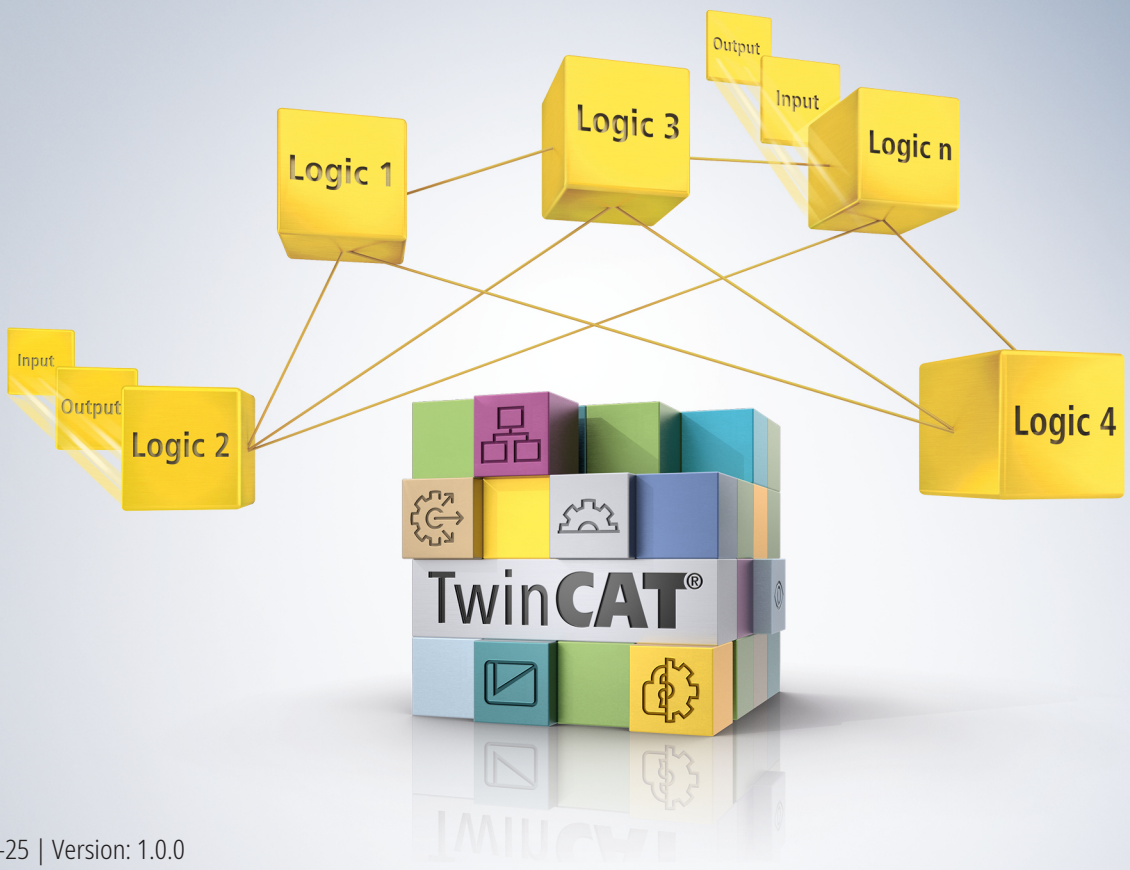
BECKHOFF New Automation Technology

TwinSAFE Tutorial 16 | EN

TwinSAFE Loader

Download via EtherCAT Mailbox Gateway



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1 Introduction

TwinSAFE includes several innovations that bring more functionality and performance to your safety controller. A major innovation is that the functionality of the safety controller is integrated in each TwinSAFE component. This means that you can, for example, use a TwinSAFE input component both as an input component and the safety control integrated on it to use application-specific pre-processing.

This is tutorial 16 of a tutorial series.

The aim of this tutorial series is to familiarize you with the TwinSAFE innovations using individual examples.

This tutorial is about the configuration of a system for the TwinSAFE Loader and the subsequent download of a project via the EtherCAT Mailbox Gateway.

1.1 Version numbers

Version	Comment
1.0.0	• First released version
0.0.1	• First draft

1.2 Requirements

Meet the following requirements for this tutorial:

- TwinCAT 3 version ≥ 3.x
- TwinSAFE Loader = p7

1.3 Starting point

At the starting point of the tutorial

- a TwinCAT 3 solution exists.

1.4 Demo system

1.4.1 Hardware

The demo system of this tutorial consists of the following hardware:

- CX for EtherCAT communication and the standard PLC controller
- EL6910 as master TwinSAFE Logic
- EL1918 with safe inputs for reading light barrier signals
- Light barrier
- AX8000-x2xx
- Engineering system connected via Ethernet

