



**acontis technologies GmbH**

**SOFTWARE**

# **EC-Inspector**

**User Manual**

**Version 4.1**

**Edition: August 21, 2025**

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

© Copyright **acontis technologies GmbH**

Neither this document nor excerpts therefrom may be reproduced, transmitted, or conveyed to third parties by any means whatever without the express permission of the publisher. At the time of publication, the functions described in this document and those implemented in the corresponding hardware and/or software were carefully verified; nonetheless, for technical reasons, it cannot be guaranteed that no discrepancies exist. This document will be regularly examined so that corrections can be made in subsequent editions. Note: Although a product may include undocumented features, such features are not considered to be part of the product, and their functionality is therefore not subject to any form of support or guarantee.

# Contents

<b>1</b>	<b>Introduction</b>	<b>5</b>
1.1	Overview . . . . .	5
1.2	Requirements . . . . .	5
<b>2</b>	<b>Installation</b>	<b>6</b>
2.1	Setup Process . . . . .	6
2.2	Silent Installation (optional) . . . . .	9
2.3	File and Folder Structure . . . . .	10
2.4	NDIS Driver . . . . .	10
<b>3</b>	<b>Graphical user interface</b>	<b>12</b>
3.1	Overview . . . . .	12
3.2	Menu/Tool/Status bar . . . . .	13
3.2.1	File . . . . .	13
3.2.2	View . . . . .	13
3.2.3	Network . . . . .	13
3.2.4	Settings . . . . .	14
3.2.5	Help . . . . .	14
3.3	Project Explorer . . . . .	14
3.3.1	Drag and Drop . . . . .	14
3.3.2	Configuration Mode . . . . .	14
3.3.3	Diagnosis Mode . . . . .	16
3.4	Device Editor . . . . .	20
3.5	Short Info . . . . .	20
3.6	Message Window . . . . .	21
<b>4</b>	<b>Configuration Mode</b>	<b>22</b>
4.1	Overview . . . . .	22
4.2	Device Settings . . . . .	22
4.2.1	General . . . . .	22
4.2.2	Process Data Image . . . . .	24
4.2.3	Watchlist . . . . .	25
4.2.4	Data Acquisition . . . . .	25
4.2.5	Trigger . . . . .	29
4.3	SubDevice Settings . . . . .	31
4.3.1	General (SubDevice) . . . . .	31
4.3.2	Variables . . . . .	32
<b>5</b>	<b>Diagnosis</b>	<b>33</b>
5.1	Overview . . . . .	33
5.2	Device . . . . .	34
5.2.1	General . . . . .	34
5.2.2	Process Data Image . . . . .	35
5.2.3	Watch list . . . . .	36
5.2.4	Performance . . . . .	37
5.2.5	Data Acquisition Diagnosis . . . . .	37
5.3	SubDevice . . . . .	38
5.3.1	General (SubDevice) . . . . .	38
5.3.2	Variables . . . . .	40
5.3.3	ESC Register . . . . .	40
5.3.4	Extended Diagnosis . . . . .	41
5.3.5	CoE Object-Dictionary . . . . .	42
5.3.6	File over Ethernet (FoE) . . . . .	45
5.3.7	History (SubDevice) . . . . .	45

5.3.8	Motion (Motion Tabs only)	47
<b>6</b>	<b>Operating with Third Party EtherCAT Controller</b>	<b>48</b>
6.1	Beckhoff TwinCAT	48
6.1.1	TwinCAT ENI	48
6.1.2	Activate TwinCAT Error Counters	48
6.2	Codesys	48
6.2.1	Codesys ENI	49
6.2.2	Activate Codesys Error Counters	49
<b>7</b>	<b>Additional Tools</b>	<b>50</b>
7.1	ESI-Manager	50
7.2	Inspection Report	51
7.3	Settings	51
7.3.1	General	52
7.3.2	Message Level	53
7.3.3	Capture File	54
7.3.4	Pcap File	57
7.3.5	FoE File	58
7.3.6	Settings File	61
<b>8</b>	<b>Customization</b>	<b>63</b>
8.1	Multi-Language-Support	63
8.2	Themes	63
<b>9</b>	<b>Licensing</b>	<b>67</b>
9.1	Third party Software	67
9.2	EC-Inspector License	67
9.3	Node Locked License	67
9.4	Floating License	67
9.4.1	Configure License Server	68
9.4.2	Configure Client Computer	69
9.5	License Update	71
9.5.1	Request License Update	71
9.5.2	Install License Update	75
9.6	Dongle Firmware Update	75
9.7	Expiration Date Dongle	77
<b>10</b>	<b>FAQ, Tips</b>	<b>79</b>
10.1	Help in case of a problem	79
10.2	Internal User Specific Settings	79
10.3	FAQ	81

# 1 Introduction

Since this software is not intended to offend any sensibilities, the term MainDevice (abbreviated MainDevice) replaces “master” and SubordinateDevice (abbreviated SubDevice) replaces “slave”.

## 1.1 Overview

EC-Inspector is a diagnosis tool for EtherCAT networks that are controlled by any EtherCAT MainDevice (EC-Master, TwinCAT, CoDeSys 3.5.17. and higher, ...) with help of the EC-Monitor.

The user needs an ENI file to start the EC-Monitor. The EC-Monitor will collect the data from the EtherCAT network.

The EtherCAT network does not have to be changed. Only a TAP or switch is needed to collect the data.

## 1.2 Requirements

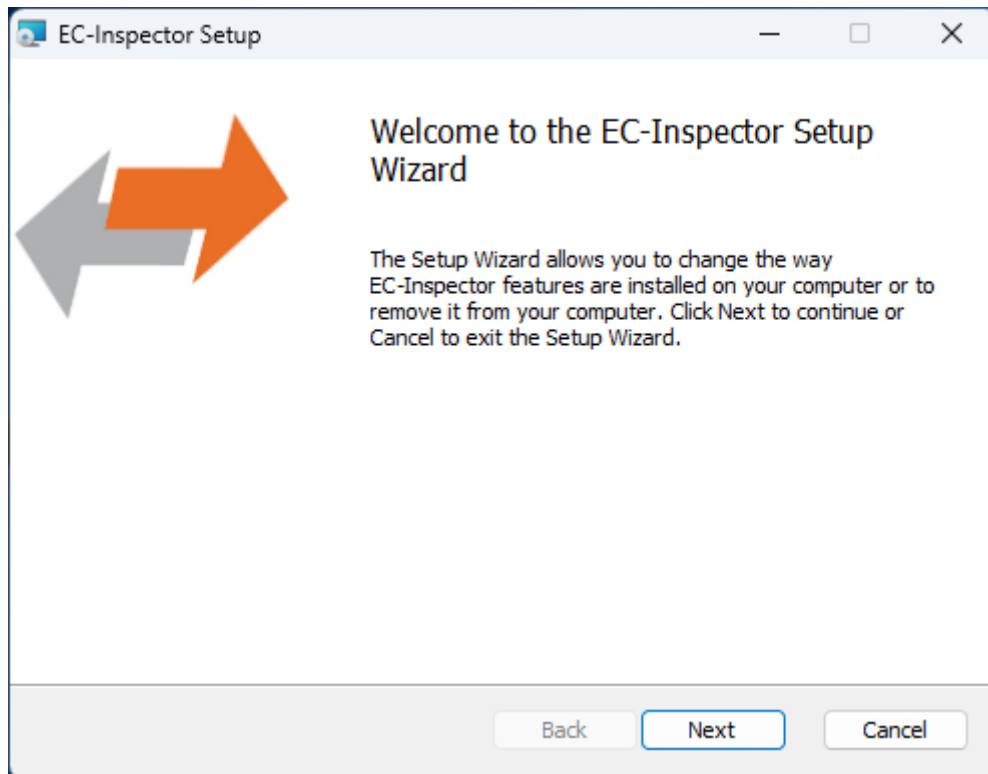
- Microsoft Windows 10 and above
- Microsoft .NET Framework 4 Client Profile
- Screen resolution at least 1024x768 pixel
- Memory as recommended for operating system
- Disk space approximately 80 MB (depend on number of ESI files)

## 2 Installation

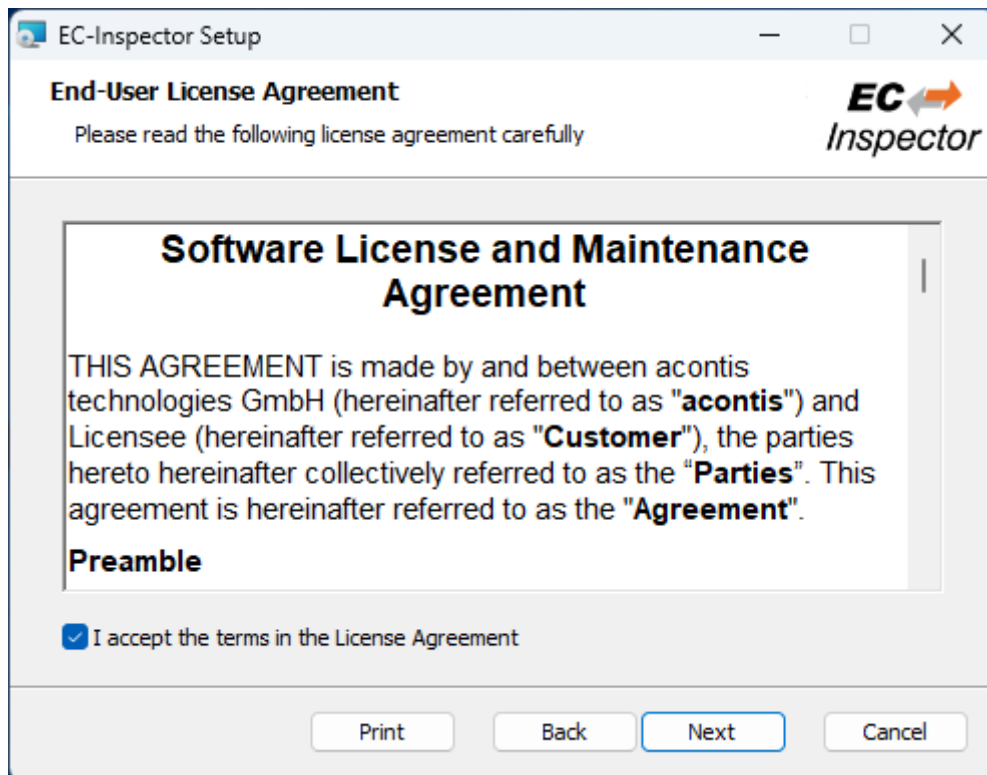
### 2.1 Setup Process

The EC-Inspector can be installed by executing the `setup.exe` (requires administrator privileges) and follow the screen instructions:

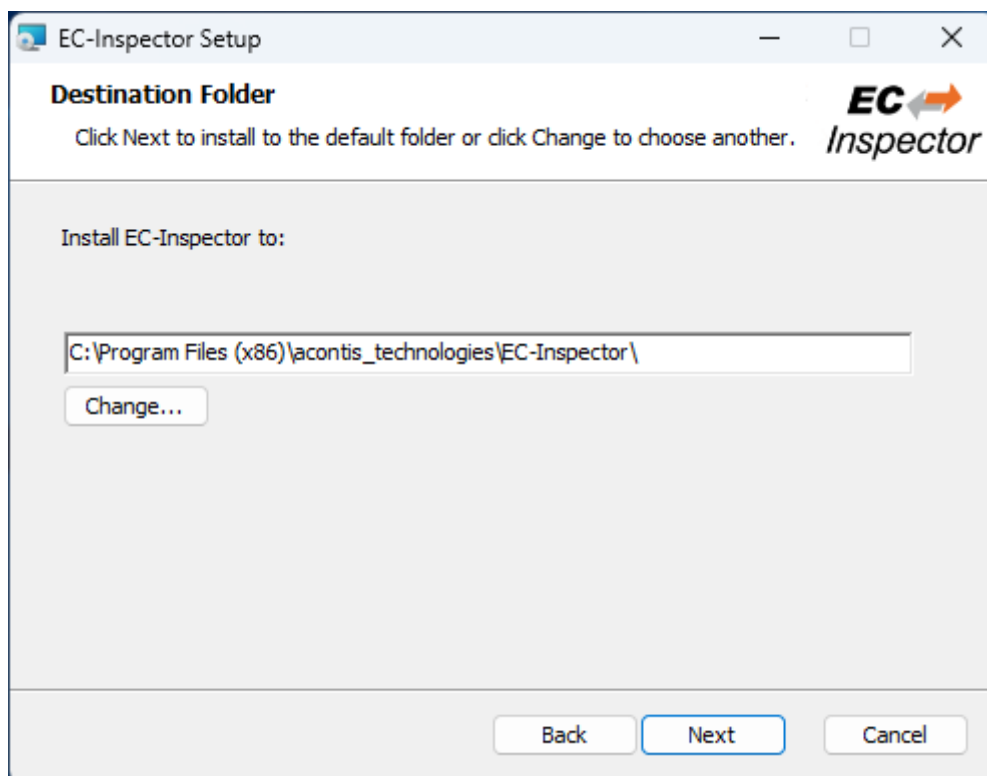
Welcome page:



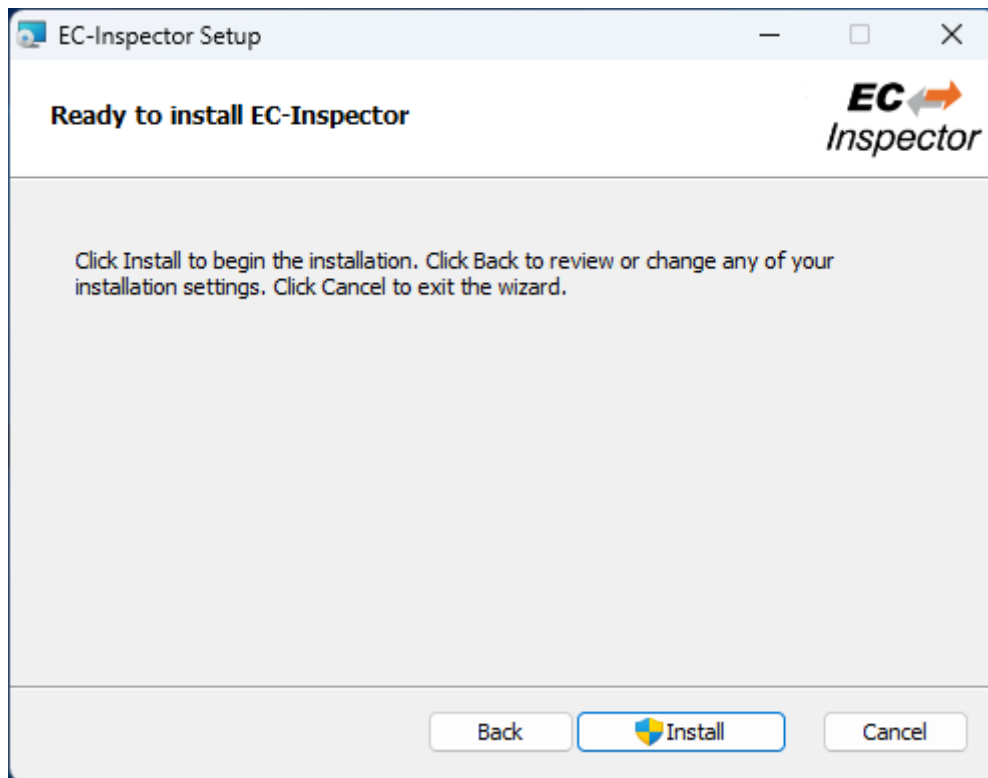
License Agreement:



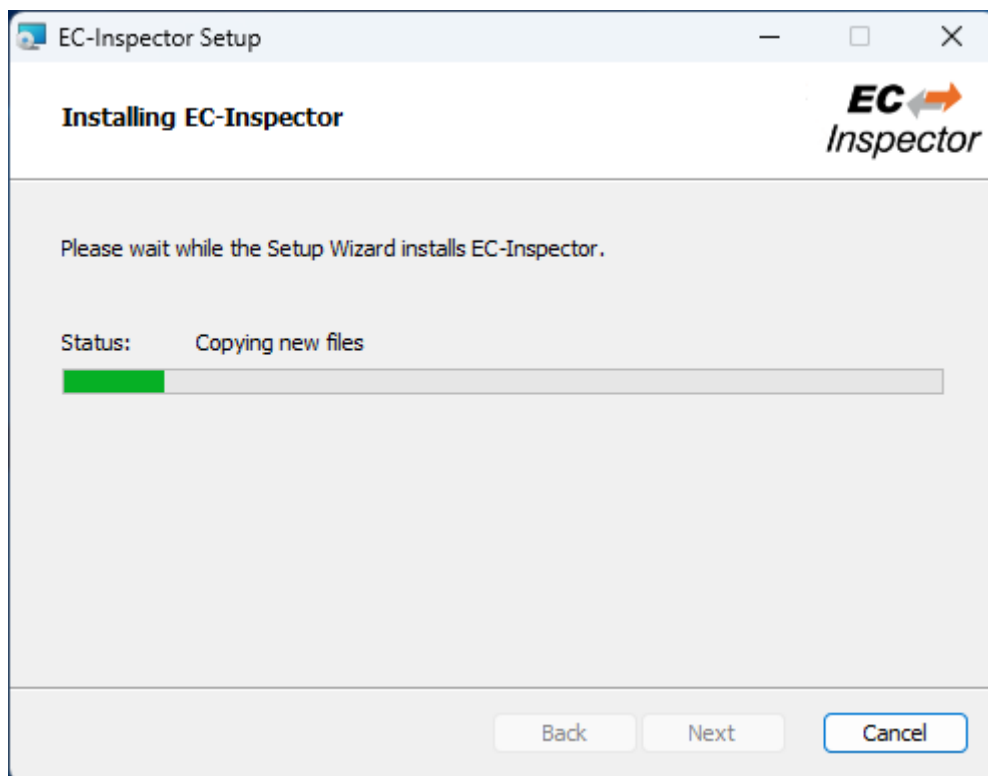
Select Installation Folder:



Confirm Installation:

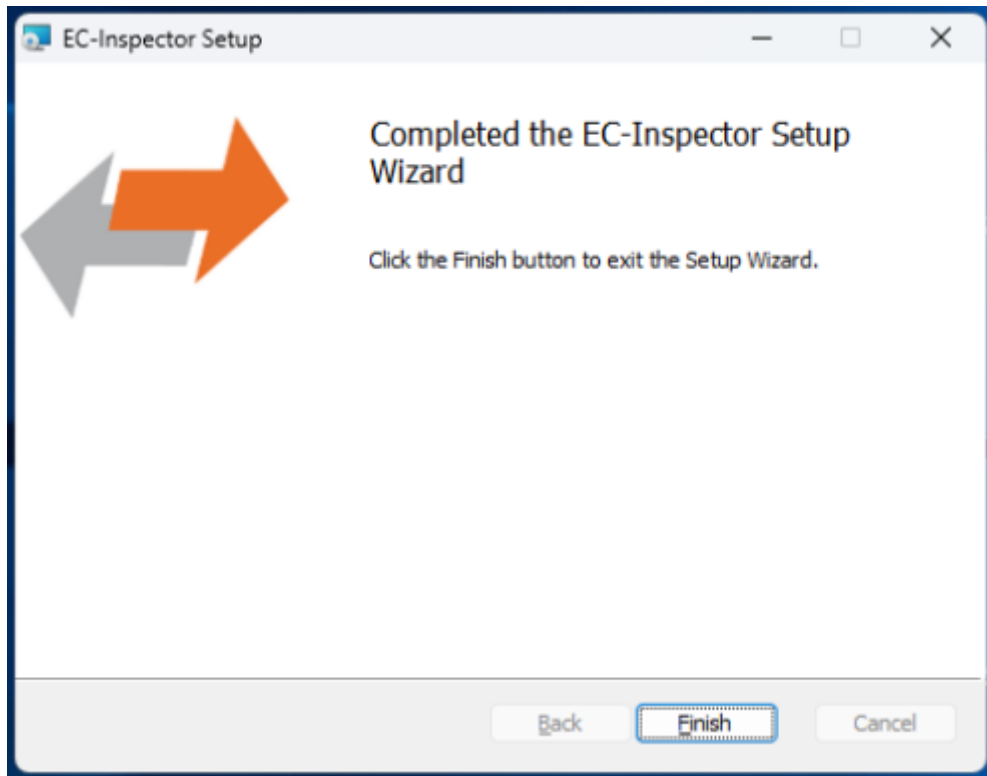


Installing:



Installation Complete:





## 2.2 Silent Installation (optional)

The EC-Inspector can be also installed in silent mode by using the command line parameters of `msiexec`.

Sample 1: Installs EC-Inspector into default installation folder

```
PS C:
> msiexec /i c:/temp/EcInspectorSetup.msi /quiet /qn /norestart /log
↪ c:/temp/install.log
```

Sample 2: Installs EC-Inspector into “C:/EC-Inspector”

```
PS C:
> msiexec /i c:/temp/EcInspectorSetup.msi /quiet /qn /norestart /log
↪ c:/temp/install.log INSTALLLOCATION="C:/EC-Inspector"
```

For more information please refer command line parameters of `msiexec`.

---

**Note:** The system requirements (see section “1.3”) will be not checked!

---

## 2.3 File and Folder Structure

The setup process will copy all necessary files into the following folder:

**Installation directory:**

- /Doc**
  - Release notes and the user manual
- /EEC**
  - Files for mapping emergency error codes
- /Languages**
  - Language specific files
- /**
  - EC-Inspector.exe
  - EcWrapper.dll
  - ...

**All users directory:** ( %ALLUSERSPROFILE%/EC-Inspector, like C:/ProgramData/EC-Inspector)

- /CAPTURE**
  - Capture files which can be analysed in offline diagnosis mode (see *Capture File*)
- /EMI**
  - EtherCAT MainDevice Information files
- /EtherCAT**
  - EtherCAT SubDevice Information (ESI) Files. Can be modified via *ESI-Manager*
- /**
  - **ESICache.xml (ESI-File-Cache for faster access of ESI files)**
    - EC-Inspector.log (Log File)
    - User.myusername.xml (User specific settings)

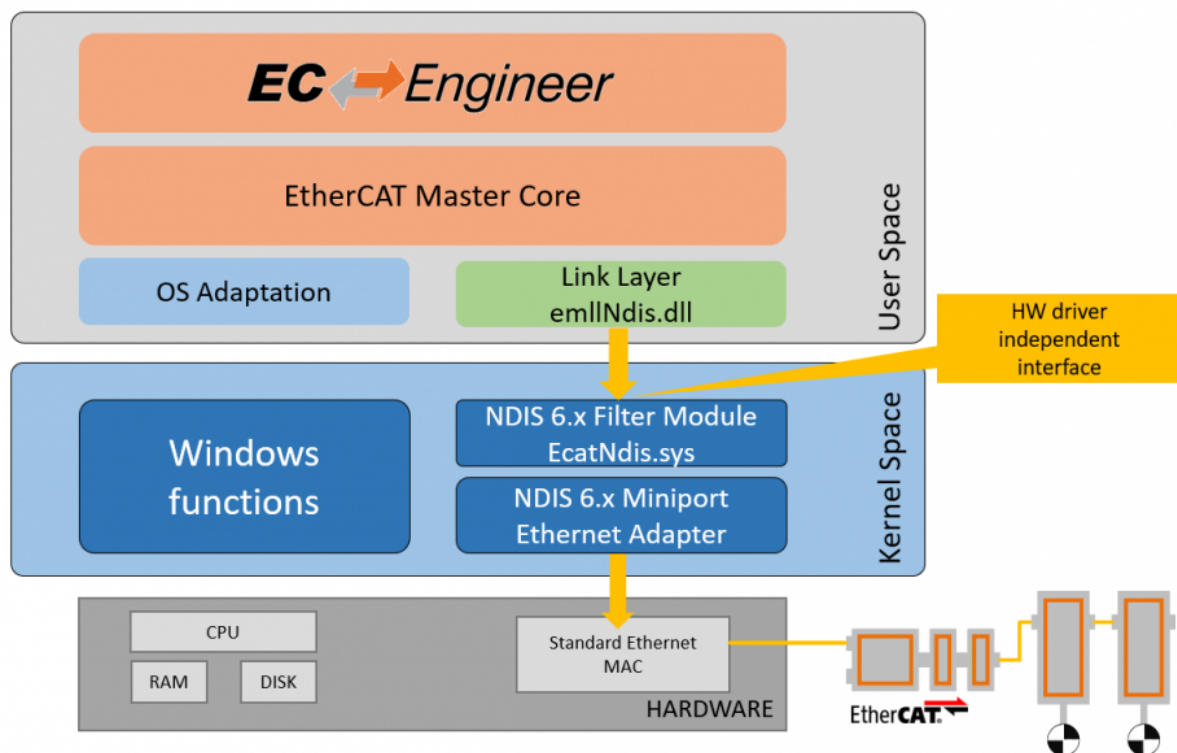
## 2.4 NDIS Driver

The Network Driver Interface Specification (NDIS) is the specification for a network driver architecture that allows transport protocols like TCP/IP to communicate with an underlying physical network adapter. For sending and receiving EtherCAT frames in Windows, EC-Inspector makes use of the well-known Windows packet capture library, WinPcap. However, WinPcap was based on the NDIS 5.x driver model, and development has ceased. The latest versions of Windows 10 do not support this old NDIS 5.x version anymore, so now EC-Inspector (V3.2 and higher) includes an installation package in the install directory of EC-Inspector to install the acontis NDIS 6.x Filter Module `EcatNdis.sys`. With this new Filter Module and the new NDIS Link Layer `emllNdis.dll`, it is now possible for EC-Inspector to work without WinPcap on all Windows 10 versions.

---

**Note:** Please restart EC-Inspector after the NDIS installation.

---

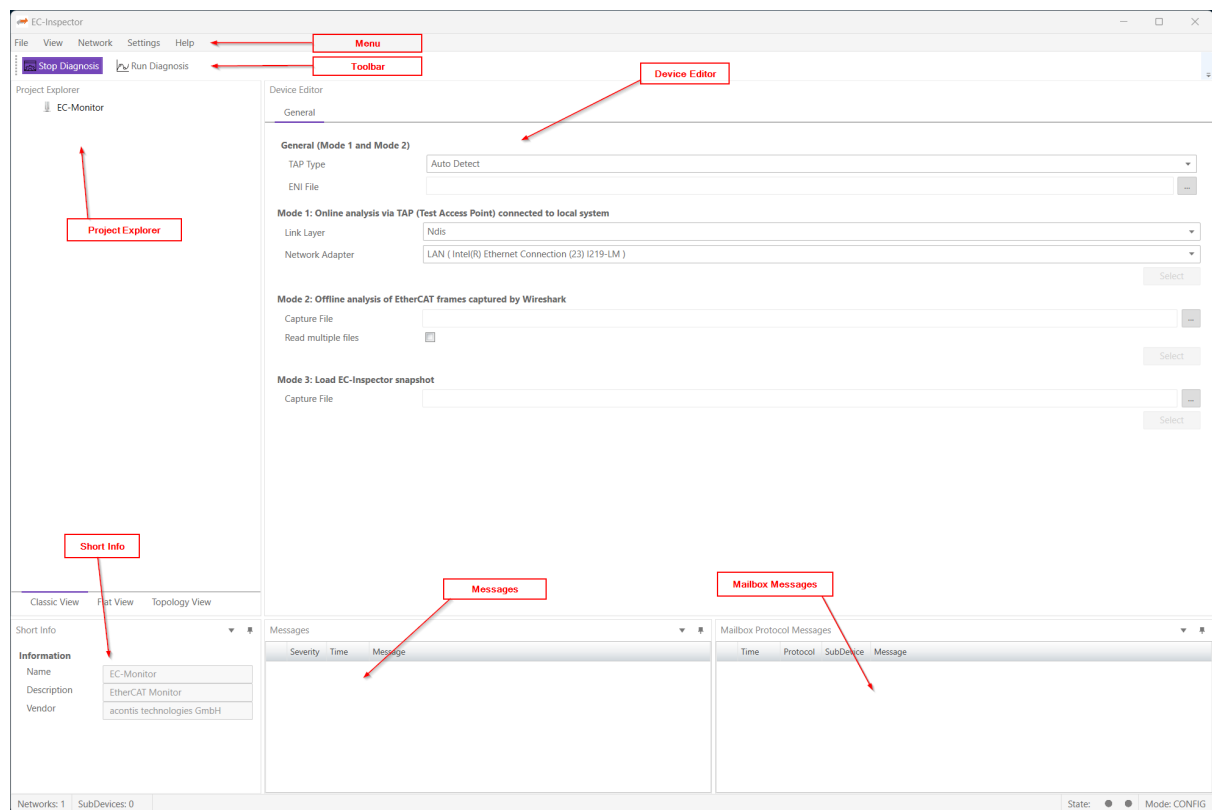
**Local system**

Link Layer	Ndis
Network Adapter	Ndis
Requested MainDevice State	IntelGbe

## 3 Graphical user interface

### 3.1 Overview

This section gives an overview about the graphical user interface:



The graphical user interface is divided into five parts:

**Menu/Tool/Status bar:**

Shows current status or mode of the EC-Inspector and allows the user to change it.

**Project Explorer:**

Shows different views of the current network configuration

**Device Editor:**

Show information about the selected device, like process variables.

**Short Info:**

Show short information about selected device, like name, description or vendor.

**Messages:**

Shows notifications which occur e.g. when the EtherCAT Device has changed its operation state or a SubDevice has been removed from (or added to) the EtherCAT network.

## 3.2 Menu/Tool/Status bar

### 3.2.1 File

**New / Open / Save / Save As / Print:**

Start new configuration or open/save/print existing configuration

**ESI-Manager:**

Add, delete or export ESI and SCI files (see: [ESI-Manager](#))

**Recent Projects:**

Open recent project

**Exit:**

Closes the EC-Inspector

### 3.2.2 View

**Message Window:**

Shows/Hides the message window

**Short-Info Window:**

Shows/Hides the short-info window

**Refresh:**

Updates the current view

### 3.2.3 Network

**Inspection Report (active only in diagnosis mode):**

Opens a statistic about the state of the network. Collects some useful data like error counters and so on.  
Possibility to print a PDF. See [Inspection Report](#)

**Hardware Diagnostics:**

Enables or disables the additional hardware diagnostics and warnings in project explorer.

**Acknowledge all warnings (active only in diagnosis mode):**

Clears the yellow warning icon of all SubDevices

**Take Snapshot:**

Takes a snapshot from the current diagnosis state and saves it into a capture file (for more information about the snapshots and capture files, see [Capture File](#))

**Automatic Snapshot Mode:**

Activates the automatic snapshot mode to take snapshots based on the configured rules

**Snapshot:**

Changes the active snapshot

### 3.2.4 Settings

**Message Level:**

Change the current message level

**Settings:**

Shows more settings in the dialog *Settings*

### 3.2.5 Help

**Show User Manual:**

Shows this user manual

**Show Log File:**

Shows the log file

**Check for updates:**

Enable / disable automatic update check (once per month). Also a manual update check is performed on activation.

**About ...:**

Show the about dialog

## 3.3 Project Explorer

### 3.3.1 Drag and Drop

It is possible to drag and drop files here to import/open them

**Project file**

Opens the configuration stored in the ECC, only one project file can be imported at a time.

**ESI files**

Adds the files to the ESI-Manager, it only allows ESI, SCI and ZIP files, multiple files are allowed.

