

EtherCAT Evaluation Kit Workshop – Installation Guide

EtherCAT[®] 

Version 1.5
Date: 2021-12-10

BECKHOFF

LEGAL NOTICE

Trademarks

Beckhoff®, TwinCAT®, EtherCAT®, Safety over EtherCAT®, TwinSAFE® and XFC® are registered trademarks of and licensed by Beckhoff Automation GmbH. Other designations used in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owners.

Patent Pending

The EtherCAT Technology is covered, including but not limited to the following German patent applications and patents: DE10304637, DE102004044764, DE102005009224, DE102007017835 with corresponding applications or registrations in various other countries.

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development. For that reason the documentation is not in every case checked for consistency with performance data, standards or other characteristics. In the event that it contains technical or editorial errors, we retain the right to make alterations at any time and without warning. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

Copyright

© Beckhoff Automation GmbH 05/2009.

The reproduction, distribution and utilization of this document as well as the communication of its contents to others without express authorization are prohibited. Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility model or design.

DOCUMENT HISTORY

Version	Comment
0.1	First version
0.2	Compiler Suite selection added
1.0	MPLAB X related information added
1.1	Add Excel and Wireshark requirement
1.2	Remove old tool instructions
1.3	Email address and mention of board hardware revision updated
1.4	Remove required Excel® installation (not required since SSC 5.13, tool 1.5.0) Add “additional hardware” chapter for online trainings
1.5	Update screenshots: MPLAB X and Beckhoff website

CONTENTS

1	Introduction	3
2	EL9800 Hardware Revision	4
3	Installation – Slave Stack Code	4
	3.1 Vendor ID	5
	3.2 .NET Framework	5
	3.3 SSC Source Files + Tool	5
4	MPLAB X	7
	4.1 Compiler Installation	7
	4.2 IDE Installation	7
	4.3 USB driver and test of the communication	8
	4.4 Create a new Project	9
5	Installation - TwinCAT	13
	5.1 TwinCAT development environment + runtime	13
	5.2 Real-Time Ethernet Driver	15
	5.3 Test of the communication	17
6	Installation - Additional Tools	20

1 Introduction

In order to properly operate with the Beckhoff EL9820 Evaluation Kit, the installation of three following software packages is needed:

- **Slave Stack Code (SSC):** source code (written in C programming language) implementing all general-purpose functionalities of an EtherCAT Slave as well as some application examples.
Chapter: Installation – Slave Stack Code
- **MPLAB IDE for Microchip PIC (+ MPLAB XC 16 Compiler for PIC24):** development environment for the programming and debugging of the Microchip PIC24 microcontroller integrated on board the EL9800 Evaluation Kit
Chapter: MPLAB X
- **TwinCAT Real-Time Control Suite:** PC-based control platform and development environment which enables to use a standard Windows PC as EtherCAT Master test platform, and therefore to control the EL9820 Evaluation Kit.
Chapter: Installation - TwinCAT

This Installation Guide is intended to allow customers to perform in advance all the preliminary steps which are required to successfully attend the EtherCAT Evaluation Kit Workshop.

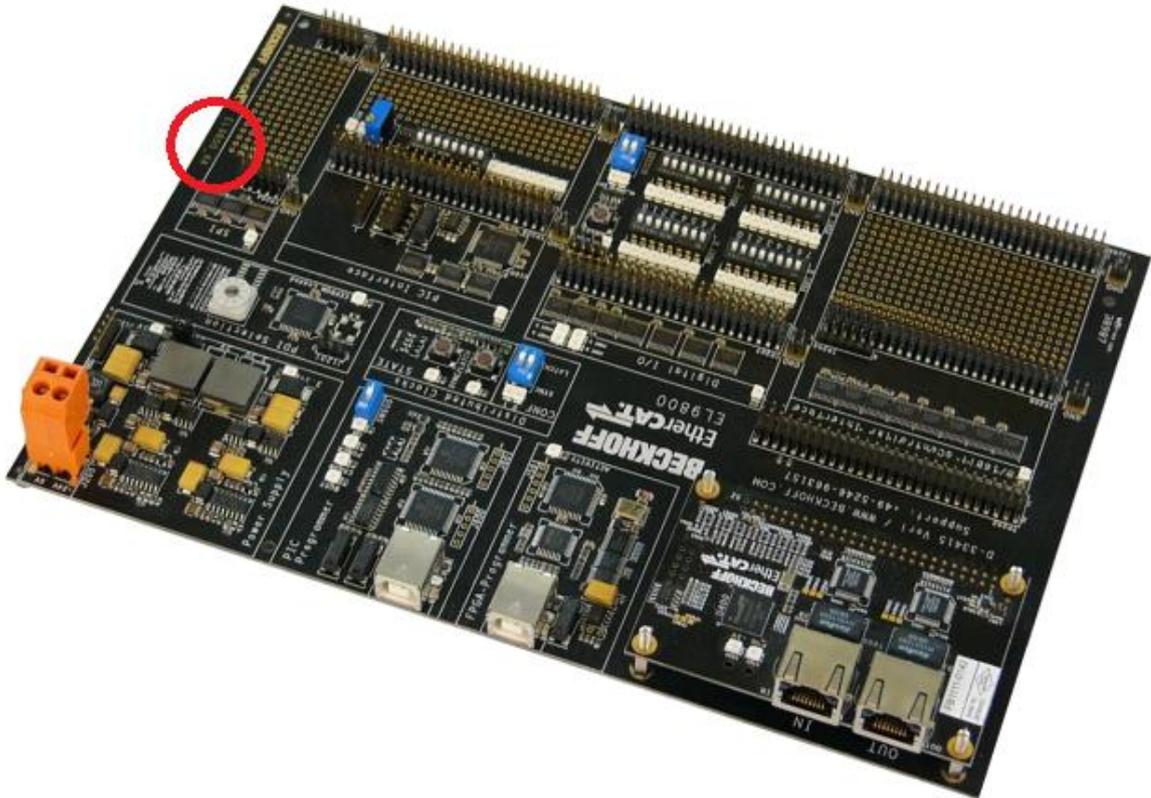
In case any of the steps described in this Installation Guide fails, please contact the ETG support team at email address Techinfo@ethercat.org as soon as possible, in order find a solution before the workshop begins.

2 Hardware

2.1 EL9800 Hardware Revision

The EtherCAT Evaluation Kit Workshop is based on the board hardware revision **EL9800_6A**.

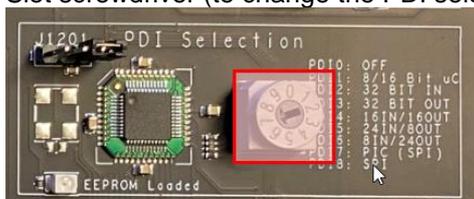
The hardware revision can be checked on the board next to the Beckhoff and EtherCAT® logos.



NOTE: Older board revisions (e.g. EL6800_4A) are not suitable to successfully attend the workshop, as they require programming software versions which are not available anymore.

