

# Anybus<sup>®</sup> CompactCom 40 - EtherCAT<sup>®</sup> Communication, SDO and PDO Services

## **APPLICATION NOTE**

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## Important User Information

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### **Contact Information**

Postal address:

Box 4126

300 04 Halmstad, Sweden

E-Mail: [info@hms.se](mailto:info@hms.se)

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# 1. Preface

## 1.1. About this Document

This document is intended to provide a description of how to establish an EtherCAT communication and use SDO and PDO Services with the CompactCom 40 EtherCAT module using TwinCAT3.

This document is meant for trained and skilled personnel working with the equipment described.

The reader of this document is expected to be familiar with high level software design and industrial network communication systems in general.

For additional information, documentation, support etc., please visit the support website at [anybus.com/support](https://anybus.com/support).

## 1.2. Referenced Documents

Short	Title	Number	Author
[ABCC40SDG]	Anybus CompactCom 40 Software Design Guide	HMSI-216-125	HMS Industrial Networks AB
[ABCC40NWG]	Anybus CompactCom 40 EtherCAT Network Guide	SCM-1202-034	HMS Industrial Networks AB

## 1.3. Version History

Version	History	Date
1.00	Initial version	2021-11-10

## 2. Overview

The Beckhoff TwinCAT3® tool can be used to configure EtherCAT communication projects. This tool can also be used if there is no physical EtherCAT master device available, since an EtherCAT master device can be simulated in the TwinCAT3 tool. Consequently, an EtherCAT communication can be established with an EtherCAT slave device to test and exchange process data and acyclic data with that slave. In the EtherCAT communication, there is a cyclic data channel to exchange the process data (PDOs - Process Data Objects) and there are parameters which either could not or should not be exchanged cyclically. These types of parameters will instead be exchanged acyclically using SDOs (Service Data Objects) services for read and write access.

This application note describes how to establish communication using the simulated master device in the TwinCAT3 tool, and how to use SDO and PDO services. The CompactCom EtherCAT module is acting as a slave device on the EtherCAT network in this application note.

## 3. Configuration

### 3.1. Slave Device Preparation

1. **Process data and parameter data configuration:**

The IOs/ADIs (Application Data Instances)/Parameters should be created in the slave device application where the CompactCom 40 EtherCAT interface is mounted. Any number of the created ADIs can be mapped to the Process data channel to be exchanged cyclically. The ADIs not mapped to the process data image can be exchanged acyclically with the master device.

In this test the slave device has the following ADI configuration:

- ADI 1 called "SPEED" and mapped to the Input Process Data Image of the Master. This ADI has 2 bytes.
- ADI 2 called "REF\_SPEED" and mapped to the Output Process Data Image of the Master. This ADI has 2 bytes.
- ADI 100 called "ByteArray" is NOT mapped to the Process Data Image and can only be accessed using acyclic services. This ADI has 10 bytes.

2. **Initialize the CompactCom 40 slave device:**

Start and initialize the CompactCom 40 EtherCAT module. If the module was configured correctly it should achieve the WAIT\_PROCESS State. If the WAIT\_PROCESS state is not achieved, EtherCAT communication can not be established. For more information, see Anybus CompactCom 40 Software Design Guide, available at [anybus.com/support](http://anybus.com/support).

### 3. Generate an ESI file:

Connect the initialized CompactCom 40 EtherCAT module directly (without using a switch) to the PC where HMS ESI generator is installed. Use the HMS ESI generator to create the ESI file from the connected CompactCom 40 module, the HMS ESI generator can be downloaded from [anybus.com/support](http://anybus.com/support).

The screenshot shows the 'HMS EtherCAT ESI Generator' window with the 'Basic' tab selected. The window has a menu bar with 'File' and 'Help'. Below the menu bar are tabs: 'Basic', 'Advanced (Optional)', 'CoE init commands (Optional)', and 'Log'. The 'Basic' tab contains several input fields and buttons:

- Names:**
  - Vendor Name:
  - Group Type:
  - Group Name:
- Image Data (Optional):**
  - Vendor Image:
  - Group Image:
  - Device Image:
- Network Adapters:**
  - Slave:
- Buttons:**
  - 
  - ☐ Use loaded file as base.
  -

The screenshot shows the 'HMS EtherCAT ESI Generator' window with the 'Log' tab selected. The window displays the 'Generation progress' section with a list of tasks:

- Collecting data for object 0x2100:1
- Collecting data for object 0x2100:2
- Collecting Manufacturer Data
- Collecting Vendor ID
- Collecting Product Code
- Collecting Revision Number
- Collecting Input Data
- Collecting Fmmu Data
- Collecting Sm Data
- Collecting Pdo Data
- Collecting PDO mappings in object 0x1600:1
- Collecting PDO mappings in object 0x1A00:1
- Collecting EEPROM Data
- C:\Users\Support\Desktop\VendorNameESI.xml Done

Below the list is a button: .

