

# TF6310

- Before Using the UR example you have to install for all socket communications the tcp/ip library

The screenshot shows the Beckhoff website for the TF6310 TwinCAT 3 TCP/IP product. The page has a red header with the Beckhoff logo and navigation links. Below the header, there is a breadcrumb trail: Produkte > Automation > TwinCAT > Txxxx > TwinCAT 3 Functions > Txxxx > TC3 Connectivity > TF6310. The main title is "TF6310 | TwinCAT 3 TCP/IP". A red arrow points from the text "Before Using the UR example you have to install for all socket communications the tcp/ip library" to the "Txxxx" part of the breadcrumb trail. Another red arrow points from the same text to the "Bestellangaben" tab in the "Produktinformationen" section. The product description states: "TwinCAT TCP/IP dient der Implementierung und Realisierung eines oder mehrerer TCP/IP-Server und/oder TCP/IP-Clients in der TwinCAT 3 SPS. Für den Kommunikationsauf- und -abbau sowie für den reinen Datenaustausch (Send und Receive) existieren entsprechende Bausteine. Hierbei unterstützen die Funktionsbausteine auch die Verwendung von Multicast-Adressen. Darüber hinaus wird eine Absicherung des Transportkanals über Transport Layer Security (TLS) ermöglicht." Below this, there is a "Produktstatus: Serienlieferung" indicator. To the right of the text is a 3D graphic of a purple cube with a network diagram on its face. A red "Kontakt" button is visible. The "Produktinformationen" section has tabs for "Technische Daten" and "Bestellangaben", with "Bestellangaben" being the active tab. Below this are links for "Dokumentation und Downloads", "Beckhoff Information System", "Media Library", and "Produktmeldungen". At the bottom, there is a table with technical data:

Technische Daten	TF6310
Benötigte Lizenz	TC1200
Betriebssystem	Windows 7, Windows 10, Windows CE, TwinCAT/BSD

# Get Trial license for if needed

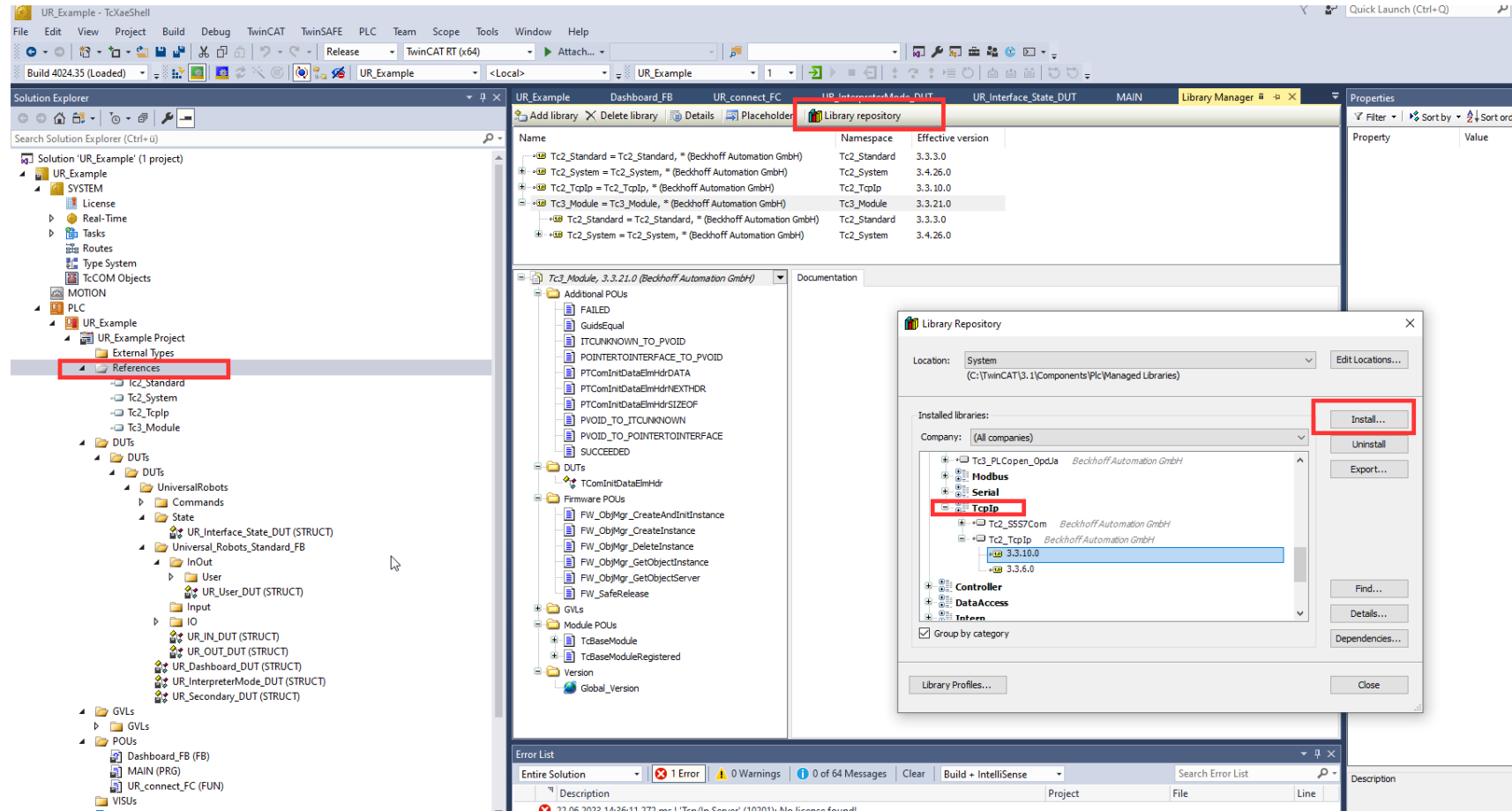
The screenshot displays the 'UR\_Example - TcXaeShell (Administrator)' interface. The 'Solution Explorer' on the left shows the project structure, with the 'License' folder highlighted. The 'Manage Licenses' dialog is open, showing a table of licenses. The 'TC3 TCP/IP' license is highlighted in red. The 'Error List' at the bottom shows an error: '22.06.2023 14:49:37 705 ms | 'Tcp/Ip Server' (10201): No license found!'.