**The context menu of one or more selected SubDevices has the following entries:**

**Enable SubDevices:**

Enable disabled slaves

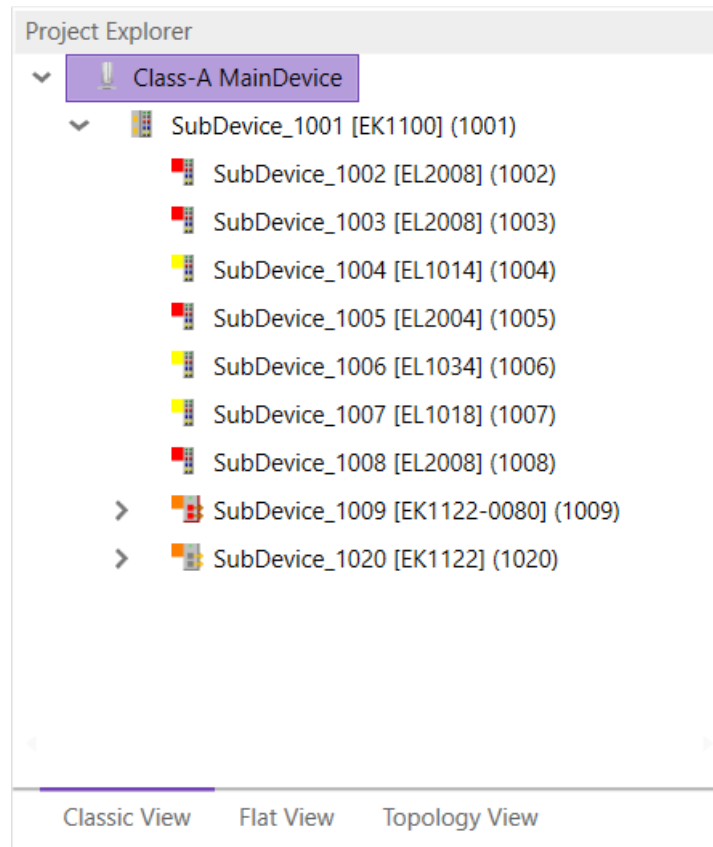
**Disable SubDevices:**

Disabled slaves will be ignored by EC-Monitor if they could not be seen by TAP

### 3.3.2 Configuration Mode

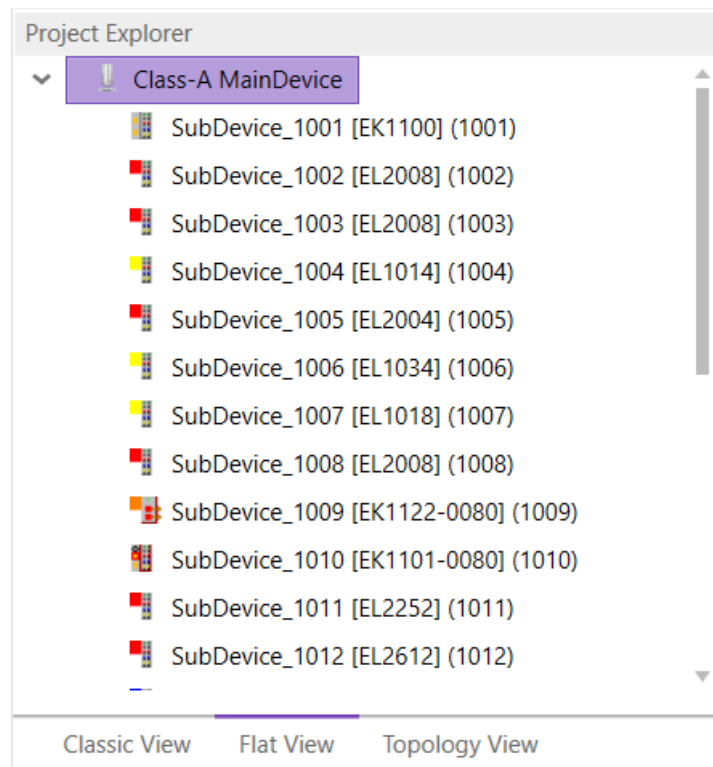
There are three topology visualisation views:

**Classic View**



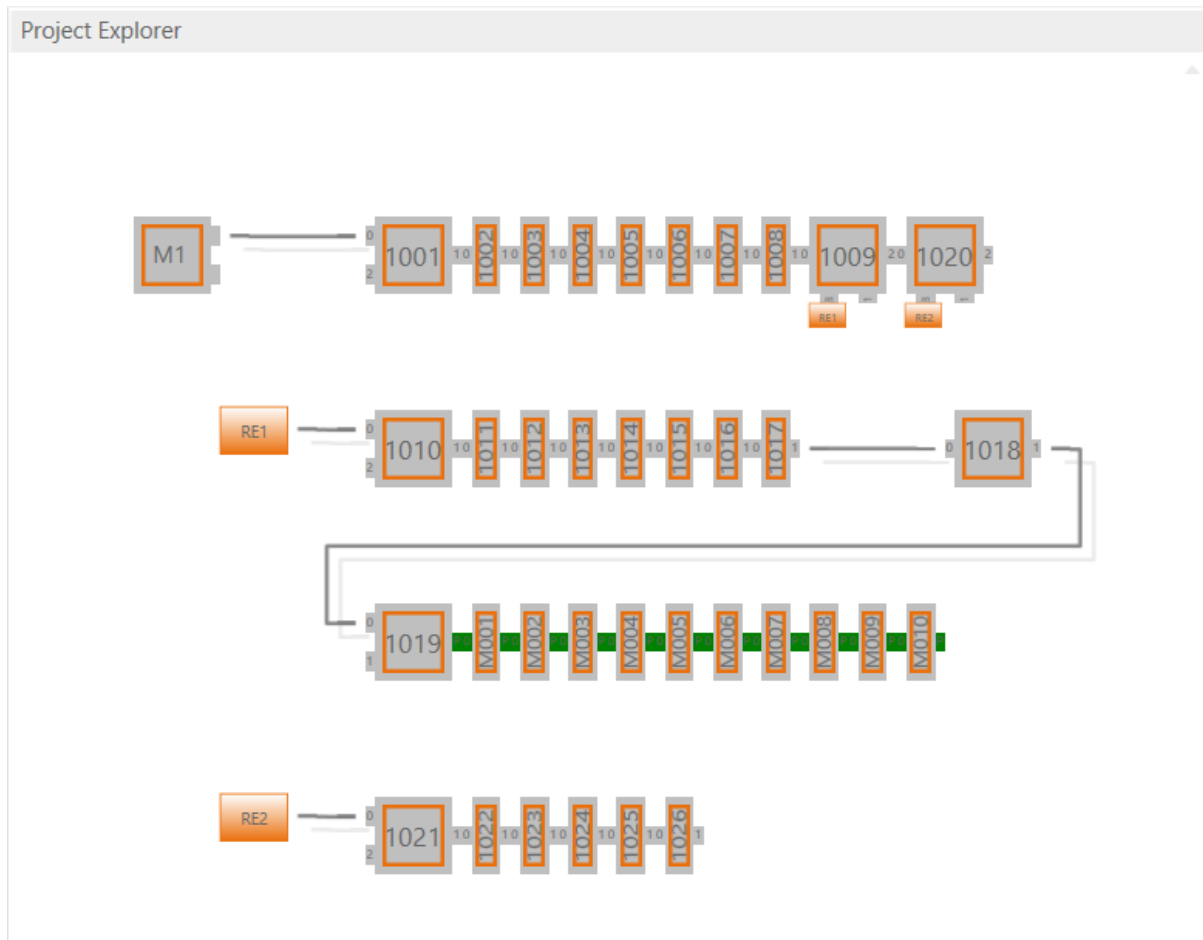
This is a tree view with multiple levels.

### Flat View



This view shows all SubDevices in a flat list, as they are connected in the EtherCAT network.

### Topology View



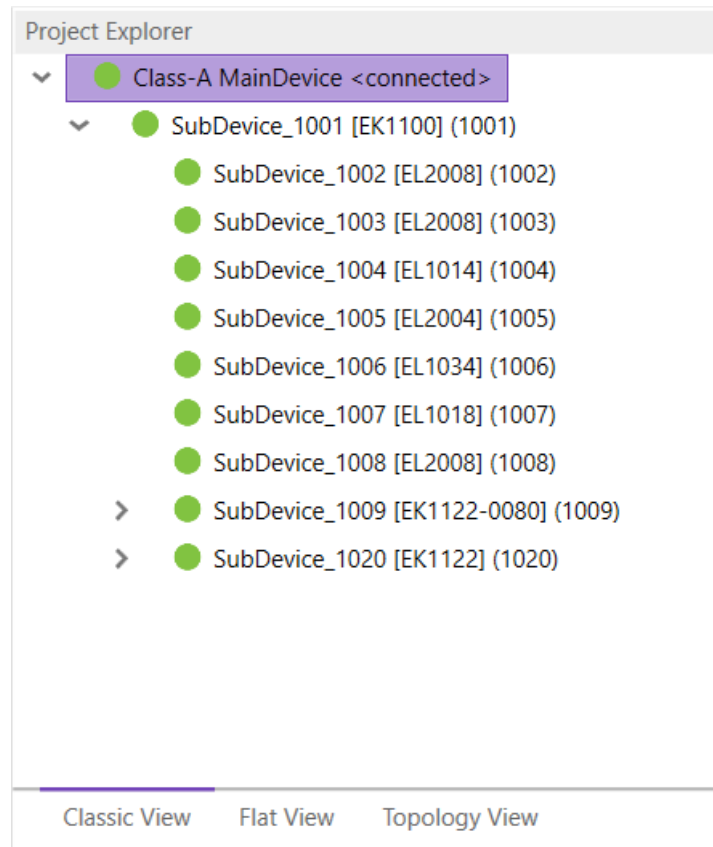
This view shows a graphical tree of all SubDevices, as they are connected in the EtherCAT network.

### 3.3.3 Diagnosis Mode

There are three topology visualisation views:




#### Classic View



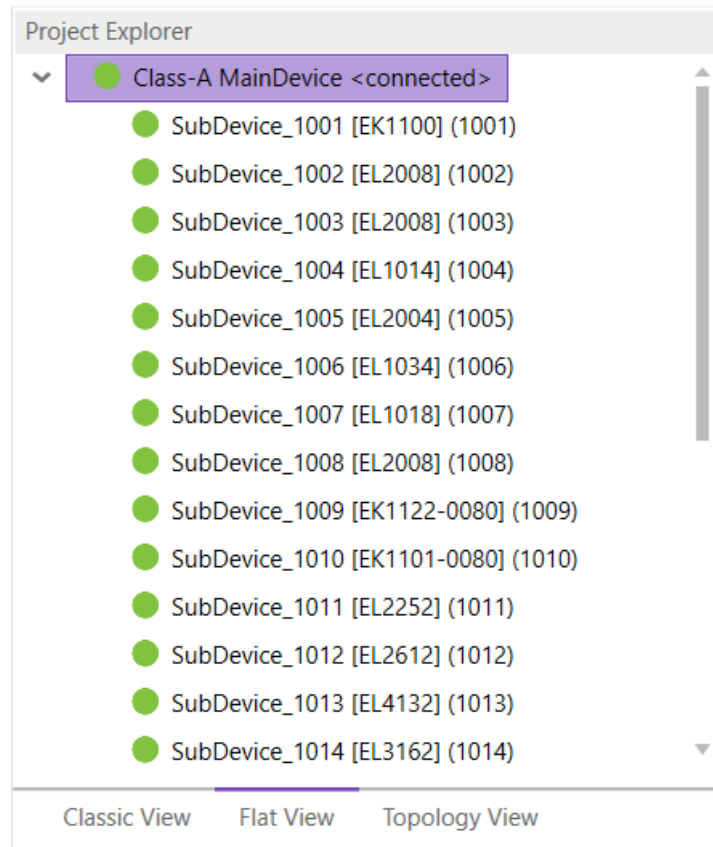


This is a tree view with multiple levels.

**Possible device states:**



-  Init Bootstrap
-  Pre-Op
-  Safe-Op
-  Op

**Flat View**

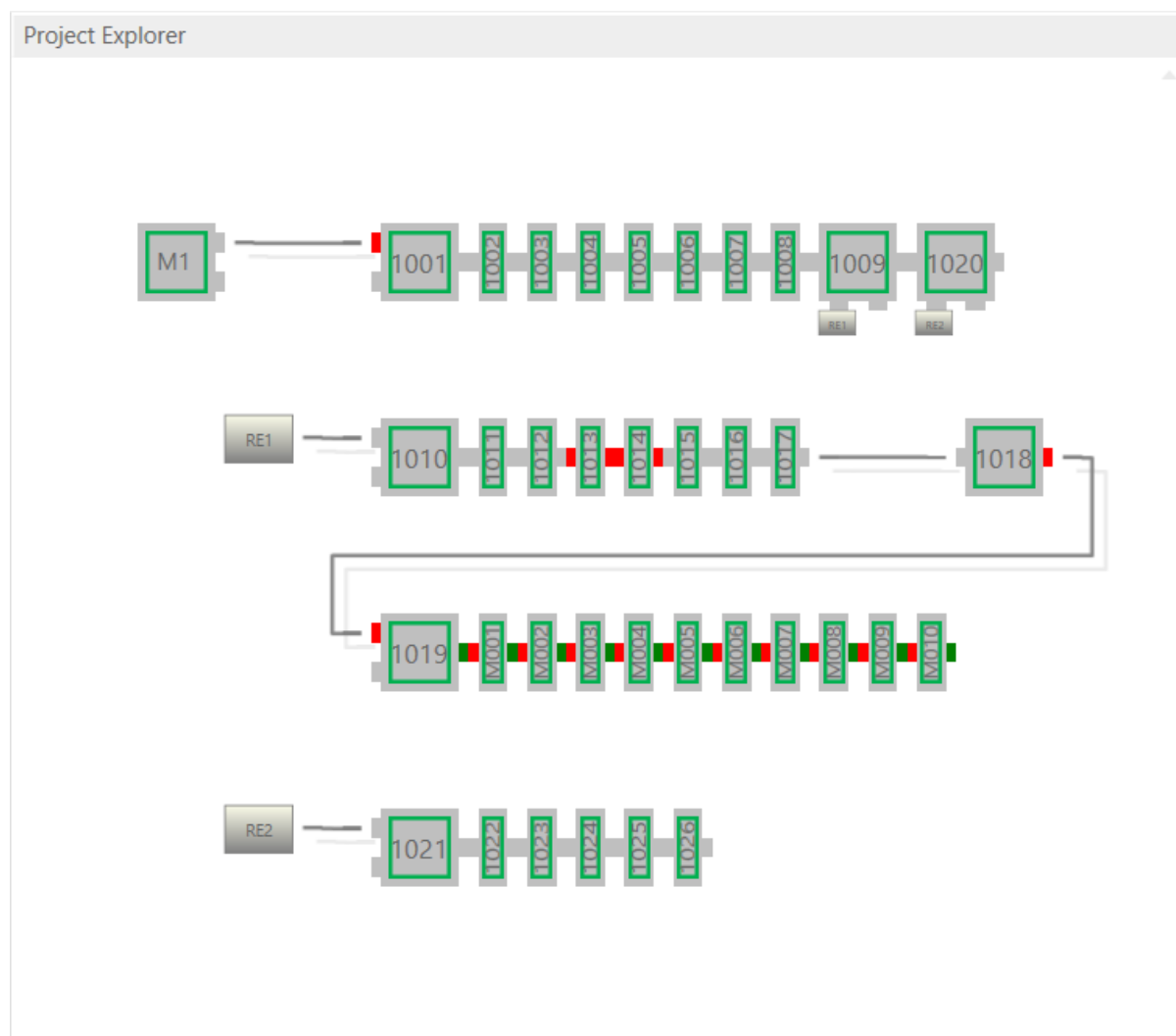


This view shows all SubDevices in a flat list, as they are connected in the EtherCAT network.

**Possible device states:**



-  Init Bootstrap
-  Pre-Op
-  Safe-Op
-  Op

**Topology View**






This view shows a graphical tree of all SubDevices, as they are connected in the EtherCAT network.

**Possible device states:**

-  Init Bootstrap
-  Pre-Op
-  Safe-Op
-  Op

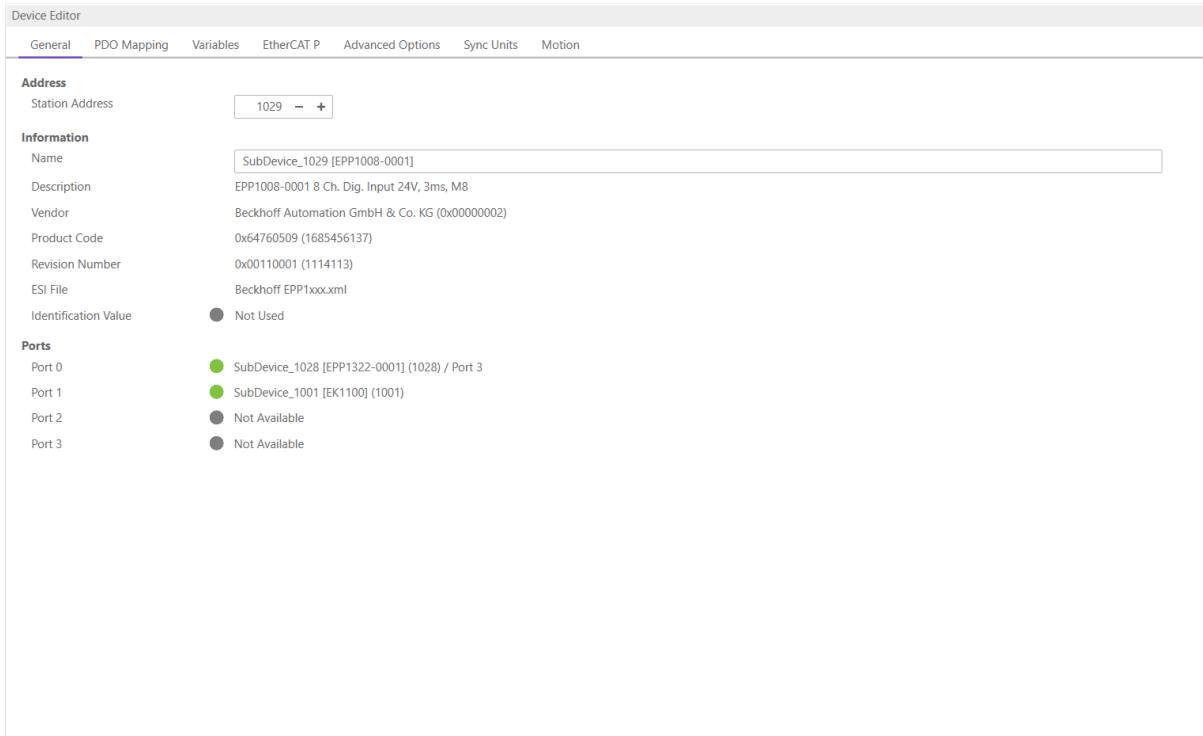
**Possible port states:**

-  Bad Cable Quality
-  Constricted Cable Quality
-  Good Cable Quality

If cable quality is constricted or bad, please check the error counters of the SubDevice (for more information about the extended diagnosis, see [Extended Diagnosis](#)).

## 3.4 Device Editor

This Editor gives the user the possibility to read and write information of the selected device or SubDevice:



The Device Editor window has a title bar "Device Editor" and a menu bar with tabs: General, PDO Mapping, Variables, EtherCAT P, Advanced Options, Sync Units, and Motion. The General tab is active.

**Address**

Station Address: 1029 - +

**Information**

Name: SubDevice\_1029 [EPP1008-0001]

Description: EPP1008-0001 8 Ch. Dig. Input 24V, 3ms, M8

Vendor: Beckhoff Automation GmbH & Co. KG (0x00000002)

Product Code: 0x64760509 (1685456137)

Revision Number: 0x00110001 (1114113)

ESI File: Beckhoff EPP1xxx.xml

Identification Value: ☒ Not Used

**Ports**

Port 0: ☒ SubDevice\_1028 [EPP1322-0001] (1028) / Port 3

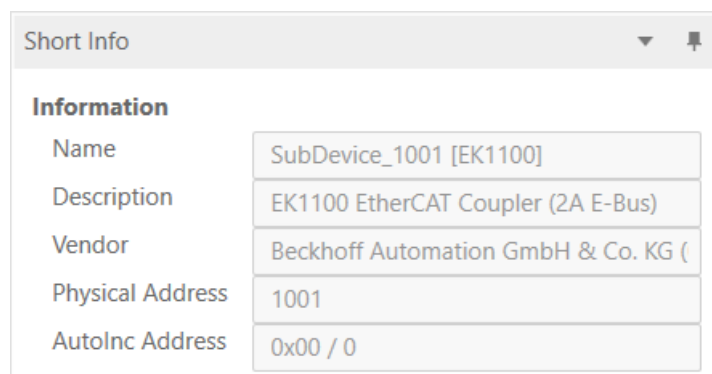
Port 1: ☒ SubDevice\_1001 [EK1100] (1001)

Port 2: ☒ Not Available

Port 3: ☒ Not Available

## 3.5 Short Info

This window shows short information about selected device, like name, description or vendor:



The Short Info window has a title bar "Short Info" with a dropdown arrow and a pin icon. It displays the following information:

**Information**

Name: SubDevice\_1001 [EK1100]

Description: EK1100 EtherCAT Coupler (2A E-Bus)

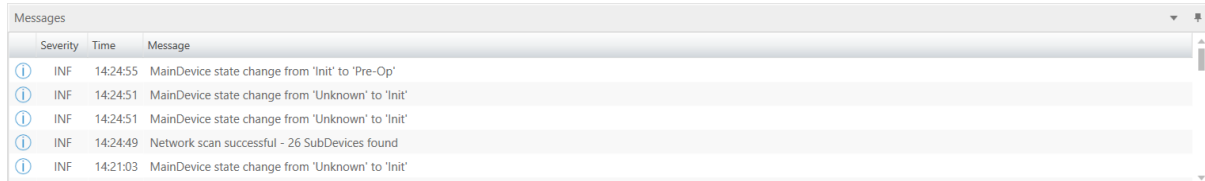
Vendor: Beckhoff Automation GmbH & Co. KG (

Physical Address: 1001

AutoInc Address: 0x00 / 0

## 3.6 Message Window

Shows notifications which occur e.g. when the EtherCAT MainDevice has changed its operation state or a SubDevice has been removed from (or added to) the EtherCAT network:



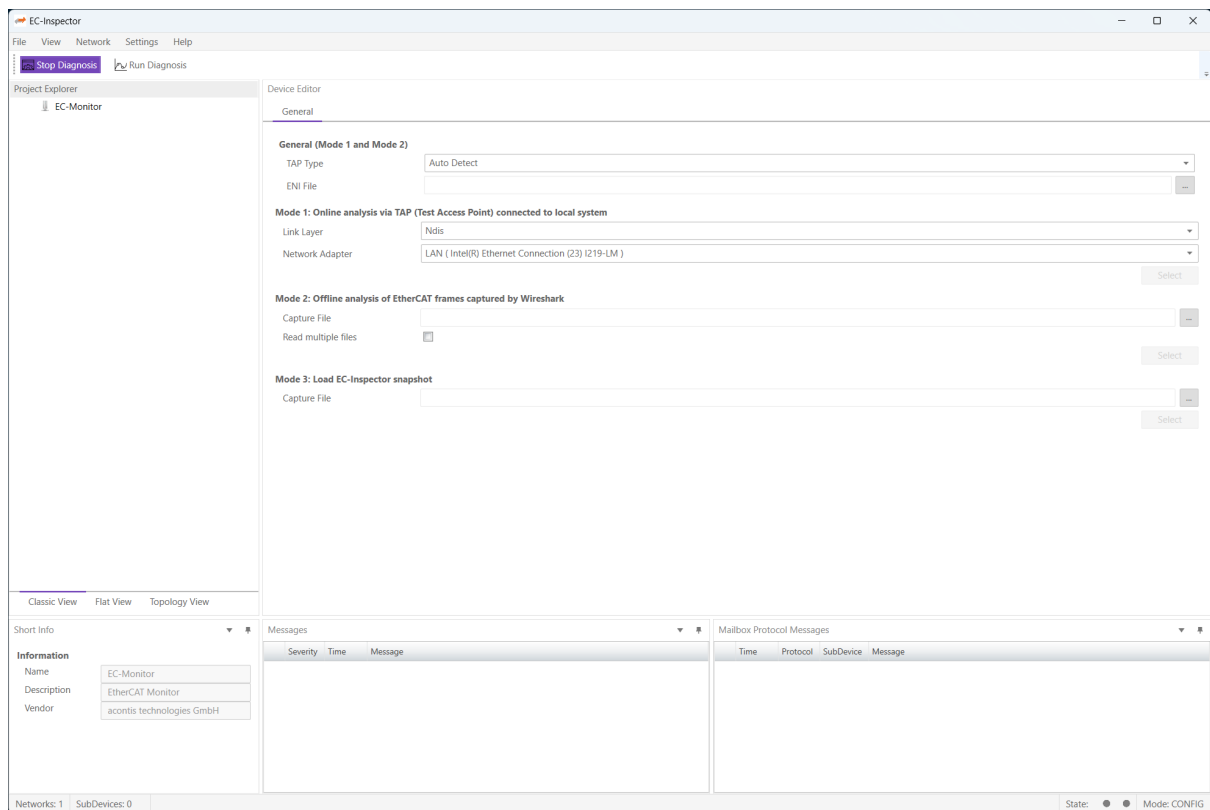
Messages			
	Severity	Time	Message
①	INF	14:24:55	MainDevice state change from 'Init' to 'Pre-Op'
①	INF	14:24:51	MainDevice state change from 'Unknown' to 'Init'
①	INF	14:24:51	MainDevice state change from 'Unknown' to 'Init'
①	INF	14:24:49	Network scan successful - 26 SubDevices found
①	INF	14:21:03	MainDevice state change from 'Unknown' to 'Init'

There is also a SDO Message Window, where only mailbox messages are shown. For example CoE messages and FoE messages. With EC-Inspector it is also possible to save the FoE file which is transferred on the network to a specific folder.

## 4 Configuration Mode

### 4.1 Overview

At startup of EC-Inspector, the user will see this page:



### 4.2 Device Settings

#### 4.2.1 General

In this tab, the user can configure the cycle time. If he wants to connect to a control system, this can also be configured. After one of these modes is selected, the ENI file will be imported to show the configuration:

Device Editor

General

General (Mode 1 and Mode 2)

TAP Type

Auto Detect

ENI File

Mode 1: Online analysis via TAP (Test Access Point) connected to local system

Link Layer

Ndis

Network Adapter

LAN ( Intel(R) Ethernet Connection (23) I219-LM )

Select

Mode 2: Offline analysis of EtherCAT frames captured by Wireshark

Capture File

Read multiple files

☐

Select

Mode 3: Load EC-Inspector snapshot

Capture File

Select

## General

### TAP Type:

Select the type of TAP adapter which is used. Generic is for a standard switch. Supported is also the ET2000. More will be supported in the future.

### ENI File:

Path to the ENI which is used in the network that should be monitored. The ENI file can be exported in EC-Inspector. More Infos about the ENI file from Third Party MainDevices can be found here [Operating with Third Party EtherCAT Controller](#)

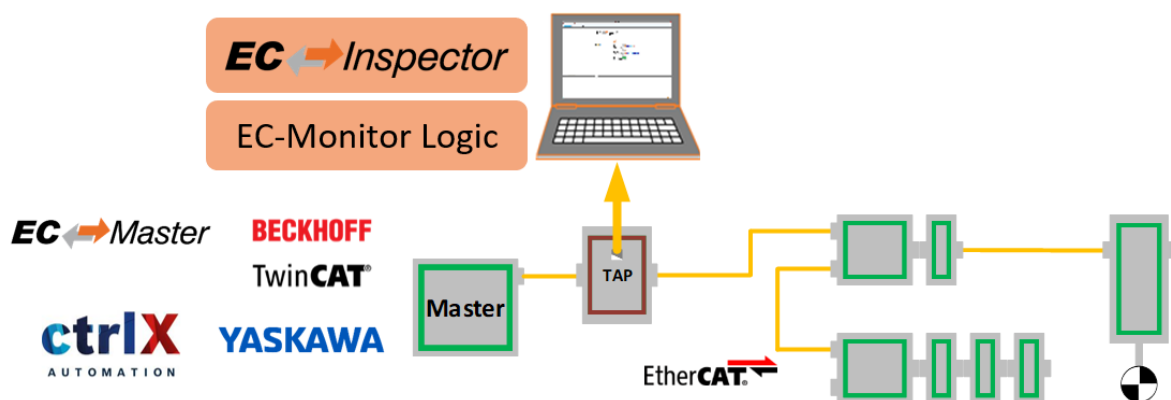
## Mode 1: Online analysis via TAP connected to local system

### LinkLayer:

Select the Link-Layer which should be used.

### Network Adapter:

Network adapter which is connected to TAP or the switch.



## Mode 2: Offline analysis of EtherCAT frames captured by Wireshark

**Capture File:**

Path to the capture file pcap

**Read multiple files:**

Select if wireshark is captured in more files

For more information about the capture files, see [Wireshark File](#)

**Mode 3: Load EC-Inspector snapshot****Capture File:**

Path to the capture file, which contains one or more snapshots ecd

For more information about the snapshots and capture files, see [Capture File](#)

## 4.2.2 Process Data Image

In this tab, the user can see all variables of the process data image. It can also be exported.

Device Editor

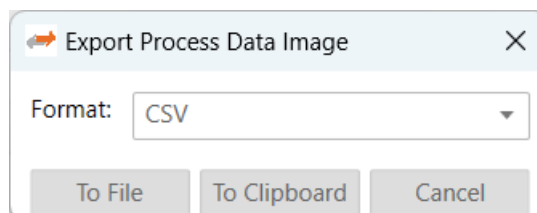
General Process Data Image Watch list Data Acquisition Trigger

Variables Export

Name	Datatype	MainDevice Sync Unit	Offset	Size
Slave_1018 [BK1120].Status PDO.CouplerState	UINT	Id 0: Default 0	IN : 0.0	2.0
Slave_1018 [BK1120].TxPDO Mapping Terminal 003.Channel 1	BOOL	Id 0: Default 0	IN : 2.0	0.1
Slave_1018 [BK1120].TxPDO Mapping Terminal 003.Channel 2	BOOL	Id 0: Default 0	IN : 2.1	0.1
Slave_1025 [EL7031].ENC Status compact.Status_Latch extern valid	BOOL	Id 0: Default 0	IN : 4.1	0.1
Slave_1025 [EL7031].ENC Status compact.Status_Set counter done	BOOL	Id 0: Default 0	IN : 4.2	0.1
Slave_1025 [EL7031].ENC Status compact.Status_Counter underflow	BOOL	Id 0: Default 0	IN : 4.3	0.1
Slave_1025 [EL7031].ENC Status compact.Status_Counter overflow	BOOL	Id 0: Default 0	IN : 4.4	0.1
Slave_1025 [EL7031].ENC Status compact.Status_Status of extern latch	BOOL	Id 0: Default 0	IN : 5.4	0.1
Slave_1025 [EL7031].ENC Status compact.Status_Sync error	BOOL	Id 0: Default 0	IN : 5.5	0.1
Slave_1025 [EL7031].ENC Status compact.Status_TxPDO Toggle	BOOL	Id 0: Default 0	IN : 5.7	0.1
Slave_1025 [EL7031].ENC Status compact.Counter value	UINT	Id 0: Default 0	IN : 6.0	2.0
Slave_1025 [EL7031].ENC Status compact.Latch value	UINT	Id 0: Default 0	IN : 8.0	2.0
Slave_1025 [EL7031].STM Status.Status_Ready to enable	BOOL	Id 0: Default 0	IN : 10.0	0.1
Slave_1025 [EL7031].STM Status.Status_Ready	BOOL	Id 0: Default 0	IN : 10.1	0.1
Slave_1025 [EL7031].STM Status.Status_Warning	BOOL	Id 0: Default 0	IN : 10.2	0.1
Slave_1025 [EL7031].STM Status.Status_Error	BOOL	Id 0: Default 0	IN : 10.3	0.1
Slave_1025 [EL7031].STM Status.Status_Moving positive	BOOL	Id 0: Default 0	IN : 10.4	0.1
Slave_1025 [EL7031].STM Status.Status_Moving negative	BOOL	Id 0: Default 0	IN : 10.5	0.1
Slave_1025 [EL7031].STM Status.Status_Torque reduced	BOOL	Id 0: Default 0	IN : 10.6	0.1

Add to watch list

If the variables should be exported, the following dialog appears:



Export Process Data Image

Format: CSV

To File To Clipboard Cancel

**Export Formats:**

- CSV File (Semicolon separated text file)
- CSV PLC File (Semicolon separated text file, where offsets are in PLC format)

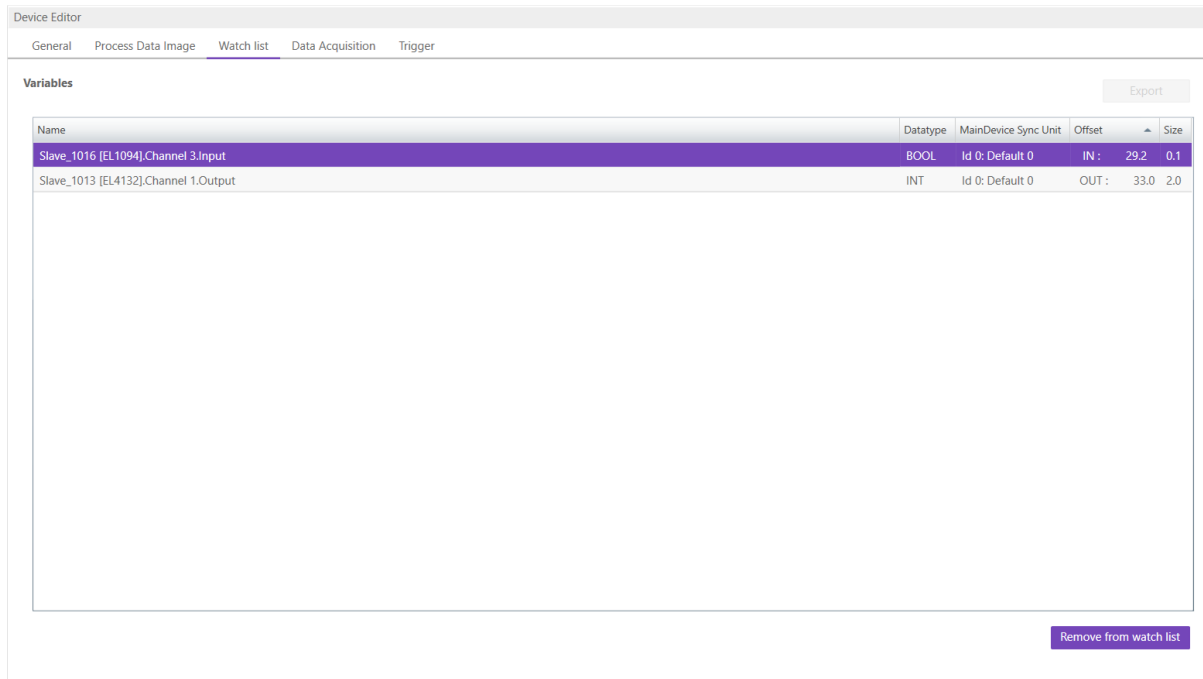


- PD Layout File (C-Header file which can be used from EC-Master-Demo application)
- XML File (Like ProcessImage in ENI)

The variables can also be added to the watchlist, to have a better overview in diagnosis mode.