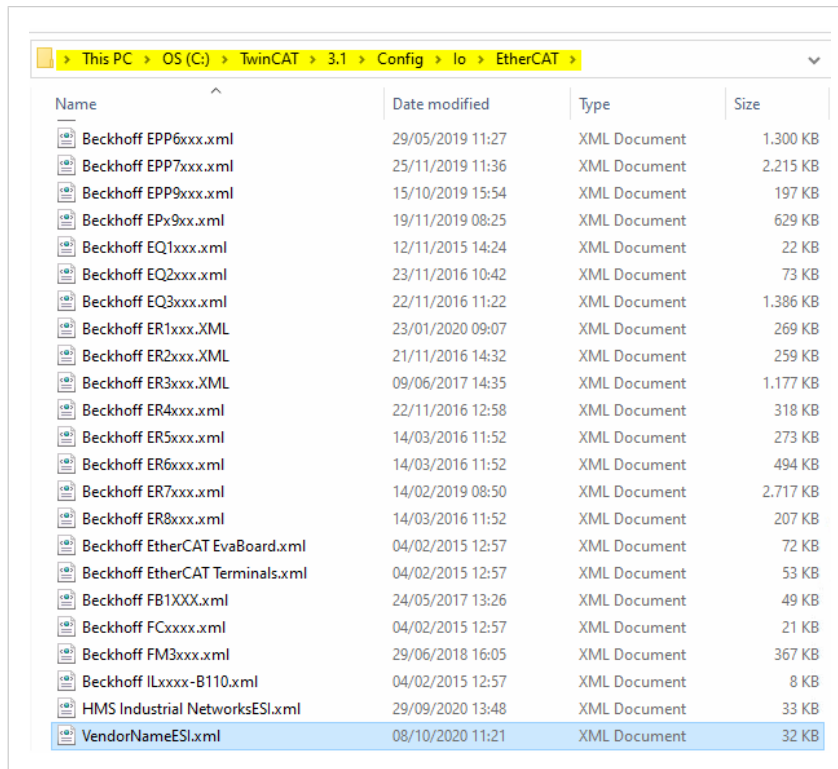
The 'Basic' tab is also visible, showing the 'Network Adapters' section with 'Wired\_Ethernet' selected and 'Slave' set to '0'. The 'Create ESI file...' button is highlighted in yellow.

At the bottom of the window, a status bar shows: C:\Users\Support\Desktop\VendorNameESI.xml Done.

The CompactCom 40 module is now ready to communicate with the TwinCAT3 master simulator, and the created ESI file can be used in the TwinCAT3 tool.



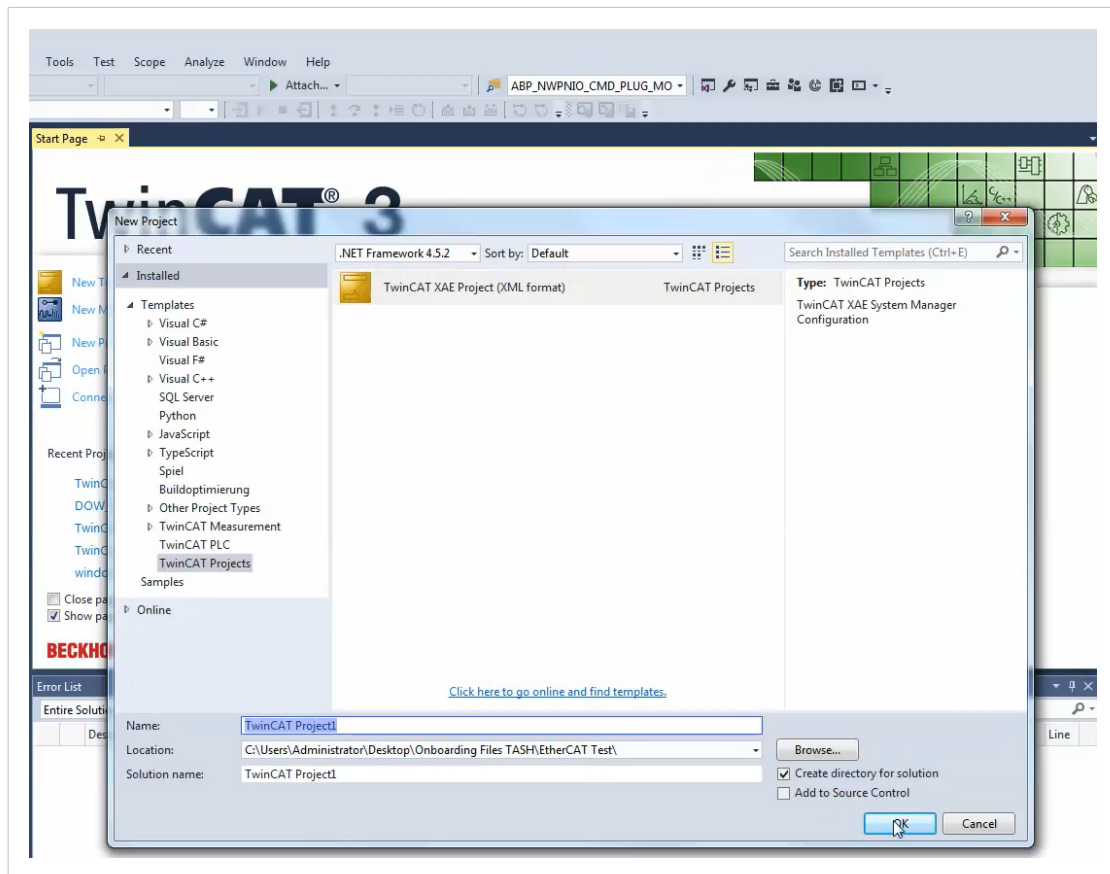
4. Save the created ESI file in the Hardware catalog repository of the TwinCAT3 tool before starting the project creation.