2.2 Additional required hardware for online training (TR8100-0010)

- 24V power supply
- Ethernet cable
- Slot screwdriver (to change the PDI selector)

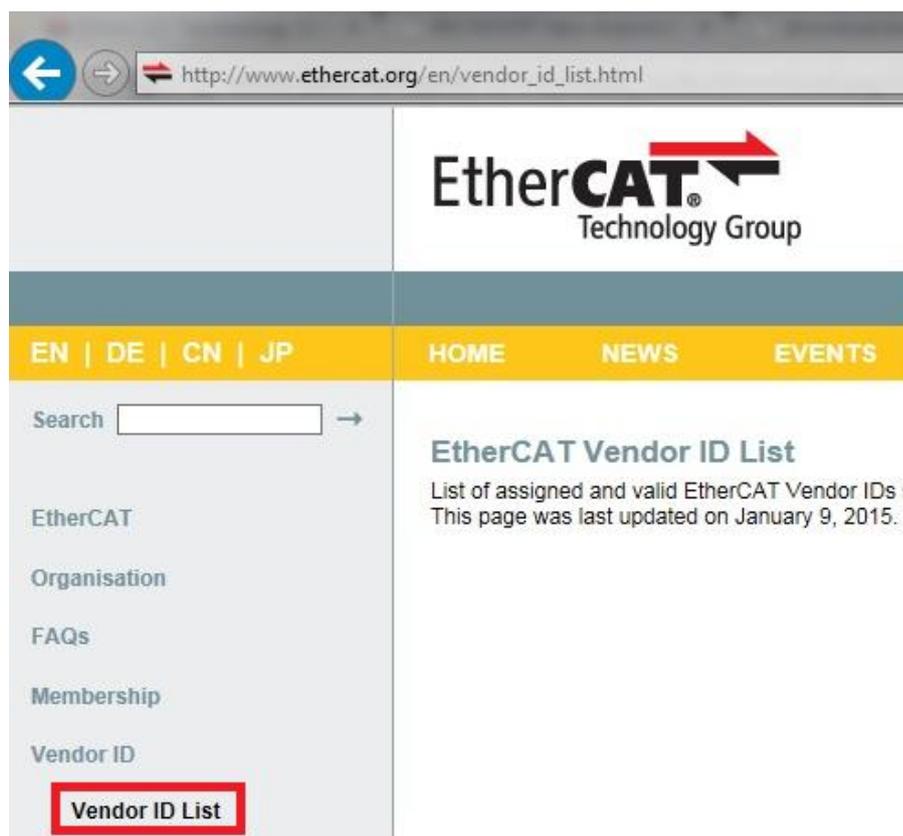


3 Installation – Slave Stack Code

The Slave Stack Code is a source code written in C programming language, provided and supported free-of-charge by Beckhoff Automation GmbH & Co. KG.

3.1 Vendor ID

Both for download and installation of the Slave Stack Code, an own EtherCAT Vendor ID is required. This information is reported in the answer to the Vendor ID Assignment Request applied by the company. A list of all registered Vendor IDs can be found in the ETG website (http://www.ethercat.org/en/vendor_id_list.html):



3.2 .NET Framework

The SSC Tool requires .NET Framework 4.0 or later. The Framework can be downloaded at the following link:

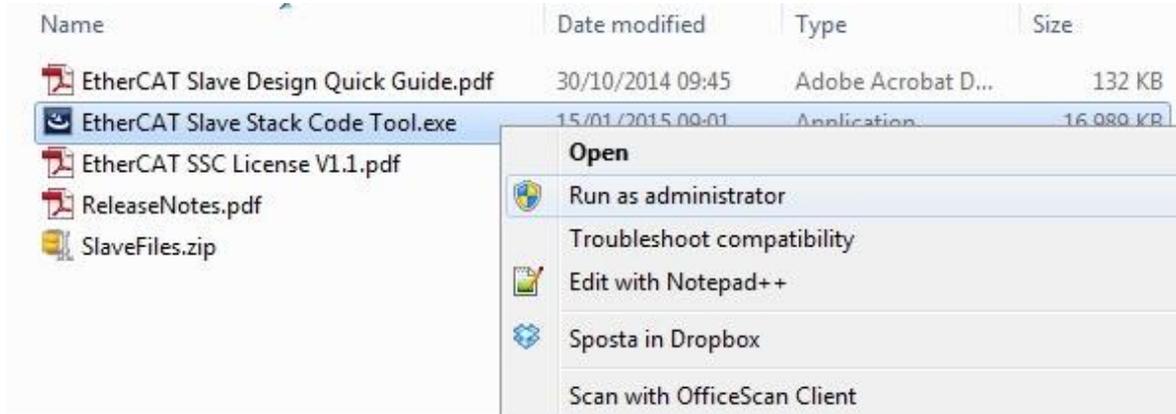
<http://www.microsoft.com/germany/net/downloadFile.aspx?file=netframework>.

3.3 SSC Source Files + Tool

The Slave Stack Code can be downloaded at the following link (Vendor ID required):

http://www.ethercat.org/memberarea/stack_code.aspx

The SSC source files and SSC tool are installed by launching the *.exe file provided within the *.zip package:



4 MPLAB X

4.1 Compiler Installation

The **XC16 C Compiler** needs to be separately installed. The component to be installed is the same both in case of MPLAB X and of MPLAB 8 IDEs. The installation file can be found at the directory: <http://www.microchip.com/mplab/compilers>.

Select “Downloads” at the bottom of the web page, then select the last available build of MPLAB XC16 Compiler for Windows platform (MPLAB XC16 Compiler vx.yz):

Compilers

At this time M1 Mac® computers are *not* supported by any Microchip development tools. We are in the process of evaluating support. Watch this space for the latest developments.

Title	Date Published	Size
Windows (x86/x64)		
MPLAB® XC8 Compiler v2.32 SHA-256:4e38738bc2e19f27d4eb7469859a634951e4806cd8a5a8028459b2804d7455a4	2/18/2021	68.1 MB
MPLAB XC16 Compiler v1.70 SHA-256: 0a04017197d3086e652de08d74fa0d32f4cf7dc326a6faf70732833e938bd5c9	3/26/2021	102.5 MB
MPLAB XC32/32++ Compiler v3.01 SHA-256: 7f55ae8facb770de92f115fdd28b7cab81d12440efd1a8301dfa578f25b6de7a	6/2/2021	389.7 MB

4.2 IDE Installation

The Development Environment for PIC microcontrollers is provided free-of-charge by Microchip.

NOTE: Do not keep MPLAB X and MPLAB 8 installed on your PC at the same time, as this could lead to driver conflicts. In case you need to change MPLAB version, uninstall the previous version and restart your PC first.

Download : <http://www.microchip.com/pagehandler/en-us/family/mplabx/>.

