

- **Integration of the ScopeViewControl in your own applications**
- In order to achieve high ease of integration, the TwinCAT Scope is subdivided into components. The separation of Scope View and Scope Server, for example, is visible. Beyond that the Scope View is based on the ScopeViewControl, which is similarly usable as an independent component. The ScopeViewControlLib developed in .NET is available with the installation of TwinCAT 3.1 from version 4006. In this way simple integration is possible in C#, VB.Net or WPF applications.

- **Integration of the ScopeViewControl in your own applications**



.Net API

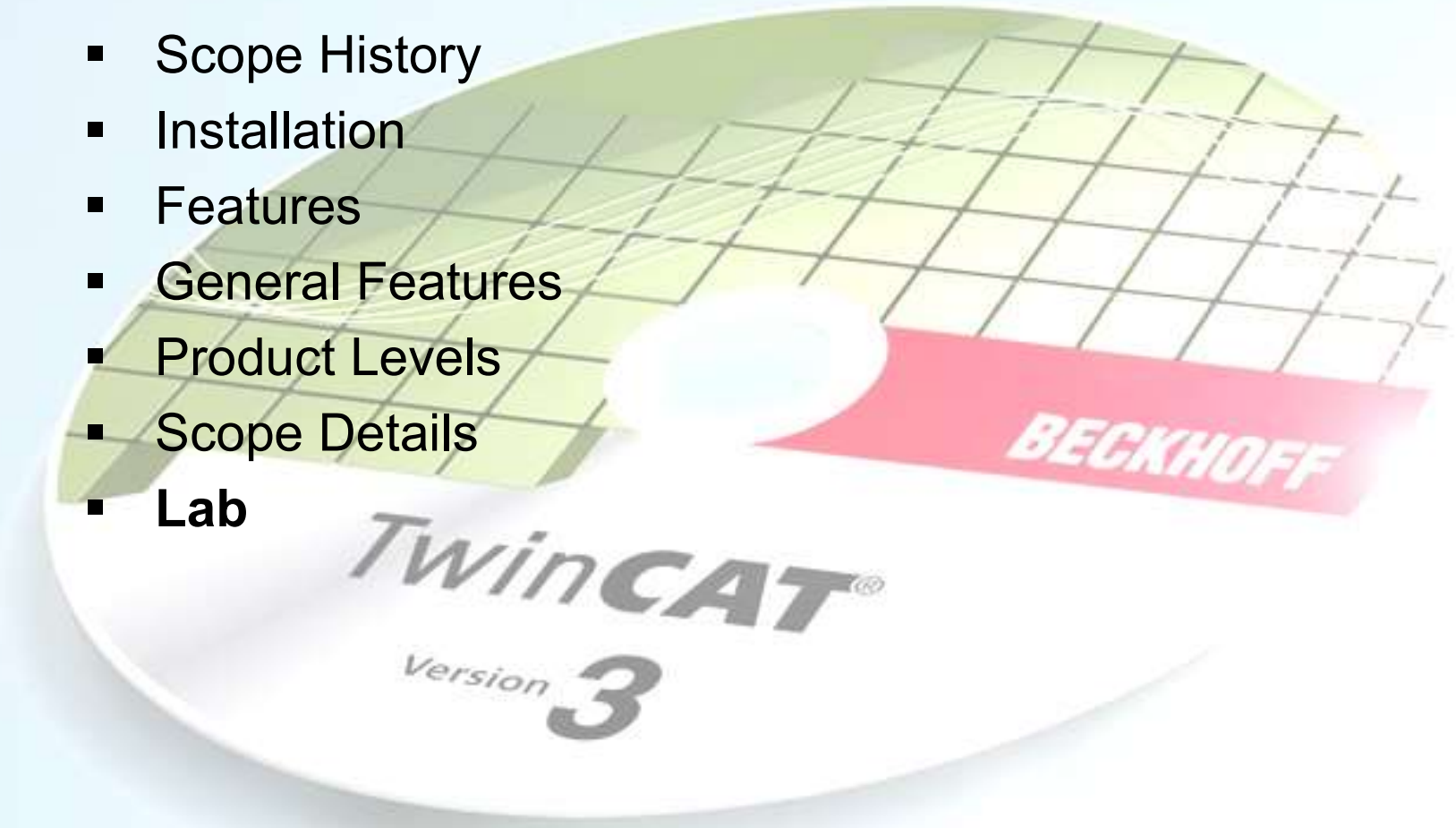
- Requirements
  - The ScopeViewControl requires .NET Framework 4.0.
  - Click on the project with the right mouse button and select "Properties".
  - The target framework ".NET Framework 4" must be selected under "Application".
  - The ".NET Framework 4 Client Profile" is **not** supported.