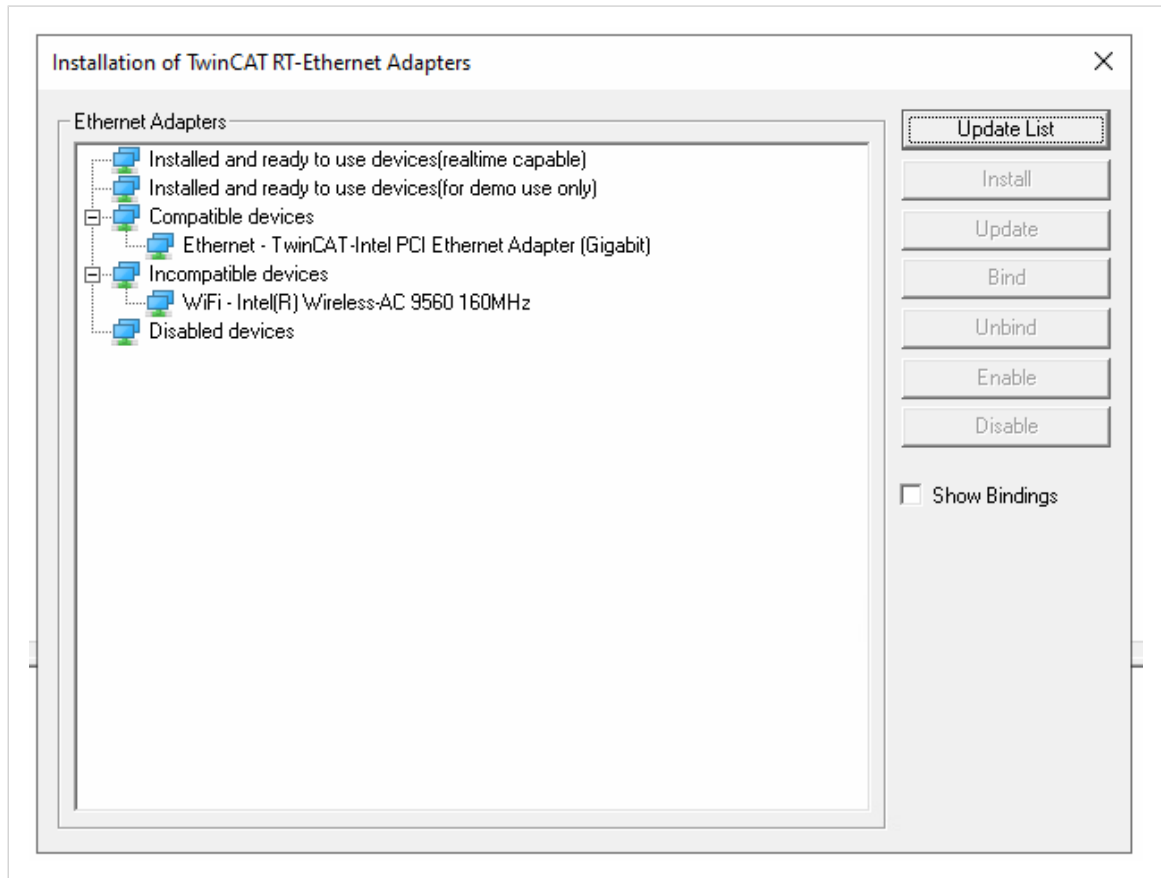
Name	Date modified	Type	Size
Beckhoff EPP6xxx.xml	29/05/2019 11:27	XML Document	1.300 KB
Beckhoff EPP7xxx.xml	25/11/2019 11:36	XML Document	2.215 KB
Beckhoff EPP9xxx.xml	15/10/2019 15:54	XML Document	197 KB
Beckhoff EPx9xx.xml	19/11/2019 08:25	XML Document	629 KB
Beckhoff EQ1xxx.xml	12/11/2015 14:24	XML Document	22 KB
Beckhoff EQ2xxx.xml	23/11/2016 10:42	XML Document	73 KB
Beckhoff EQ3xxx.xml	22/11/2016 11:22	XML Document	1.386 KB
Beckhoff ER1xxx.XML	23/01/2020 09:07	XML Document	269 KB
Beckhoff ER2xxx.XML	21/11/2016 14:32	XML Document	259 KB
Beckhoff ER3xxx.XML	09/06/2017 14:35	XML Document	1.177 KB
Beckhoff ER4xxx.xml	22/11/2016 12:58	XML Document	318 KB
Beckhoff ER5xxx.xml	14/03/2016 11:52	XML Document	273 KB
Beckhoff ER6xxx.xml	14/03/2016 11:52	XML Document	494 KB
Beckhoff ER7xxx.xml	14/02/2019 08:50	XML Document	2.717 KB
Beckhoff ER8xxx.xml	14/03/2016 11:52	XML Document	207 KB
Beckhoff EtherCAT EvaBoard.xml	04/02/2015 12:57	XML Document	72 KB
Beckhoff EtherCAT Terminals.xml	04/02/2015 12:57	XML Document	53 KB
Beckhoff FB1XXX.xml	24/05/2017 13:26	XML Document	49 KB
Beckhoff FCxxx.xml	04/02/2015 12:57	XML Document	21 KB
Beckhoff FM3xxx.xml	29/06/2018 16:05	XML Document	367 KB
Beckhoff ILxxx-B110.xml	04/02/2015 12:57	XML Document	8 KB
HMS Industrial NetworksESI.xml	29/09/2020 13:48	XML Document	33 KB
VendorNameESI.xml	08/10/2020 11:21	XML Document	32 KB