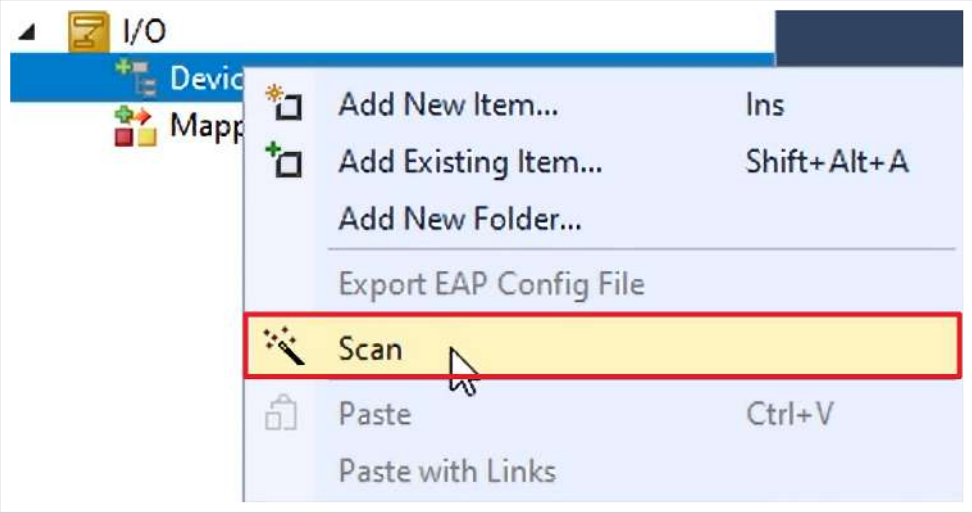
1.4.2 Desired functionality

This tutorial describes the realization of the following functionality:

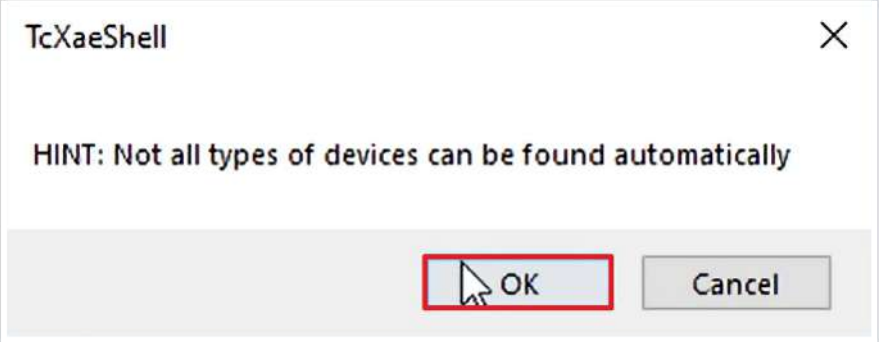
- Download of a Safety project without TwinCAT 3.