### 4.2.3 Watchlist

In this tab, the user can see all variables which were added to the watchlist in config mode:



The screenshot shows the 'Device Editor' window with the 'Watch list' tab selected. The 'Variables' section contains a table with the following data:

Name	Datatype	MainDevice Sync Unit	Offset	Size
Slave_1016 [EL1094].Channel 3.Input	BOOL	Id 0: Default 0	IN : 29.2	0.1
Slave_1013 [EL4132].Channel 1.Output	INT	Id 0: Default 0	OUT : 33.0	2.0

Buttons for 'Export' and 'Remove from watch list' are visible.

The variables can be edited and removed from the watchlist.

### 4.2.4 Data Acquisition

In this tab, the user can configure our Data Acquisition (DAQ) library. This library can be used from EC-Master to record process data in realtime.

**After adding a new *recorder*, the user can select the variables which should be recorded and specify some triggers:**

Device Editor
General
Simulator
Process Data Image
Watch list
Trace Data
Advanced Options
SubDevice to SubDevice
Distributed Clocks
Tasks + Sync Units
Data Acquisition
Motion

Variables
Export
Recorder 1

Name	Datatype	Offset	Size	Recorded
SubDevice_1002 [EL3314].TC Inputs Channel 1.Status_Underrange	BOOL	IN : 0.0	0.1	<input checked="" type="checkbox"/>
SubDevice_1002 [EL3314].TC Inputs Channel 1.Status_Ovrange	BOOL	IN : 0.1	0.1	<input type="checkbox"/>
SubDevice_1002 [EL3314].TC Inputs Channel 1.Status_Limit 1	BIT2	IN : 0.2	0.2	<input type="checkbox"/>
SubDevice_1002 [EL3314].TC Inputs Channel 1.Status_Limit 2	BIT2	IN : 0.4	0.2	<input type="checkbox"/>
SubDevice_1002 [EL3314].TC Inputs Channel 1.Status_Error	BOOL	IN : 0.6	0.1	<input type="checkbox"/>
SubDevice_1002 [EL3314].TC Inputs Channel 1.Status_TxPDO State	BOOL	IN : 1.6	0.1	<input type="checkbox"/>
SubDevice_1002 [EL3314].TC Inputs Channel 1.Status_TxPDO Toggle	BOOL	IN : 1.7	0.1	<input type="checkbox"/>
SubDevice_1002 [EL3314].TC Inputs Channel 1.Value	INT	IN : 2.0	2.0	<input type="checkbox"/>
SubDevice_1002 [EL3314].TC Inputs Channel 2.Status_Underrange	BOOL	IN : 4.0	0.1	<input type="checkbox"/>

No longer record

Triggers

Left Operand	Operator	Right Operand	Enable	Start	Duration	Count
SubDevice_1002 [EL3314].TC Inputs Channel 1.Status_Underrange	=	1	True	True	0	0

Edit Trigger

New
Edit
Delete

## Variables:

### Add/Remove:

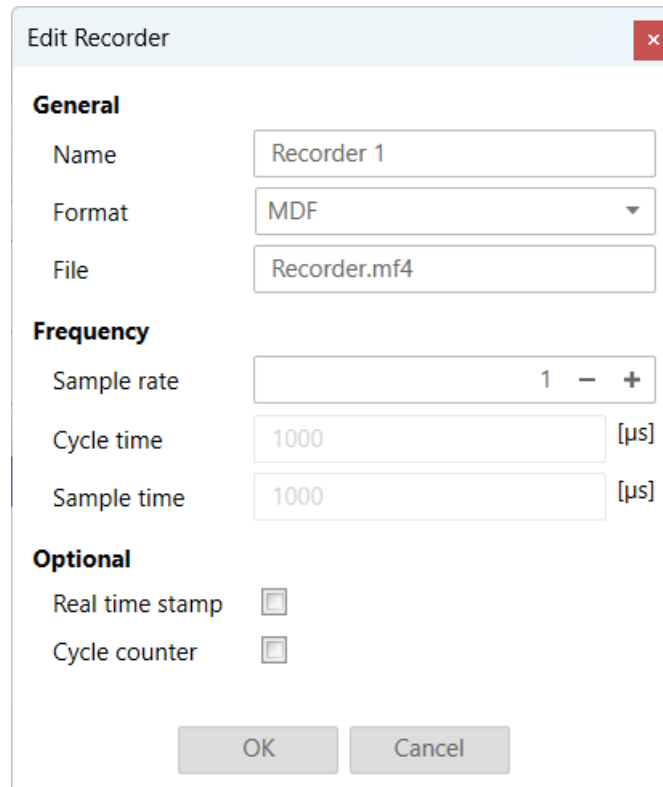
Used for adding or removing the selected variable to the recording.

## Triggers:

### New/Edit/Delete:

Used for changing the trigger list.

If user wants to edit a recorder, he will see the following dialog:



**Edit Recorder**

**General**

Name: Recorder 1

Format: MDF

File: Recorder.mf4

**Frequency**

Sample rate: 1

Cycle time: 1000 [µs]

Sample time: 1000 [µs]

**Optional**

Real time stamp: ☐

Cycle counter: ☐

OK Cancel

**Name:**

Name of the recorder

**File:**

Absolute path of the recorder file on the MainDevice system

**Format:**

**Format of the recorder file, e.g.**

- MDF (Measurement Data Format)
- CSV (Comma Separated Values)

**Sample Rate:**

Sample rate of the recorded data e.g. every cycle or every second cycle, ...

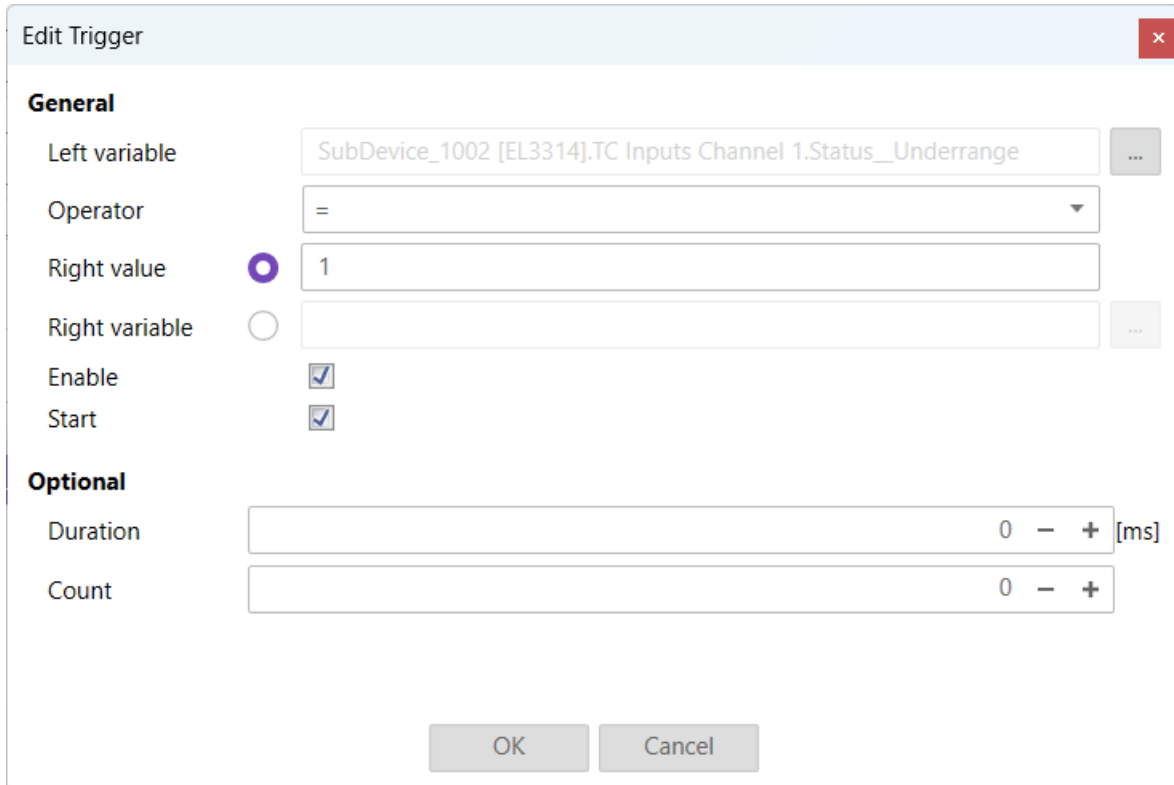
**Real time stamp:**

Adds a real time stamp to the recorded data

**Cycle counter:**

Adds a cycle counter to the recorded data

**If user wants to edit a trigger, he will see the following dialog:**



### General

**Left variable:**

Name of the left variable

**Operator:**

Operator of the trigger (e.g. =, >, >=, <, <=, !=)

**Right value:**

Value of the right operand to compare the left variable against a static value e.g. trigger, if variable is greater than 5

**Right variable:**

Name of the right variable to compare the left variable against the value of another variable e.g. trigger, if variable 1 is smaller than variable 2

**Enable:**

Enabled or disabled trigger (can be enabled from application later)

**Start:**

Start or stop trigger

### Optional

**Duration:**

Duration in ms (0 = infinite) e.g. trigger should start recording for 500 ms

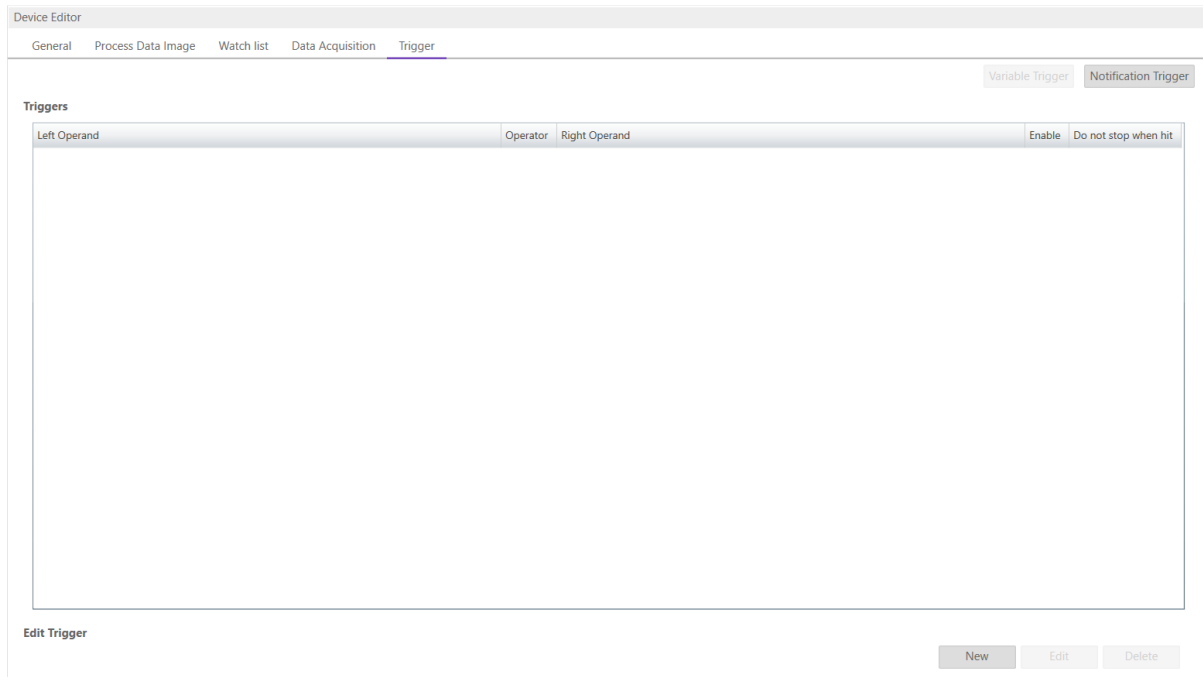
**Count:**

Trigger count (0 = infinite) e.g. trigger should hit only for 5 times

For more information please refer the manual of the EC-Master-Data-Acquisition-Library.

## 4.2.5 Trigger

In this tab, the user can create, edit und delete trigger. When a trigger is hit, the monitor will stop and show the actual state. Trigger can be created for process data and notifications. To switch to the notification trigger select the tab in top right corner. This tab is also shown in the diagnosis mode to enable and disable trigger while in diagnosis mode.



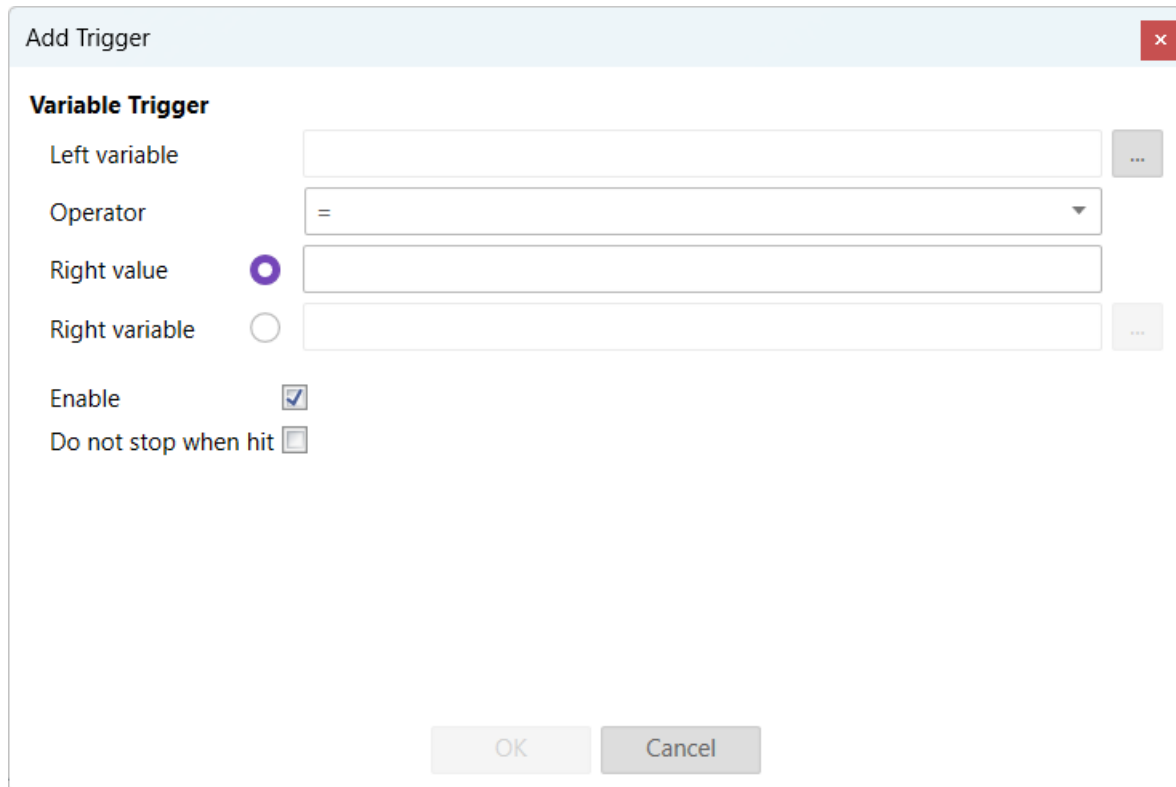
The screenshot shows the 'Device Editor' window with the 'Trigger' tab selected. The window has a top navigation bar with tabs: 'General', 'Process Data Image', 'Watch list', 'Data Acquisition', and 'Trigger'. Below the navigation bar, there are two sub-tabs: 'Variable Trigger' and 'Notification Trigger'. The 'Triggers' section contains a table with columns: 'Left Operand', 'Operator', 'Right Operand', 'Enable', and 'Do not stop when hit'. The table is currently empty. At the bottom left, there is a label 'Edit Trigger'. At the bottom right, there are three buttons: 'New', 'Edit', and 'Delete'.

### Trigger:

List of trigger.

### Edit Trigger:

**New:** When new is clicked the following dialog pops up:



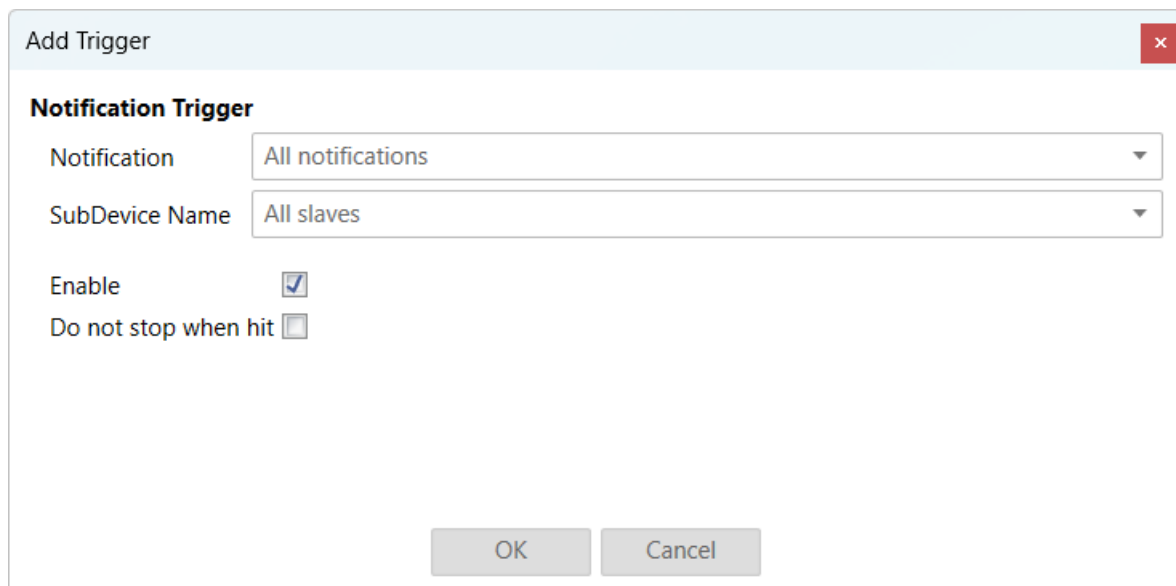
The dialog box is titled "Add Trigger" and has a close button (X) in the top right corner. It contains a section titled "Variable Trigger" with the following fields and controls:

- Left variable:** A text input field with a dropdown arrow on the right.
- Operator:** A dropdown menu showing the "=" operator.
- Right value:** A radio button (selected) followed by a text input field.
- Right variable:** A radio button (unselected) followed by a text input field with a dropdown arrow on the right.
- Enable:** A checked checkbox.
- Do not stop when hit:** An unchecked checkbox.

At the bottom of the dialog are "OK" and "Cancel" buttons.

The user can select variable which should be compared and the select if he wants to compare with a value or another variable. With enable the trigger can be enabled and disabled.

**The following dialog pops up on the notification trigger tab:**



The dialog box is titled "Add Trigger" and has a close button (X) in the top right corner. It contains a section titled "Notification Trigger" with the following fields and controls:

- Notification:** A dropdown menu showing "All notifications".
- SubDevice Name:** A dropdown menu showing "All slaves".
- Enable:** A checked checkbox.
- Do not stop when hit:** An unchecked checkbox.

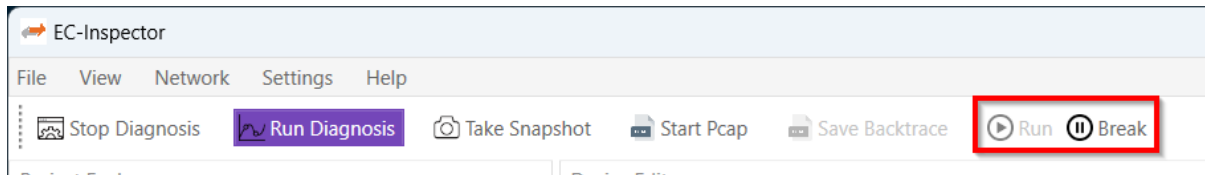
At the bottom of the dialog are "OK" and "Cancel" buttons.

The user can select which notification should be triggered. He can also select for which SubDevice the notification should be triggered. Default is "All SubDevices". It is also possible to trigger all notifications for all SubDevices.

Edit: Edit the selected trigger

Delete: Remove the selected trigger from project

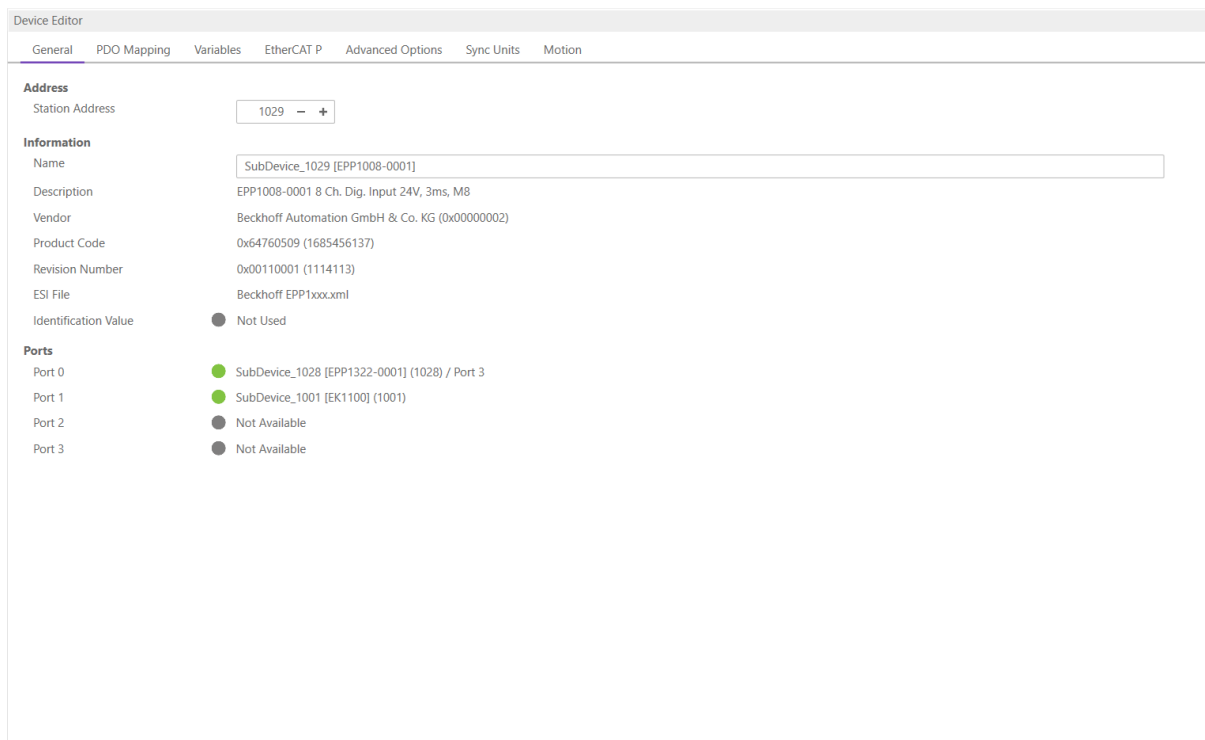
If the EC-Inspector stops because of a trigger it can be restarted with Run. It is also possible to pause the EC-Inspector without a trigger:



## 4.3 SubDevice Settings

### 4.3.1 General (SubDevice)

In this tab, the user can see general SubDevice settings like station address or the name of the SubDevice. Also the connected ports can be seen.



#### Address

##### Station Address:

Station address of the SubDevice. By default, the first station address is 1001.

#### Information

##### Name:

Name of the SubDevice. By default the following format is used "SubDevice\_N [TYPE]"

##### Description:

Description of the SubDevice (Read from ESI file)

**Vendor:**

Name of the vendor the SubDevice

**Product Code:**

### Product Code of the SubDevice

**Revision Number:**

Revision Number of the SubDevice

**ESI File:**

Name of the ESI file where the description of the SubDevice is stored.  
:file: ESI files can be managed by using the *ESI-Manager*

**Identification Value:**

### Identification Value of the SubDevice

## Ports

### Connected Devices:

### List of connected devices

### 4.3.2 Variables

**In this tab, the user can see the variables of the SubDevice.**

Device Editor

General Variables

Variables

Name	Datatype	MainDevice Sync Unit	Offset	▲	Size
Slave_1014 [EL3162].Channel 1.Status	BYTE	Id 0: Default 0	IN :	22.0	1.0
Slave_1014 [EL3162].Channel 1.Value	INT	Id 0: Default 0	IN :	23.0	2.0
Slave_1014 [EL3162].Channel 2.Status	BYTE	Id 0: Default 0	IN :	25.0	1.0
Slave_1014 [EL3162].Channel 2.Value	INT	Id 0: Default 0	IN :	26.0	2.0

Add to watch list

## Lists of Variables

Variables comes from the import of the ENI file.

## Buttons

**Add to watchlist:**

Adds the variable into the watchlist



## 5 Diagnosis

### 5.1 Overview

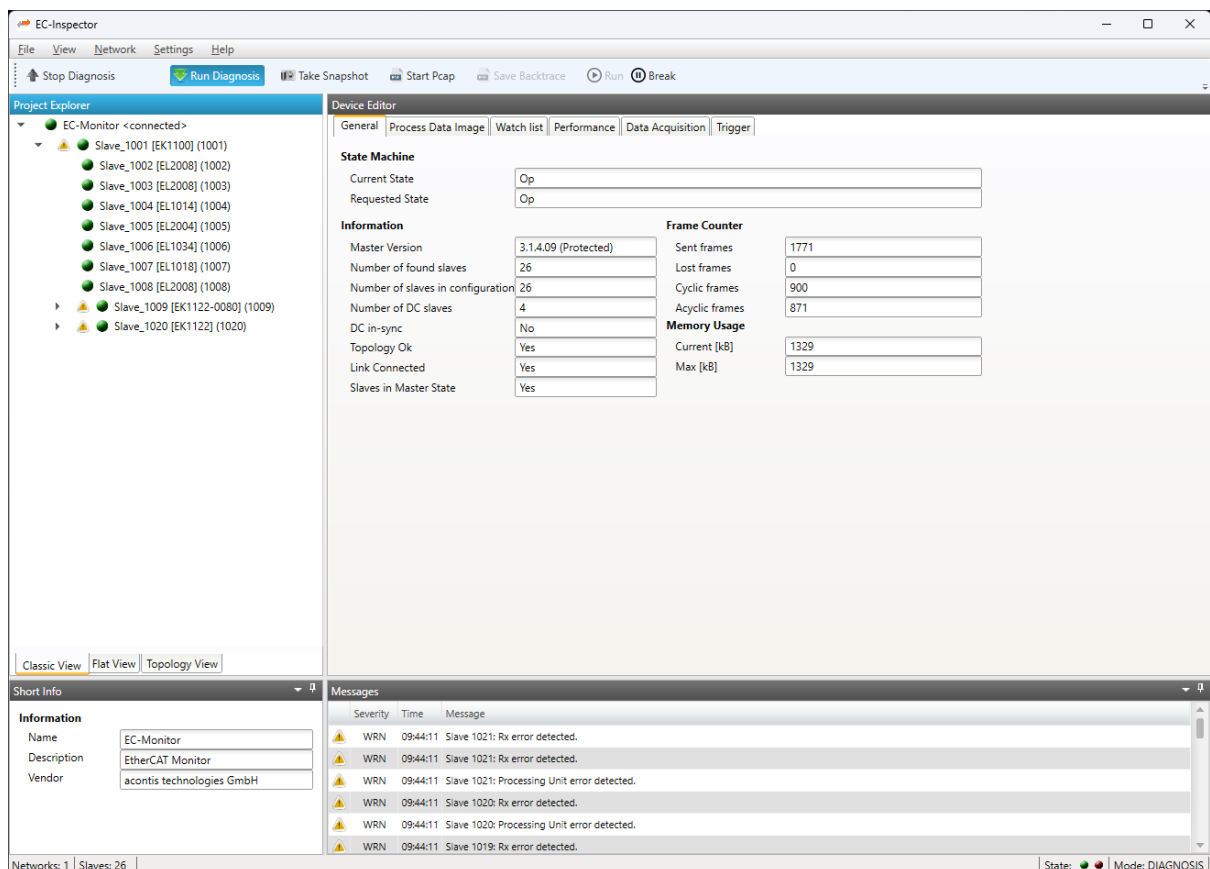
EC-Inspector is a diagnosis application specifically developed to analyze EtherCAT networks that are controlled by an EtherCAT MainDevice. Automated control systems usually require high availability of the whole system. Due to the rough industrial environment this is often hardly to achieve.

If high availability shall be guaranteed for an automated control system it is important to verify and maintain the field bus. Using EC-Inspector it is possible to take a look into the “health” of the EtherCAT system. Detection of signs of system degradation prior to running into a system failure will be of great benefit. In that case it is possible to exchange the problematic components (cables, SubDevice devices).

**Many aspects of diagnosis are covered by the EC-Inspector:**

- System analysis and maintenance
- Error detection
- Documentation

After switching into diagnosis mode of EC-Inspector, the user will see this page:



The screenshot shows the EC-Inspector application window. The top menu bar includes File, View, Network, Settings, and Help. Below the menu is a toolbar with buttons for Stop Diagnosis, Run Diagnosis, Take Snapshot, Start Pcap, Save Backtrace, Run, and Break. The main interface is divided into several panels:

- Project Explorer:** Displays a tree view of the network topology. It shows a root node 'EC-Monitor <connected>' with several slave nodes listed below it, including Slave\_1001 through Slave\_1020, each with its ID and status (e.g., 'connected').
- Device Editor:** Contains tabs for General, Process Data Image, Watch list, Performance, Data Acquisition, and Trigger. The 'General' tab is active, showing various system information and state machine details.
 

State Machine	
Current State	Op
Requested State	Op

Information		Frame Counter	
Master Version	3.1.4.09 (Protected)	Sent frames	1771
Number of found slaves	26	Lost frames	0
Number of slaves in configuration	26	Cyclic frames	900
Number of DC slaves	4	Acyclic frames	871
DC in-sync	No	Memory Usage	
Topology OK	Yes	Current [kB]	1329
Link Connected	Yes	Max [kB]	1329
Slaves in Master State	Yes		
- Short Info:** Displays basic information about the application:
 

Information	
Name	EC-Monitor
Description	EtherCAT Monitor
Vendor	acontis technologies GmbH
- Messages:** A log of system events. It shows several warning messages (WRN) at 09:44:11, indicating errors detected for various slave units (Slave 1021, Slave 1020, Slave 1019).

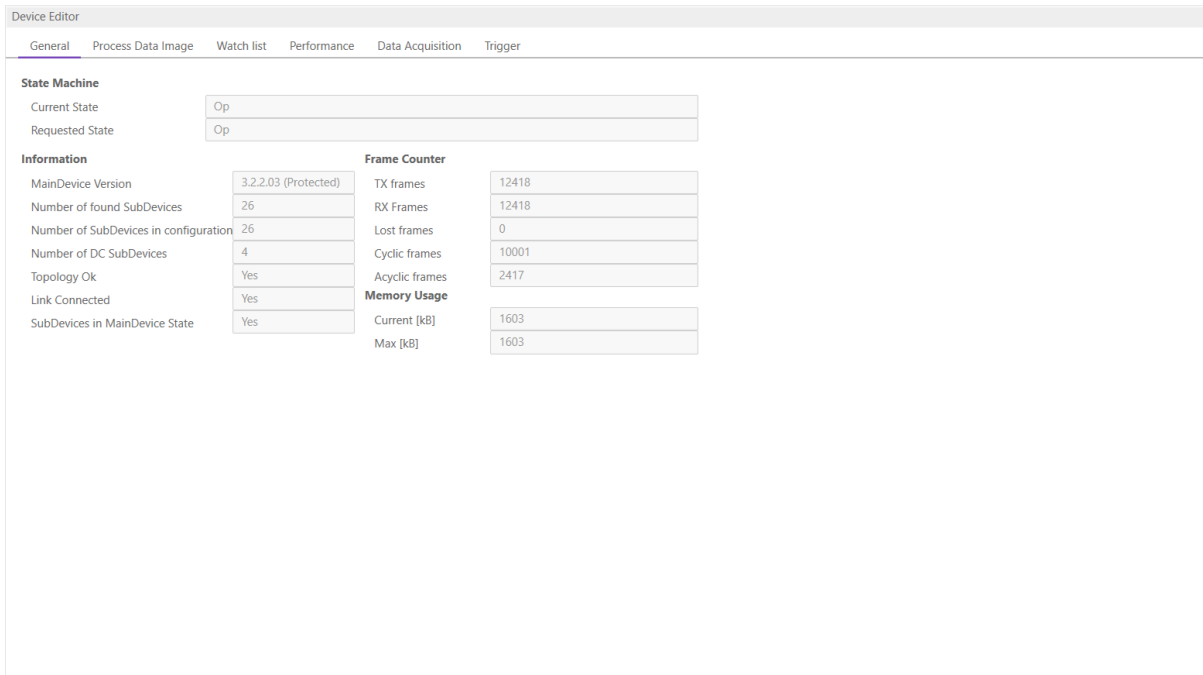
At the bottom of the window, a status bar shows 'Networks: 1 | Slaves: 26' and 'State: [green icon] | Mode: DIAGNOSIS'.

## 5.2 Device

This section shows the current “health” state of the MainDevice and helps the user to analyze MainDevice related problems.

### 5.2.1 General

In this tab, the user can see the current state of the state machine of the MainDevice. He has also an overview over the current “health” state of his EtherCAT network:



The screenshot shows the 'Device Editor' window with the 'General' tab selected. The 'State Machine' section has two dropdown menus for 'Current State' and 'Requested State', both set to 'Op'. The 'Information' section displays various device parameters. The 'Frame Counter' section shows TX frames, RX Frames, Lost frames, and Acyclic frames. The 'Memory Usage' section shows Current and Max memory usage in kB.