## 3.2. Configure the Communication in TwinCAT3

1. Open the TwinCAT3 tool and create a new project.



2. Install the TwinCAT real-time driver. In the System Manager bring up the TwinCAT overview of the local network interfaces via “TwinCAT” → “Show Real Time Ethernet Compatible Devices”. The following dialog appears:

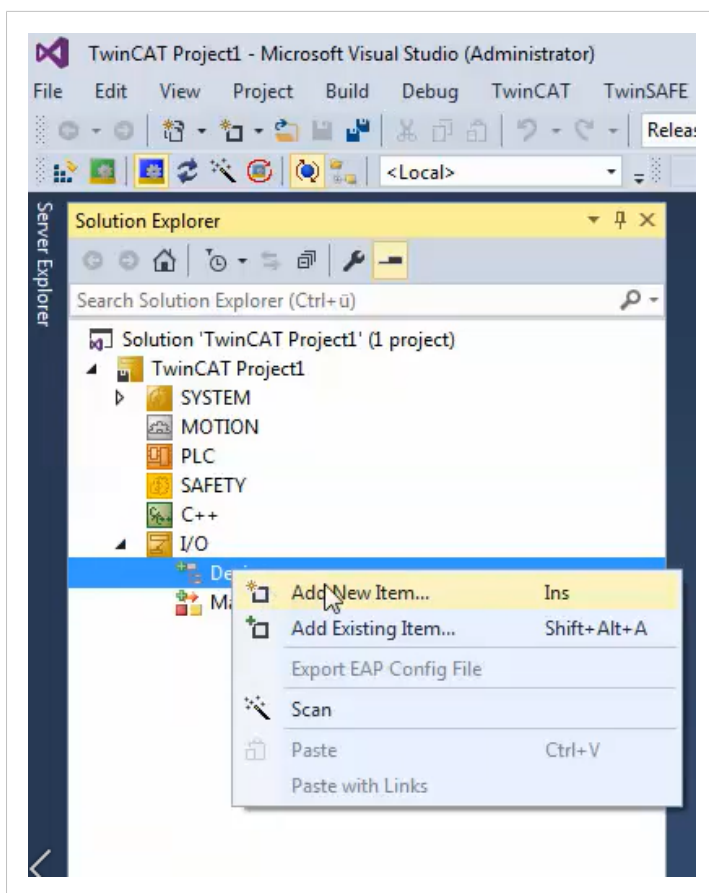


Interfaces listed under “Compatible devices” can be assigned a driver via the **Install** button. A driver should only be installed on compatible devices.

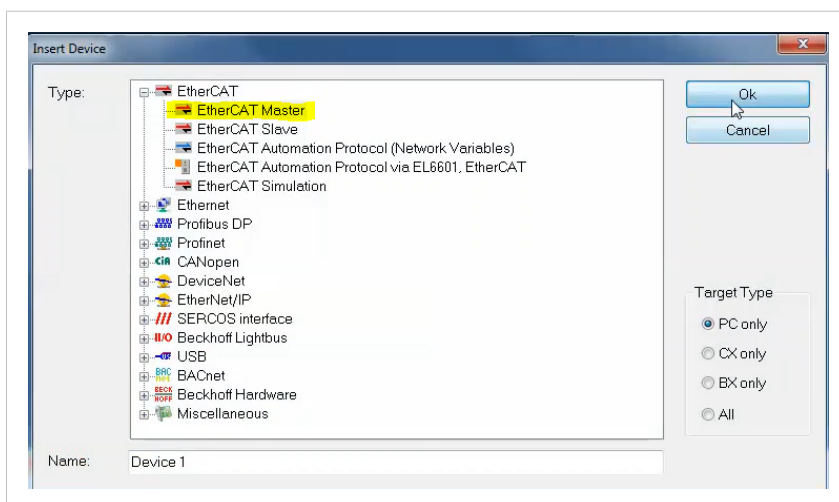
**NOTE**

This step only needs to be done once per system.