Select “Download” at the bottom of the web page, and then the latest available build of MPLAB X (MPLAB® X IDE vx.yz):

Downloads, Documentation and Other Resources

Downloads Features Documentation Debug Features			
MPLAB X IDE only supports computers with processors designed with the Intel® 64 architecture.			
↓ Title		Date	Download
MPLAB X IDE Windows		14 May 2021	Download
MPLAB X IDE Linux		14 May 2021	Download
MPLAB X IDE OSX	📄 6839ceb3... 9f08	14 May 2021	Download
MPLAB X IDE Release Notes		14 May 2021	Download

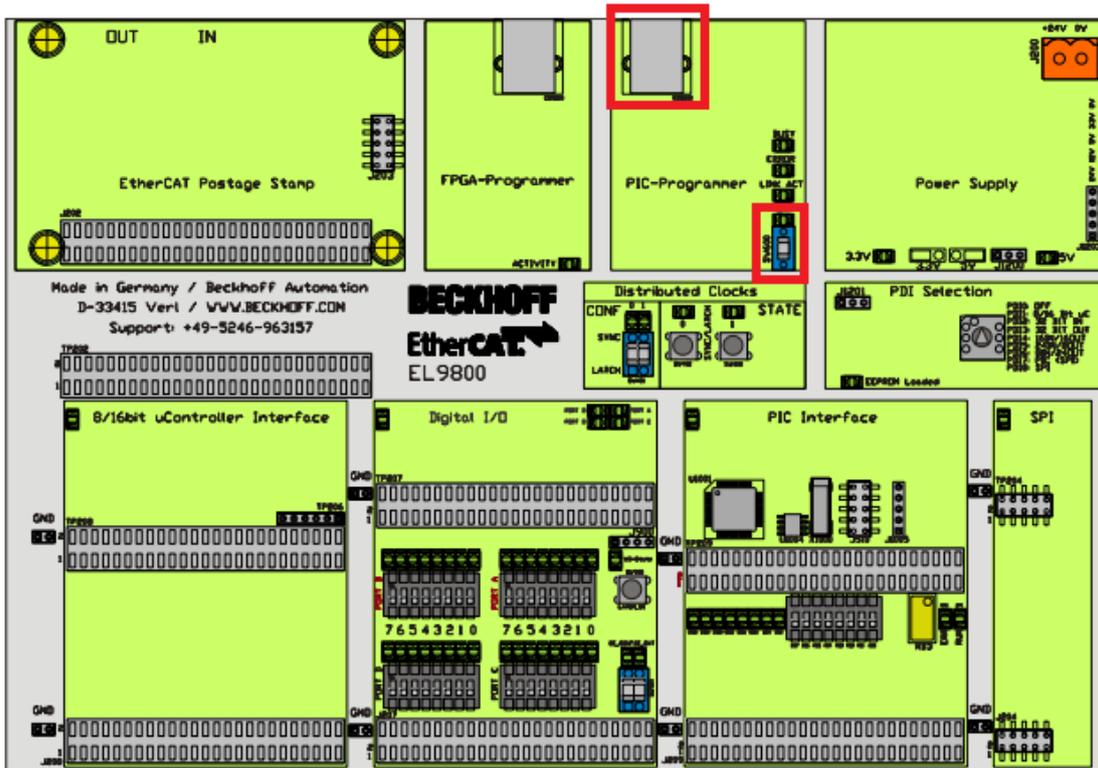
Run the *.exe setup file:



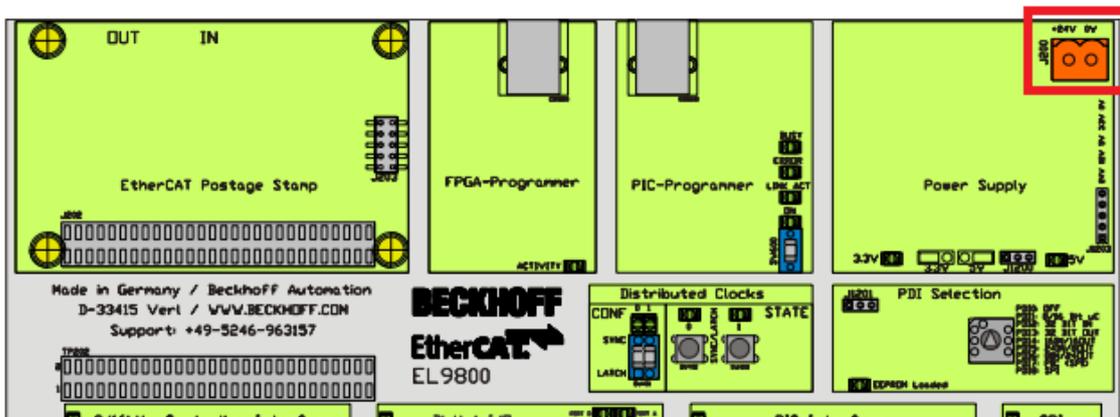
Confirm all the default installation settings proposed by the installation wizard.

4.3 USB driver and test of the communication

With the board powered-off, connect the USB cable from a USB port of the PC to connector **CON600** of the Evaluation Kit, and set switch **SW600** to ON in order to enable the on-board debugger interface.



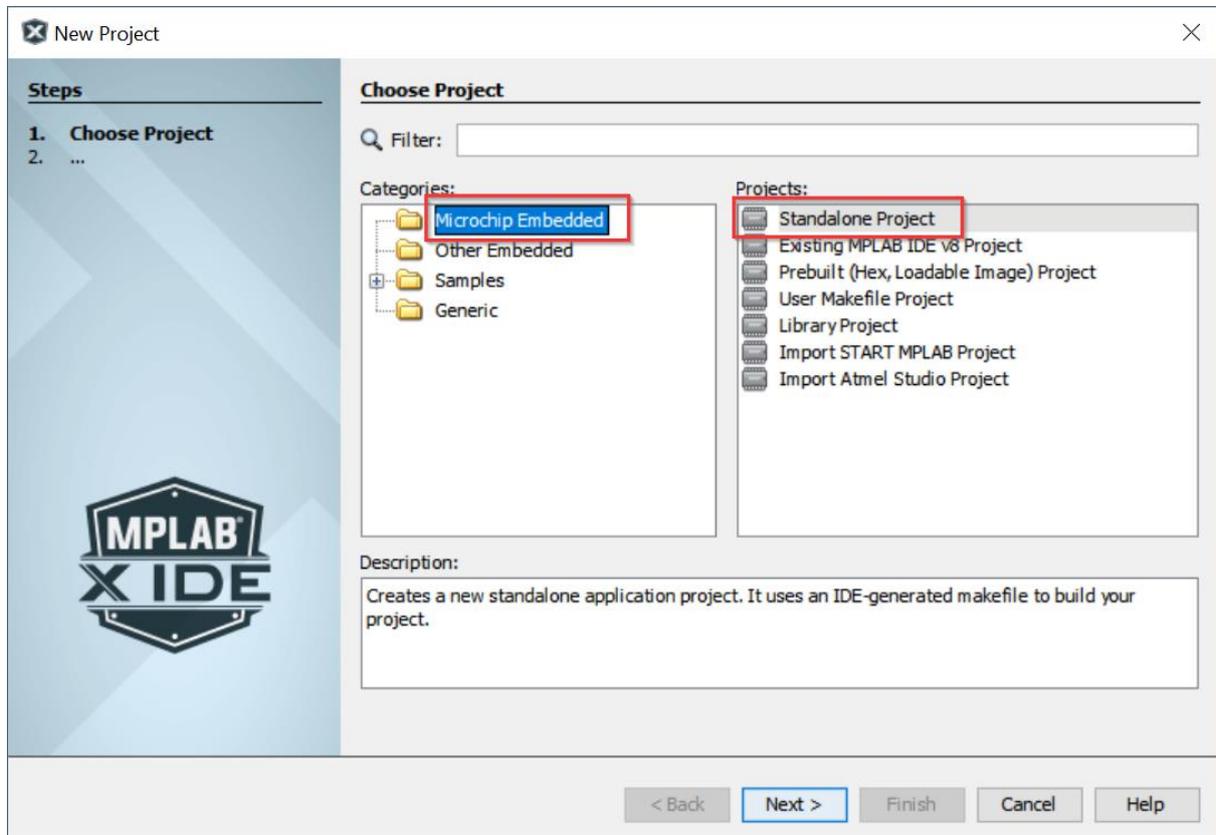
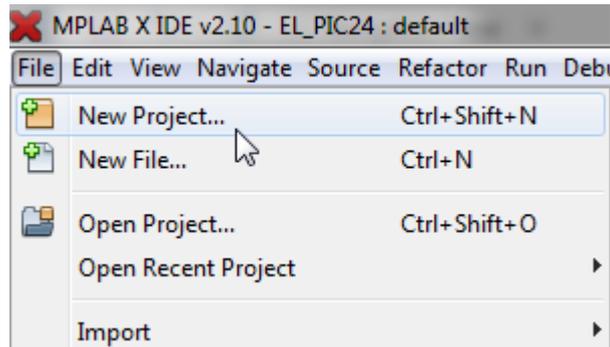
Power the Evaluation Kit on with a standard 24V power supply.