- Further information can be found in the TE13xx TwinCAT 3 Scope View documentation
- TwinCAT 3 Scope View

Agenda

BECKHOFF

- Scope History
- Installation
- Features
- General Features
- Product Levels
- Scope Details
- **Lab**



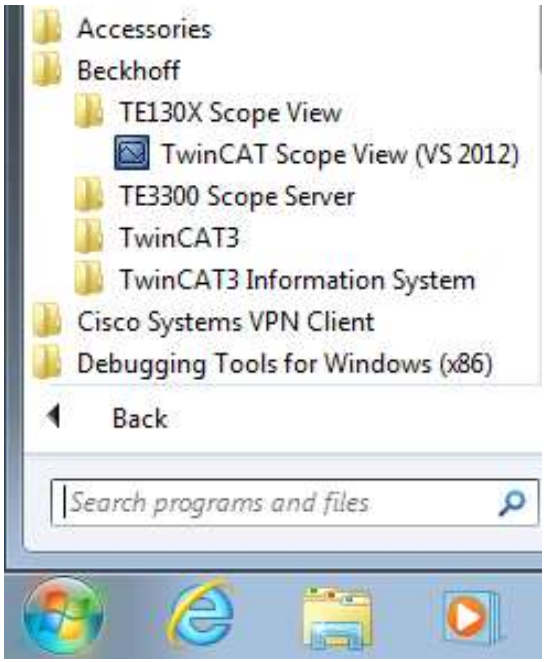
Lab

- In order to allow a fast startup and to simplify work with the TwinCAT 3 Scope software oscilloscope, the first steps are briefly described. We have consciously avoided dealing with every detail. For example, trigger-controlled recordings and the creation of reports are not subjects of this documentation.