Order No	License	Add License
TF6221	TC3 EtherCAT Redundancy unlimited	<input type="checkbox"/> cpu license
TF6225	TC3 EtherCAT External Sync	<input type="checkbox"/> cpu license
TF6250	TC3 Modbus-TCP	<input type="checkbox"/> cpu license
TF6255	TC3 Modbus-RTU	<input type="checkbox"/> cpu license
TF6270	TC3 Profinet IO-Device	<input type="checkbox"/> cpu license
TF6271	TC3 Profinet Controller	0
TF6280	TC3 EtherNet/IP Adapter (Slave)	0
TF6281	TC3 EtherNet/IP Scanner (Master)	0
TF6300	TC3 FTP	<input type="checkbox"/> cpu license
TF6310	TC3 TCP/IP	<input checked="" type="checkbox"/> cpu license
TF6311	TC3 TCP/UDP RT	<input type="checkbox"/> cpu license
TF6340	TC3 Serial-Communication	<input type="checkbox"/> cpu license
TF6350	TC3 SMS-SMTP	<input type="checkbox"/> cpu license
TF6360	TC3 Virtual-Serial-COM	<input type="checkbox"/> cpu license
TF6420	TC3 Database-Server	<input type="checkbox"/> cpu license
TF6421	TC3 XML-Server	<input type="checkbox"/> cpu license
TF6500	TC3 IEC60870-5-10x Telecontrol	<input type="checkbox"/> cpu license