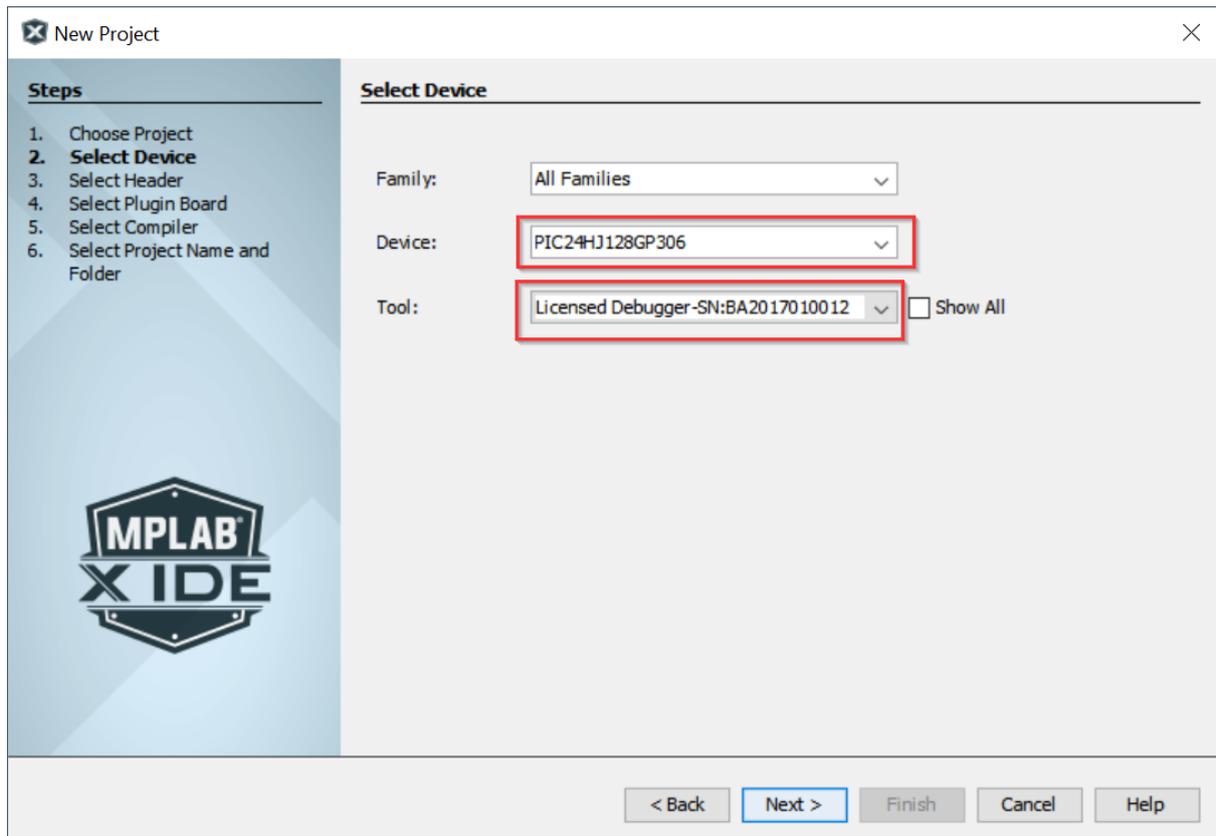
A new USB device will be detected. The corresponding USB driver should be automatically installed: in case the Operating System shows the dialog window, confirm the automatic installation.

4.4 Create a new Project

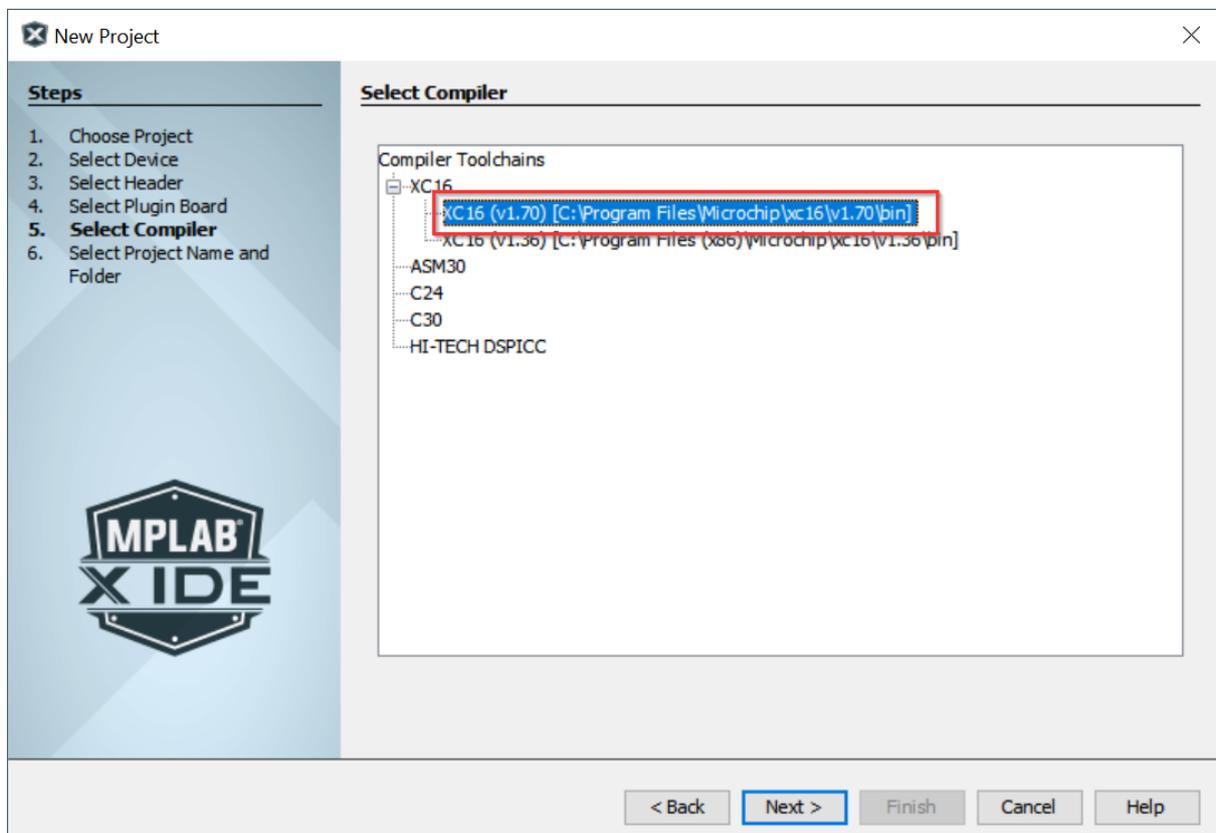
Open MPLAB IDE and create a new Project:



Select the Device “**PIC24HJ128GP306**” and Tool “**Licensed Debugger-SN:BAxxxxxxx**”.
Note: If the tool is not listed, check the USB connection and the correct driver installation.



Select the XC 16 compiler



Create the Project in a temporary location (directory and project name are not relevant):

New Project

Steps

1. Choose Project
2. Select Device
3. Select Header
4. Select Plugin Board
5. Select Compiler
- 6. Select Project Name and Folder**

Select Project Name and Folder

Project Name:

Project Location:

Project Folder:

Overwrite existing project.

Also delete sources.

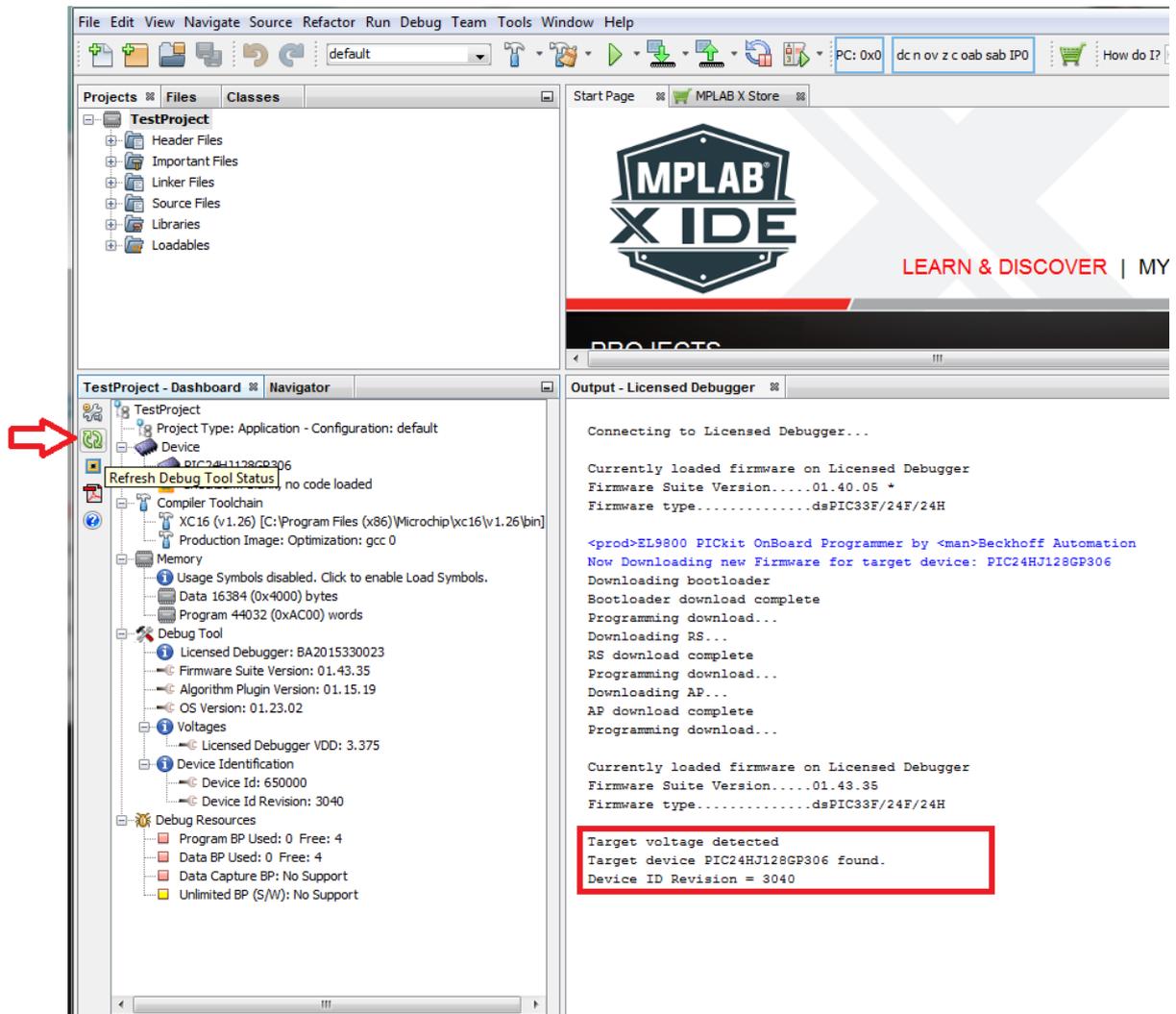
Set as main project

Use project location as the project folder

Encoding:

< Back Next > **Finish** Cancel Help

Refresh the debug tool status, and wait until the output interface reports correct connection (a new firmware version will be automatically installed if needed during the process).



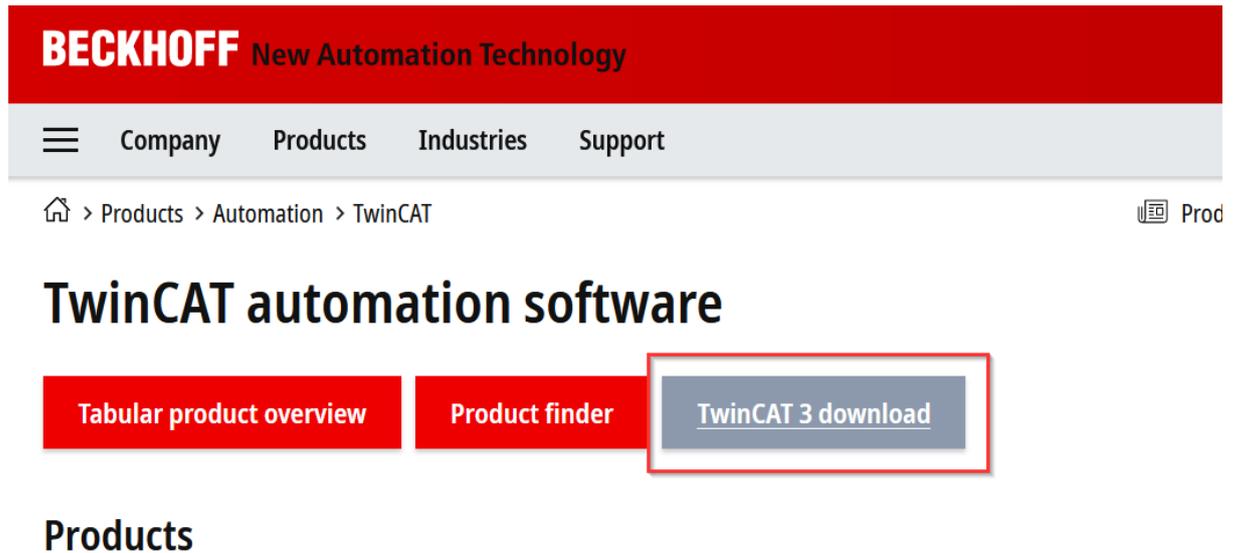
This confirms a correct communication between MPLAB X IDE and the Evaluation Kit.