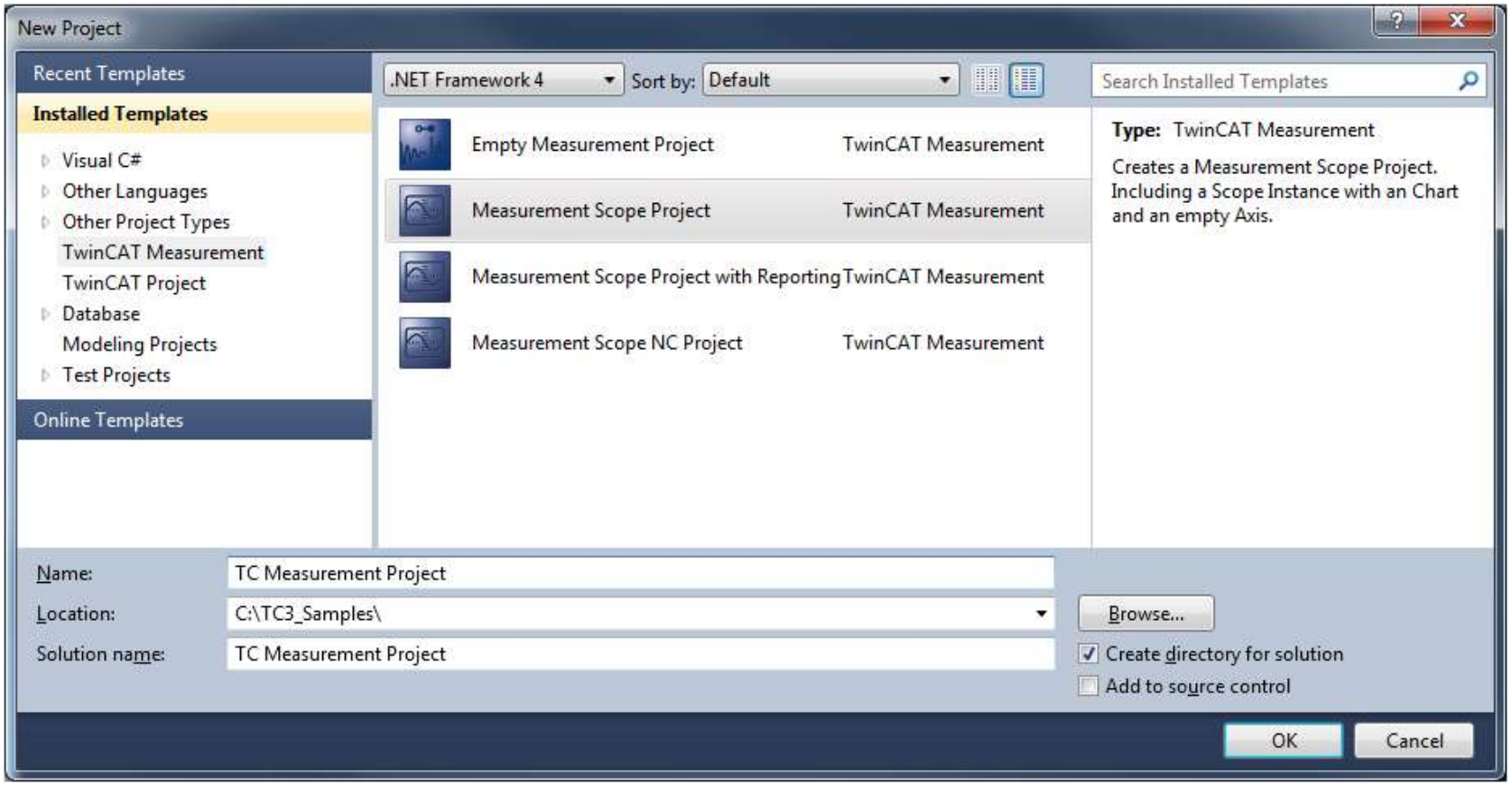
Lab

- **1. Installation:**
  For basic understanding is important to know that a Scope Server is always installed with a Scope View, since otherwise no saved data can be displayed locally in the View. Conversely, the Scope component installation can also install the Server without View on a target device.
- **2. Licensing:**
  Regardless of whether the Scope View was installed by its own setup or by the TwinCAT 3 XAE setup, the initially activated license is "Base" for View and Server. You can find out here which functions are enabled with which license key.

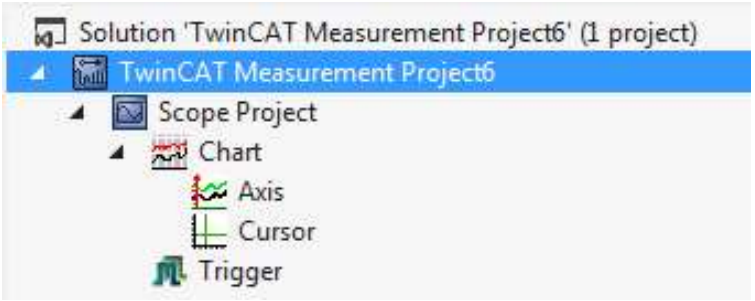
- **3. New project:**
  The Scope View can be selected under Beckhoff in the Windows Start Menu.