2 Demonstration

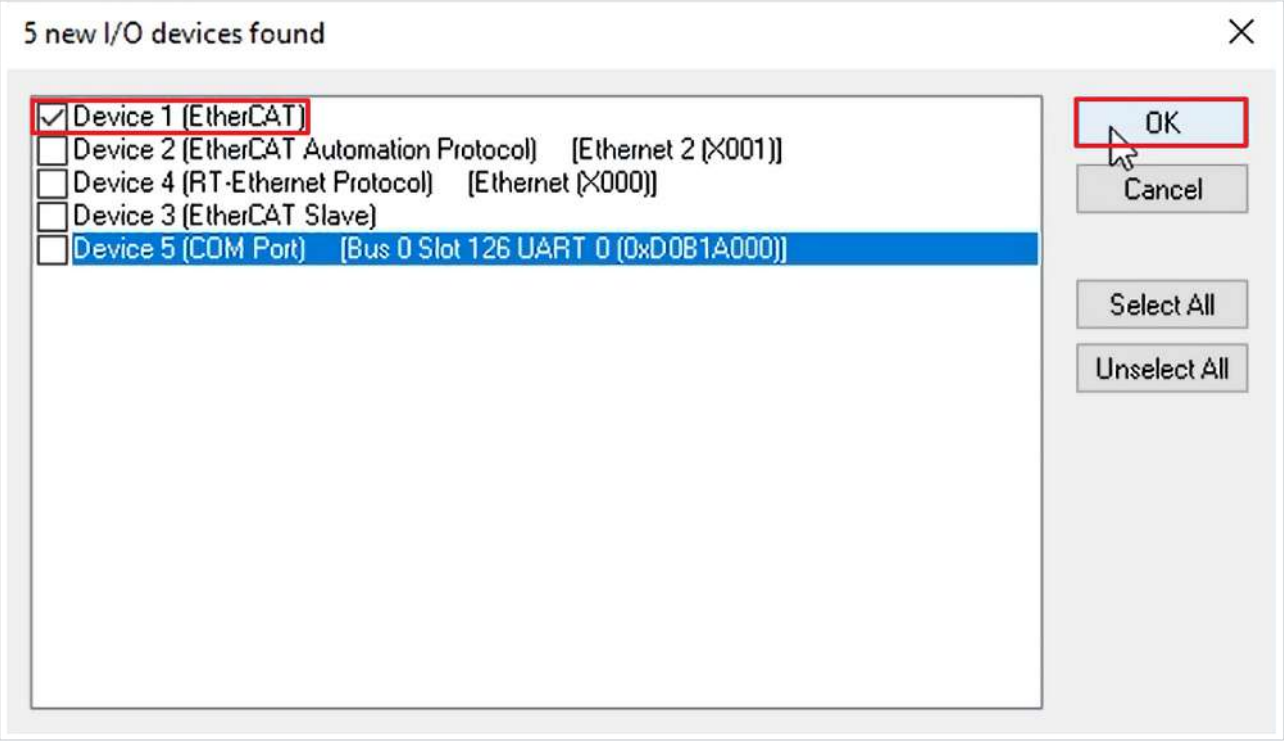
2.1 Load adapter



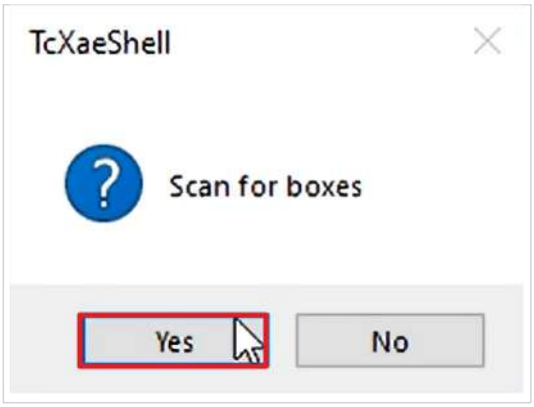
1. Right click on Devices
2. Click on “Scan“ to scan all devices



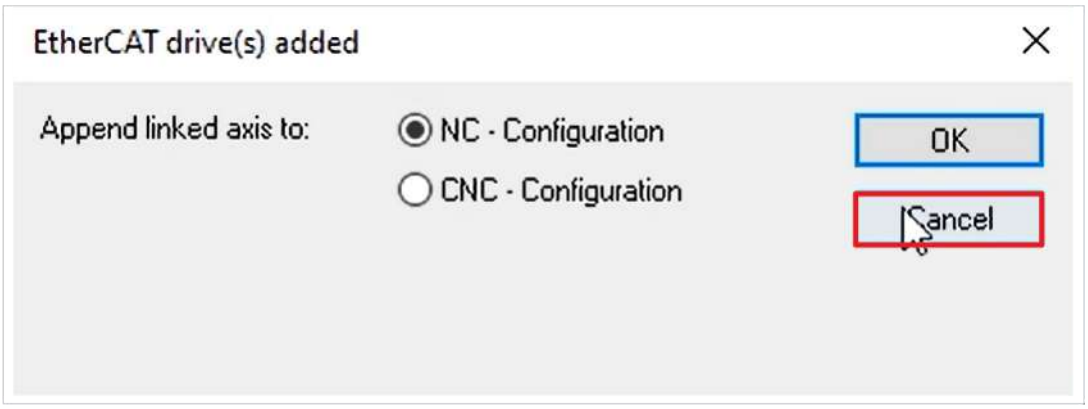
3. Confirm window with “OK”



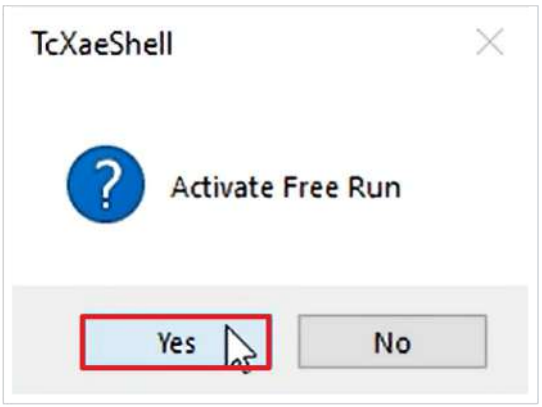
4. Select EtherCAT adapter
5. Confirm selection with “OK“