5 Installation - TwinCAT

The TwinCAT software can be installed free-of-charge for a 7-day trial period. The trial can be extended for an arbitrary number of times - always in 7-day steps - without re-installing the entire software (only a displayed 5-digit code shall be copied in order to restart the trial license).

5.1 TwinCAT development environment + runtime

The installation file for TwinCAT can be downloaded by the website www.beckhoff.com. Select "Download" at the top of the page:



The screenshot shows the Beckhoff website header with the logo and navigation menu. The breadcrumb trail is "Products > Automation > TwinCAT". The main heading is "TwinCAT automation software". Below the heading are three buttons: "Tabular product overview", "Product finder", and "TwinCAT 3 download". The "TwinCAT 3 download" button is highlighted with a red border. Below the buttons is the heading "Products".

Select the **TE1xxx | Engineering** version:

TwinCAT 3 download | eXtended Automation Engineering (XAE)

Software and tools, ZIP (1.0 GB)

TwinCAT Engineering contains the engineering environment of the TwinCAT 3 control software:

- integration into Visual Studio® 2013/2015/2017/2019 (if available)
- support for the native Visual Studio® interfaces (e.g. connection to source code management systems)
- IEC 61131-3 (IL, FB, LD, AS, ST) and CFC editors
- compiler for the IEC 61131-3 languages
- integrated system manager for the configuration of the target system
- instancing and parameterisation of TwinCAT modules
- integrated TwinCAT C++ debugger
- integrated user interface for the parameterisation of modules generated by MATLAB®/Simulink®
- if integrated into Visual Studio®, instancing of .NET projects in the same solution (e.g. for HMI)

In addition many functions are already included, please license only. Earlier TwinCAT 3 versions are available upon inquiry with the Support department.

Valid for the following products

TC1000, TC1100, TC1200, TC1210, TC1220, TC1250, TC1260, TC1270, TC1275, TC1300, TC1320, TE1000, TE1111, TF1800, TF1910, TF5120, TF

[Show more ↓](#)

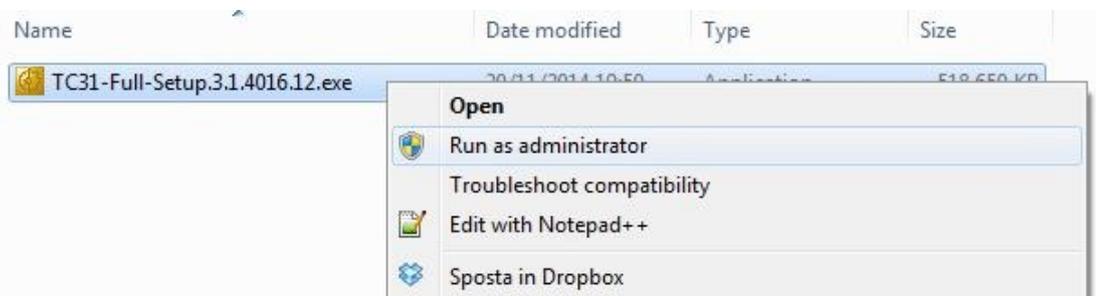
X Downloads	
Version	Build
3.1	4024.22

↓ ZIP (1.0 GB)
 myBeckhoff registration required

NOTE : Take care not to install the “Runtime” version: this installation version will not provide the TwinCAT development environment, which is instead needed to test the EtherCAT communication.

NOTE : This Installation Guide refers to TwinCAT 3.1, which is compatible both with 32-bit and with 64-bit Windows Operating Systems. For those who already installed TwinCAT 2 runtime on their 32-bit PC, the installation of TwinCAT 3.1 will not be necessary. Please be sure in this case to have installed the latest build of TwinCAT 2.11 R3. Do not install the TwinCAT 2.11 x64 Engineering version on a 64-bit PC, as this version contains only the development environment for TwinCAT 2 and not the runtime (in case of Windows 64-bit, only TwinCAT 3.1 can be used).

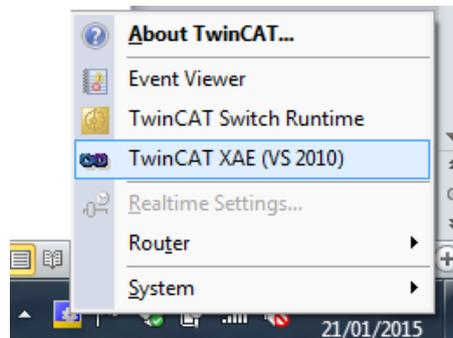
NOTE : if you are working with Windows 7 Operating System or later, always perform the installation by selecting **Run as Administrator**:



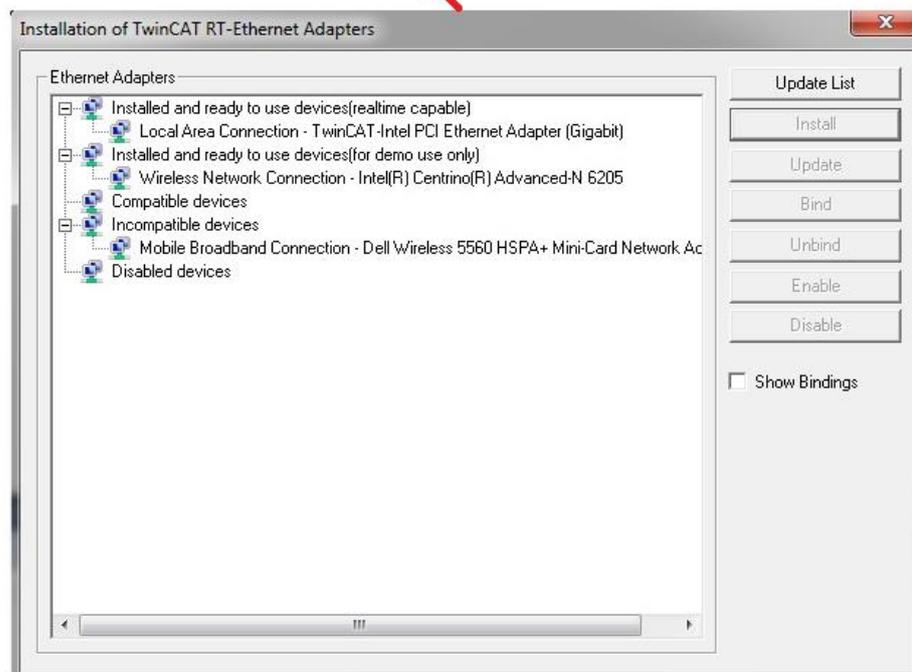
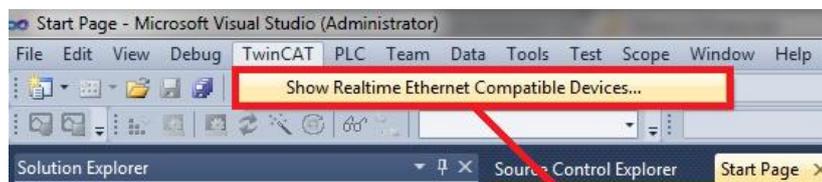
5.2 Real-Time Ethernet Driver

In order to use the standard PC network card of a PC as EtherCAT Master, an additional Real-Time Ethernet Driver shall be installed.