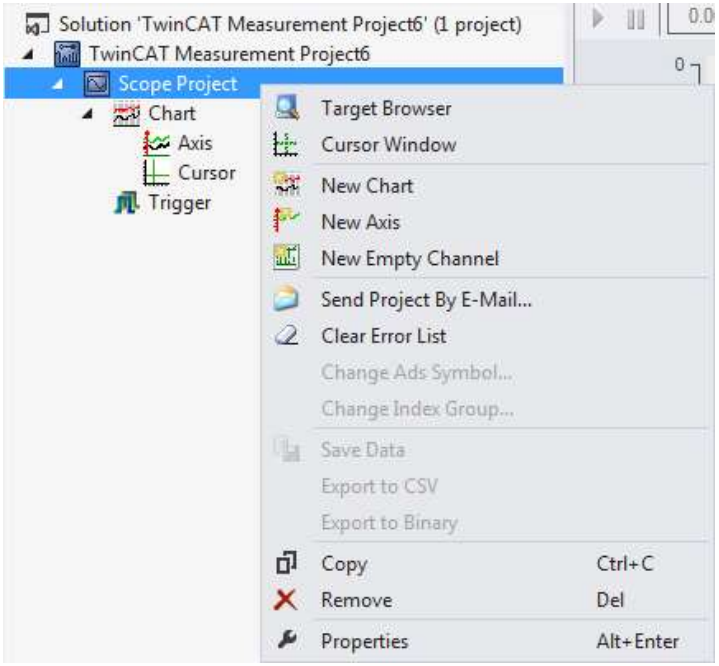
- The Visual Studio opens in its shell or in a full version if installed. You can choose between various templates. For this demo please select ‘Measurement Scope Project’ and click ‘OK’



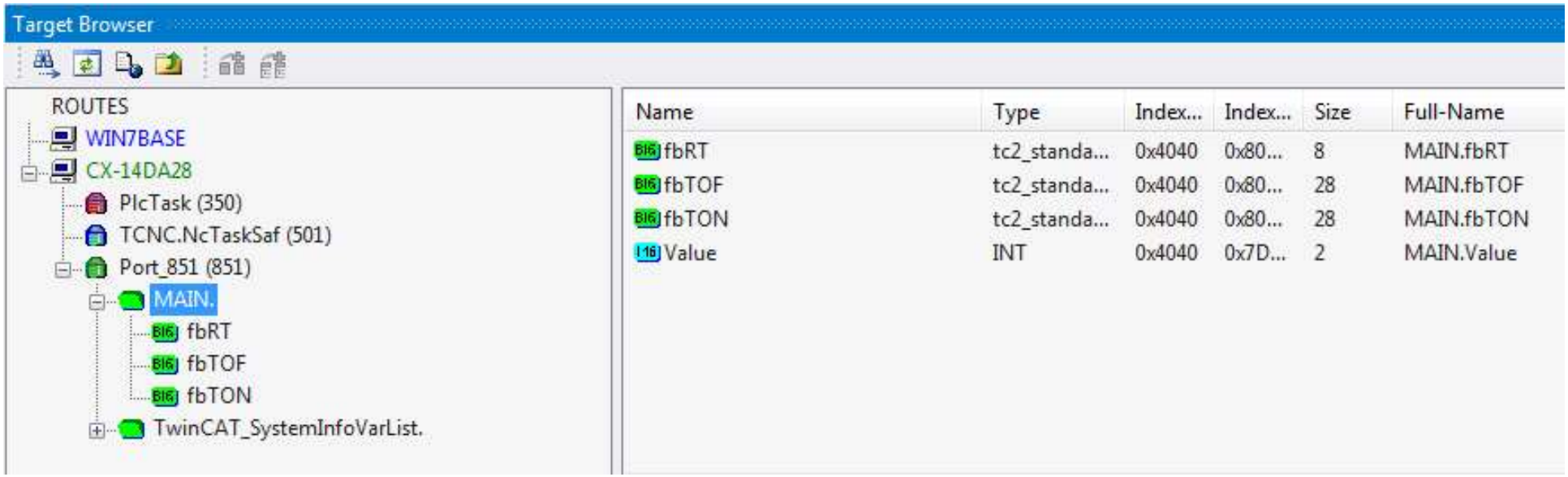
- In the Solution Explorer the starting point for the new Scope configuration assembles itself automatically.