State Machine	
Current State	Op
Requested State	Op

Information	
MainDevice Version	3.2.2.03 (Protected)
Number of found SubDevices	26
Number of SubDevices in configuration	26
Number of DC SubDevices	4
Topology Ok	Yes
Link Connected	Yes
SubDevices in MainDevice State	Yes

Frame Counter	
TX frames	12418
RX Frames	12418
Lost frames	0
Cyclic frames	10001
Acyclic frames	2417

Memory Usage	
Current [kB]	1603
Max [kB]	1603

#### State Machine

##### Current State:

Current state of the MainDevice

##### Requested State:

Requested state of the MainDevice

#### Information

##### Device version:

Version number of the running MainDevice

##### Number of found SubDevices:

Number of SubDevices, which were found from device on the network

##### Number of SubDevices in configuration:

Number of SubDevices, which are configured in the ENI file

##### Number of DC SubDevices:

Number of SubDevices with DC support, which were found from MainDevice on the network

**DC in-sync:**

Signals that all SubDevices with DC support are correctly synchronized or not. If not all SubDevices are correctly synchronized, please refer the [Message Window](#) for more information.

**Topology OK:**

Signals that topology is “okay” or not. If topology is not “okay”, you have a mismatch between the configured bus and the currently connected bus. Please open the ‘Network Mismatch Analyzer’ (Menu Network Network Mismatch Analyzer) to solve the problem.

**Link Connected:**

Signals the link is connected.

**SubDevices in MainDevice State:**

Signals that all SubDevices are in MainDevice state.

**Frame Counter****TX frames:**

Number of sent frames

**RX frames:**

Number of received frames

**Lost frames:**

Number of lost frames

**Cyclic frames:**

Number of cyclic frames

**Acyclic frames:**

Number of acyclic frames

**Memory Usage****Current:**

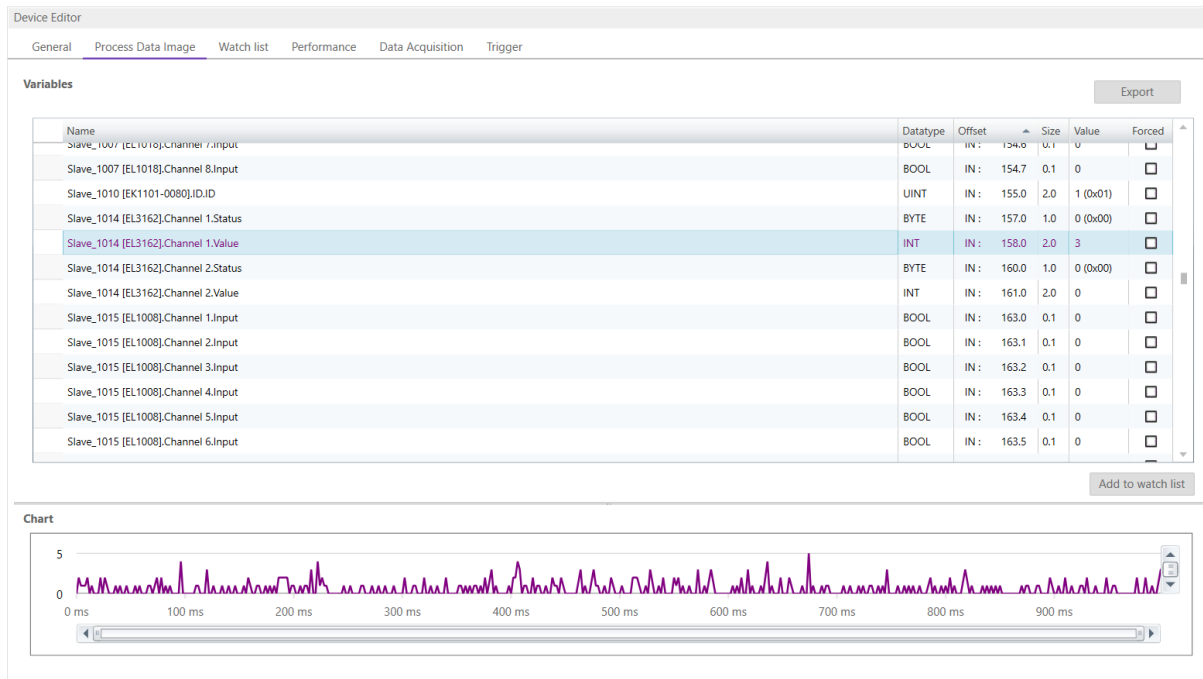
Current memory usage in bytes

**Max:**

Maximum memory usage in bytes

## 5.2.2 Process Data Image

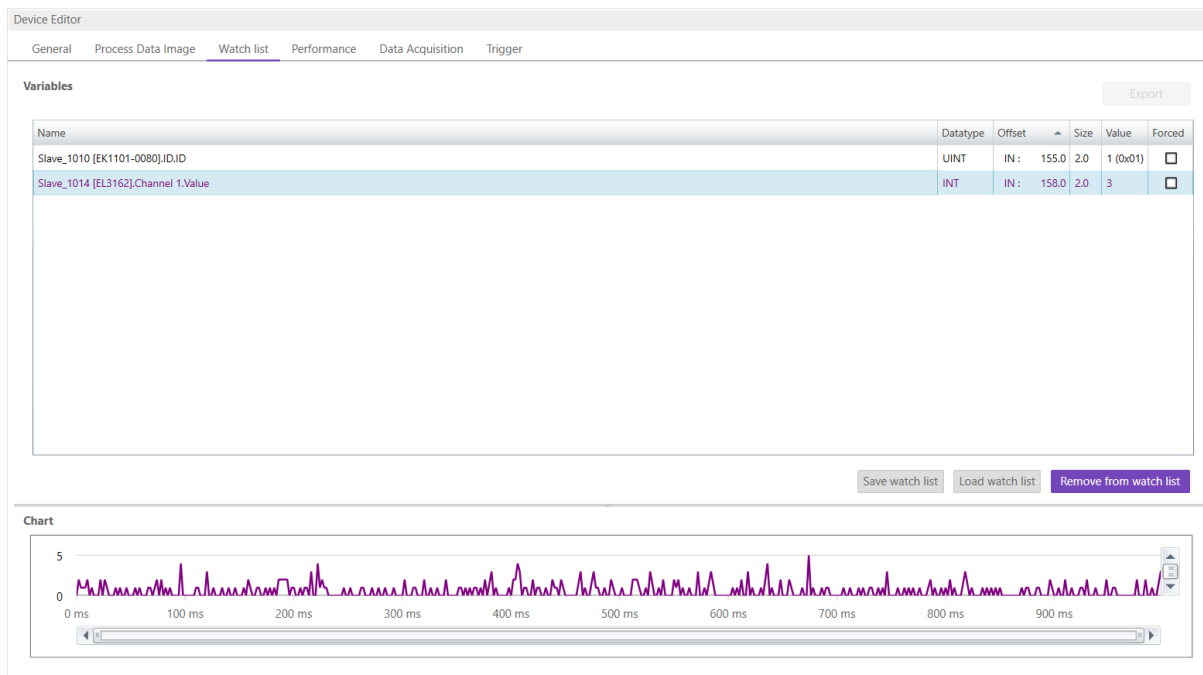
In this tab, the user can see and change the values of the process variables. The variables will be forced to the value the user entered. The user can press release to release the variable. If one or two variables are selected, a chart of the values is shown. Also resize and zoom is possible to see more details. The chart will be updated every 250 milliseconds:



It is also possible to add the variables to a watch list (next chapter).

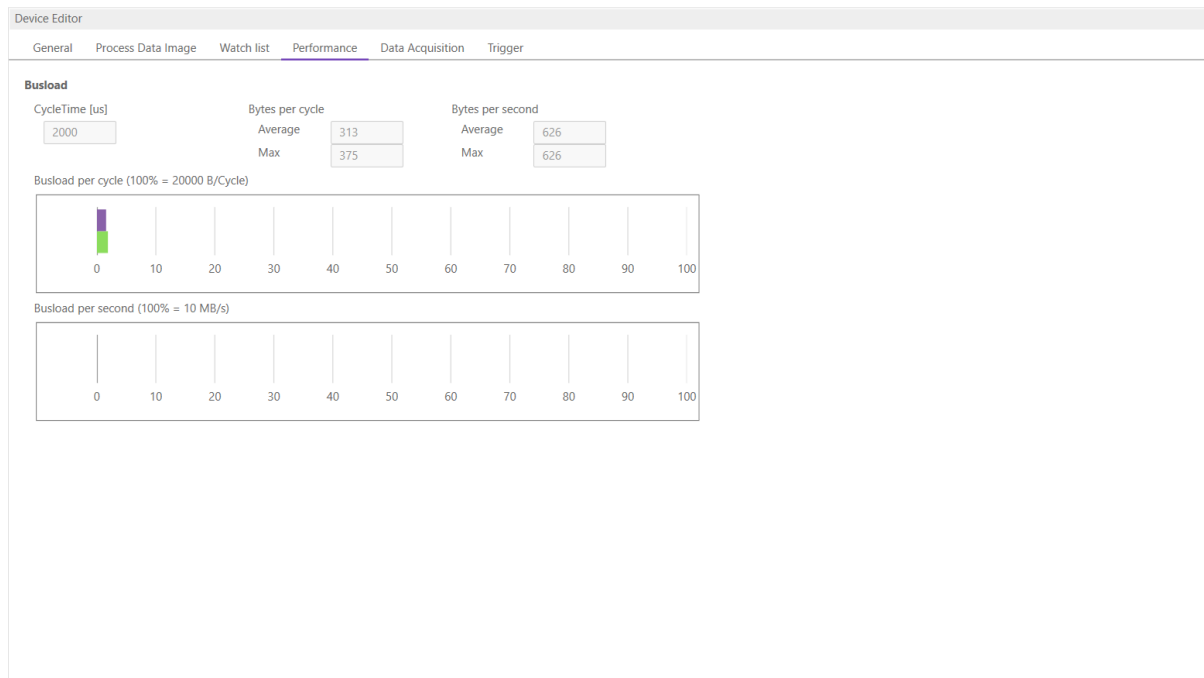
## 5.2.3 Watch list

In this tab, the user can monitor selected variables. He can go through the SubDevices and add variables to the watch list to monitor them. The user can also export or import the watch list, so changes can be saved:



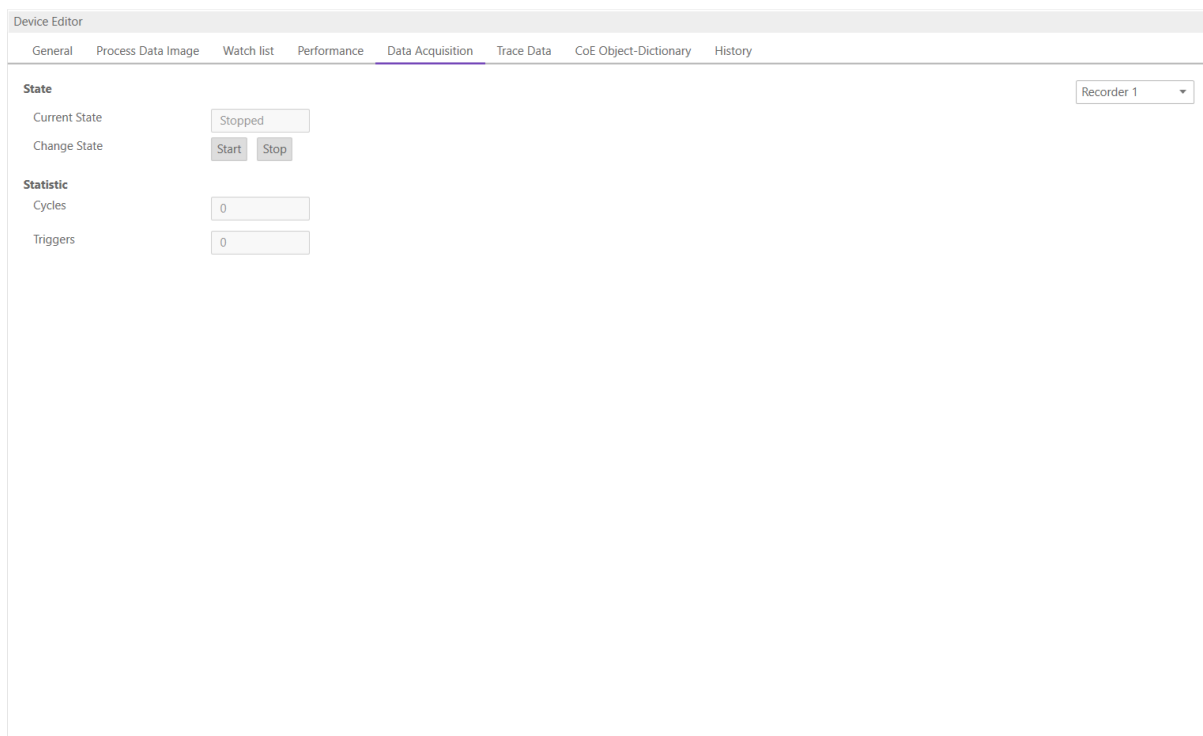
## 5.2.4 Performance

In this tab, the user can see the busload per cycle and per second:



## 5.2.5 Data Acquisition Diagnosis

In this tab, the user can start and stop the DAQ recorders. Also he can see some statistics of running recorders.



The screenshot shows the 'Data Acquisition' tab in the 'Device Editor' window. The interface includes a 'State' section with a 'Recorder 1' dropdown menu. The 'Current State' is 'Stopped'. The 'Change State' section has 'Start' and 'Stop' buttons. The 'Statistic' section shows 'Cycles' and 'Triggers' both at 0.

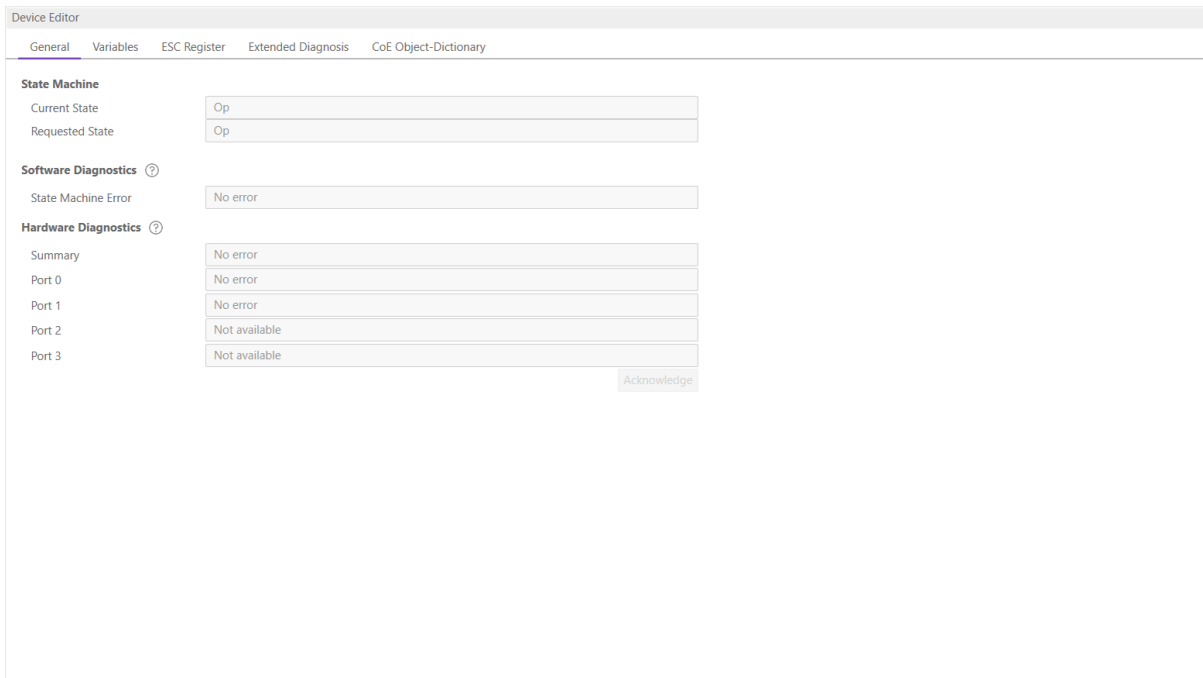
Section	Parameter	Value
State	Current State	Stopped
	Change State	Start, Stop
Statistic	Cycles	0
	Triggers	0

## 5.3 SubDevice

This section shows the current “health” state of the selected SubDevice and helps the user to analyze SubDevice related problems.

### 5.3.1 General (SubDevice)

In this tab, the user can see the current state of the state machine of the SubDevice:



The screenshot shows the 'Device Editor' window with the 'General' tab selected. The interface is divided into several sections:

- State Machine:** Contains two input fields: 'Current State' and 'Requested State', both with a dropdown menu showing 'Op'.
- Software Diagnostics:** Includes a 'State Machine Error' field with a dropdown showing 'No error'.
- Hardware Diagnostics:** Includes a 'Summary' field with a dropdown showing 'No error', and four port-specific fields (Port 0, Port 1, Port 2, Port 3) with dropdowns showing 'No error', 'No error', 'Not available', and 'Not available' respectively.

An 'Acknowledge' button is located at the bottom right of the Hardware Diagnostics section.

#### State Machine

##### Current State:

Current state of the selected SubDevice

##### Requested State:

Requested state of the selected SubDevice

#### Software Diagnostics

##### State Machine Error:

SubDevice error which occurred during state transition

#### Hardware Diagnostics

##### Summary:

Summary of hardware diagnostics

##### Port A:

Port specific error

##### Port D:

Port specific error

**Port B:**

Port specific error

**Port C:**

Port specific error

**Buttons****Acknowledge:**

Acknowledge the current error state and notify the user again if error state was changed again.

**Possible warning and errors:****Disturbed Connection:**

There may be problems in the connection between two SubDevices. The message will tell either that there is a problem between two SubDevices or two ports. The warning appears if error counters are increased (Invalid Frame: 0x300-0x306, RX Errors: 0x301-0x307, Lost Link: 0x308-0x30B). The value from which a warning is issued can be set in the User.xml files in C:/ProgramData/EC-Engineer. More information below.

**Bad Connection:**

The same as “Disturbed Connection” but the error counters are higher. The value from which an error is issued can be set in the User.xml files in C:/ProgramData/EC-Engineer. More information below.

**Line break:**

A line break is detected before a SubDevice. This error is detected by looking at the topology.

**Link missing:**

A link is missing on input port of the SubDevice. This error is detected by looking at the topology.

**Multiple warnings:**

There are multiple warning for this port.

**Multiple errors:**

There are multiple errors for this port.

**Multiple warnings and errors:**

There are multiple warning and errors for this port.

**State Machine:**

See ETG1020 “Description of AL Status Codes” or ETG.1000.6. This error is detected by looking at the AL Status (0x130).

**How to solve errors?**

- Lost Link errors are often caused by the power supply system
- Helpful might be the usage of an extra power supply
- It is recommended to clear all error counters after startup

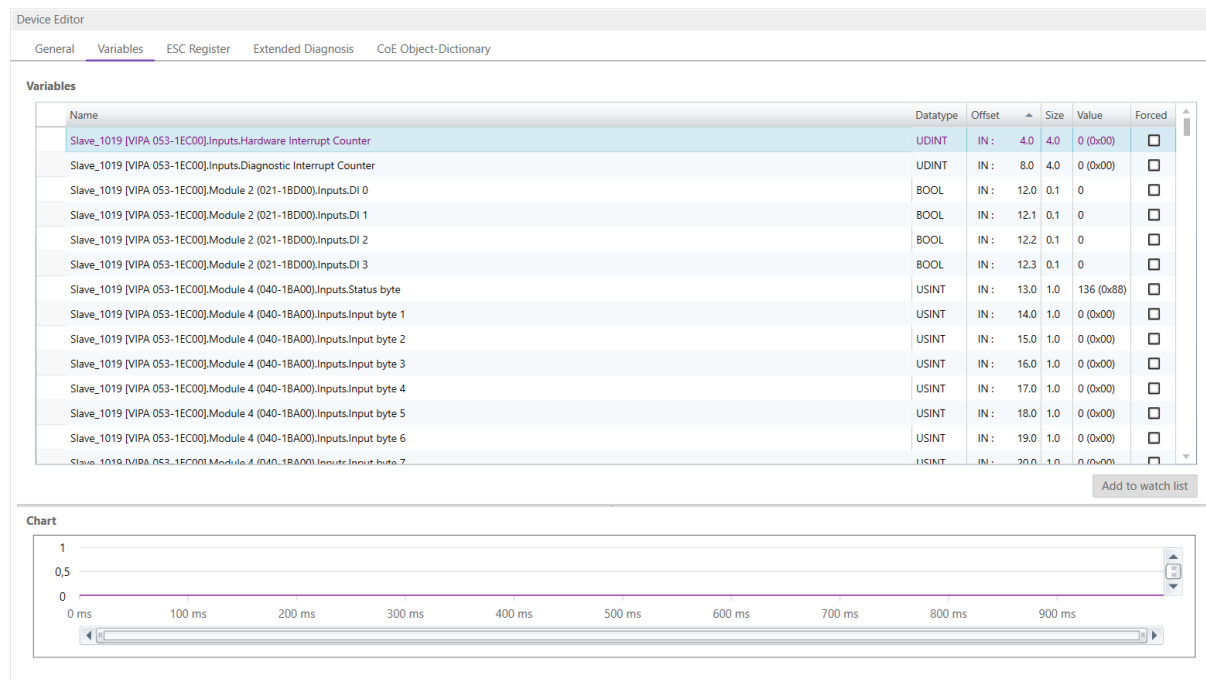
**How to change amount of errors leading to a warning or error:**

- Open C:/ProgramData/EC-Inspector
- Search for DiagGeneral
- **Change the values which should be adjusted**
  - LostLink: The value entered is used
  - All others are calculated depending on the amount of cyclic frames:  $(\text{Value} / \text{CyclicFrames}) \times 10^6$

**Note:** Please refer also the “ETG.1600 EtherCAT Installation Guideline”: <http://www.ethercat.org/ETG1600>.

### 5.3.2 Variables

In this tab, the user can see and change the values of the process variables. The variables will be forced to the value the user entered. The user can press release to release the variable. If one or two variables are selected, a chart of the values is shown. Also resize and zoom is possible to see more details. The chart will be updated every 250 milliseconds:



### 5.3.3 ESC Register

In this tab, the user can see the values of the registers. In the settings section he can set the offset and the length. If he activates the compact view, he will only see the registers which have a description:



Device Editor

General Variables ESC Register Extended Diagnosis CoE Object-Dictionary

**Settings**  
 Offset  Dec Hex  
 Length  Dec Hex  
 Compact ☒

**Registers**

Index	Name	Value	Type
> 0x0000	Type	17 (0x11)	USINT
> 0x0001	Revision	0 (0x00)	USINT
> 0x0002	Build	2 (0x0002)	UINT
> 0x0004	FMMUs supported	8 (0x08)	USINT
> 0x0005	SyncManagers supported	8 (0x08)	USINT
> 0x0006	RAM Size	8 (0x08)	USINT
> 0x0007	Port Descriptor	15 (0x0F)	USINT
> 0x0008	ESC Features supported	252 (0x00FC)	UINT
> 0x0010	Configured Station Address	1019 (0x03FB)	UINT
> 0x0012	Configured Station Alias	500 (0x01F4)	UINT
> 0x0020	Write Register Enable	0 (0x00)	USINT
> 0x0021	Write Register Protection	0 (0x00)	USINT
> 0x0030	ESC Write Enable	0 (0x00)	USINT
> 0x0031	ESC Write Protection	0 (0x00)	USINT
> 0x0040	ESC Reset ECAT	0 (0x00)	USINT
> 0x0041	ESC Reset PDI	0 (0x00)	USINT
> 0x0100	ESC DL Control	460033 (0x00070501)	UDINT
> 0x0108	Physical Read/Write Offset	0 (0x0000)	UINT

### 5.3.4 Extended Diagnosis

In this tab, the user can see the extended diagnosis information:

Device Editor

General Variables ESC Register Extended Diagnosis CoE Object-Dictionary

**Common Error Counter**  
 Processing Unit Error (0x030C)   
 PDI Error (0x030D)

**Port 0 counters (In port)**

Invalid Frame, CRC error (0x0300)	<input type="text" value="0"/>
RX Error (0x0301)	<input type="text" value="0"/>
Lost Link (0x0310)	<input type="text" value="0"/>
Forwarded RX Error (0x0308)	<input type="text" value="87"/>

**Port 1 counters**

Invalid Frame, CRC error (0x0302)	<input type="text" value="0"/>
RX Error (0x0303)	<input type="text" value="0"/>
Lost Link (0x0311)	<input type="text" value="0"/>
Forwarded RX Error (0x0309)	<input type="text" value="0"/>

**Port 2 counters**

Invalid Frame, CRC error (0x0304)	<input type="text" value="0"/>
RX Error (0x0305)	<input type="text" value="0"/>
Lost Link (0x0312)	<input type="text" value="0"/>
Forwarded RX Error (0x030A)	<input type="text" value="0"/>

**Port 3 counters**

Invalid Frame, CRC error (0x0306)	<input type="text" value="0"/>
RX Error (0x0307)	<input type="text" value="0"/>
Lost Link (0x0313)	<input type="text" value="0"/>
Forwarded RX Error (0x030B)	<input type="text" value="0"/>

There will be a red ! to signalize that a counter is higher than 0. Except for the forwarded errors.

If an error counter is '-' it was not read. If it is '0' it is really zero. So there is a difference between '0' and '-'.

## Common Error Counter

### Processing Error Counter:

Indicates that SubDevice received “not EtherCAT frames”, which are not allowed in the EtherCAT segment (of course acceptable in a test environment)

### PDI Error Counter:

Counts if a PDI access has an interface error (read from register: 0x30D)

## Port 0..3

- Invalid Frame Counter of Port y (read from register: 0x0300+y\*2)
- RX Error Counter of Port y (read from register: 0x0300+y\*2+8Bit)
- Lost Link Counter of Port y (read from register: 0x0310+y)
- Forwarded RX Error Counter of Port y (read from register: 0x0308+y)

### Acknowledge warning

If one of the error counters increase there will be a warning in the tree, sigalized with an icon. With this button it is possible to acknowledge this warning. So the SubDevice can be monitored again and the icon will come back with the next error.

To see this information the error counters must be read by the EtherCAT MainDevice. Only if this is activated the EC-Inspector is able to read this. Here is a quick overview on how to activate this function on different MainDevices:

### acontis EC-Master:

To activate the error collection of the acontis EC-Master, the follwing API has to be called:

```

/* SubDevice statistics polling for error diagnostic */
EC_T_DWORD dwPeriodMs = 1000;
dwRes      = ecatIoctl(EC_IOCTL_SET_SLVSTAT_PERIOD,      (EC_T_BYTE*)&dwPeriodMs,
sizeof(EC_T_DWORD), EC_NULL, 0, EC_NULL);
if (dwRes != EC_E_NOERROR)
{
    EcLogMsg(EC_LOG_LEVEL_ERROR, (pEcLogContext, EC_LOG_LEVEL_ERROR,
"ecatIoctl(EC_IOCTL_SET_SLVSTAT_PERIOD) returns with error=0x%x\n", dwRes));
    goto Exit;
}

```

### Third Party MainDevice:

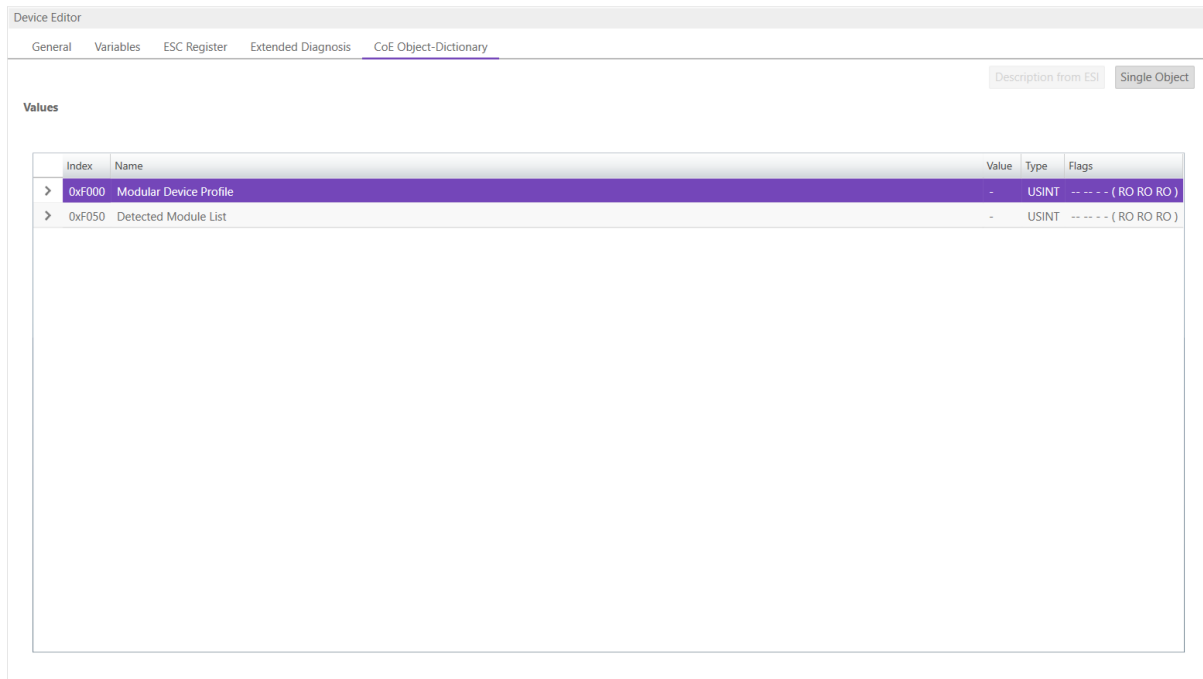
Find more details here [Operating with Third Party EtherCAT Controller](#)

## 5.3.5 CoE Object-Dictionary

This tab consists of different modes:

### Description from ESI

In this tab, the user can see the description of the object dictionary from ESI and the values from the SubDevice.



### Lists of CoE Object-Dictionary entries

- Entries comes from ESI
- The “Flags” column tells the user if this entry is an PDO entry and if it can be edited
  - “AA BB C D (EE FF GG)”
  - AA = Mapping as RX PDO or not
  - BB = Mapping as TX PDO or not
  - C = Backup Flag
  - D = Settings Flag
  - EE = Access rights for PreOp (RO, WO, RW)
  - FF = Access rights for SafeOp (RO, WO, RW)
  - GG = Access rights for Op (RO, WO, RW)

### Single Object

In this tab, the user can read and write (not EC-Inspector) the values of the object dictionary of the SubDevice.

Device Editor

General Variables ESC Register Extended Diagnosis CoE Object-Dictionary

Description from ESI Single Object

**Settings**

Index	0x1018	Dec	Hex
SubIndex	0	Dec	Hex
Size	1	Dec	Hex
Complete Access	<input type="checkbox"/>		

**Operation**

	Read
--	------

## Settings

**Index:**

Index of the CoE value

**SubIndex:**

SubIndex of the CoE value

**Size:**

Size of the CoE value (only used for reading)

**Complete Access:**

Activate, if complete access mode should be used for reading or writing the CoE value (can be used only if it is supported from SubDevice)

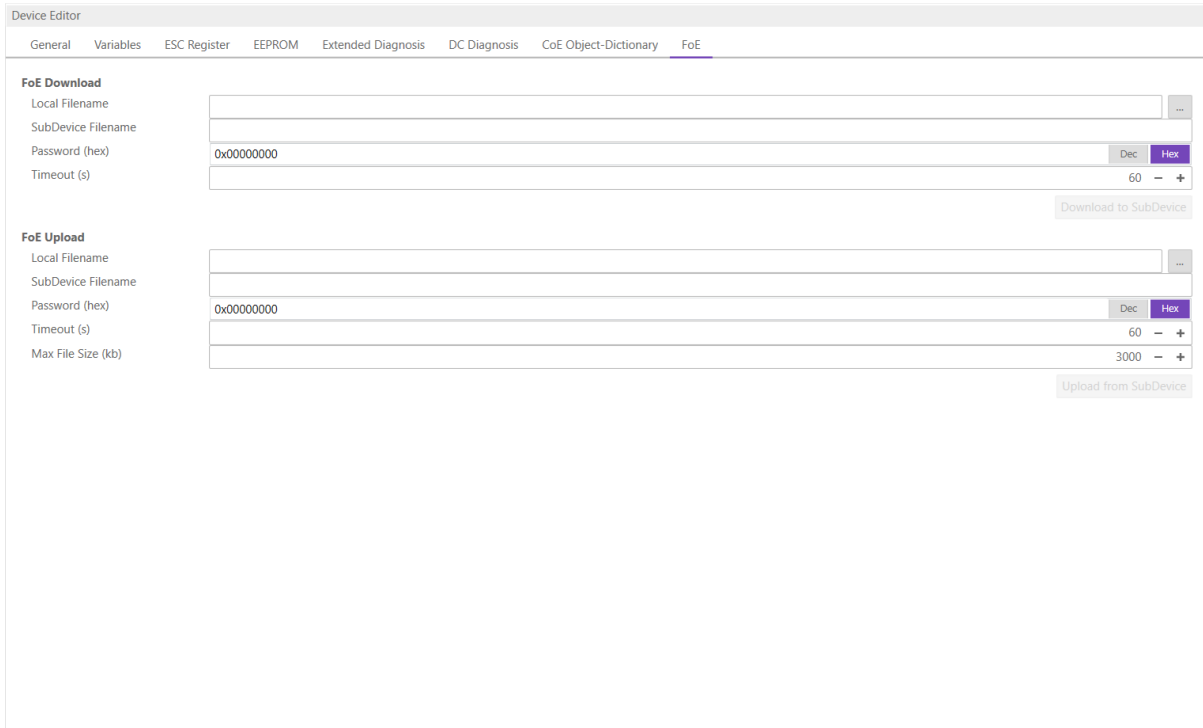
## Operation

**Read:**

Reads the value from SubDevice (Hex format, like: "00 11 22 33 ...")