6. Confirm window “Scan for boxes“ with “Yes”

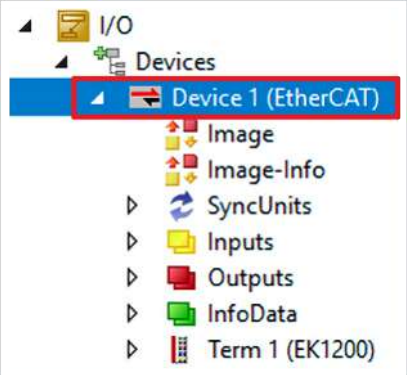


7. Close window “EtherCAT drive(s) added” with „Cancel” since no NC configuration is required in this application

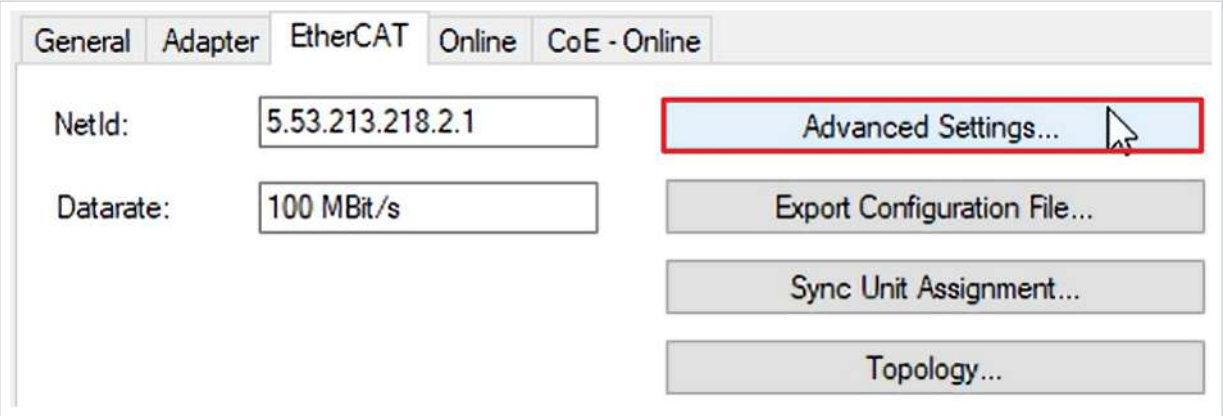


8. Close window ”Activate Free Run“ with “Yes”

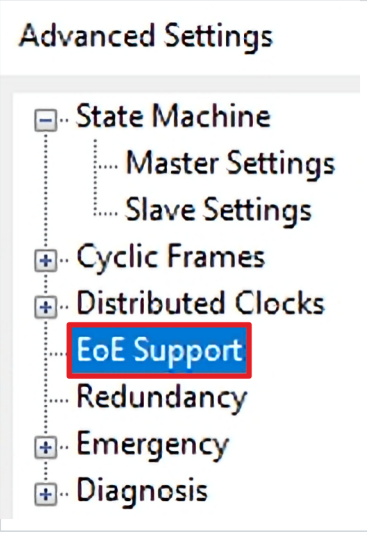
2.2 Advanced Settings



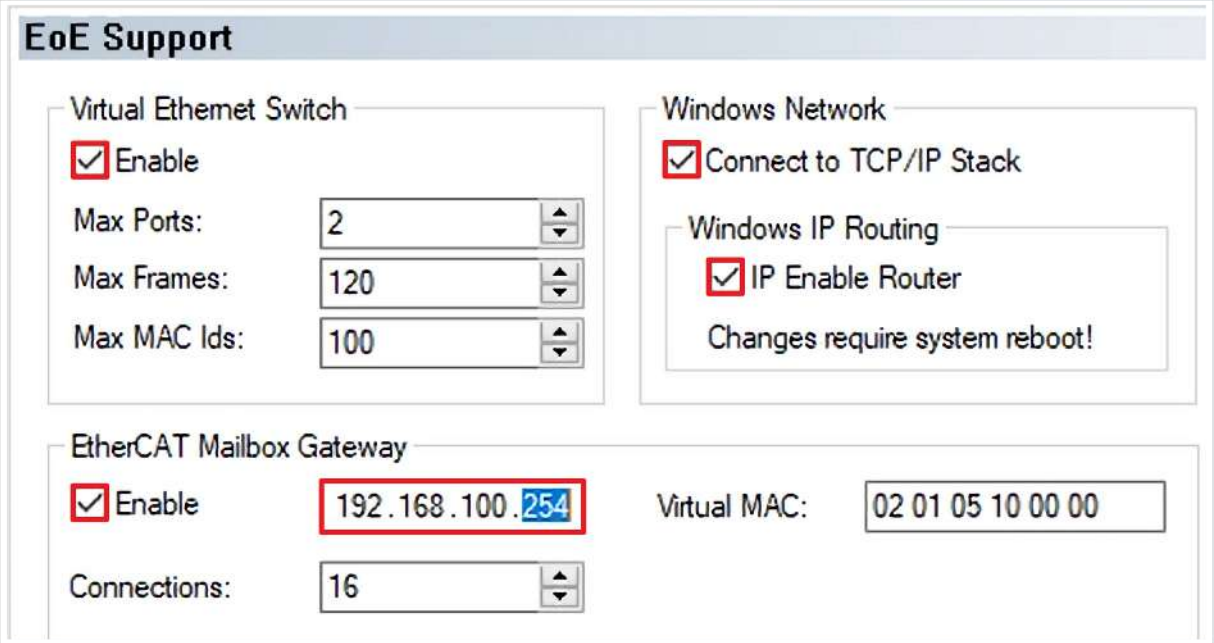
1. Open EtherCAT master



2. Open “Advanced Settings”



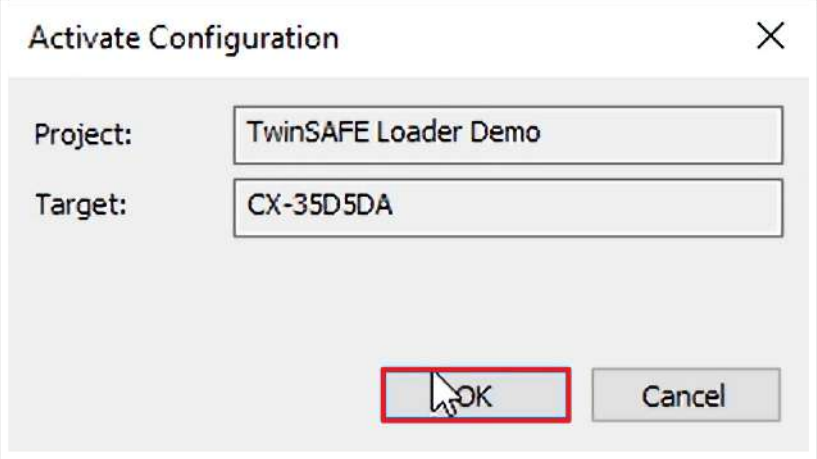
3. Select “EoE Support”