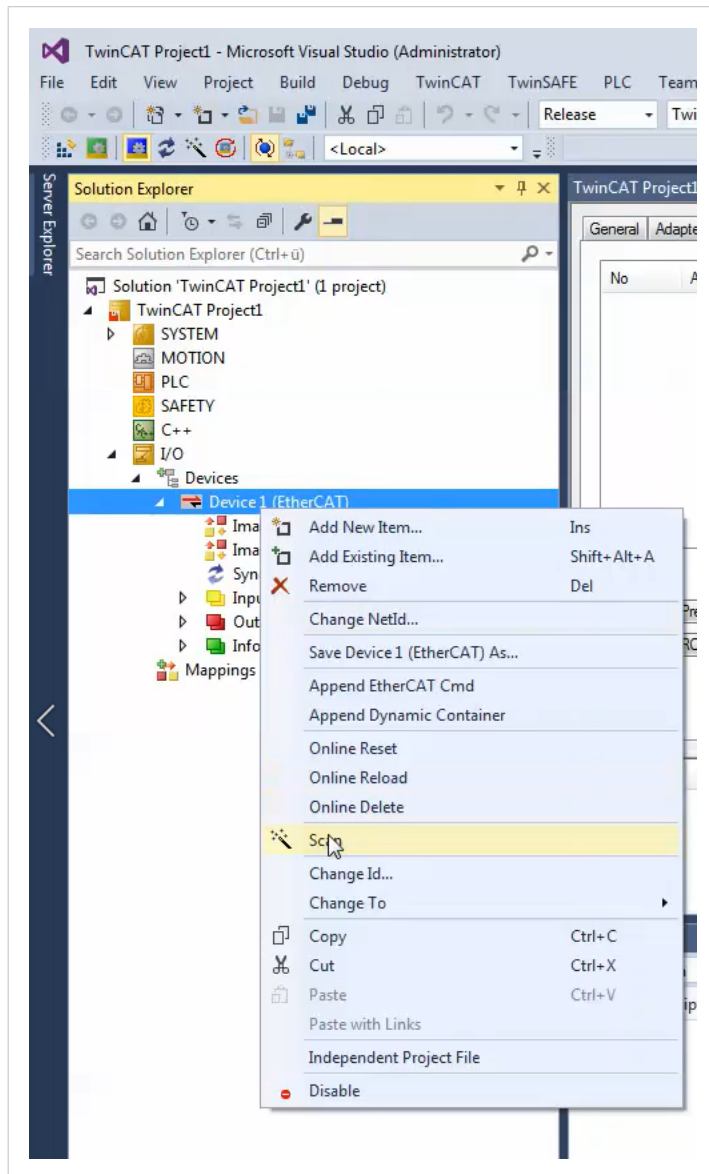
3. a. Add a virtual Master device by right-clicking on **Devices** and choosing **Add New Item....**