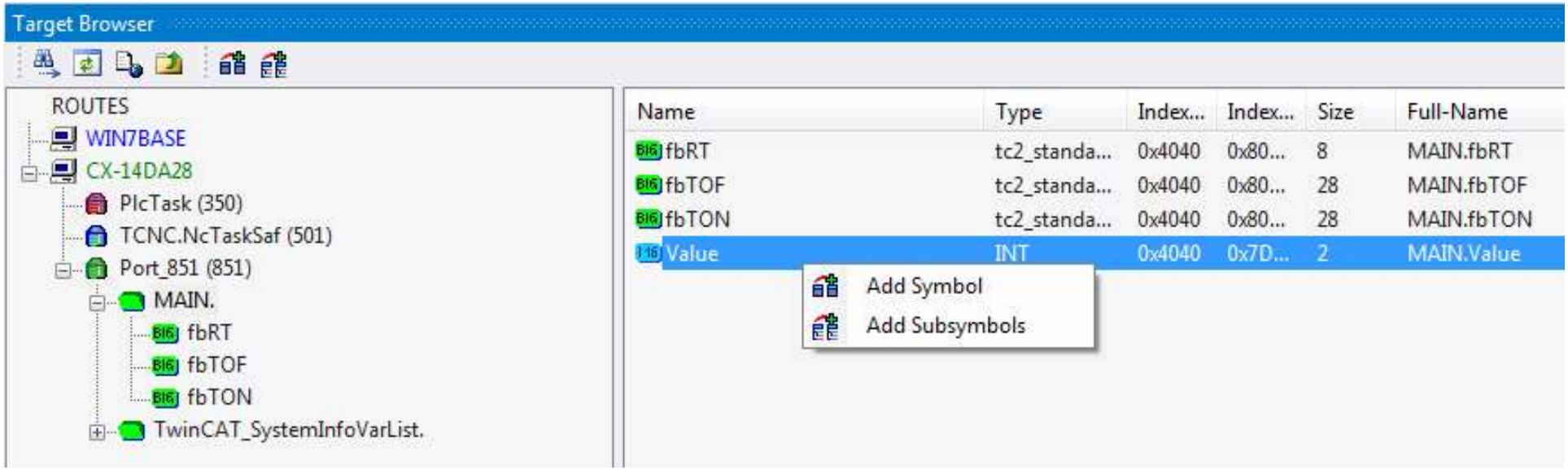
- **4. Selection of channels:**
  Variables or channels now have to be added to the generated configuration. These can be selected via the target browser. When using for the first time it is possible that this will not be directly visible as a window in Visual Studio. The target browser can be selected in the context menu with a right-click on the Scope node.



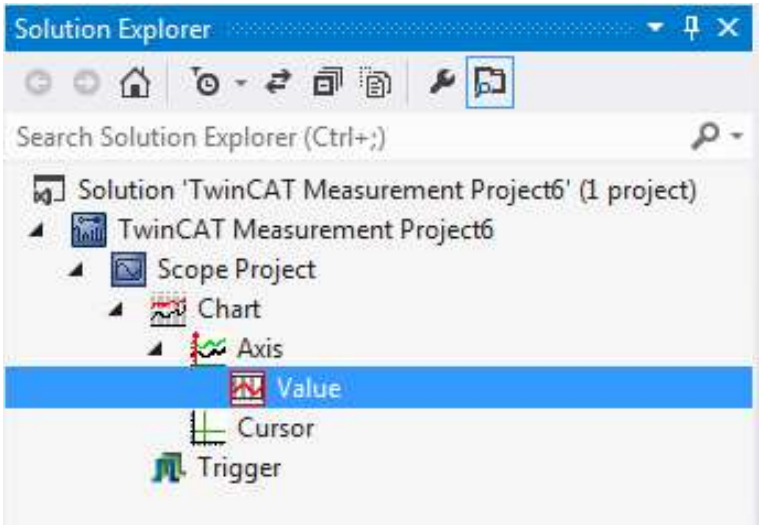
- Alternatively the target browser can also be selected via the Scope menu in Visual Studio. Once the target browser has opened, the window can be docked in any position in the user interface. It is possible to select the desired variables by browsing into the respective target system.



- The variables can be selected by multi-select and added to the configuration by right-clicking on "Add symbol" or by drag & drop.