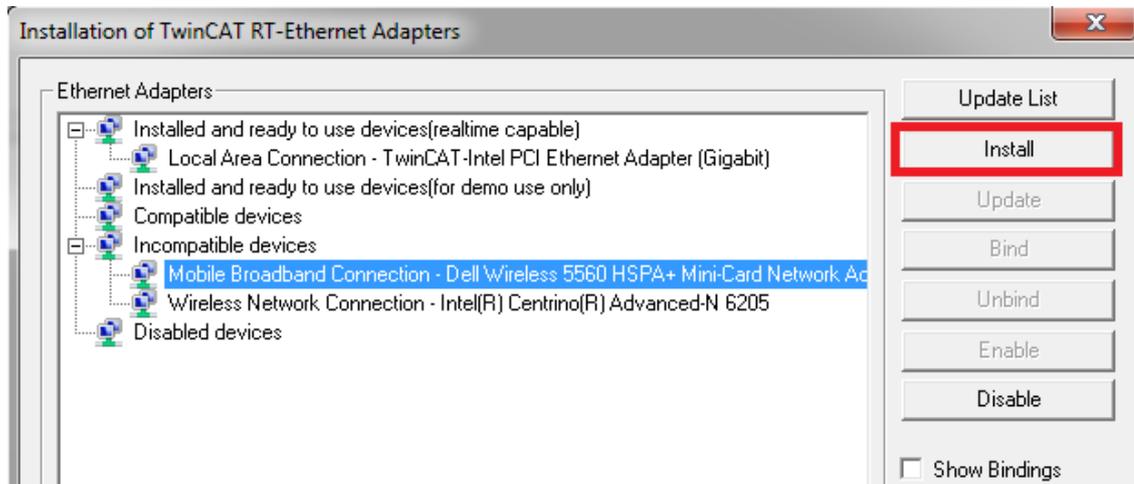
The driver can be installed directly from the TwinCAT development environment. Open (the most recent version of) Visual Studio from the TwinCAT icon located on the Windows task bar:



Select the menu “TwinCAT” → “Show Realtime Ethernet Compatible Devices...”. All the network cards of the PC where the Real-Time Ethernet Driver was not yet installed will be listed either under “Compatible devices” or under “Incompatible devices”.



Select the network card that will be used as EtherCAT Master for testing purposes, and click on “Install”.



NOTE : If a network card is listed under “Incompatible devices”, this does not mean that the card cannot be used as EtherCAT Master for testing purposes. It only means that this card will provide only weak real-time capabilities. For testing purposes this is more than enough, therefore you can proceed with the installation.

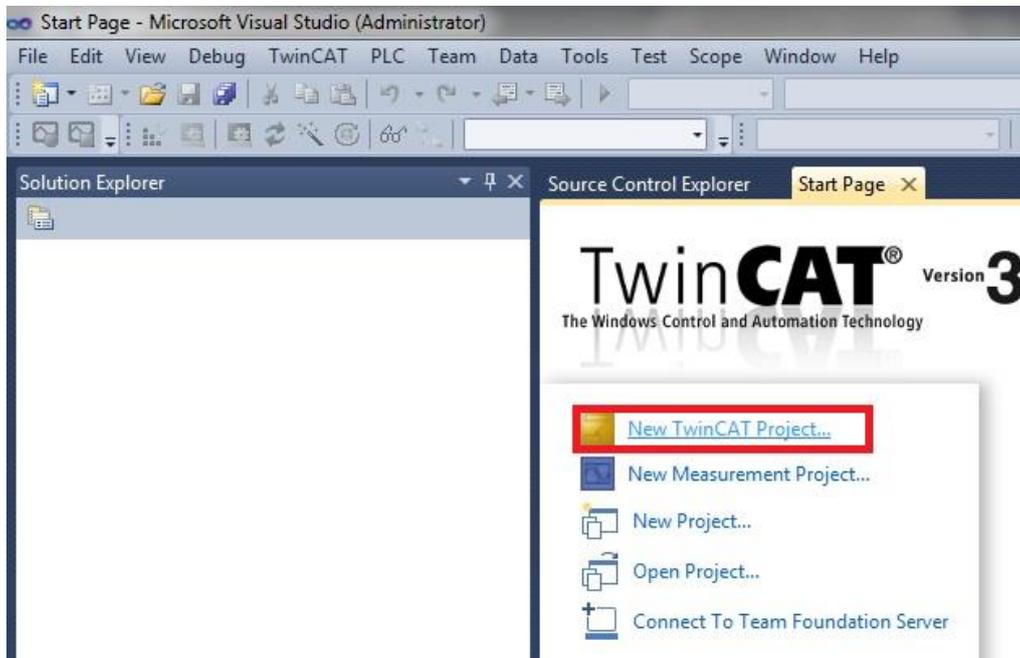
If the installation was successfully completed, the network card should have been moved under the “Installed and ready to use devices” list:

- Compatible devices → Installed and ready to use devices (realtime capable)
- Incompatible devices → Installed and ready to use devices (for demo use only)

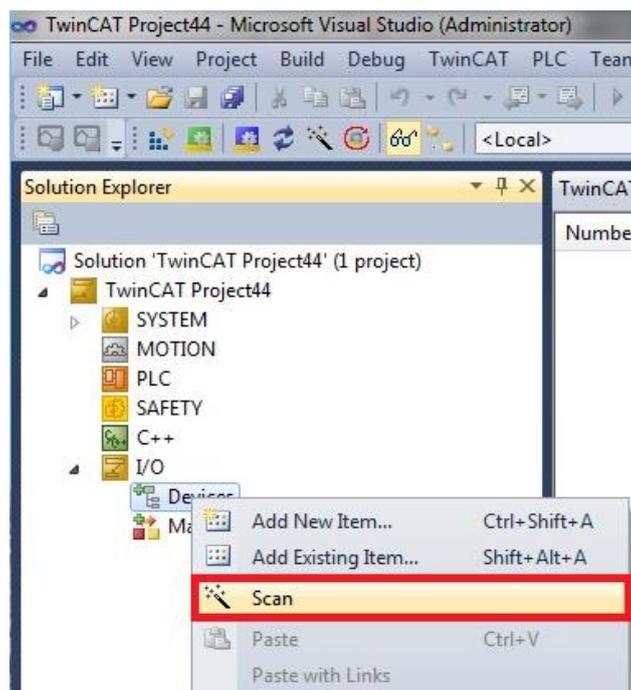
5.3 Test of the communication

Connect the Evaluation Kit to the PC network card where the Real-Time Ethernet Driver was installed with a standard Ethernet cable (straight or cross), and power-on the Evaluation Kit.