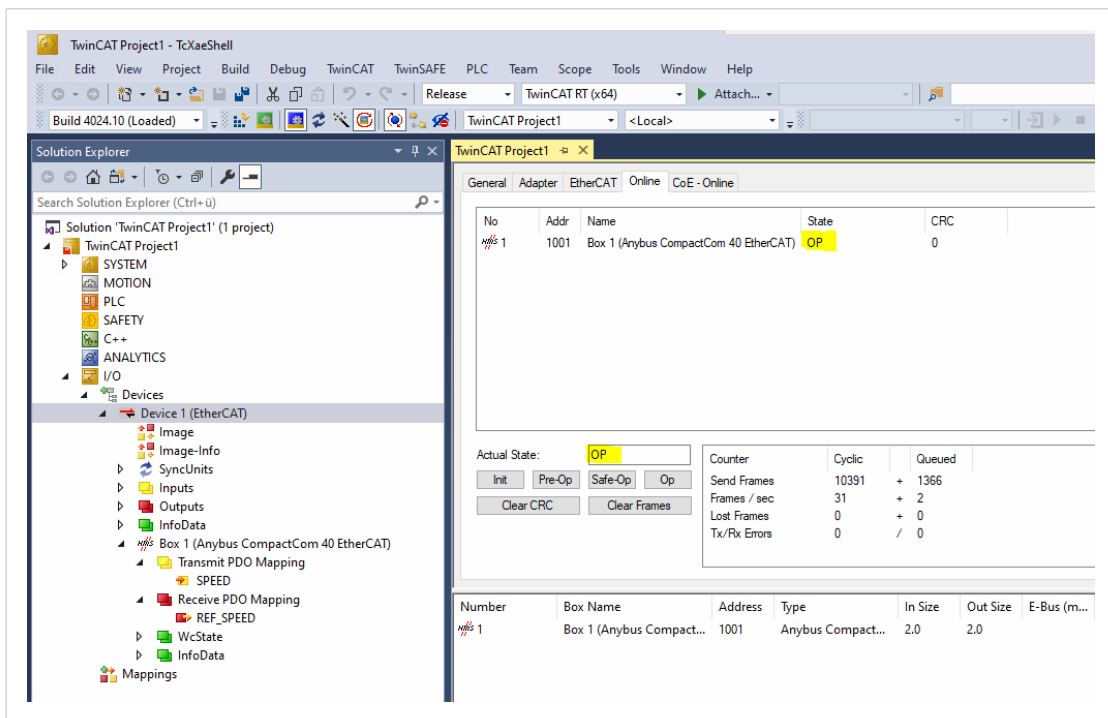
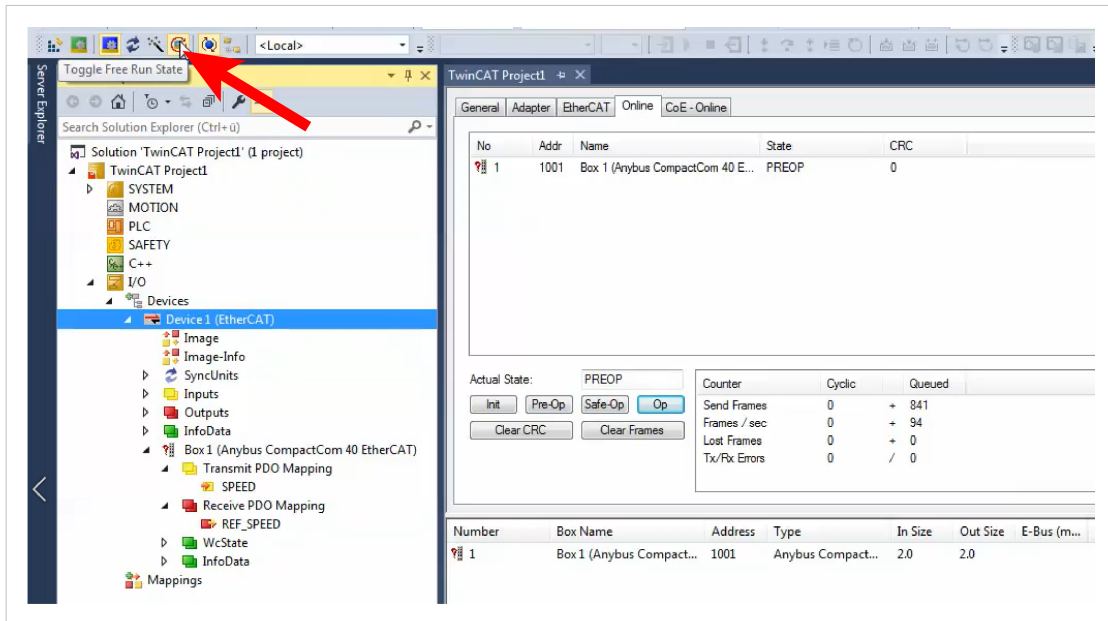
- b. Choose **EtherCAT Master** and click **Ok**.