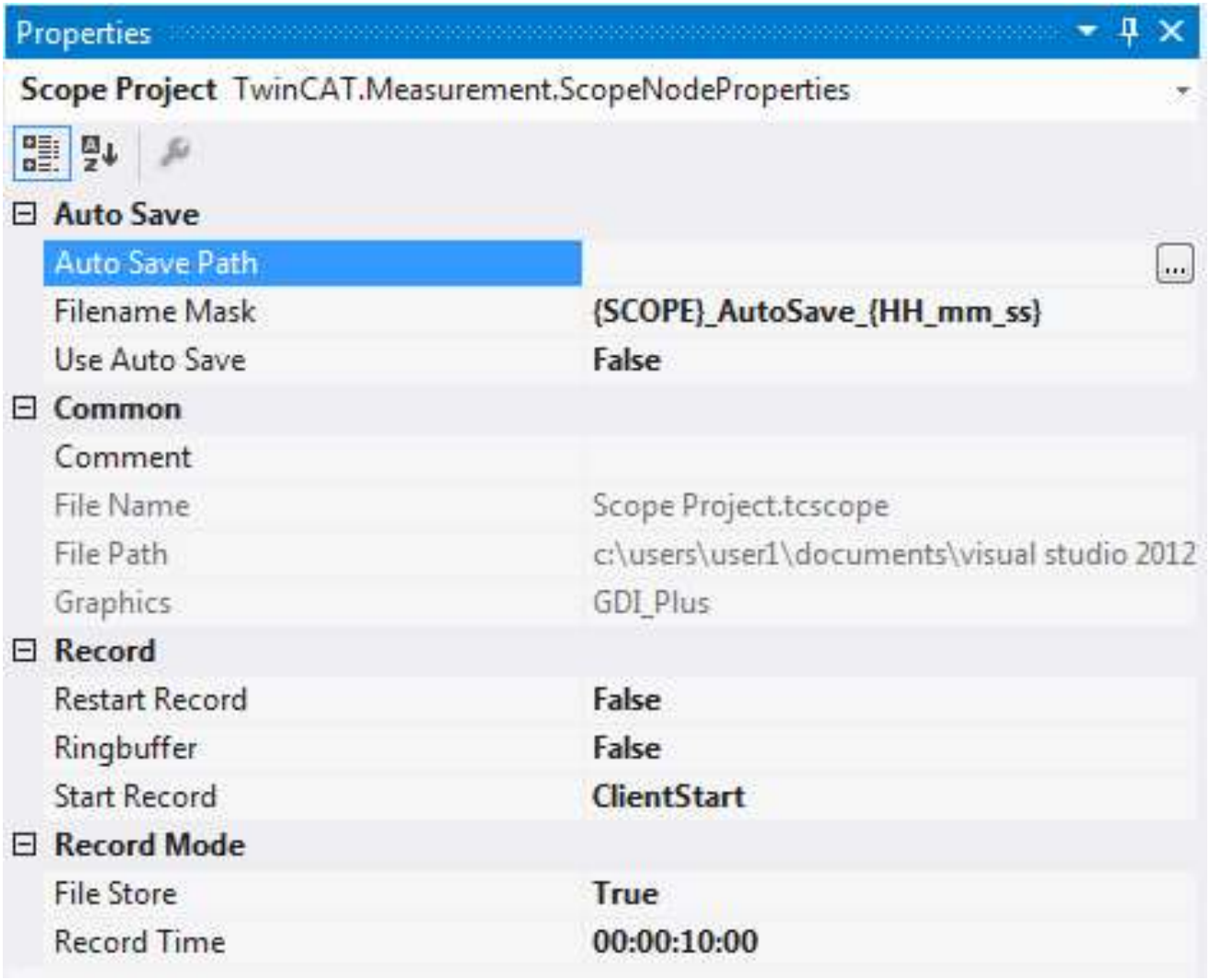


- The selected channels are assigned to the last-selected axis. In this case only one axis is present.