Error List

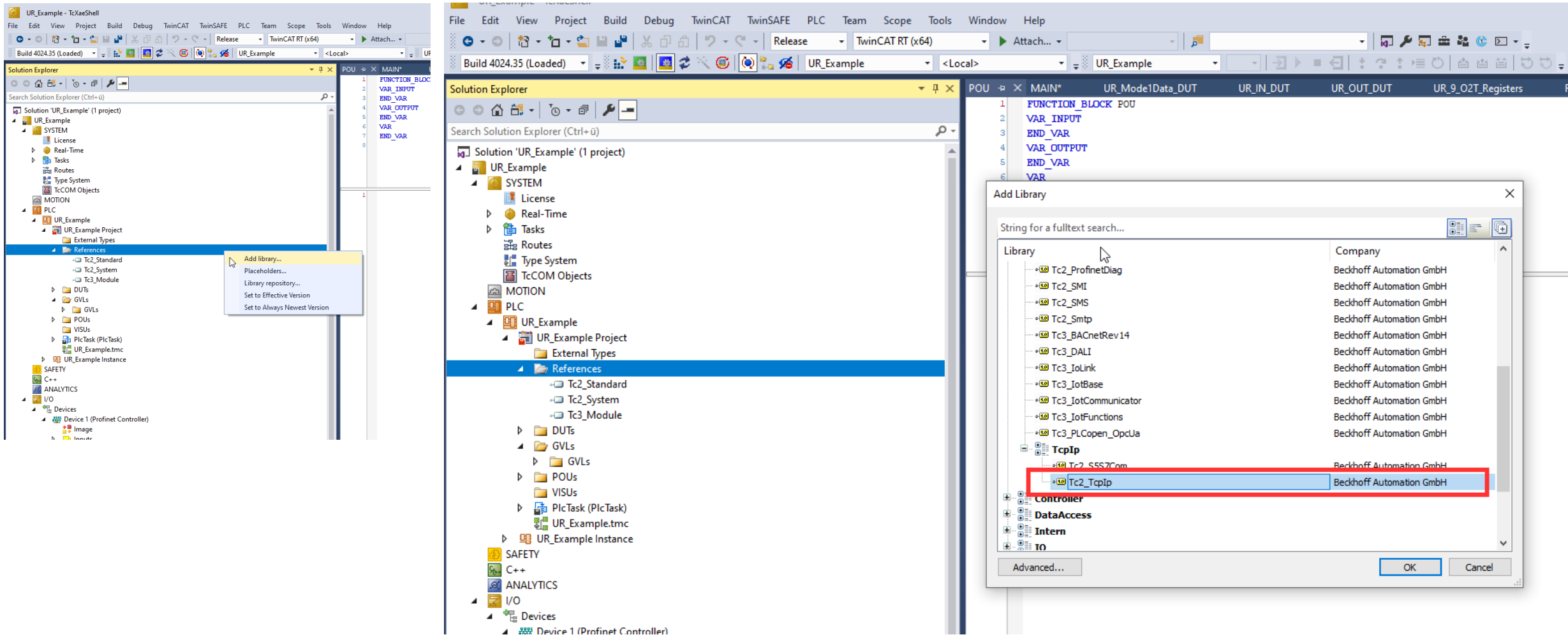
Description	Project	File	Line
22.06.2023 14:49:37 705 ms   'Tcp/Ip Server' (10201): No license found!			