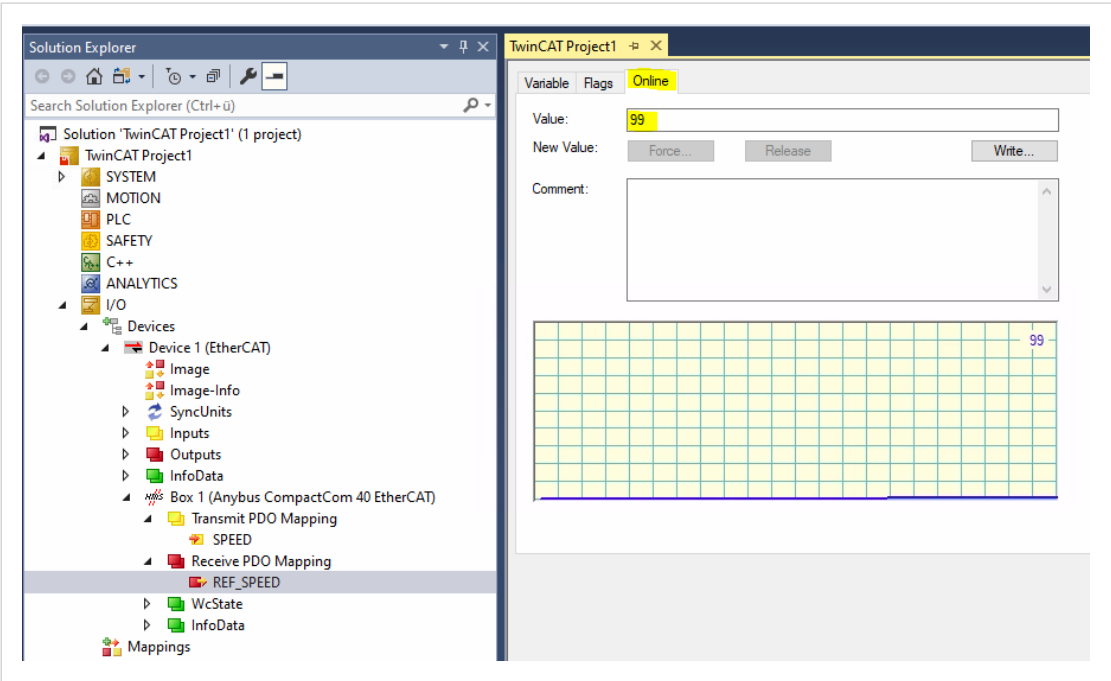
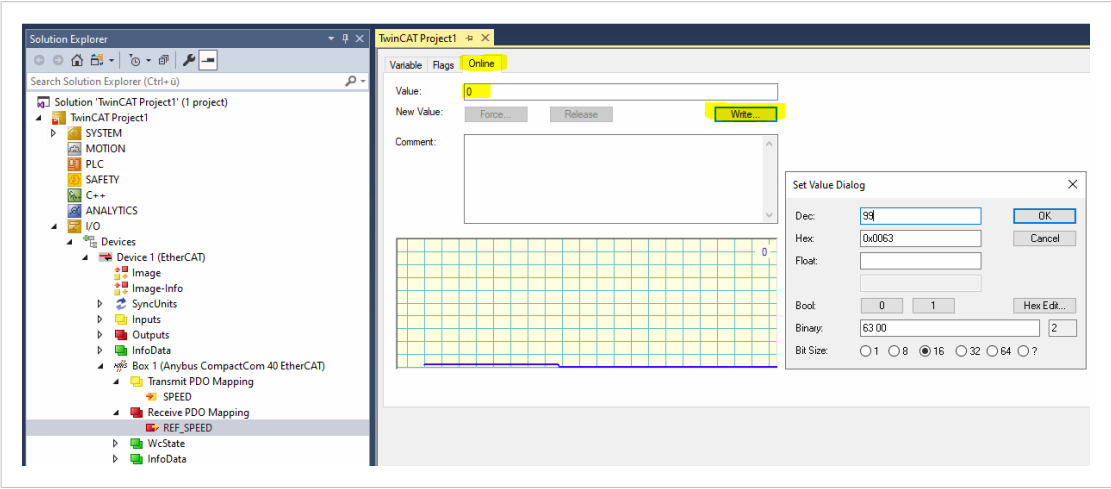
4. Initialize the CompactCom 40 module and then connect it to the computer's Ethernet port. Right-click on the master device and select **Scan**.



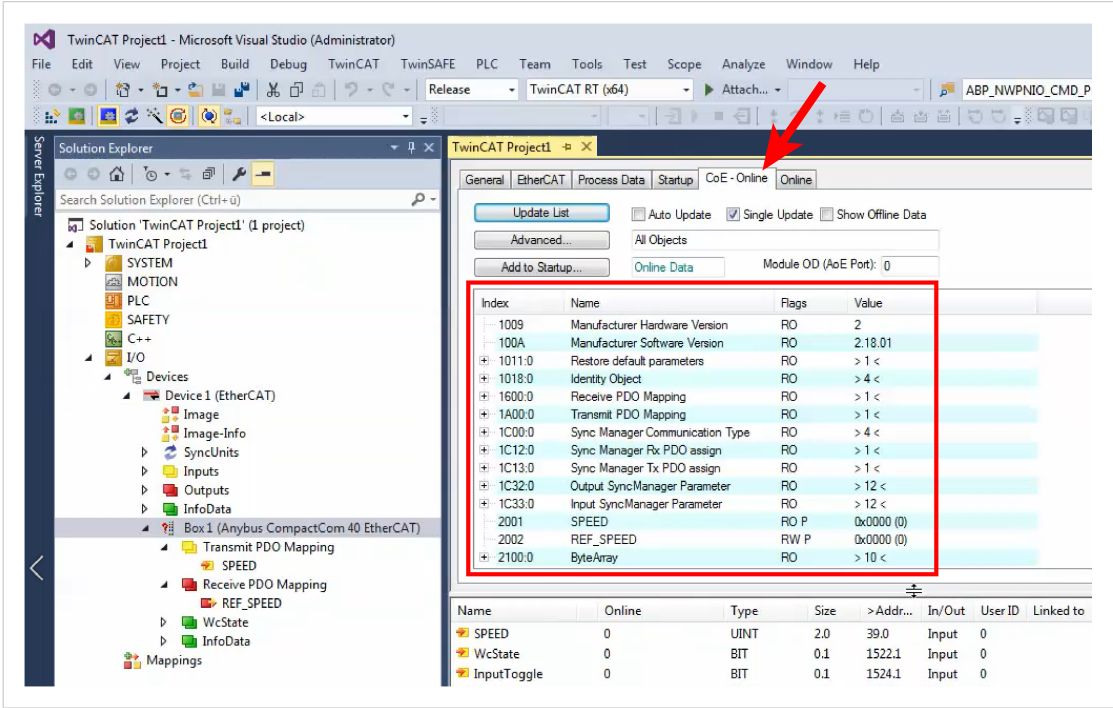
- After the slave has been added to the project, the communication can be established using the **Toggle Free Run State** button. The communication state of both the master and the slave will change from PREOP to OP (Operational). This means that the communication has been established and the cyclic process data exchange is working.