### 5.3.6 File over Ethernet (FoE)

In this tab, the user has the possibility to download or upload a file to the SubDevice:



The screenshot shows the 'Device Editor' window with the 'FoE' tab selected. It contains two sections: 'FoE Download' and 'FoE Upload'. Each section has fields for 'Local Filename', 'SubDevice Filename', 'Password (hex)' (set to 0x00000000), and 'Timeout (s)' (set to 60). The 'FoE Upload' section also includes a 'Max File Size (kb)' field (set to 3000). Buttons for 'Download to SubDevice' and 'Upload from SubDevice' are located at the bottom right of each section.

#### FoE Operations

**Local Filename:**

Name of the file on the harddrive

**SubDevice Filename:**

Name of the file on the SubDevice

**Password:**

Password on the SubDevice as a hex-number

**Timeout:**

Timeout for downloading or uploading the file in milliseconds

**Max File Size:**

Maximal file size which should be uploaded from the SubDevice in kilo bytes

### 5.3.7 History (SubDevice)

In this tab, the user can see and change the diagnosis history of the SubDevice. It is also possible to export the data:

Device Editor
General
Variables
ESC Register
EEPROM
Extended Diagnosis
DC Diagnosis
CoE Object-Dictionary
History
FoE

**Settings**

Show Info Messages
True

Show Warning Messages
True

Show Error Messages
True

Show Emergency Messages
False

Current Mode
Overwrite Mode

**Messages**

Export

	Severity	Time	ID	Acknowledged	Code	Message
	INF	21.11.2024 13:50:14.818	030	No	0x1877E000	(0x1135) Cycle time o.k.: 2934
	INF	21.11.2024 13:50:14.677	029	No	0x1877E000	(0x1100) Detection of operation mode completed: 0x100, 0
	INF	21.11.2024 13:45:30.546	028	No	0x1877E000	(0x1135) Cycle time o.k.: 3001
	INF	21.11.2024 13:45:30.404	027	No	0x1877E000	(0x1100) Detection of operation mode completed: 0x100, 0
	INF	21.11.2024 13:41:01.102	026	No	0x1877E000	(0x1135) Cycle time o.k.: 2911
	INF	21.11.2024 13:41:00.966	025	No	0x1877E000	(0x1100) Detection of operation mode completed: 0x100, 0
	INF	12.11.2024 10:59:07.034	024	No	0x1877E000	(0x1135) Cycle time o.k.: 2972
	INF	12.11.2024 10:59:06.896	023	No	0x1877E000	(0x1100) Detection of operation mode completed: 0x100, 0
	INF	12.11.2024 10:58:53.389	022	No	0x1877E000	(0x1135) Cycle time o.k.: 2831
	INF	12.11.2024 10:58:53.255	021	No	0x1877E000	(0x1100) Detection of operation mode completed: 0x100, 0
	INF	12.11.2024 10:58:37.409	020	No	0x1877E000	(0x1135) Cycle time o.k.: 2906
	INF	12.11.2024 10:58:37.272	019	No	0x1877E000	(0x1100) Detection of operation mode completed: 0x100, 0
	INF	12.11.2024 10:58:23.712	018	No	0x1877E000	(0x1135) Cycle time o.k.: 2999

Number of messages: 50 / 50

**Change Message Handling**

Tasks:
None

Execute

## Settings

### Show Info Messages:

Info messages will be collected from SubDevice

### Show Warning Messages:

Warning messages will be collected from SubDevice

### Show Error Messages:

Error messages will be collected from SubDevice

### Show Emergency Messages:

Emergency messages will be collected from SubDevice

### Current Mode:

Overwrite Mode: Messages will be overwritten if buffer is full  
 Acknowledge Mode: Messages will be discarded if buffer is full

## Messages

List of history messages

## Change Message Handling

### Enable/Disable Info Messages:

Enable or disable info messages

### Enable/Disable Warning Messages:

Enable or disable warning messages

### Enable/Disable Info Messages:

Enable or disable info messages

### Enable/Disable Error Messages:

Enable or disable error messages

### Enable/Disable Emergency Messages:

Enable or disable emergency messages

**Enable Acknowledge Mode:**

Enable acknowledge mode

**Enable Overwrite Mode:**

Enable overwrite mode

**Clear All Messages:**

Clear all messages (only available if “Overwrite Mode” is active)

**Clear All Acknowledged Messages:**

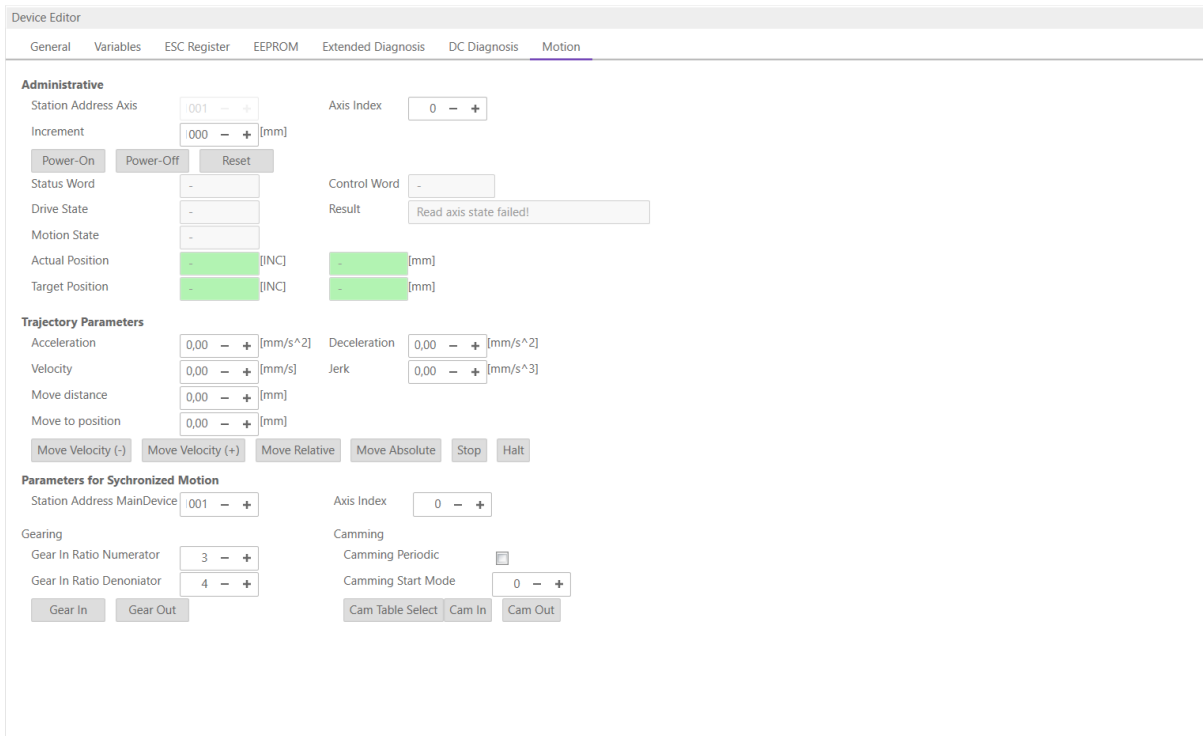
Clear all acknowledged messages (only available if “Acknowledge Mode” is active)

**Acknowledge All Messages:**

Acknowledge all messages, that they can be overwritten from new messages (only available if “Acknowledge Mode” is active)

### 5.3.8 Motion (Motion Tabs only)

In this tab, the user can see and change the motion settings of the SubDevice. He can read important variables and change velocity and direction of the axis. Also gearing and camming are possible to use:



The screenshot shows the 'Motion' tab in the 'Device Editor' software. The interface is divided into several sections:

- Administrative:** Includes 'Station Address Axis' (001), 'Increment' (000 [mm]), 'Axis Index' (0), 'Power-On', 'Power-Off', 'Reset', 'Status Word' (-), 'Control Word' (-), 'Drive State' (-), 'Motion State' (-), 'Actual Position' (- [INC] [mm]), and 'Target Position' (- [INC] [mm]).
- Trajectory Parameters:** Includes 'Acceleration' (0,00 [mm/s^2]), 'Deceleration' (0,00 [mm/s^2]), 'Velocity' (0,00 [mm/s]), 'Jerk' (0,00 [mm/s^3]), 'Move distance' (0,00 [mm]), and 'Move to position' (0,00 [mm]).
- Parameters for Synchronized Motion:** Includes 'Station Address MainDevice' (001), 'Axis Index' (0), 'Gearing' (Gear In Ratio Numerator: 3, Gear In Ratio Denominator: 4), 'Camming' (Camming Periodic: checked, Camming Start Mode: 0), and buttons for 'Gear In', 'Gear Out', 'Cam Table Select', 'Cam In', and 'Cam Out'.

At the bottom, there are buttons for 'Move Velocity (-)', 'Move Velocity (+)', 'Move Relative', 'Move Absolute', 'Stop', and 'Halt'.

## 6 Operating with Third Party EtherCAT Controller

### 6.1 Beckhoff TwinCAT

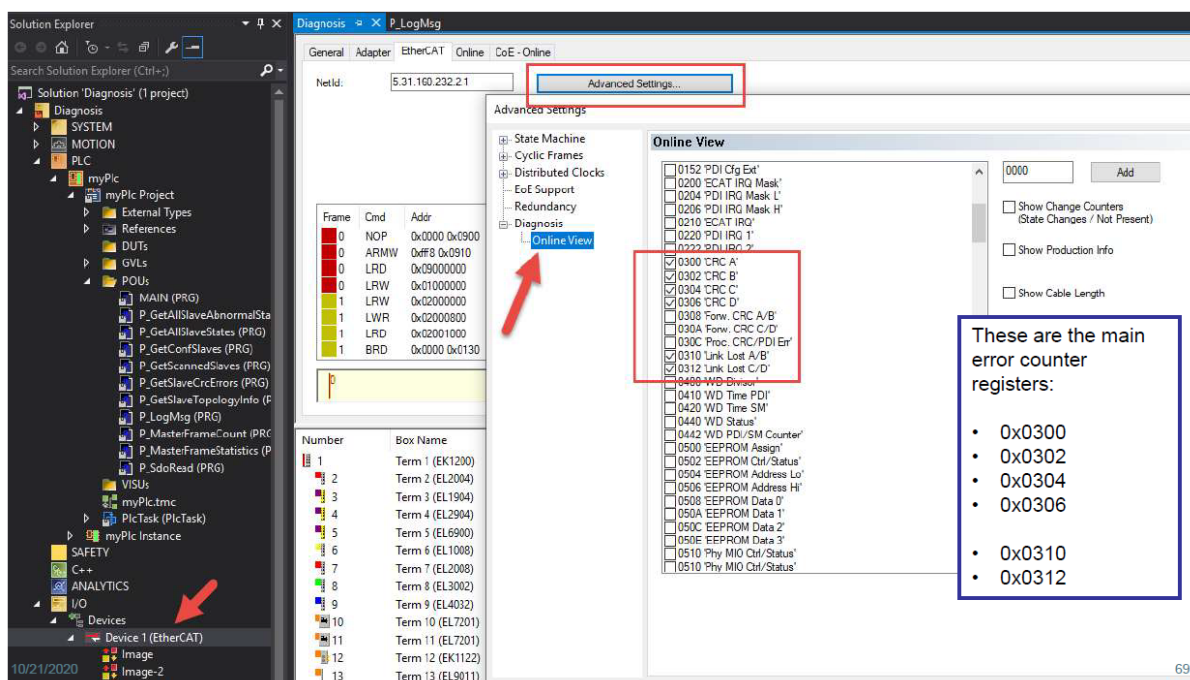
This section shows how to operate with Beckhoff TwinCAT.

#### 6.1.1 TwinCAT ENI

In the EtherCAT tab in TwinCAT is a button “Export Configuration File...”. The “Export Configuration File...” button opens a “Save as” dialog for saving the XML MainDevice configuration file. This file describes the process data and the transfer frames that are sent during the EtherCAT state transitions. This is the ENI file, that can be used with EC-Inspector.

#### 6.1.2 Activate TwinCAT Error Counters

At the EtherCAT MainDevice, select Properties and then select all hardware counters that you would like to monitor.



### 6.2 Codesys

This section shows how to operate with Codesys. Codesys is supported from version 3.5.17. and higher.



### 6.2.1 Codesys ENI

Command 'Generate EtherCAT XML'. The command is not integrated in the standard main menu. You can add it via the dialog box Tools, Customize from the category Devices. This command opens the standard dialog box for saving a file in the local file system. You can define a name and a storage location for an xml file, in which CODESYS is to store the EtherCAT configuration of the EtherCAT MainDevice currently selected in the device tree. Call: Context menu of an EtherCAT MainDevice device object in the device tree.

### 6.2.2 Activate Codesys Error Counters

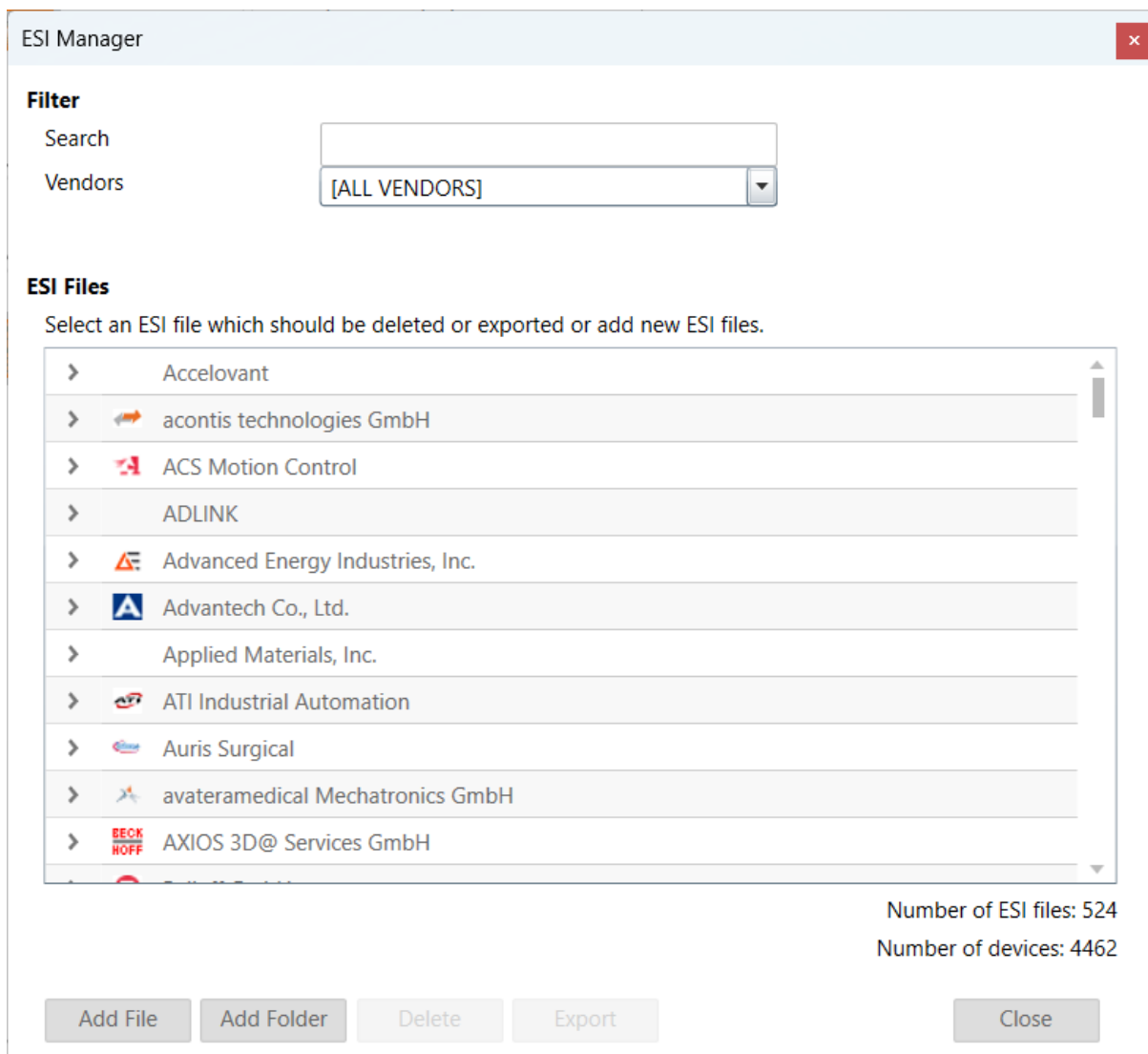
The error registers are not read cyclically. With the function block readmemory from the EtherCAT Library this can be realized within the application.

## 7 Additional Tools

### 7.1 ESI-Manager

ESI-Manager can be found through the main menu File -> ESI-Manager.

**This dialog helps the user to administrate his ESI and SCI files. Here, he can add/delete/export ESI and SCI files.**



The screenshot shows the 'ESI Manager' dialog box. It has a title bar with a close button. Inside, there is a 'Filter' section with a 'Search' text box and a 'Vendors' dropdown menu currently set to '[ALL VENDORS]'. Below this is the 'ESI Files' section, which contains a list of vendors with expandable arrows. The list includes: Accelovant, acontis technologies GmbH, ACS Motion Control, ADLINK, Advanced Energy Industries, Inc., Advantech Co., Ltd., Applied Materials, Inc., ATI Industrial Automation, Auris Surgical, avateramedical Mechatronics GmbH, and AXIOS 3D@ Services GmbH. At the bottom right, it displays 'Number of ESI files: 524' and 'Number of devices: 4462'. At the bottom, there are five buttons: 'Add File', 'Add Folder', 'Delete', 'Export', and 'Close'.

ESI Manager

**Filter**

Search

Vendors [ALL VENDORS]

**ESI Files**

Select an ESI file which should be deleted or exported or add new ESI files.

- > Accelovant
- > acontis technologies GmbH
- > ACS Motion Control
- > ADLINK
- > Advanced Energy Industries, Inc.
- > Advantech Co., Ltd.
- > Applied Materials, Inc.
- > ATI Industrial Automation
- > Auris Surgical
- > avateramedical Mechatronics GmbH
- > AXIOS 3D@ Services GmbH

Number of ESI files: 524  
Number of devices: 4462

Add File Add Folder Delete Export Close

## 7.2 Inspection Report

If you want to print or show a report about the actual session, it is possible with the inspection report. It shows a lot of different data about the network communication. It is also possible to print a PDF.

Inspection Report

**Network Status**

Please, select the statistic of which you want to see the details. The complete network status can be also printed.

General

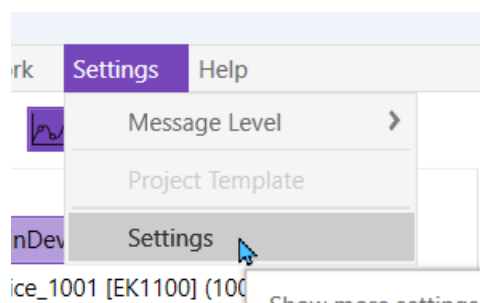
Category	Name	Value
Information	MainDevice Version	3.2.2.02
Information	Cycle Time	4000
Information	Number of found SubDevices	26
Information	Number of SubDevices in configu	26
Information	Number of DC SubDevices	4
Information	DC in-sync	No
Information	Topology Ok	Yes
Information	Link Connected	Yes
Information	SubDevices in MainDevice State	Yes
Frame Counter	TX frames	57405

Print

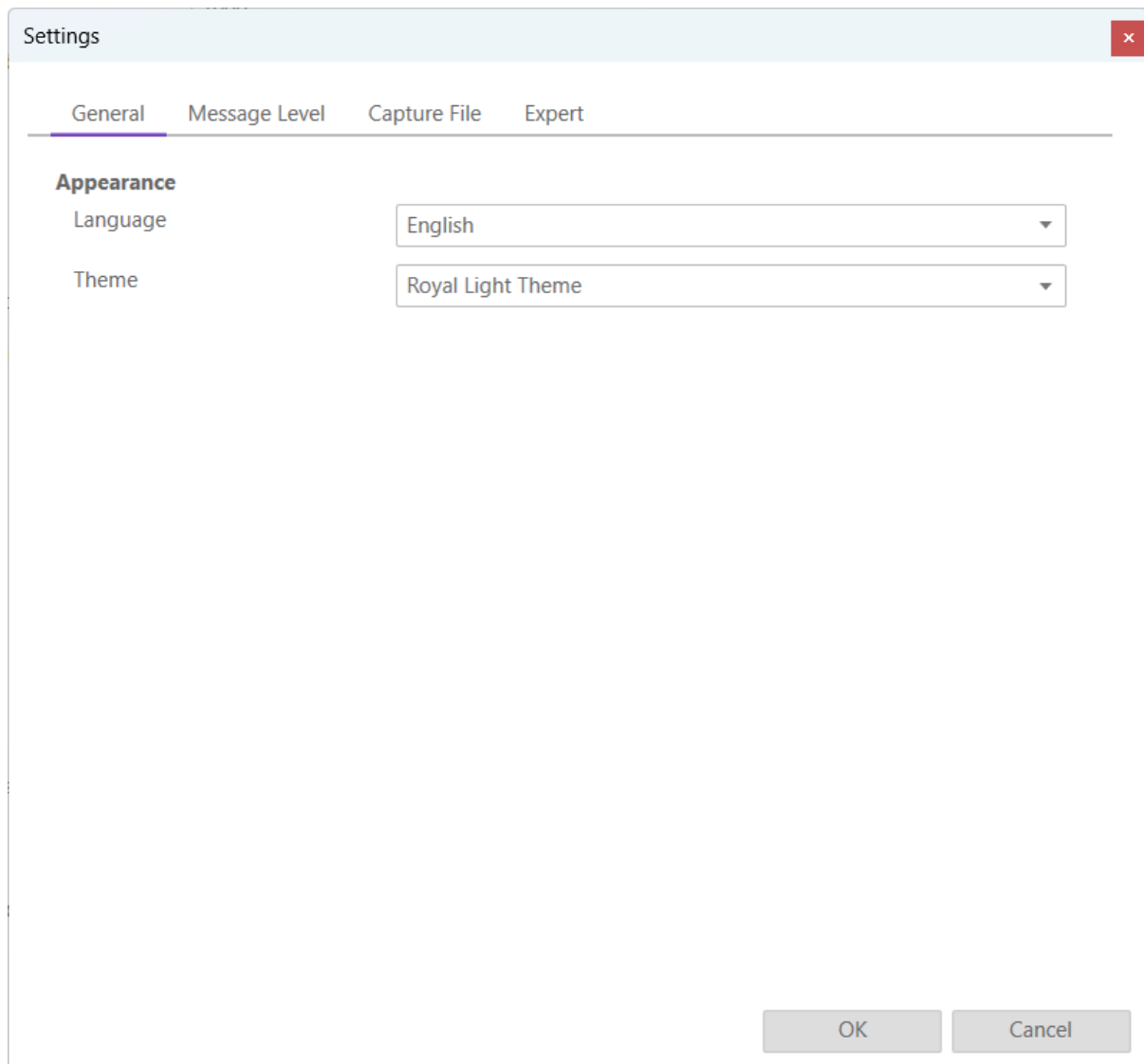
Close

## 7.3 Settings

Can be found inside the settings menu bar.



### 7.3.1 General



#### Appearance

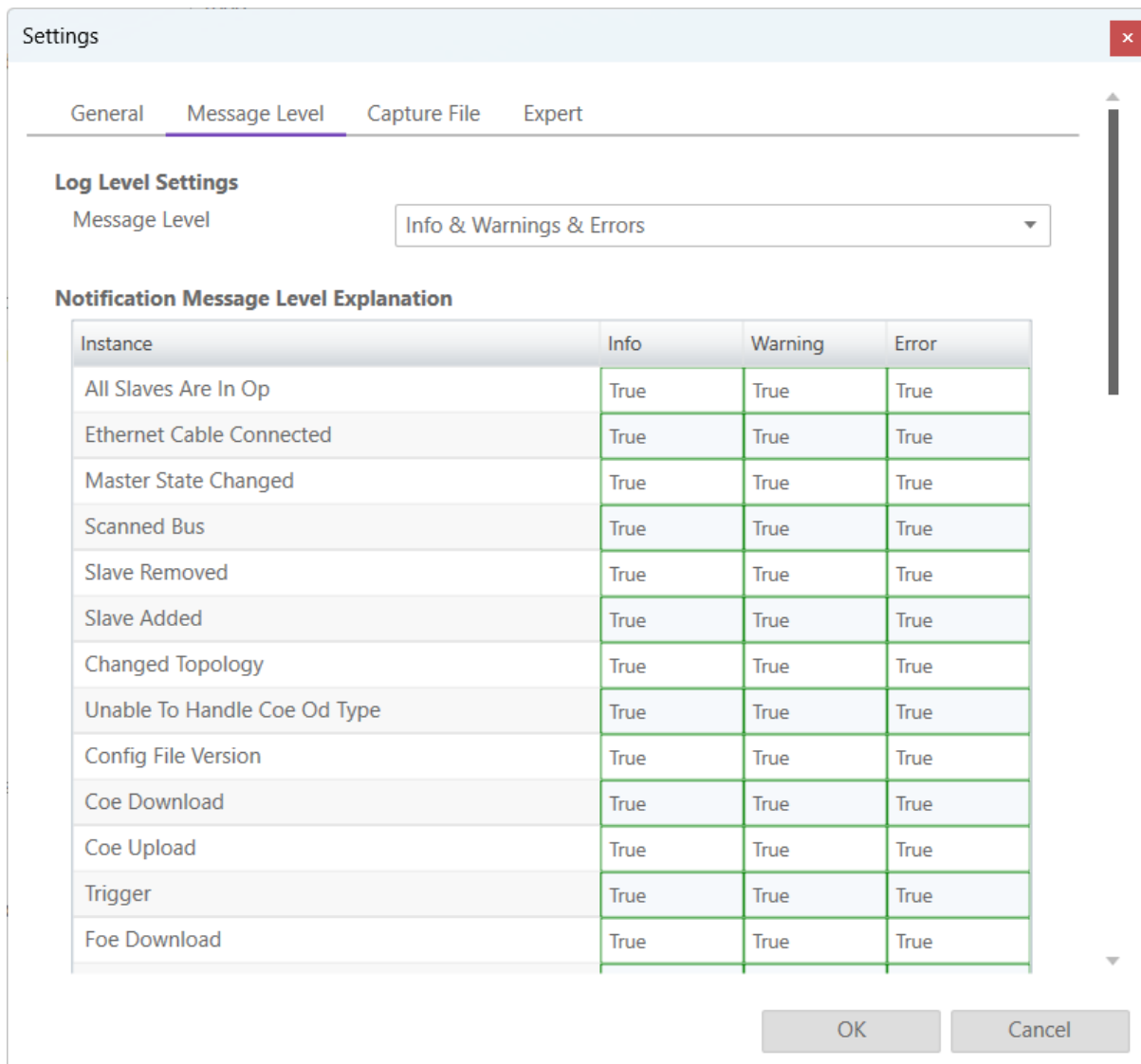
**Language:**

Changes the current language

**Theme:**

Changes the current theme

### 7.3.2 Message Level



In this tab the log level of the message panel can be changed.

#### Log Level Settings

##### Message Level:

Changes what messages are displayed on the message panel

##### Explanation

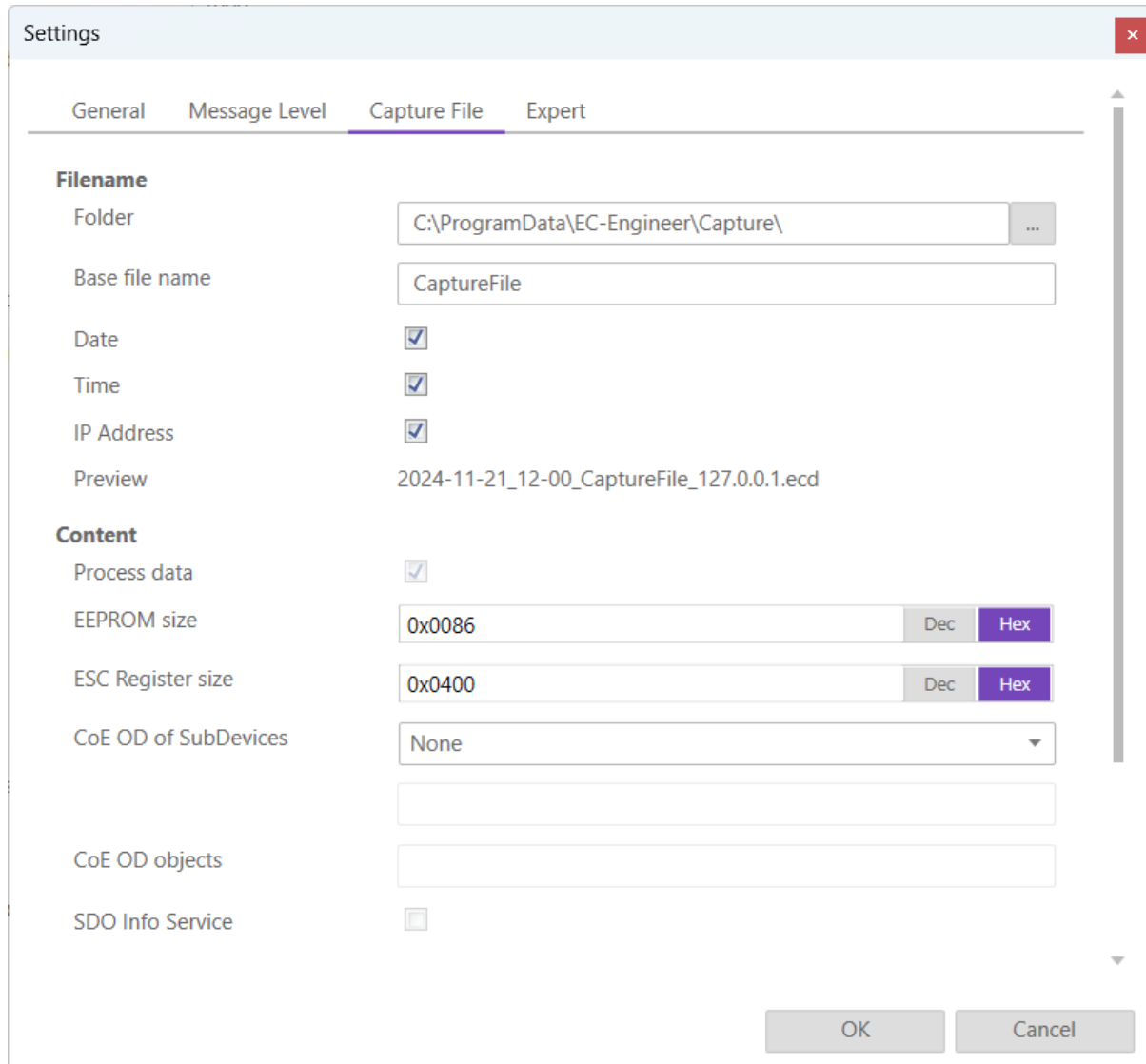
We can see what messages are displayed depending on the selected message level (true it is displayed, false it is not displayed)

### 7.3.3 Capture File

A capture file could be helpful, if a very large system is given or the system is not always available. In that case the user can connect to their system, save one or more snapshots into a capture file and analyse the created capture file later.

Another use case is, that their system from time to time some problems. In that case the user can activate the automatic mode and create the snapshots at specific intervals or based on specific MainDevice notifications.

**At the moment there are the following options:**



The screenshot shows the 'Settings' dialog box with the 'Capture File' tab selected. The dialog has four tabs: 'General', 'Message Level', 'Capture File', and 'Expert'. The 'Capture File' tab contains the following settings:

- Filename**
  - Folder: C:\ProgramData\EC-Engineer\Capture\
  - Base file name: CaptureFile
  - Date: ☒
  - Time: ☒
  - IP Address: ☒
  - Preview: 2024-11-21\_12-00\_CaptureFile\_127.0.0.1.ecd
- Content**
  - Process data: ☒
  - EEPROM size: 0x0086 (Dec/Hex buttons)
  - ESC Register size: 0x0400 (Dec/Hex buttons)
  - CoE OD of SubDevices: None (dropdown menu)
  - CoE OD objects: (empty text box)
  - SDO Info Service: ☐

At the bottom right are 'OK' and 'Cancel' buttons.

#### Filename

**Folder:**

Path, where the capture files should be saved

**Base file name:**

Base file name of the generated capture file name

**Date:**

Activate, to add the date to the generated capture file name

**Time:**

Activate, to add the time to the generated capture file name

**IP Address:**

Activate, to add the IP address to the generated capture file name

**Preview:**

Shows a preview of the generated capture file name

**Content****Process data:**

Activate to add process data to the capture file (read-only)

**EEPROM size:**

Enter size of the EEPROM (0x86 = default, 0 = no EEPROM)

**ESC Register size:**

Enter size of the ESC Registers (0x400 = default, 0 = no ESC register)

**CoE OD of SubDevices:**

**Select the SubDevices of which the CoE OD information will be captured**

**None:**

CoE OD will be not captured

**All:**

CoE OD will be captured of all SubDevices

**User defined:**

CoE OD will be captured of the defined SubDevices by physical address (e.g. 1001-1003; 1005)

**CoE OD objects:**

Enter index of specific objects or all objects will be collected (e.g. 0x1018; 0x7000-0x7FFF)

**SDO Info Service:**

Activate to use the SDO Info Service for loading the CoE Object Dictionary instead of reading the information from the ESI file.