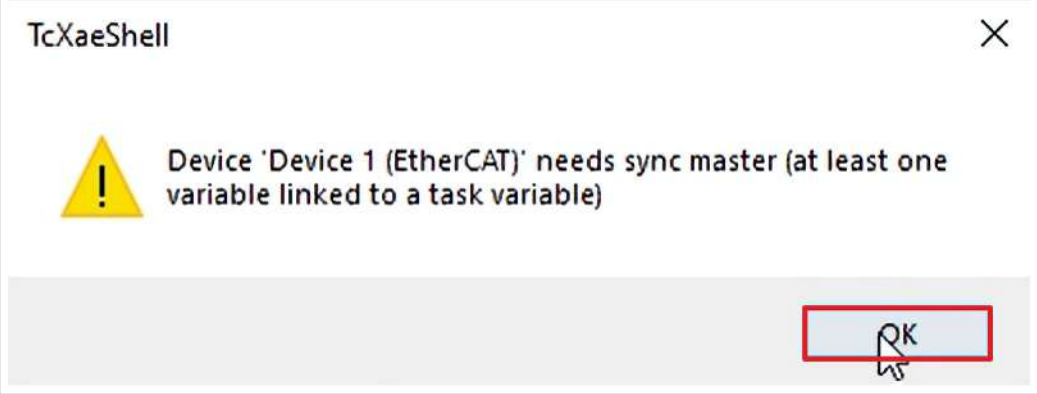
4. Set the following checkmarks
   - Virtual Ethernet Switch
     - Enable
   - Windows Network
     - Connect to TCP/IP Stack
     - IP Enable Router
   - EtherCAT Mailbox Gateway
     - Enable
5. Assign an IP address to the EtherCAT Mailbox Gateway as shown in the figure
6. Close window “Advanced Settings” with “OK”

2.3 Activate configuration

1. Click on “Activate Configuration” in the menu bar

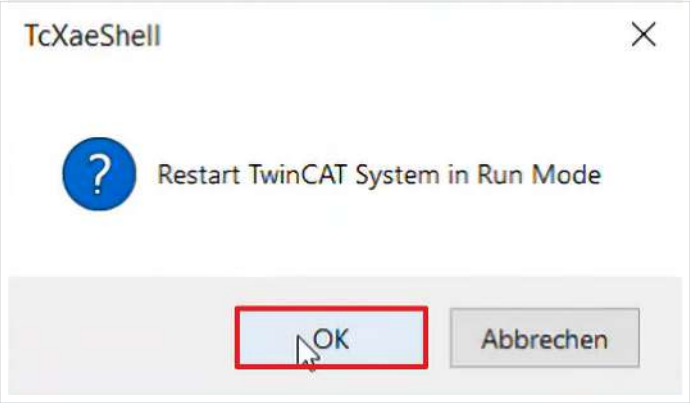


2. Confirm window “Activate Configuration” with “OK”



A message box appears because currently no task is connected to the EtherCAT.

3. Close message box with “OK”



4. Confirm window “Restart TwinCAT System in Run Mode” with “OK”

2.4 Configuration of the EtherCAT Mailbox Gateway

2.4.1 Check availability

1. Open a command line

```
C:\Users\Administrator>ping 192.168.100.254
```

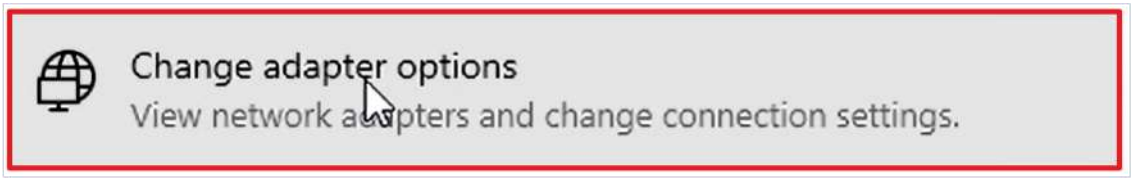
2. Execute ping command for the IP address of the EtherCAT Mailbox Gateways

```
Pinging 192.168.100.254 with 32 bytes of data:
Request timed out.
```

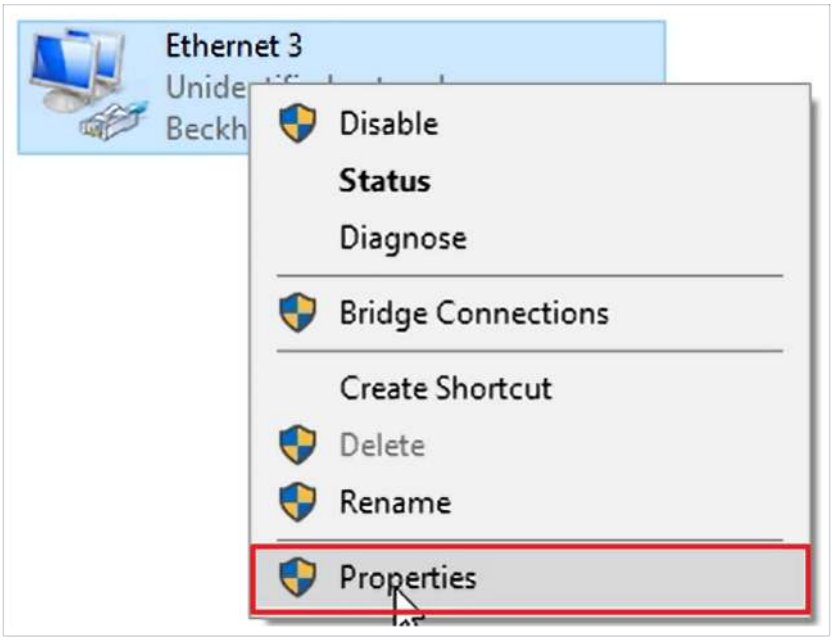
You can see that the EtherCAT Mailbox Gateway is not reachable.