- 6. The Transmit PDO Mapping can be monitored and the Receive PDO Mapping can be written from the master online.



7. The available CoE objects, which can be accessed using SDO services, are now available under the **CoE-Online** tab of the CompactCom 40 EtherCAT slave device.





8. For objects flagged with RW (Read/Write), it is possible to modify the value by double-clicking on the value. For objects flagged with RO (Read Only) this is not possible.

The screenshot shows the TwinCAT3 Online Manager interface. The 'Online' tab is selected, displaying a list of SDO objects. The 'Flags' column indicates the access rights for each object. The 'Value' column shows the current value of the object. A 'Set Value Dialog' box is open, allowing the user to modify the value of a selected object.

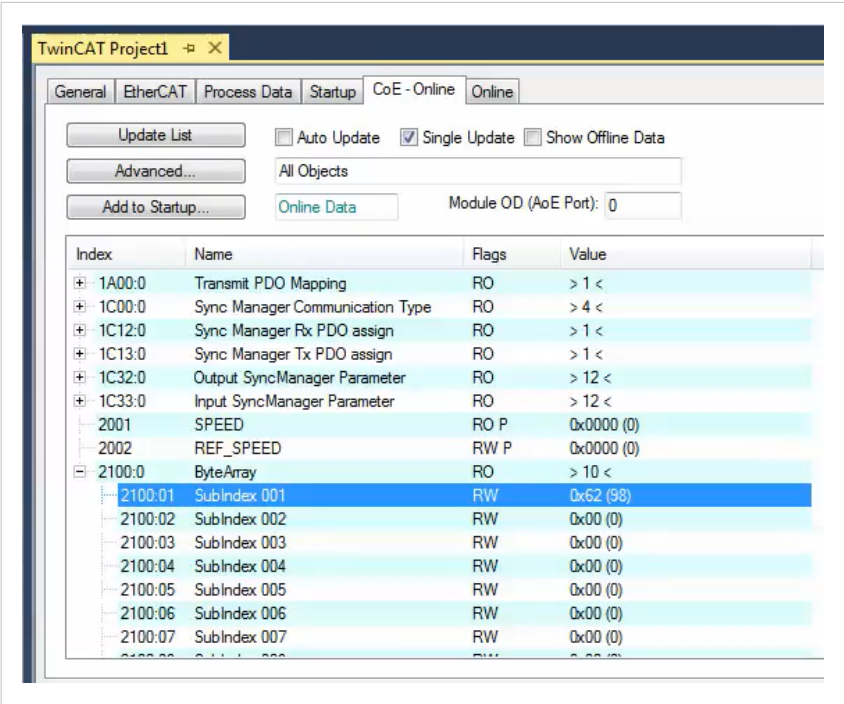
Index	Name	Flags	Value
1A00:0	Transmit PDO Mapping	RO	> 1 <
1C00:0	Sync Manager Communication Type	RO	> 4 <
1C12:0	Sync Manager Rx PDO assign	RO	> 1 <
1C13:0	Sync Manager Tx PDO assign	RO	> 1 <
1C32:0	Output SyncManager Parameter	RO	> 12 <
1C33:0	Input SyncManager Parameter	RO	> 12 <
2001	SPEED	RO P	0x0000 (0)
2002	REF_SPEED	RW P	0x0000 (0)
2100:0	ByteArray	RO	> 10 <
2100:01	SubIndex 001	RW	0x00 (0)
2100:02	SubIndex 002	RW	0x00 (0)
2100:03	SubIndex 003	RW	0x00 (0)
2100:04	SubIndex 004	RW	0x00 (0)
2100:05	SubIndex 005	RW	0x00 (0)
2100:06	SubIndex 006	RW	0x00 (0)
2100:07	SubIndex 007	RW	0x00 (0)

The 'Set Value Dialog' box is open, showing the following fields:

- Dec: 98
- Hex: 0x62
- Float:
- Bool: 0 1
- Binary: 62 1
- Bit Size: 1 8 16 32 64 ?

The 'OK' button is highlighted, indicating that the user is about to confirm the new value.

9. After modifying the object/parameter value, the new value will be visible online.



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