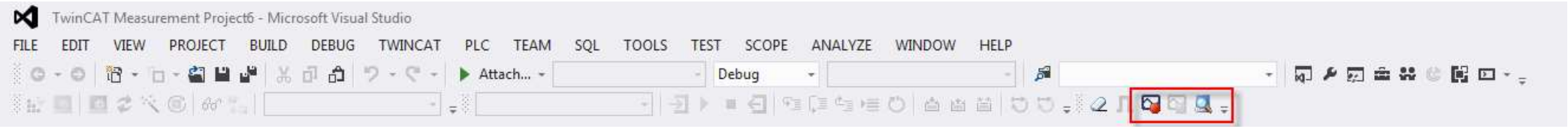


- **5. Recording:**
  Prior to a recording the basic recording settings must be made in the Scope Properties. Standard is a ten-minute recording which is started manually and automatically stopped after the respective time. The settings for all hierarchical levels – Scope, Charts, Axis and Channel – as well as for trigger and cursor can be made in the standard Property window of Visual Studio. A simple click on the corresponding element in the Solution Explorer is sufficient, provided that the Property window has already been opened first under View in Visual Studio.

- **5. Recording:**

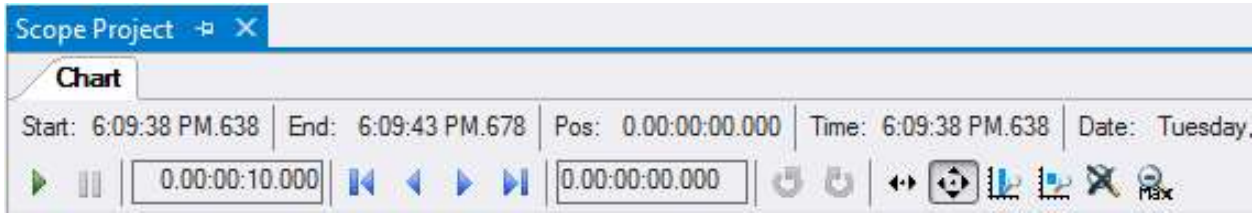

Properties
Scope Project TwinCAT.Measurement.ScopeNodeProperties
Auto Save
Auto Save Path
Filename Mask {SCOPE}_AutoSave_{HH_mm_ss}
Use Auto Save False
Common
Comment
File Name Scope Project.tcscope
File Path c:\users\user1\documents\visual studio 2012
Graphics GDI_Plus
Record
Restart Record False
Ringbuffer False
Start Record ClientStart
Record Mode
File Store True
Record Time 00:00:10:00

- If the standard settings are left as they are, the recording can be started. To this end the Scope toolbar must be opened when using for the first time.
  In Visual Studio > View > Toolbars > TwinCAT Measurement.

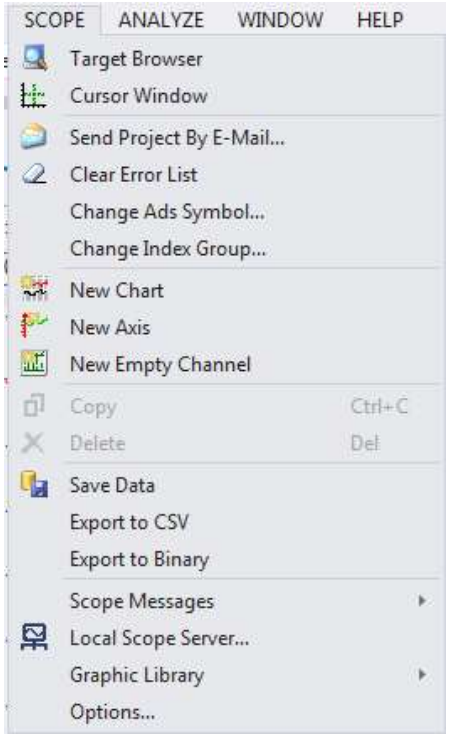


- The recording is started by clicking on the icon with the red recording symbol.

- **6. During the recording:**
  In order to improve the display of the channels in the View, charts and axes can be added even during the recording in TwinCAT 3 Scope View and channels can be shifted within the Scope.
- X and Y cursors can also be added and deleted at runtime.
- An important feature is the possibility to stop the display of the current recording while the recording of the data continues to run in the background. Once the display is stopped you can zoom into the data and analyze the signal curve with the cursors at your leisure.



- **7. Stopping the recording and saving the data:**
  In this case the started recording is stopped automatically on expiry of the recording time of ten minutes. Alternatively the recording can of course be ended manually at any time via the stop button in the Scope toolbar. The recorded data are only consistent if they are stored as a .svd file. Click on the Scope menu in Visual Studio and select Save Data.



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