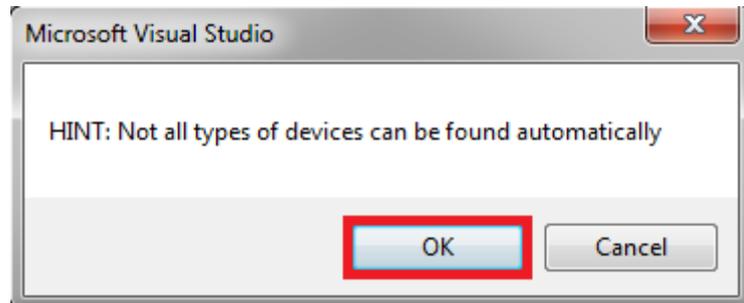
Create a new TwinCAT project by selecting the corresponding template in Visual Studio (project name and directory are arbitrary):



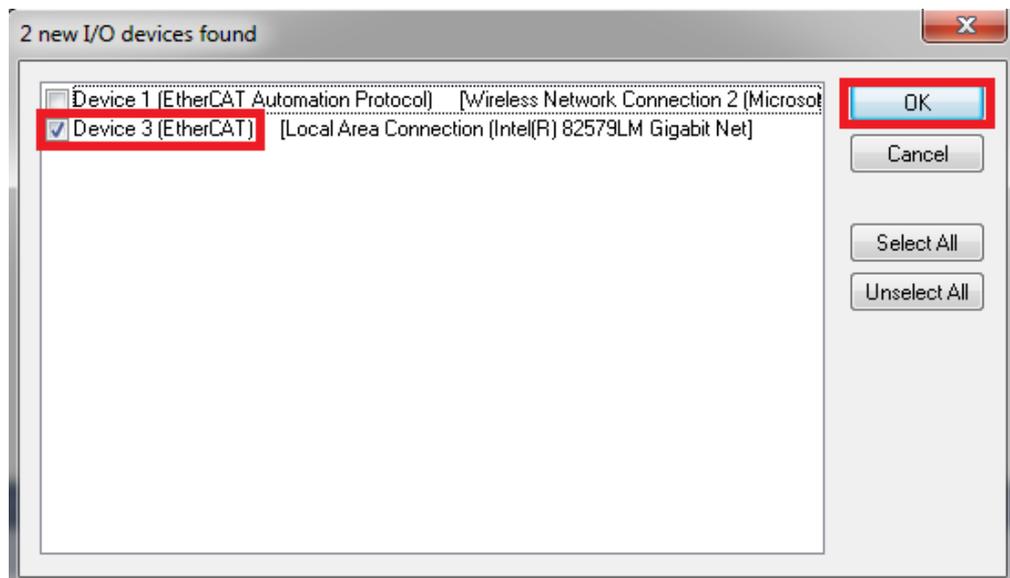
Right mouse-click on "I/O" → "Devices" and select "Scan".



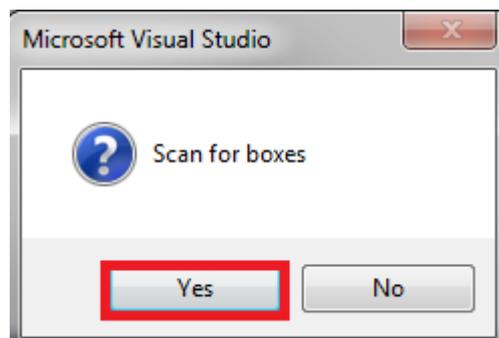
Confirm the message, which is always shown by TwinCAT when automatically scanning the hardware:



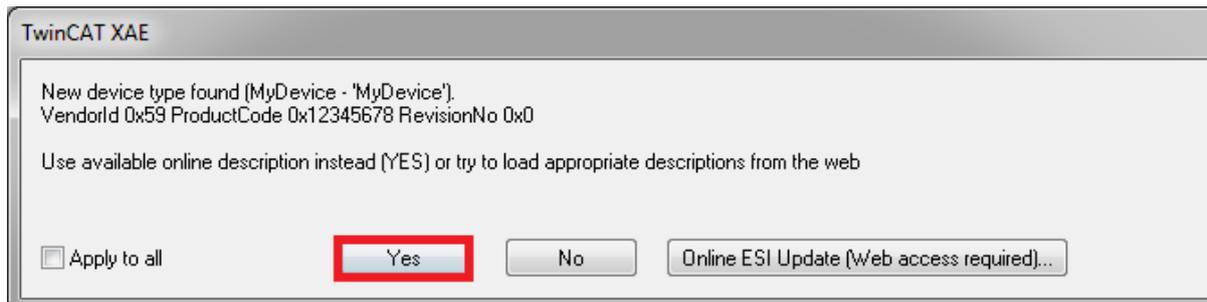
Check that the network card where the Real-Time Ethernet Driver was installed is marked as "Device n (EtherCAT)", then select "OK" (if other Devices are shown, deselect them).



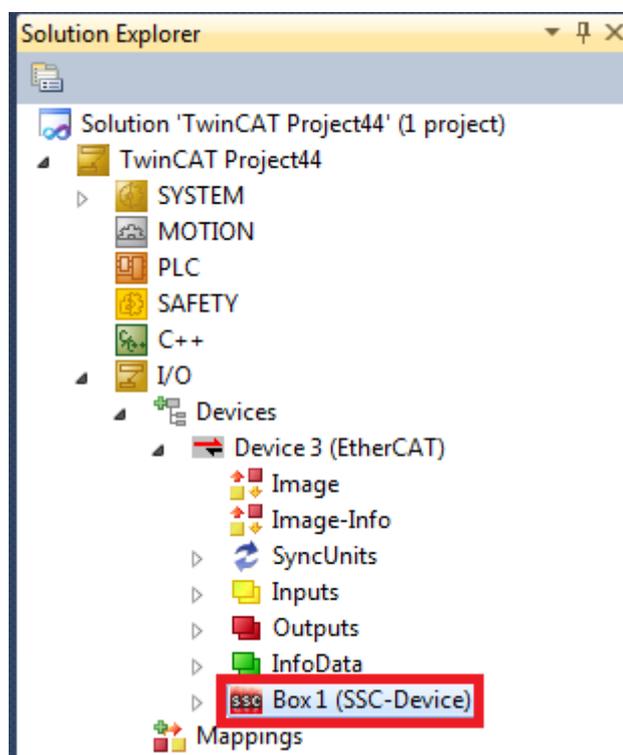
Request scan of Slave devices:



In case the following pop-up appears, just confirm it:



Check that one Slave device was detected and automatically added to the tree configuration under the EtherCAT Master:



NOTE : The particular icon and name of the detected device are not relevant, as they depend on the previous status of the Evaluation Kit. The important thing is that a slave “Box m (xxxx)” is detected.

This confirms a correct communication between TwinCAT and the Evaluation Kit.

6 Installation - Additional Tools

- Wireshark should be installed (<https://www.wireshark.org/download.html>).