2.4.2 Configure Windows settings

1. Open Windows settings

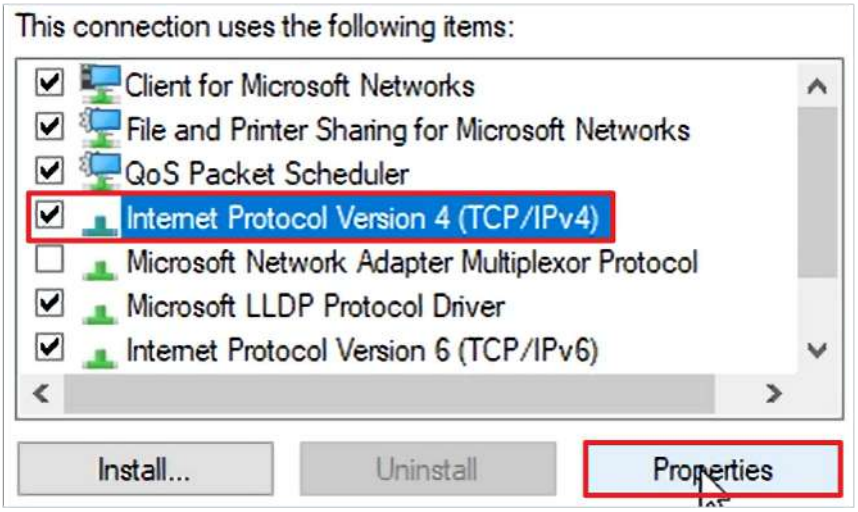


2. Open network adapter options

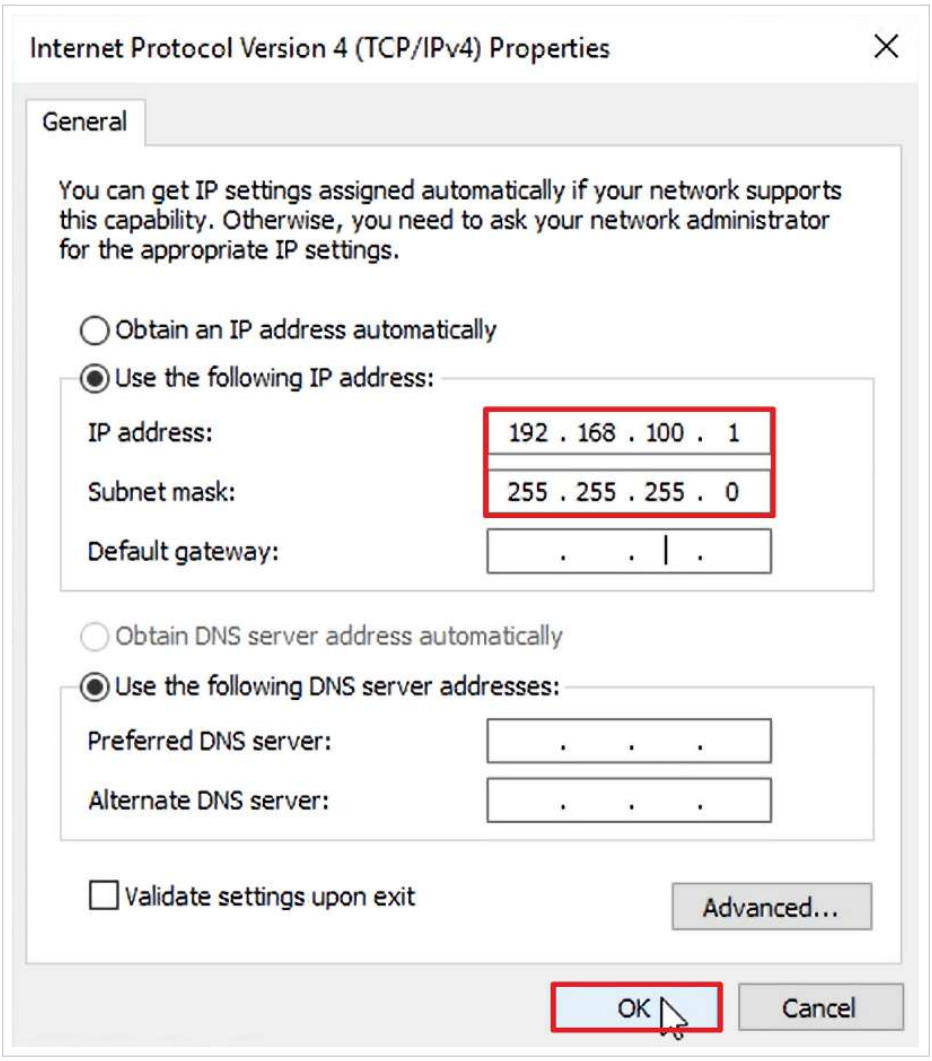


In this use case a virtual adapter called “Beckhoff Virtual Ethernet Adapter” is used resides at Ethernet 3.