**Automatic Mode****Interval (min):**

Time to wait until next snapshot will be taken

**Maximum Snapshots:**

Enter count of maximum snapshots

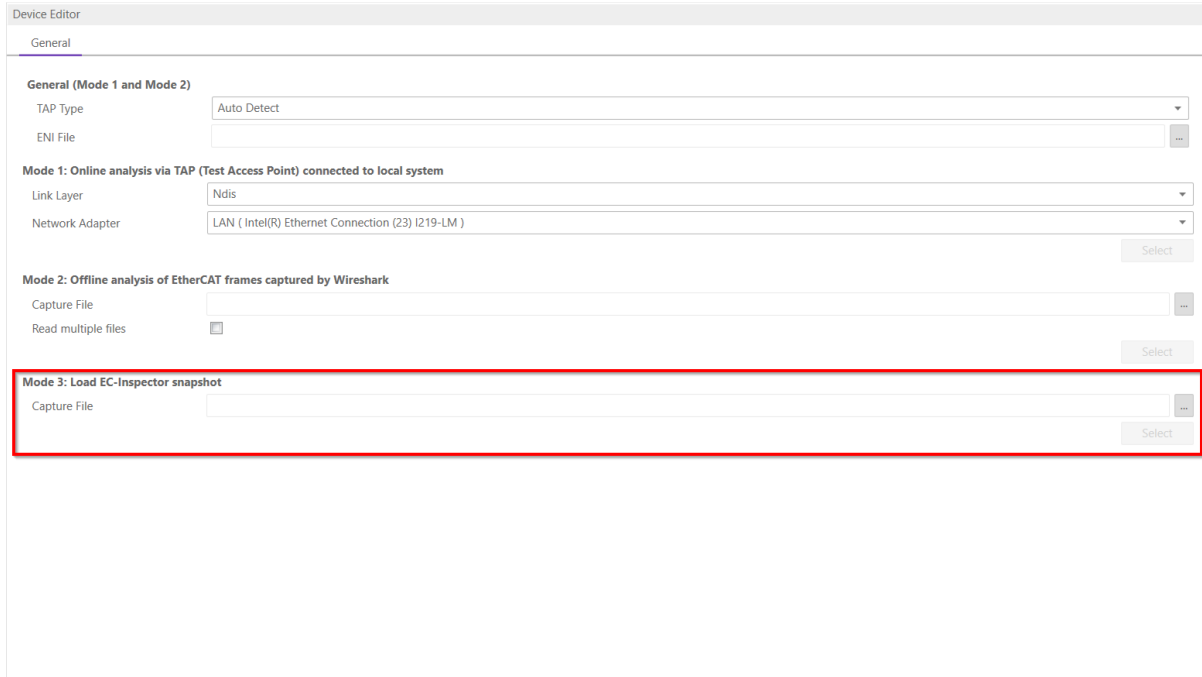
**Notifications:**

**Select the notifications, which will trigger a snapshot. The following notifications are available (for more information about notifications please refer the manual of EC-Master):**

- STATECHANGED
- ETH\_LINK\_CONNECTED
- ETH\_LINK\_NOT\_CONNECTED
- SLAVE\_STATECHANGED
- SLAVE\_PRESENCE
- SLAVE\_INITCMD\_RESPONSE\_ERROR

- STATUS\_SLAVE\_ERROR
- SLAVE\_UNEXPECTED\_STATE
- DC\_SLV\_SYNC
- DCM\_SYNC

After the snapshot(s) is / are made in diagnosis mode they can be selected in the overview in config mode:



Device Editor

General

General (Mode 1 and Mode 2)

TAP Type: Auto Detect

ENI File:

Mode 1: Online analysis via TAP (Test Access Point) connected to local system

Link Layer: Ndis

Network Adapter: LAN ( Intel(R) Ethernet Connection (23) I219-LM )

Mode 2: Offline analysis of EtherCAT frames captured by Wireshark

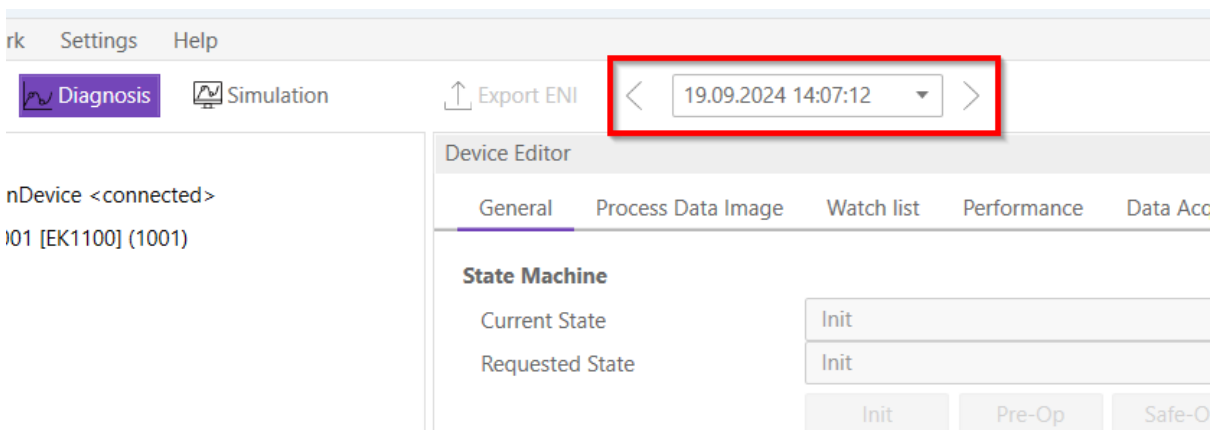
Capture File:

Read multiple files: ☐

Mode 3: Load EC-Inspector snapshot

Capture File:

After the selection switching to diagnosis mode is possible. In the toolbar will be an additional combobox to select the snapshot and switch between them:



rk Settings Help

Diagnosis Simulation Export ENI

19.09.2024 14:07:12

Device Editor

General Process Data Image Watch list Performance Data Acc

State Machine

Current State: Init

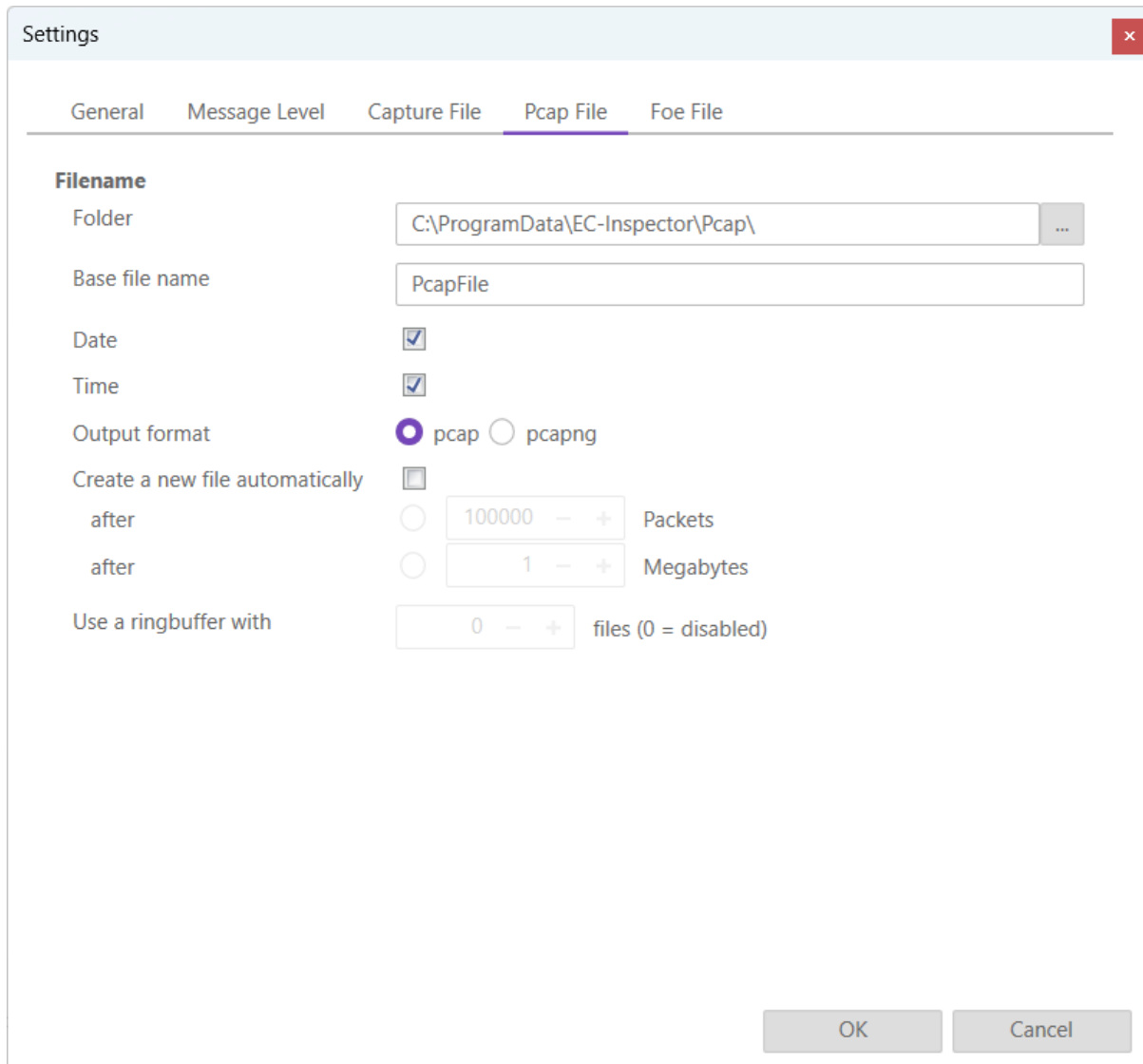
Requested State: Init

Init Pre-Op Safe-O



### 7.3.4 Pcap File

With EC-Inspector it is possible to capture a pcap file, same as Wireshark. Open Settings/Pcap File and the following dialog appears:



The screenshot shows the 'Settings' dialog box with the 'Pcap File' tab selected. The dialog has a title bar with a close button. Below the title bar are five tabs: 'General', 'Message Level', 'Capture File', 'Pcap File' (selected), and 'Foe File'. The 'Pcap File' tab contains the following settings:

- Filename**
  - Folder:** A text field containing 'C:\ProgramData\EC-Inspector\Pcap\' with a browse button ('...').
  - Base file name:** A text field containing 'PcapFile'.
  - Date:** A checkbox that is checked.
  - Time:** A checkbox that is checked.
  - Output format:** Two radio buttons: 'pcap' (selected) and 'pcapng'.
  - Create a new file automatically**
    - after** (radio button): A numeric field with '100000', minus/plus buttons, and the label 'Packets'.
    - after** (radio button): A numeric field with '1', minus/plus buttons, and the label 'Megabytes'.
  - Use a ringbuffer with**: A numeric field with '0', minus/plus buttons, and the label 'files (0 = disabled)'.

At the bottom right of the dialog are 'OK' and 'Cancel' buttons.

#### Filename

**Folder:**

Path, where the pcap files should be saved

**Base file name:**

Base file name of the generated pcap file name

**Date:**

Activate, to add the date to the generated pcap file name

**Time:**

Activate, to add the time to the generated pcap file name

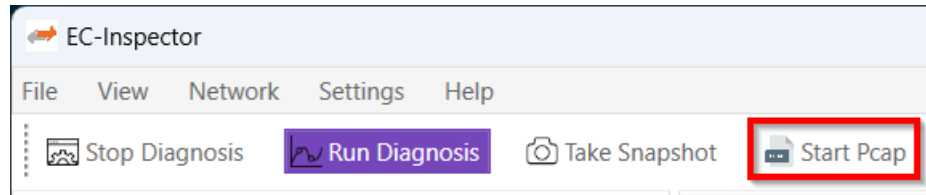
**Output format:**

The output format can be selected. Pcap or pcapng

**Create a new file automatically:**

A new file is created after one of the multiple file switch conditions is met. They will be named: name.00000.pcap. With the ringbuffer option a file is created if value is not reached, otherwise it will replace the oldest of the formerly used files (thus forming a “ring”). This mode will limit the maximum disk usage, even for an unlimited amount of capture input data, only keeping the latest captured data.

**On the toolbar will be a new button in diagnosis mode to start and stop the pcap file recorder:**

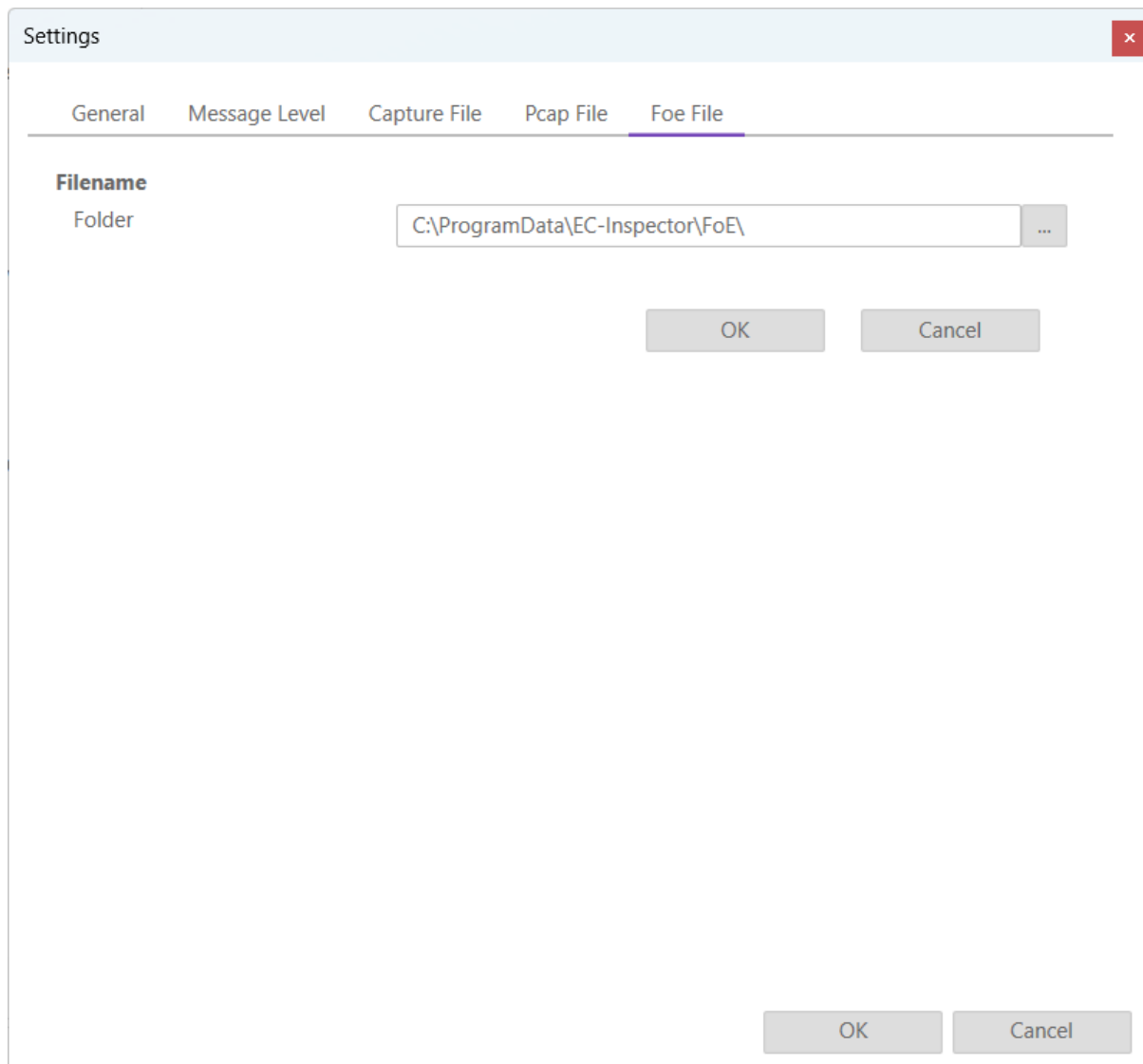


It is also possible to record a pcap backtrace file. When EC-Inspector is in pause mode (e.g. from a trigger condition) the user can capture the last 64 frames via the backtrace button in the toolbar.

After the capture is made in diagnosis mode it can be selected in the overview in config mode as described in the previous chapter [Wireshark File](#).

### 7.3.5 FoE File

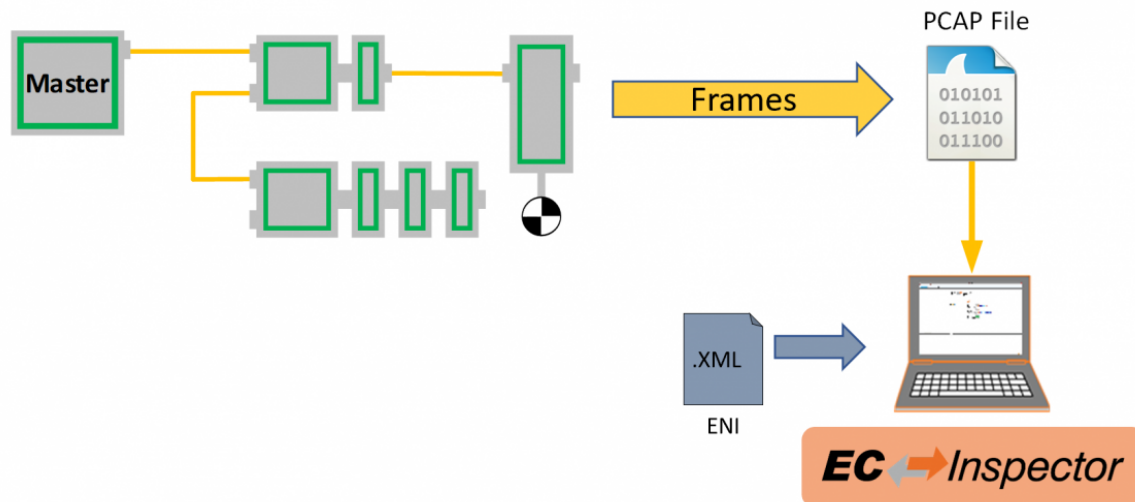
**With EC-Inspector it is possible to capture a file which is transferred via FoE. Open Settings/FoE File and the following dialog appears:**

**Filename****Folder:**

Path, where the FoE files should be saved

**Wireshark File**

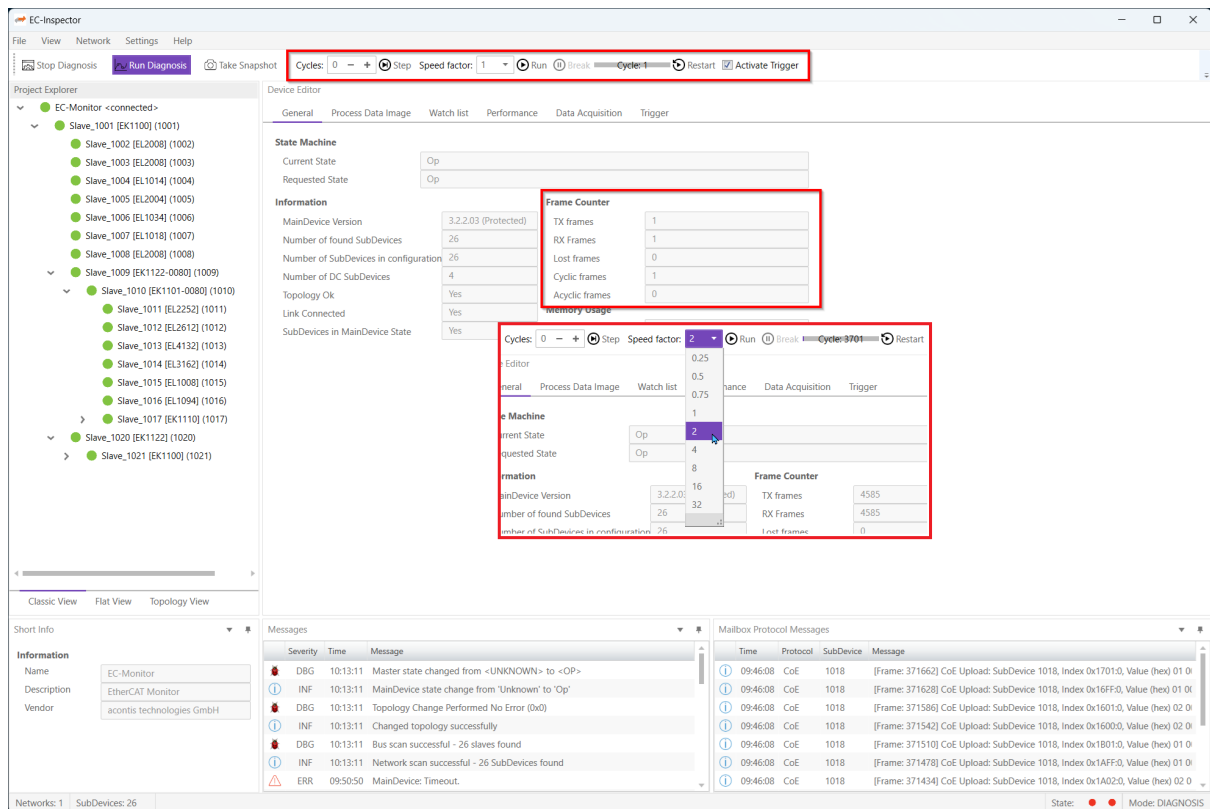
With the EC-Inspector it is possible to analyze a previous recorded capture file pcap or pcapng.



Therefore a wireshark have to be captured and saved as pcap or pcapng. Then it can be selected in the starting view of the EC-Inspector. Also the ENI file has to be selected.

It is also possible to read multiple files. Therefore the pcap files have to named like that: name.00000.pcap.

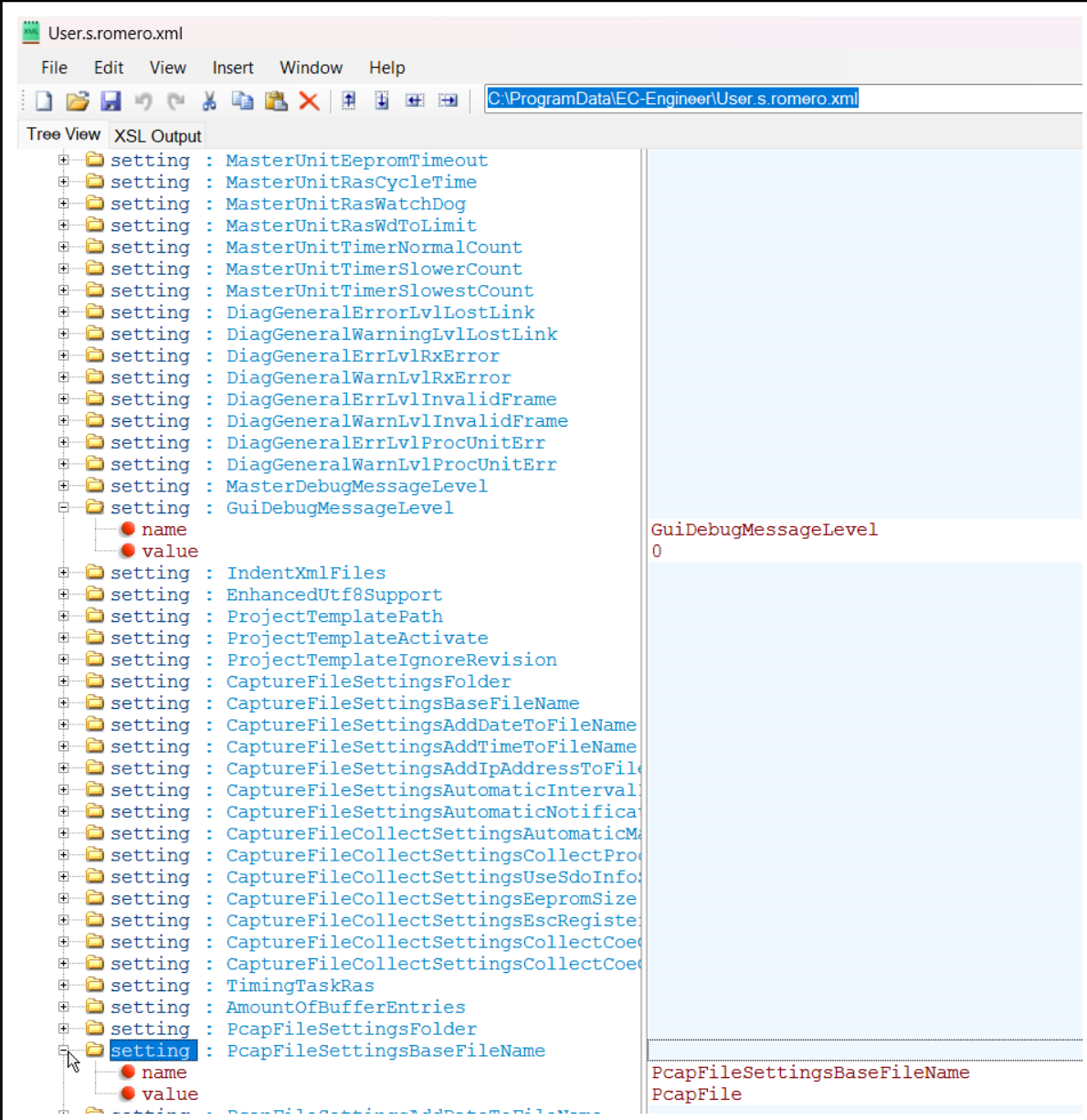
On switching to diagnosis mode the file will be read by EC-Monitor. After that the file is in play mode. It is possible to play the file faster or slower or select pause. There is also a function to execute a specified amount of cycles. This can all be done in the toolbar:



## 7.3.6 Settings File

Inside this file the user can modify all settings, including some that are not present in the settings dialog.

**Warning:** Only modify this file if you know what you are doing.



The file can be located either at “C:/ProgramData/EC-Engineer/User.<username>.xml” or inside the install directory.

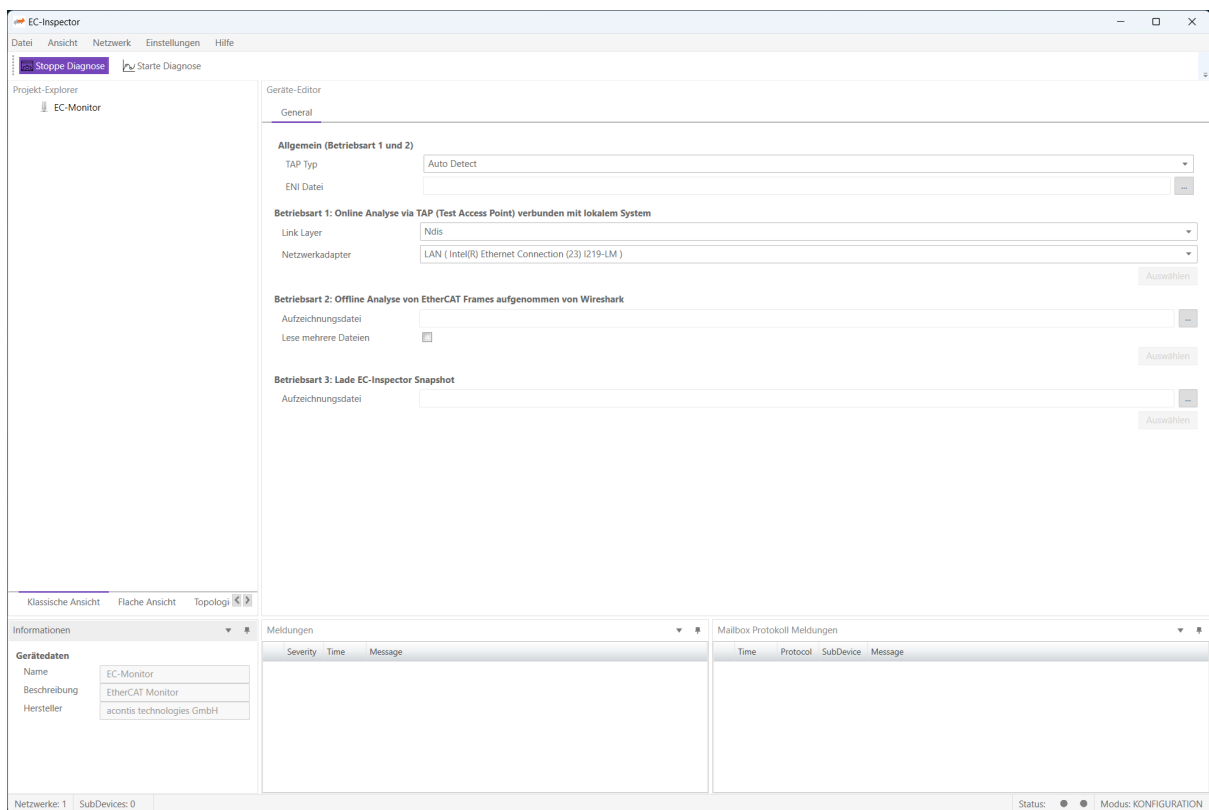
## 8 Customization

### 8.1 Multi-Language-Support

EC-Inspector supports multiple languages, which can be changed at runtime. Adding support for further languages is quite easy because it is just a simple XML file which must be added to the kit.

All language files are stored in: “%ProgramFiles%/acontis\_technologies/EC-Inspector/Languages/...”

EC-Inspector has also full UNICODE support, which means that it is also possible to support Asian languages:

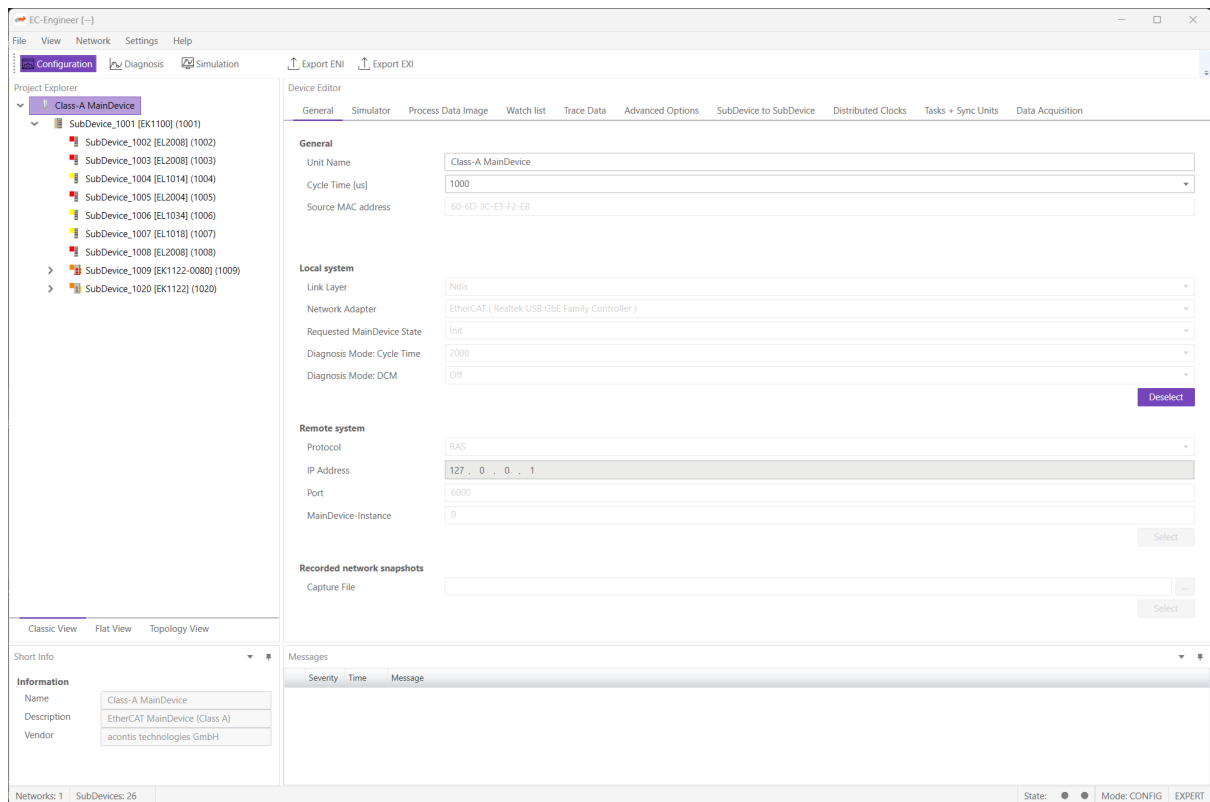


### 8.2 Themes

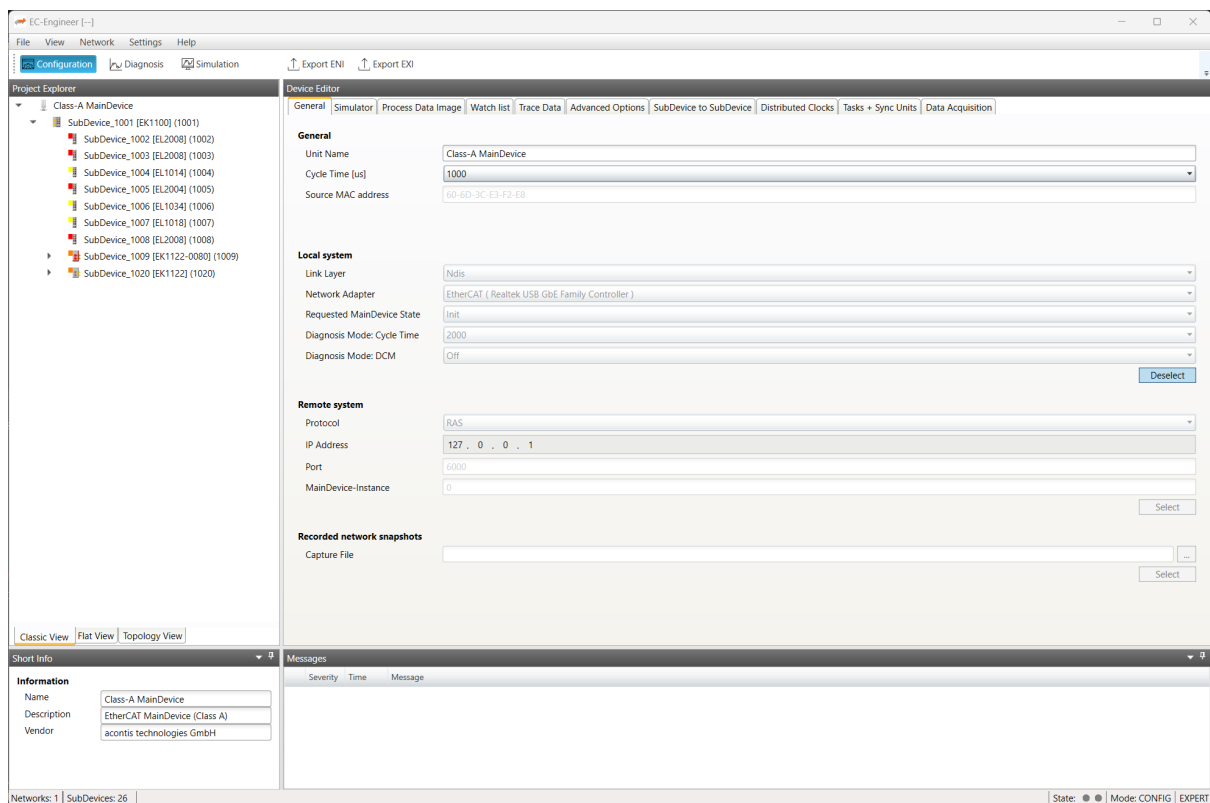
EC-Inspector supports multiple themes, which can be changed during compile time. Adding support for further themes is quite easy because a theme consists of a couple of XAML files which must be added to the kit.

Five themes are already included into EC-Inspector:

#### Royal Light Theme

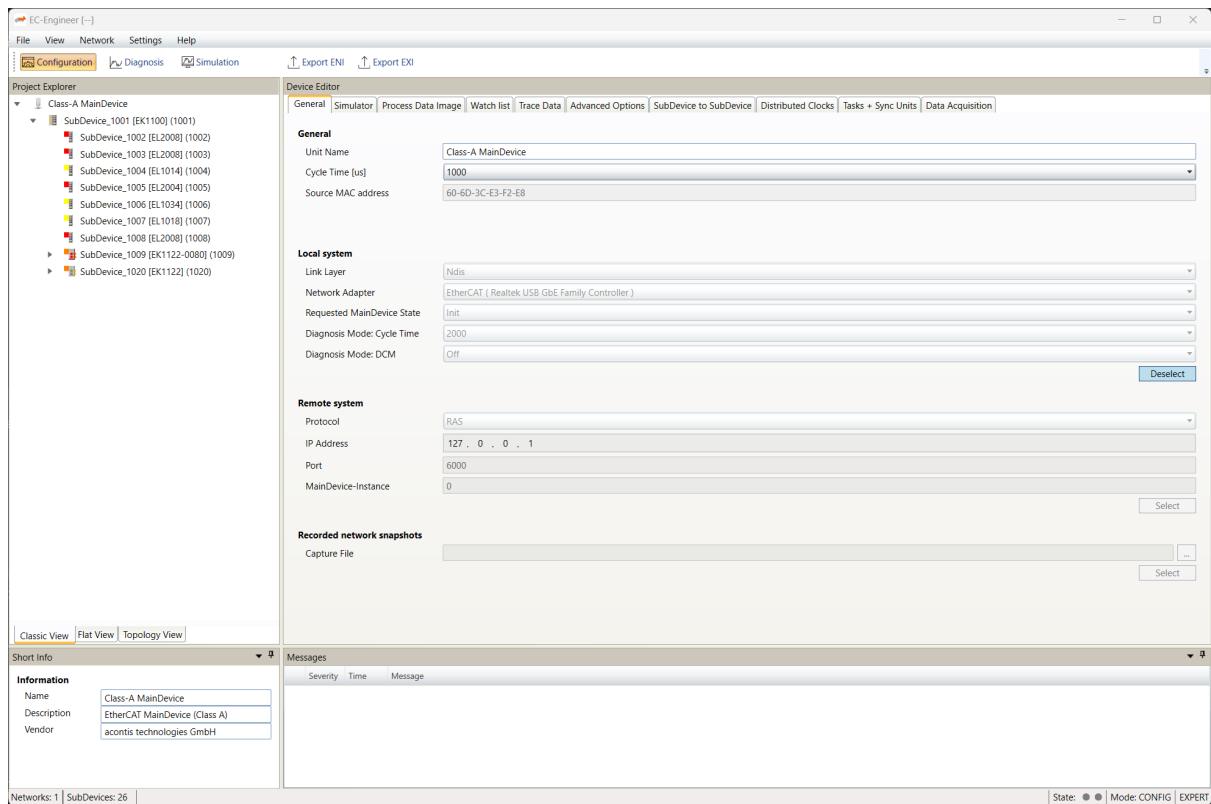


## IG Theme

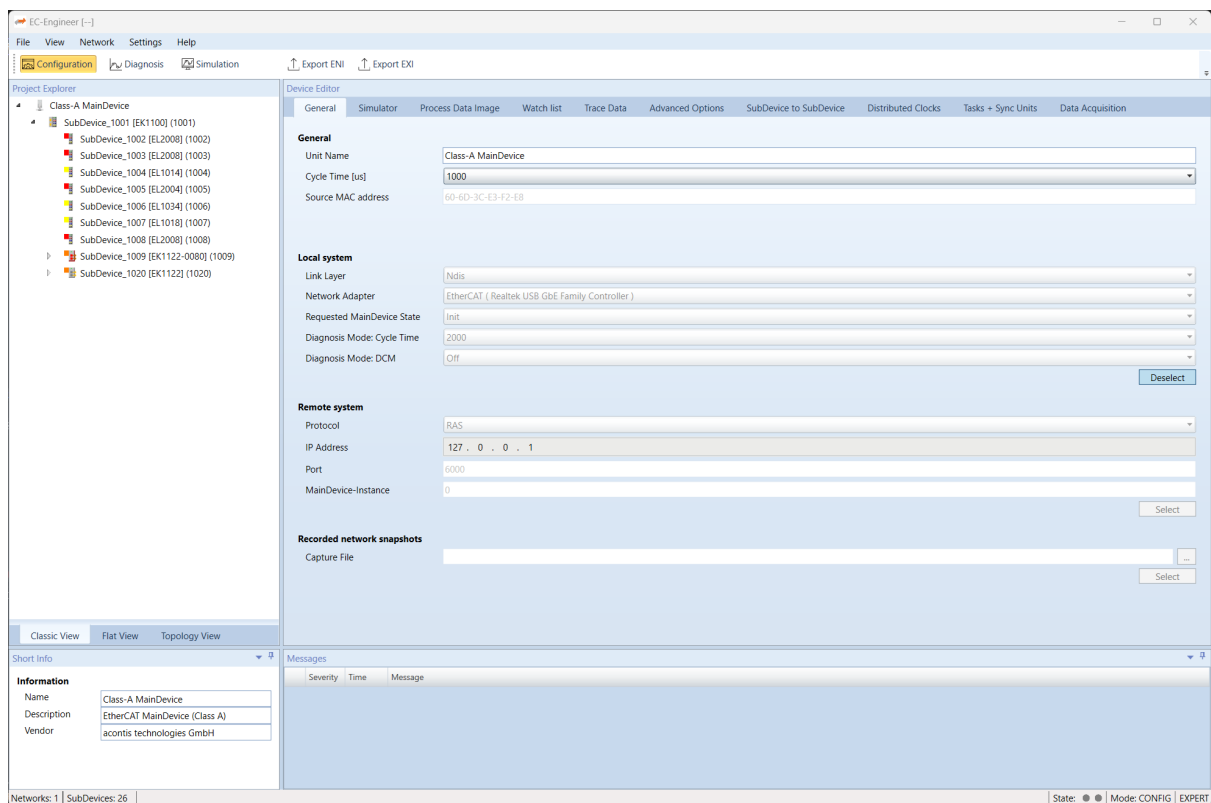


## Luna Theme

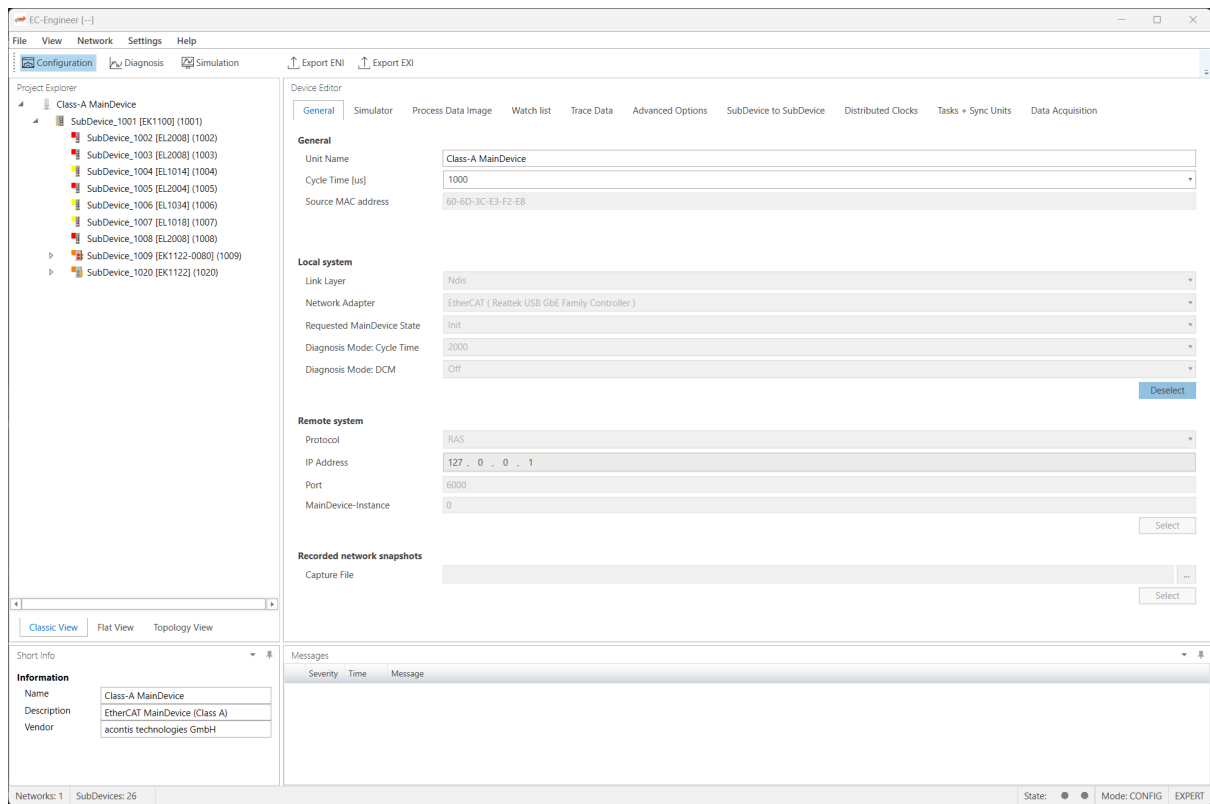




## Office 2010 Blue Theme



## Office 2013 Theme



## 9 Licensing

### 9.1 Third party Software

EC-Inspector is using the following third party software:

- Infragistics

### 9.2 EC-Inspector License

For EC-Inspector we have two license models:

- Node Locked License
- Floating License

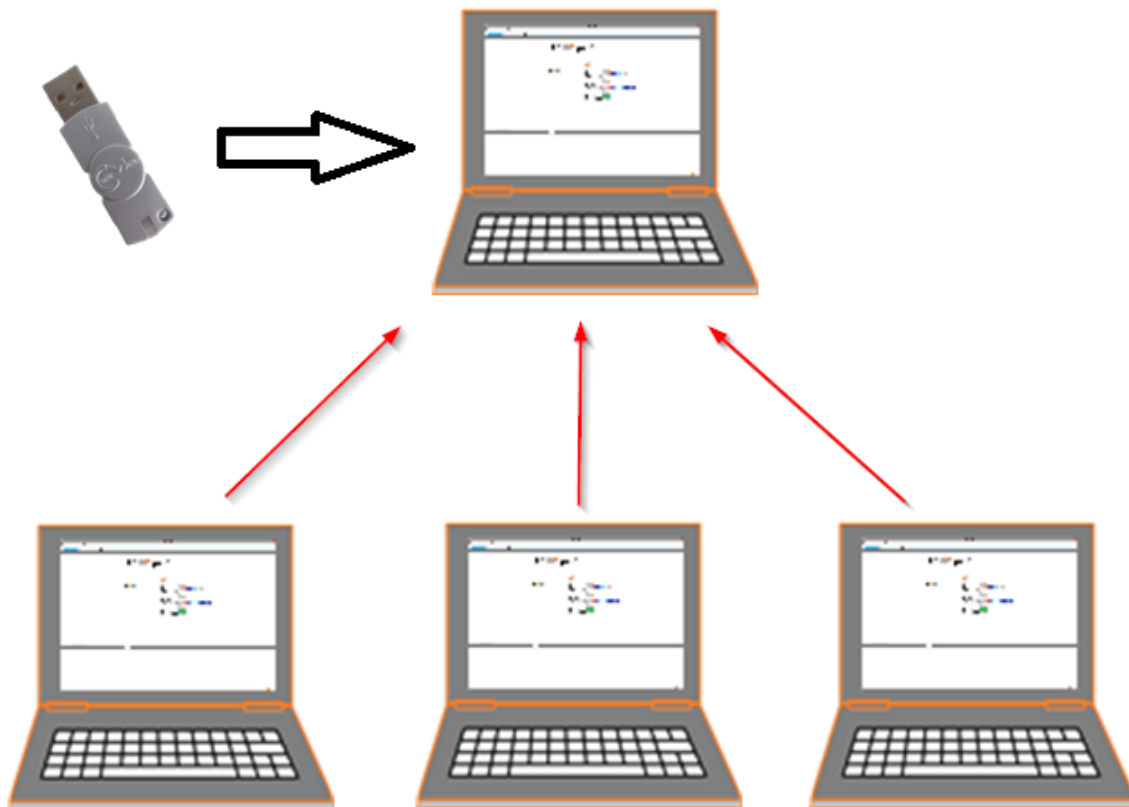
### 9.3 Node Locked License

If you choose this license model, you need an USB dongle for every single computer. This dongle must be plugged into the computer where you want to use EC-Inspector.



### 9.4 Floating License

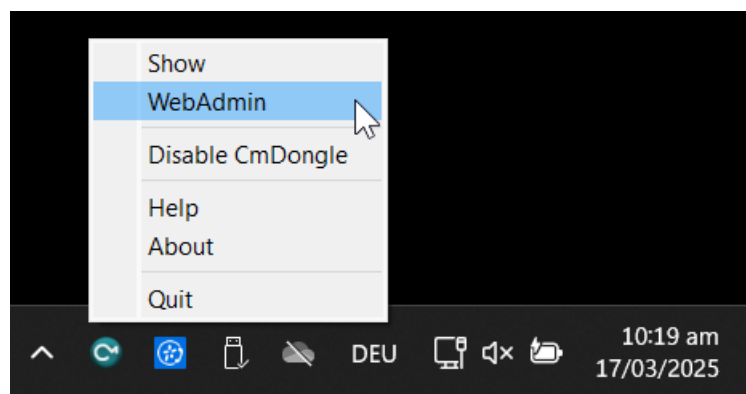
If you choose this license model, you need only one USB dongle with multiple floating licenses. This dongle must be plugged into your license server and all client computers will connect to this license server.



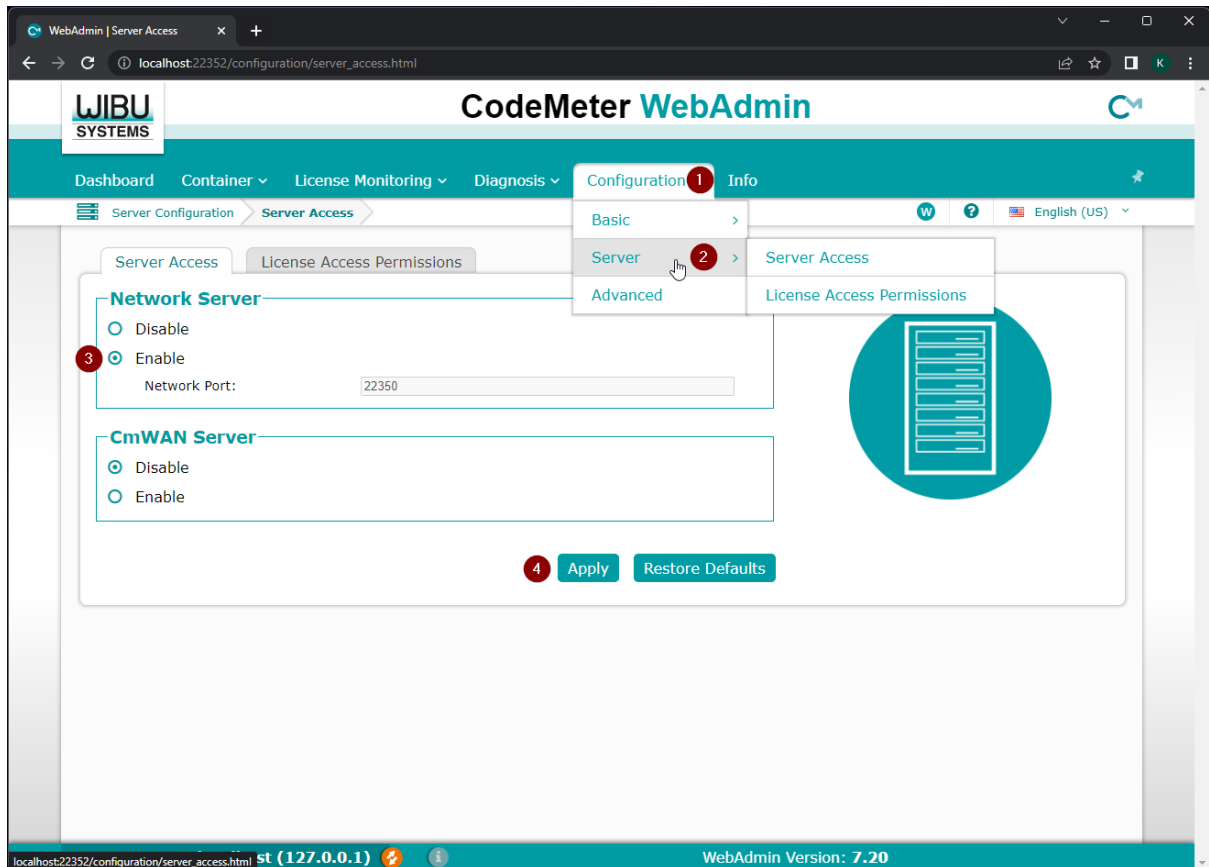
**Note:** This requires that the “WebAdmin” of the “Code Meter” is installed on the system. Please download and install the “Code Meter Runtime” from WIBU: <https://www.wibu.com/>

### 9.4.1 Configure License Server

Install the “Dongle-Version” of EC-Inspector on your license server, plug-in your USB dongle and open the “WebAdmin”:

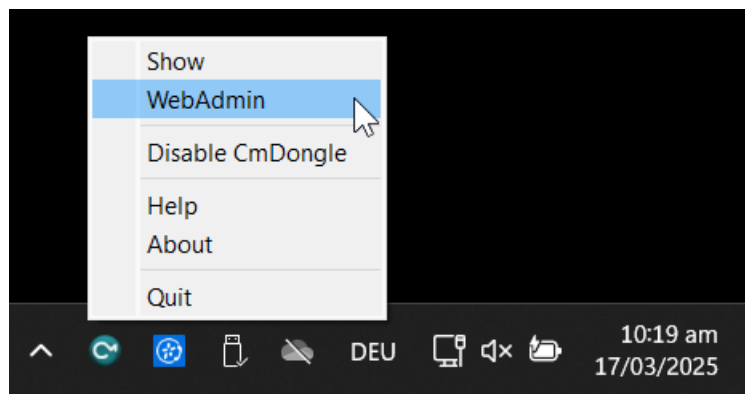


In the “WebAdmin” navigate to “Configuration Server”, select the option “Run Network Server” and press *Apply*:

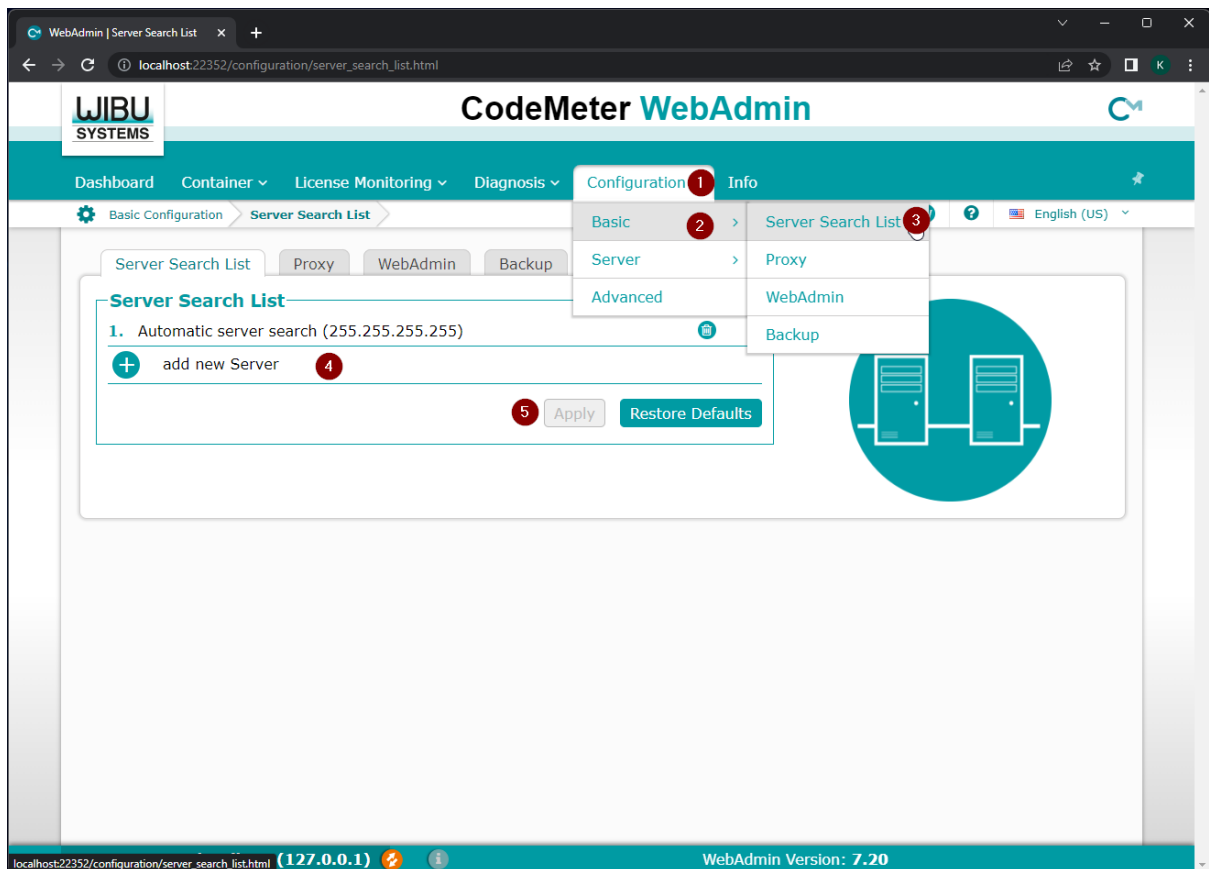


## 9.4.2 Configure Client Computer

Install the “Dongle-Version” of EC-Inspector and open the “WebAdmin”:

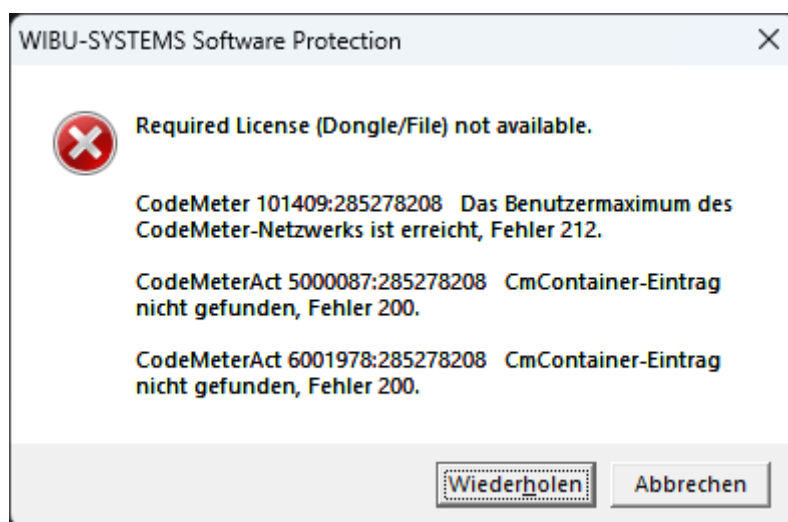


In the “WebAdmin” navigate to “Configuration Network”, press *add*, enter your IP address of your license server and press *Apply*:



Now, you should be able to start EC-Inspector.

**Note:** If too many clients are connected you will, you will receive the following error message:

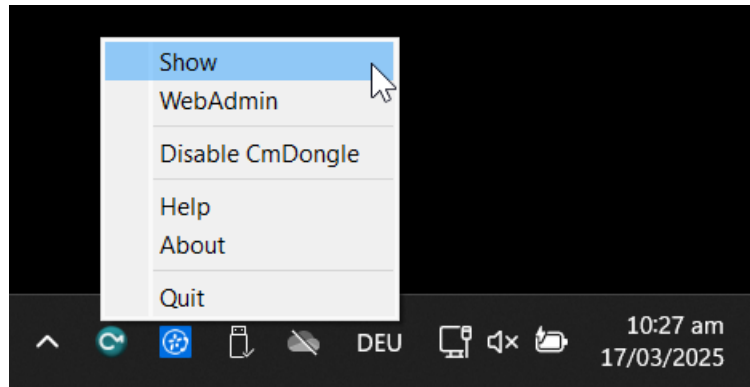


In that case, you should try to close unused EC-Inspector instances or buy more floating licenses.

## 9.5 License Update

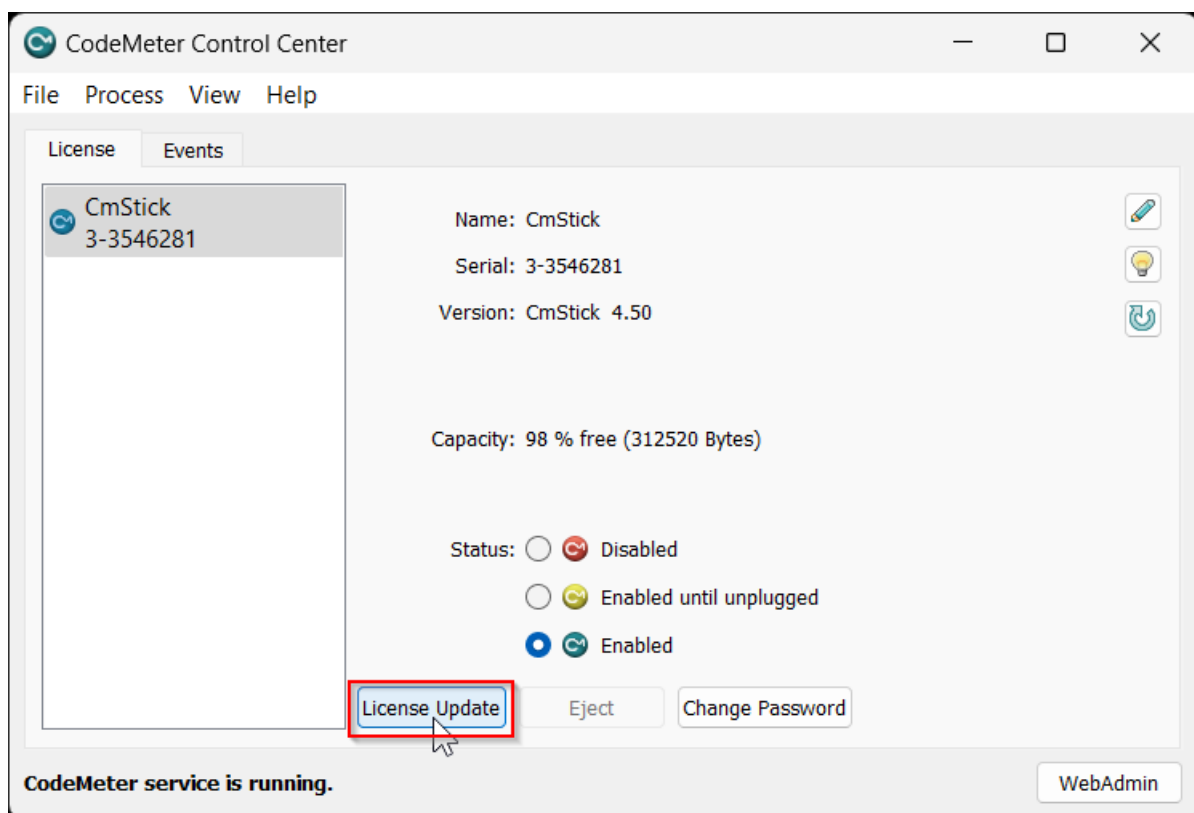
### 9.5.1 Request License Update

**Step 1:** Install the “Dongle-Version” of EC-Inspector and open the “CodeMeter Control Center”:

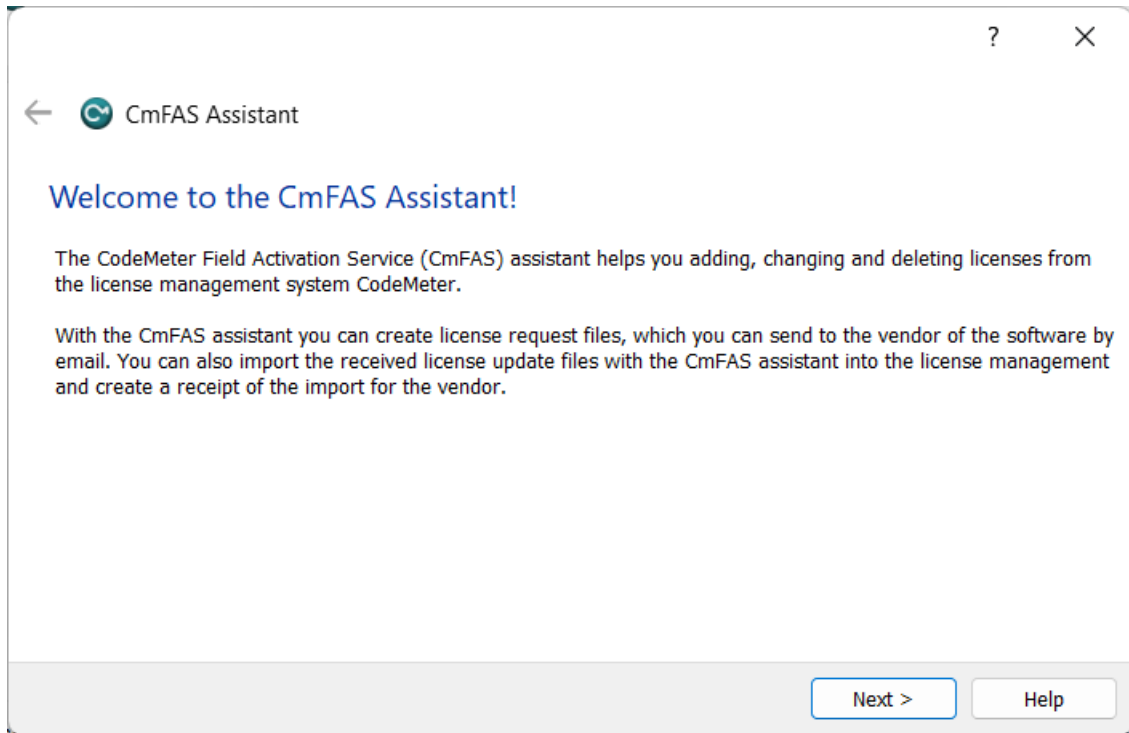


If the selected license is a virtual dongle, simply drag and drop the WibuCmLIF file onto the CodeMeter Control Center. Otherwise, the dongle should already be visible.