3. Right click on Ethernet 3
4. Click on “Properties”



5. Select “Internet Protocol Version 4 (TCP/IPv4)”
6. Click on “Properties”



7. Activate “Use the following IP address”
8. Enter the IP address of the EtherCAT Mailbox Gateway, here replace the 254 with a 1
9. Close window with “OK”
10. Close window “Ethernet 3 Properties” with “Close”
11. Close Windows settings

To check the correctness of the settings, check again the availability of the EtherCAT Mailbox Gateway as follows:

12. Reopen command line

```
C:\Administrator>ping 192.168.100.1
```

13. Execute ping command for the adapter

You can see that the Adapter is reachable.

```
C:\Administrator>ping 192.168.100.254
```

14. Execute ping command for the EtherCAT Mailbox Gateway

You see that the EtherCAT Mailbox Gateway is reachable.

2.4.3 Configure Gateway in engineering system

1. Open command line with administrator rights

```
C:\Windows\system32>ping 192.168.100.254
```

2. Execute ping command for EtherCAT Mailbox Gateway

You can see that the EtherCAT Mailbox Gateway is not available.

```
C:\Windows\system32>route print 192.168.100.0
```

3. Execute command “route print“ for network 192.168.100.0

The command shows you all routes for the entered network. You can see in this use case that there is no active route for this network.

```
C:\Windows\system32>route add 192.168.100.0 mask 255.255.255.0.172.17.40.19
```

4. Use the “route add“ command to add a route as shown

Enter the subnet mask and the address of the target system. In this application, the target system has the address 172.17.40.19.

5. Repeat the “route print“ command for network 192.168.100.0

You can see that that you can reach the interface via the gateway 172.17.40.19.

6. Repeat the ping command for EtherCAT Mailbox Gateway

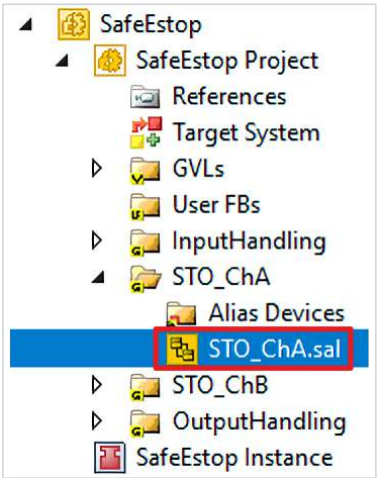
You can see that the EtherCAT Mailbox Gateway is reached.

Now you have everything ready for the use of the TwinSAFE Loader.

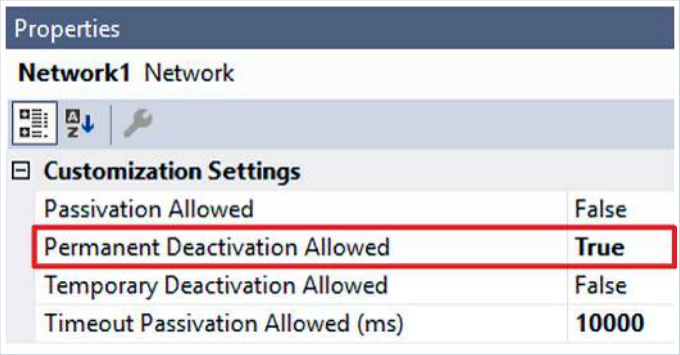
2.5 Prepare Safety project

2.5.1 Determine CRC

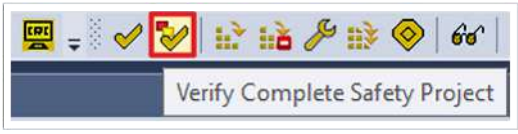
In this application, a TwinCAT 3 solution already exists with a Safety project for the demo system.



1. Open STO_ChA



You can see in the Customization Settings of the STO functionality for ChA that a permanent deactivation of the functionality is already allowed.