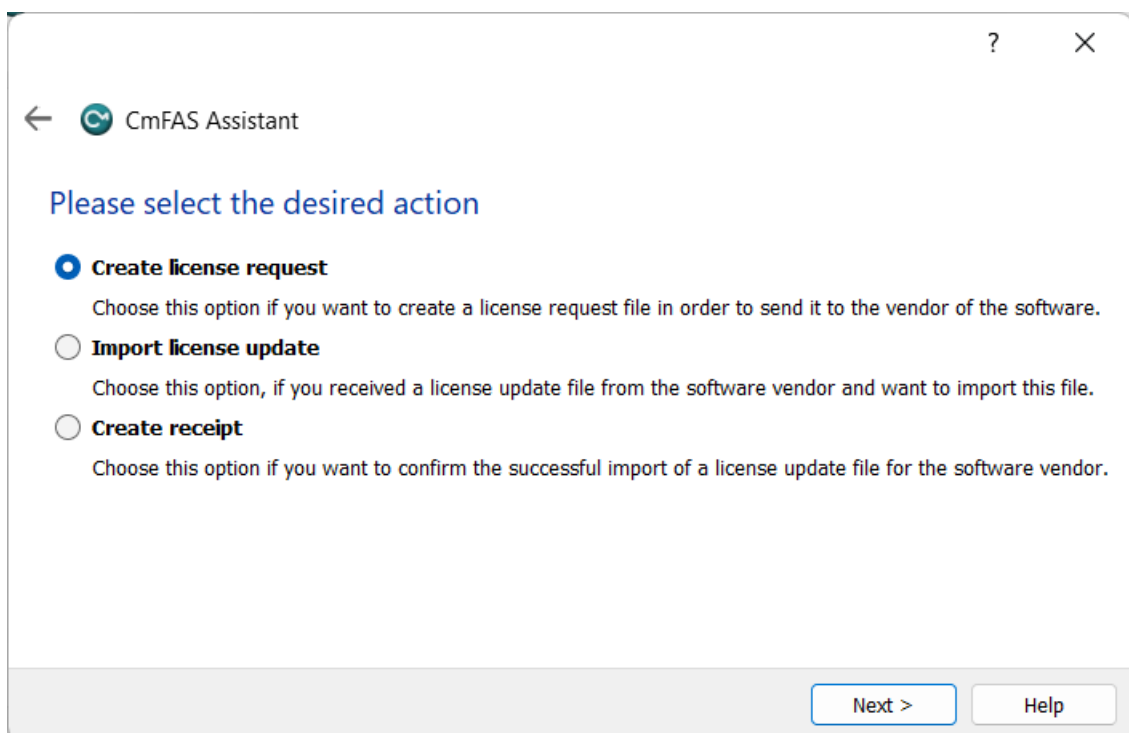
**Step 2:** In the “CodeMeter Control Center” open the “CmFAS Assistant” by clicking on *License Update*:



**Step 3:** Now, follow the assistant until you can select a file name:

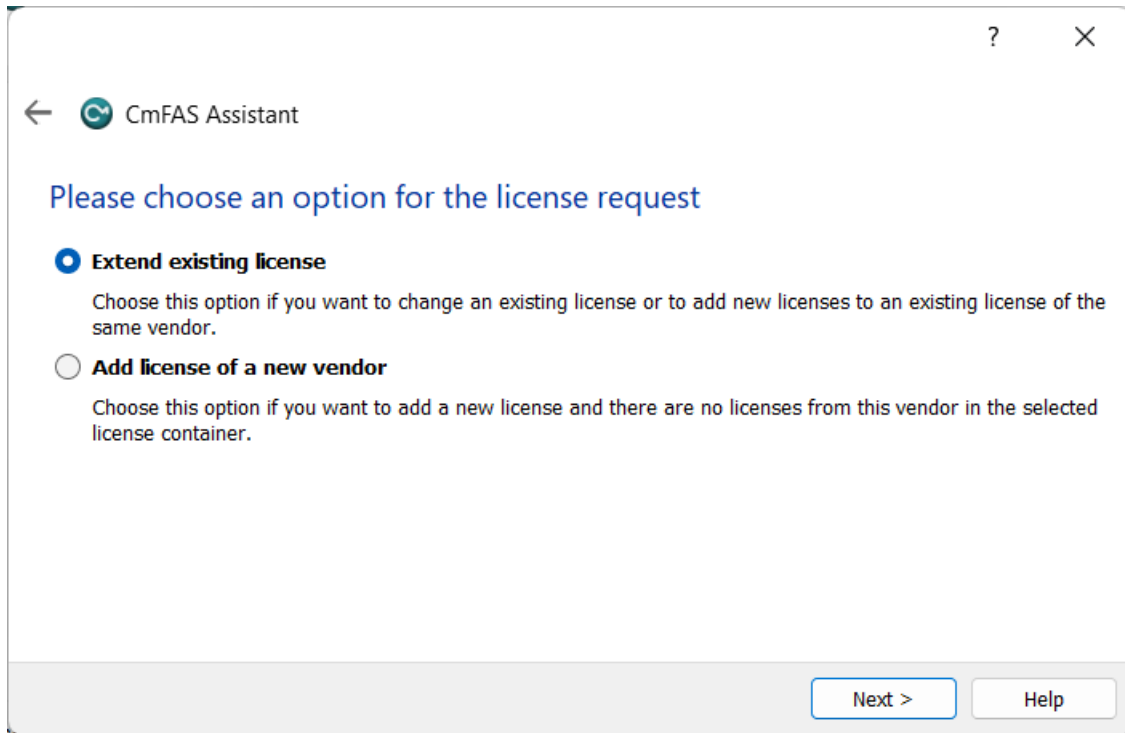


**Step 4: Select “Create license request”:**



**Step 5: Select “Extend existing license”:**





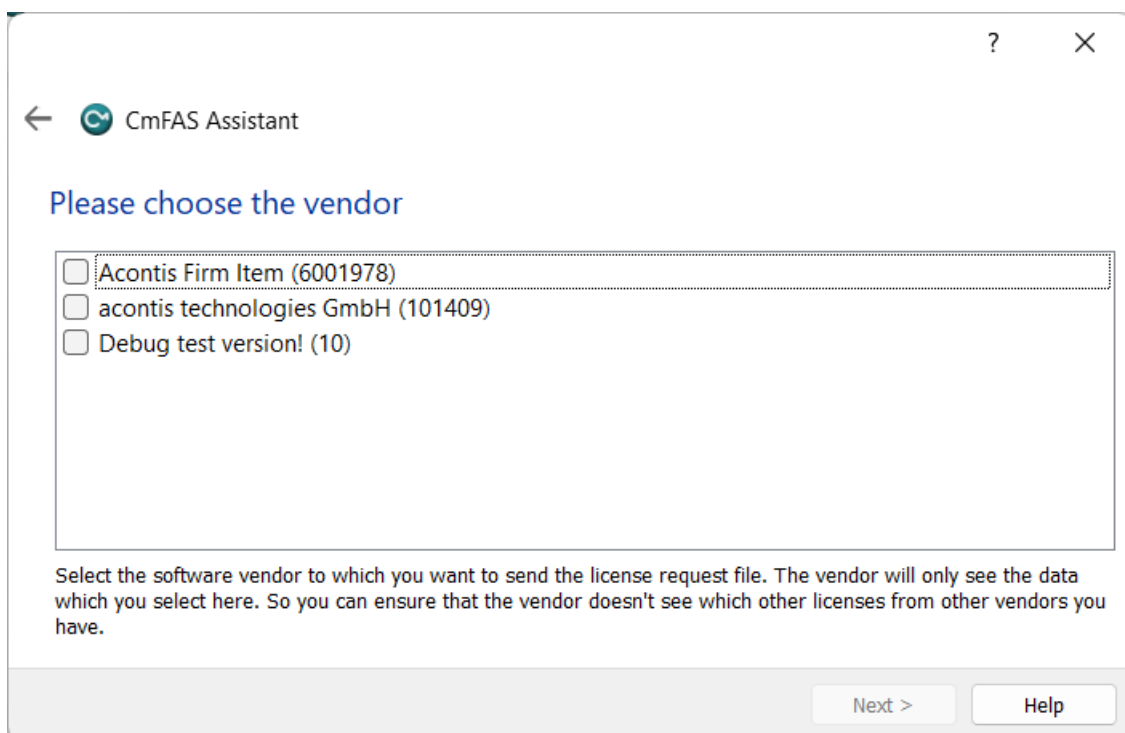
← CmFAS Assistant

Please choose an option for the license request

☒ **Extend existing license**  
Choose this option if you want to change an existing license or to add new licenses to an existing license of the same vendor.

☐ **Add license of a new vendor**  
Choose this option if you want to add a new license and there are no licenses from this vendor in the selected license container.

Next > Help

**Step 6: Keep the selected the vendor:**

← CmFAS Assistant

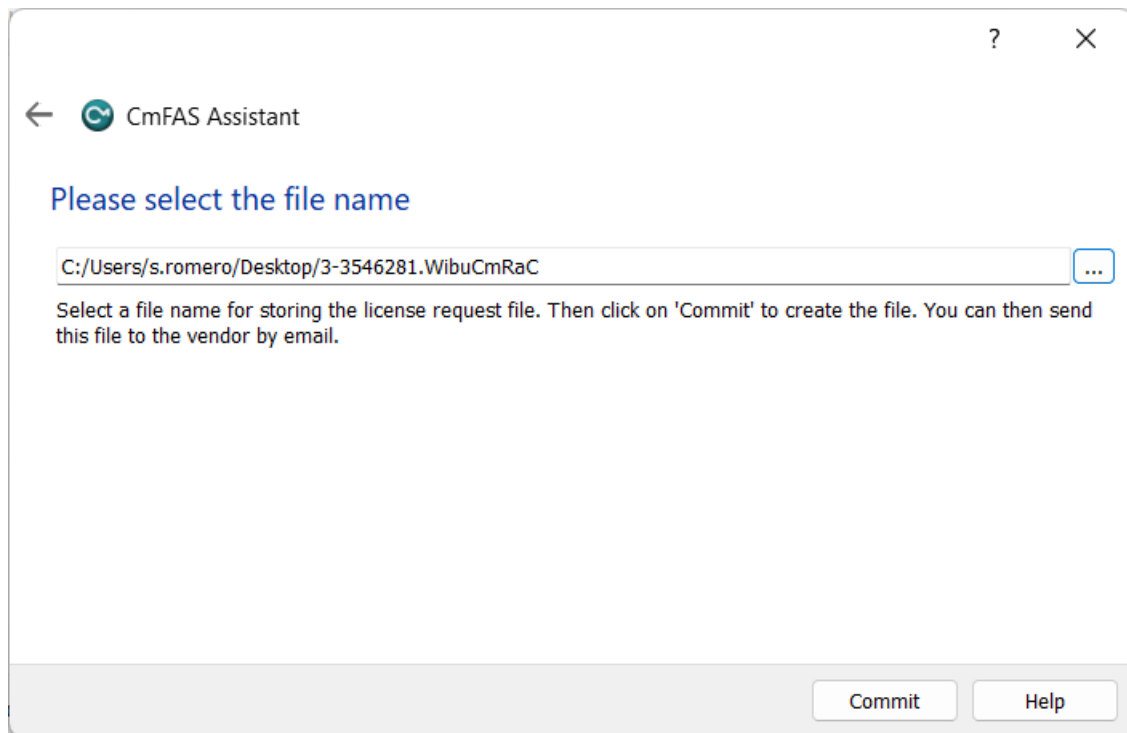
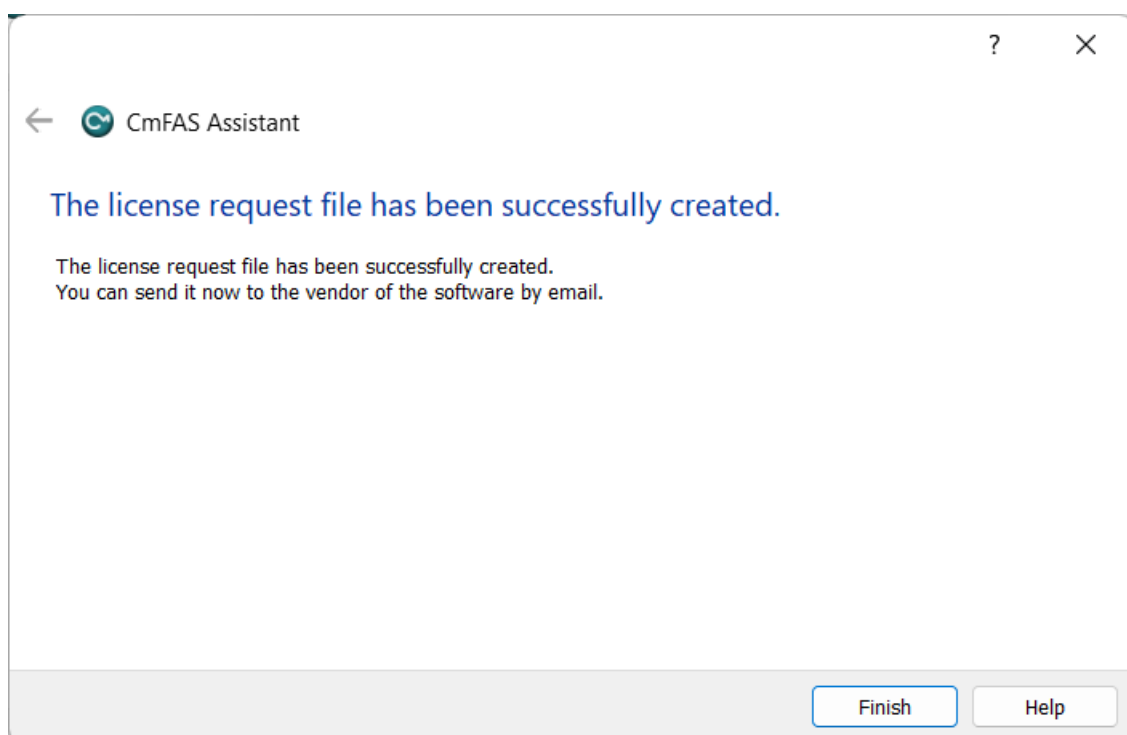
Please choose the vendor

☐ Acontis Firm Item (6001978)  
☐ acontis technologies GmbH (101409)  
☐ Debug test version! (10)

Select the software vendor to which you want to send the license request file. The vendor will only see the data which you select here. So you can ensure that the vendor doesn't see which other licenses from other vendors you have.

Next > Help

**Step 7: Select the file name:**

**Step 8: Finish the assistant:**

Step 9: Your license request file \*.WibuCmRaC has been successfully created. Please send it to [sales@acontis.com](mailto:sales@acontis.com)

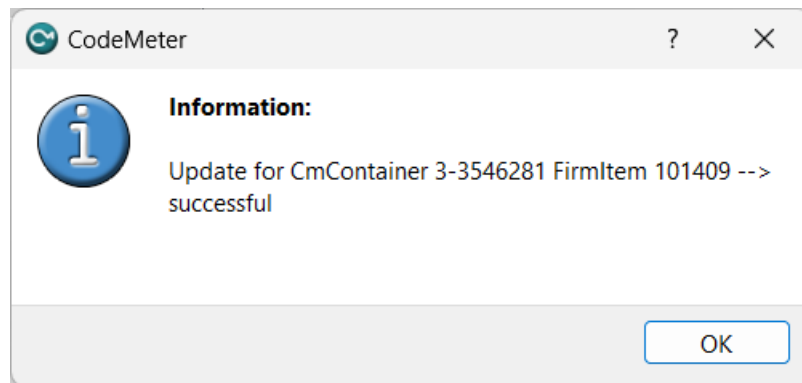
### 9.5.2 Install License Update

After you have been sent your license request file you will receive the license update file \*.WibuCmRaU.

Step 1: Connect your dongle.

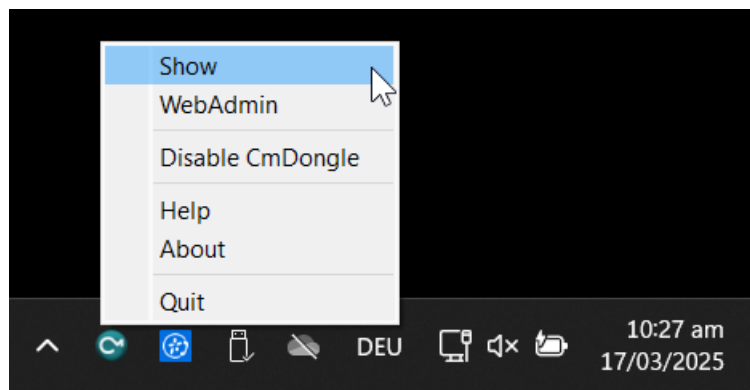
Step 2: Copy the license update file to your desktop.

**Step 3: Double-click on the license update file:**

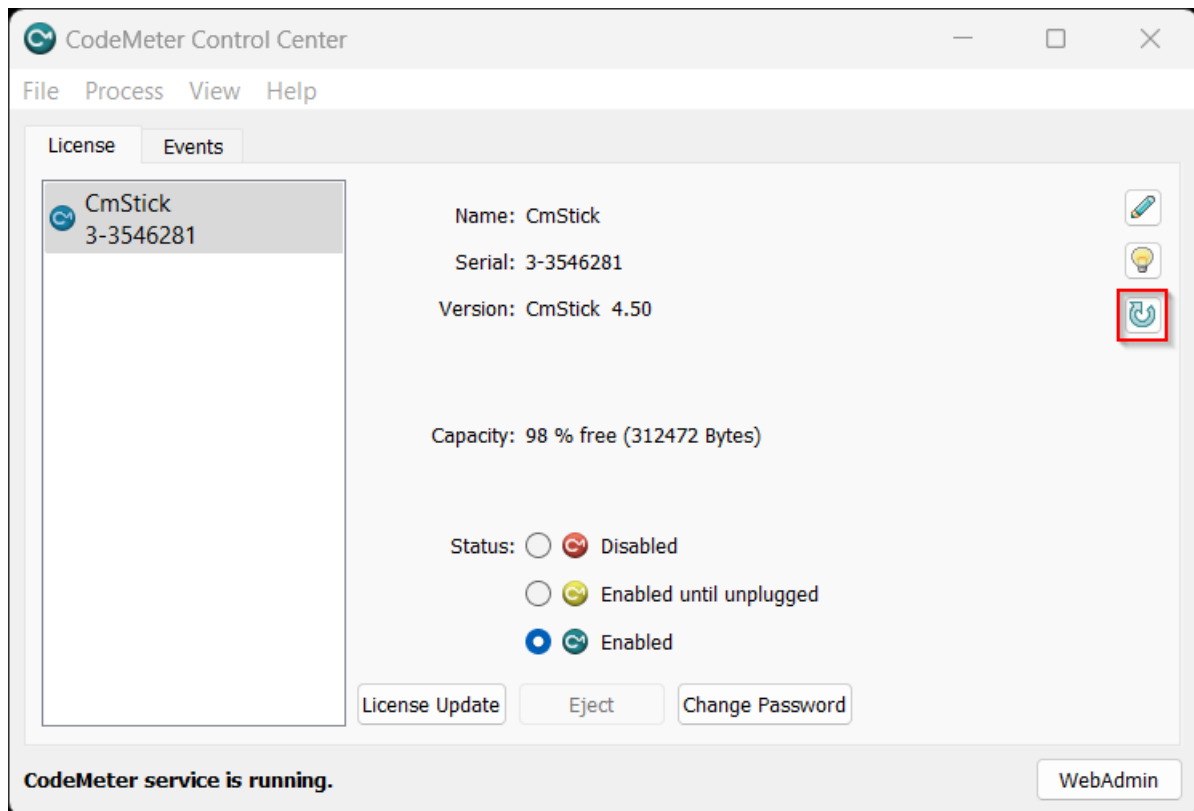


## 9.6 Dongle Firmware Update

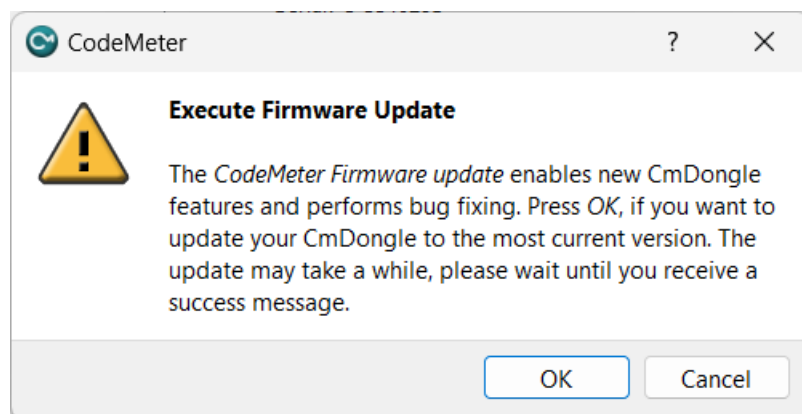
**Step 1: Install the “Dongle-Version” of EC-Inspector and open the “CodeMeter Control Center”:**



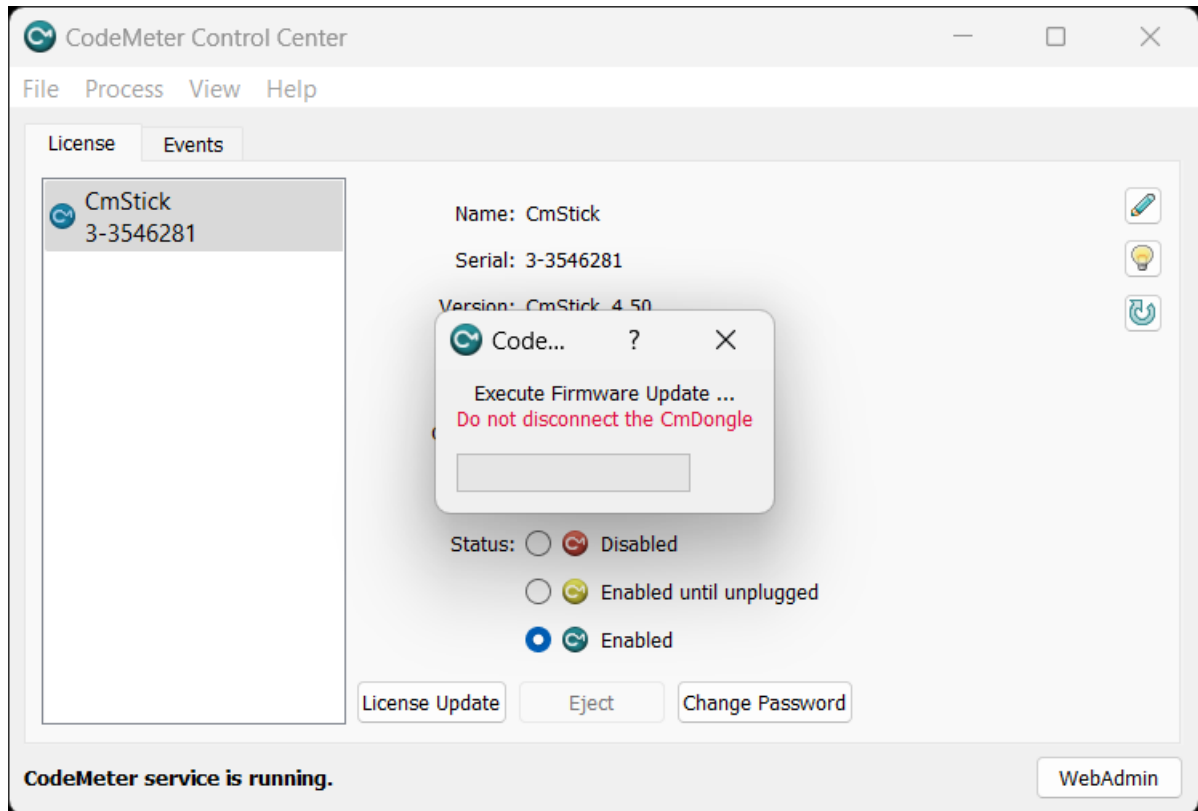
**Step 2: In the “CodeMeter Control Center” click on *Update Firmware of selected Cm Dongle*:**



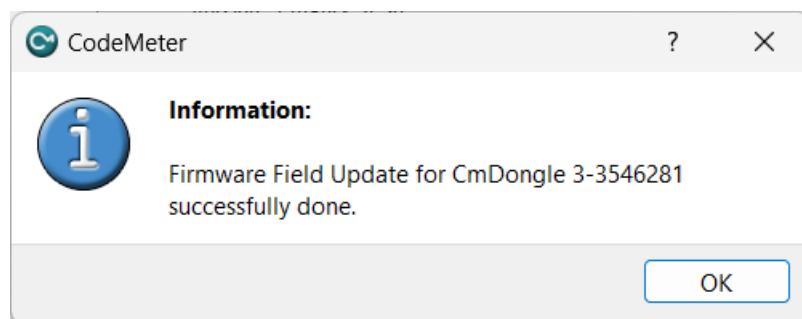
**Step 3: Execute firmware update by pressing *OK*:**



**Step 4: Wait until firmware update was executed:**



**Step 5: Firmware update was done and dongle can be removed:**



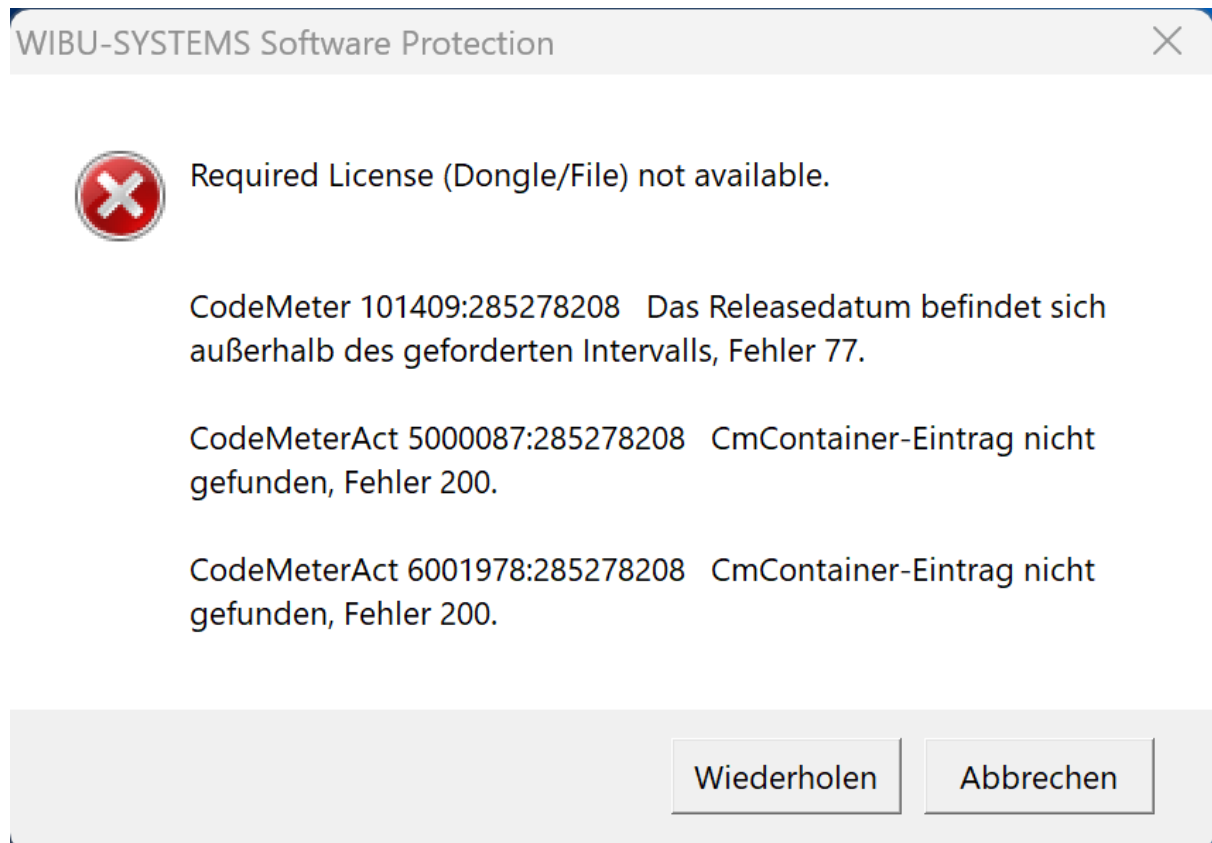
## 9.7 Expiration Date Dongle

If you chose a expiration dongle you can find your expiration date in the 'About Dialog'. If you have an unlimited dongle you will not see a date in the dialog.



If you see this date you can not use an Engineer which was released after the expiration date, but all older ones are possible.

**If you try to start an Engineer which is newer than the expiration date, you will get the following error:**



## 10 FAQ, Tips

### 10.1 Help in case of a problem

If you have a problem with EC-Inspector or something does not run as expected, please try first the following things:

- Read messages in message window
- Increase message level *Menu ▶ Settings ▶ All Messages*
- Read log file for more information *Menu ▶ Help ▶ Show ▶ Log ▶ File*
- Restart EC-Inspector and try to do it again
- **Contact support by sending a mail to [ecsupport@acontis.com](mailto:ecsupport@acontis.com) and attach the following information**
  - Project file `.ecc` or `.eci` if available
  - EC-Inspector Version *Menu ▶ Help ▶ About*
  - Log file *Menu ▶ Help ▶ Show Log File*
  - Short description how the reproduce it

### 10.2 Internal User Specific Settings

EC-Inspector saves all user specific settings in a subfolder of the all users directoy `%ALLUSERSPROFILE%/EC-Inspector` like `C:/ProgramData/EC-Inspector`.

In this directoy there is a XML file called `User.myusername.xml`. In this file, the user can find additional settings, which can be helpful for solving some problems:

**MasterUnitLocalCycleTime = 1**

Bus cycle time of the internal MainDevice in milliseconds

**MasterUnitLocalWorkerSleepTimeMs = 100**

Cycle time of the local MainDevice thread in milliseconds

**MasterUnitRemoteWorkerSleepTimeMs = 300**

Cycle time of the remote MainDevice thread in milliseconds

**MasterUnitTimerNormalCount = 4**

- Time shift to cycle time of the normal refresh cycle
- E.g. local MainDevice = 100 ms, normal refresh cycle is every 400 ms
- Used e.g. for updating MainDevice information, error counters of SubDevice, ...

**MasterUnitTimerSlowerCount = 20**

- Time shift to cycle time of the slower refresh cycle
- E.g. local MainDevice = 100 ms, slower refresh cycle is every 2 seconds
- Used e.g. for updating the SubDevice information, EEPROM data, register data, ...

**MasterUnitTimerSlowestCount = 120**

- Time shift to cycle time of the slowest refresh cycle

- E.g. local MainDevice = 100 ms, slower refresh cycle is every 12 seconds
- Used e.g. for updating the CoE Object Dictionary, ...

**MasterUnitScanBusTimeout = 5000**

Timeout for bus scan in milliseconds

**MasterUnitMailboxTimeout = 5000**

Timeout for mailbox access in milliseconds

**MasterUnitStateChangeTimeout = 5000**

Timeout for changing state machines in milliseconds

**MasterUnitRegisterTimeout = 3000**

Timeout for register access in milliseconds

**MasterUnitProcessDataTimeout = 1000**

Timeout for process data access in milliseconds

**MasterUnitEepromTimeout = 3000**

Timeout for EEPROM access in milliseconds

**MasterUnitRasCycleTime = 0**

Internal RAS cycle time for polling

**MasterUnitRasWatchDog = 0**

Internal RAS watchdog interval

**MasterUnitRasWdToLimit = 0**

Internal RAS watchdog limit

**DiagGeneralErrorLvlLostLink = 10**

Threshold value for the “Lost Link Errors”, which leads to an error

**DiagGeneralWarningLvlLostLink = 1**

Threshold value of the “Lost Link Errors”, which leads to a warning

**DiagGeneralErrLvlRxError = 10**

Threshold value for the “RX Errors”, which leads to an error

**DiagGeneralWarnLvlRxError = 0.001**

Threshold value of the “RX Errors”, which leads to a warning

**DiagGeneralErrLvlInvalidFrame = 10**

Threshold value for the “Invalid Frames”, which leads to an error

**DiagGeneralWarnLvlInvalidFrame = 0.001**

Threshold value of the “Invalid Frames”, which leads to a warning

**DiagGeneralErrLvlProcUnitErr = 1000**

Threshold value for the “Processing Unit Errors”, which leads to an error

**DiagGeneralWarnLvlProcUnitErr = 100**

Threshold value of the “Processing Unit Errors”, which leads to a warning

**MasterDebugMessageLevel = 0**

Activates extended debug messages of the EC-Master (0 = Silent, 1 = Any, 2 = Critical, 3 = Error, 4 = Warning, 5 = Info, 6 = InfoApi, 7 = Verbose, 8 = VerboseCyc)

**GuiDebugMessageLevel = 0**

Activates extended debug messages of the GUI (0 = Off, 1 = Errors, 2 = All)

**IndentXmlFiles = False**

Activates indenting of XML files (makes exported XML files readable, but increases size)

**EnhancedUtf8Support = False**

Activates the enhanced UTF-8 support, which might be necessary if characters will be not displayed correctly



## 10.3 FAQ

Solutions for possible problems:

- **The integrated Device does not react as estimated**  
Increase the message level (Menu Settings All Messages) and try it again.
- **EC-Inspector reports a message with ErrCode: 0x...**  
Error Codes comes directly from the Device. If you want to know what to know how to solve this problem, please refer the manual of EC-Master / EC-Monitor.
- **Permanent frame loss while monitoring TwinCAT**  
Please try with Npcap instead of NDIS driver
- **WebAdmin in Dongle-Version shows page not found, what can I do?**  
You have to download and install the Code Meter Runtime from WIBU <https://www.wibu.com/>
- **UTF8 characters e.g. in variables or PDOs will be not displayed correctly**  
This requires the enhanced UTF-8 support and can be enabled by setting “EnhancedUtf8Support = True”, (see *Internal User Specific Settings*)