2. Click on “Verify Complete Safety Project” in the menu bar to verify the Safety project

3. Note CRC

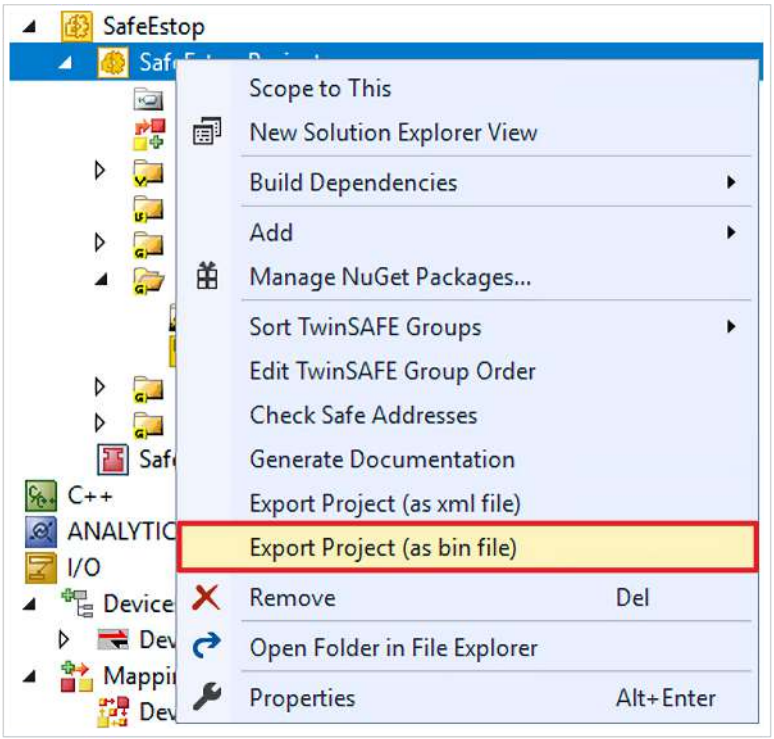
2.5.2 Determine EtherCAT address

1. Open Device 1

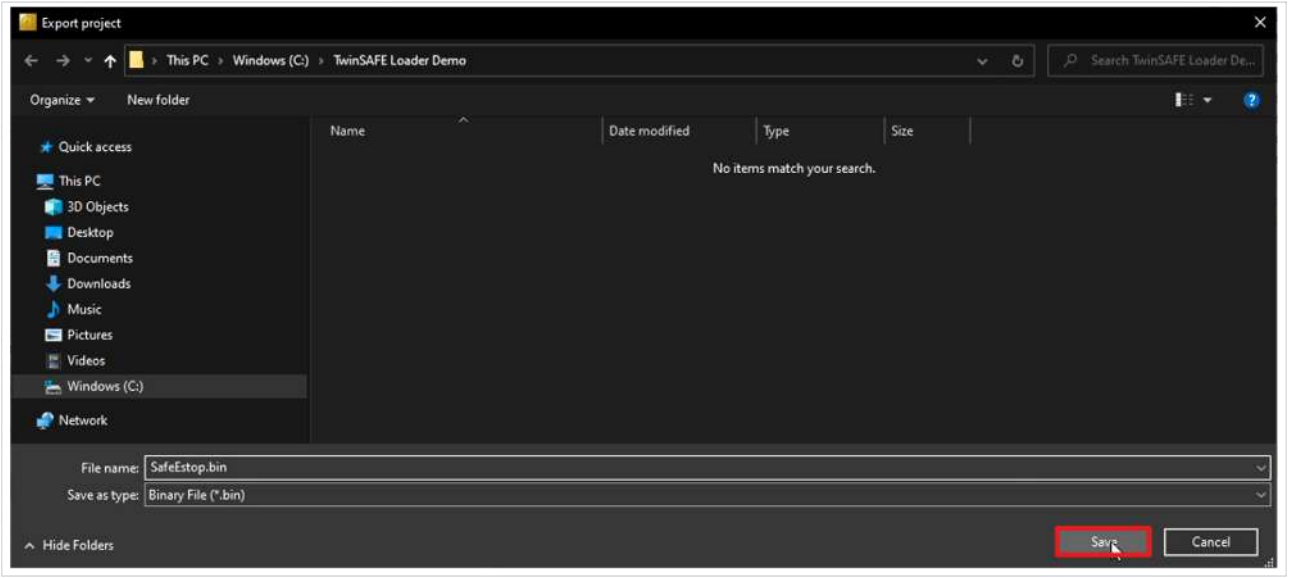
Number	Box Name	Address	Type	In Size	Out Size	E-Bus (m...
1	Term 1 (EK1200)		EK1200			
2	Term 2 (EL1918)	1001	EL1918	9.0	8.0	1835
3	Term 3 (EL6910)	1002	EL6910	15.0	17.0	1645
4	Term 4 (EK1122)	1003	EK1122			1425
5	Term 5 (AX8620-0000-01...	1004	AX8620-0000-0103	2.0		
6	Drive 6 (AX8206-0210-01...	1005	AX8206-0210-0104	32.0	32.0	1425
7	Term 7 (EL9011)		EL9011			

2. Note EtherCAT address of the EL6910

2.5.3 Export Safety project



1. Right click on the Safety project
2. Click on “Export Project (as bin file)”



3. Select location on the hard disk
4. Confirm location with “Save”

2.6 Download Safety project

1. Open command line

You can also start the command line via HMI or a batch file.

First, download the Safety project via the following command:

```
C:\TwinSAFE Loader Demo>TwinSAFE_Loader.exe --gw 192.168.100.254 --user Administrator --pass
TwinSAFE --slave 1002 --proj SafeEstop.bin
```

2. Call up the TwinSAFE-Loader, thereby enter the following information
   - Gateway configuration
     ```
     --gw 192.168.100.254
     ```
   - Username for the EL6910 as target system
     ```
     --user Administrator
     ```
   - Password for the EL6910 as target system
     ```
     --pass TwinSAFE
     ```
   - Slave address
     ```
     --slave 1002
     ```
   - Path to project file
     ```
     --proj SafeEstop.bin
     ```
3. Confirm with Enter button

The Safety project is downloaded.

Next, enable the Safety project via the following command:

```
C:\TwinSAFE Loader Demo>TwinSAFE_Loader.exe --gw 192.168.100.254 --user Administrator --pass
TwinSAFE --slave 1002 --proj SafeEstop.bin --crc 0xC019
```

4. Add the CRC information to the download command
5. Confirm with Enter button

After enabling, the EL6910 is completely configured with an activated Safety project.

More Information:
www.beckhoff.com/twinsafe

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