# Install library Tc2\_Tcplp (Communication)

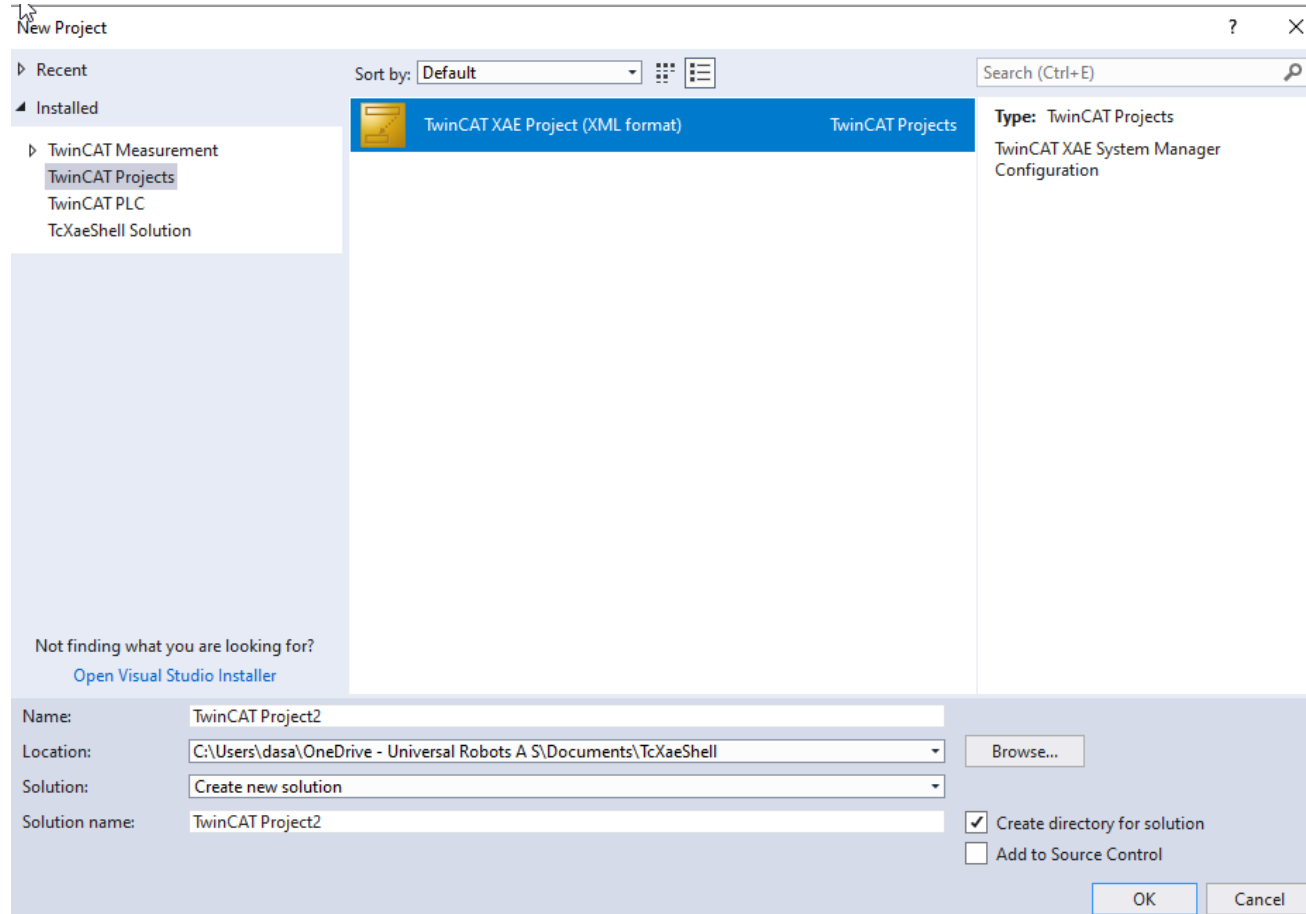


# add Tc2\_Tcplp (Communication) library

it is necessary for all TCP communications



# Create new project



TwinCAT Project2 - TcXaeShell

File Edit View Project Build Debug TwinCAT TwinSAFE PLC Team Scope Tools Window Help

Release TwinCAT RT (x64) Attach...

Build 4024.35 (Loaded) TwinCAT Project2 <Local>

Solution Explorer

Search Solution Explorer (Ctrl+u)

Solution 'TwinCAT Project2' (1 project)

- TwinCAT Project2
  - SYSTEM
    - MOTION
    - PLC
    - SAFETY
    - C++
    - ANALYTICS
    - I/O

Toolbox

Search Toolbox

General

There are no usable controls in this group. Drag an item onto this text to add it to the toolbox.

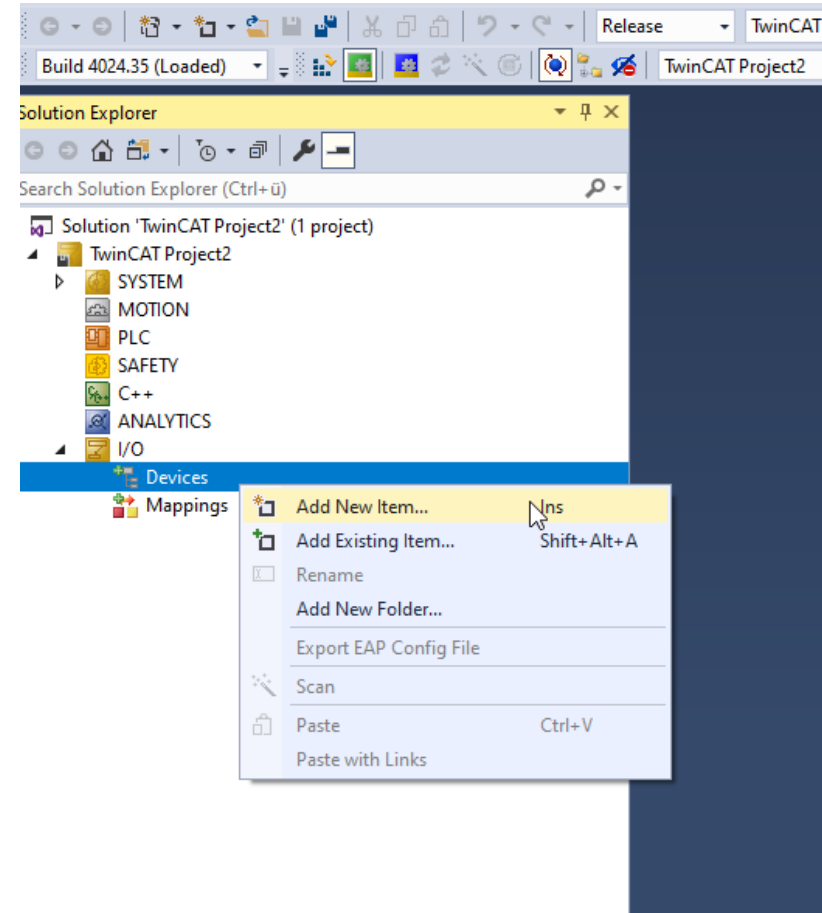
Error List

Entire Solution 0 Errors 0 Warnings 0 Messages Clear Build + IntelliSense Search Error List

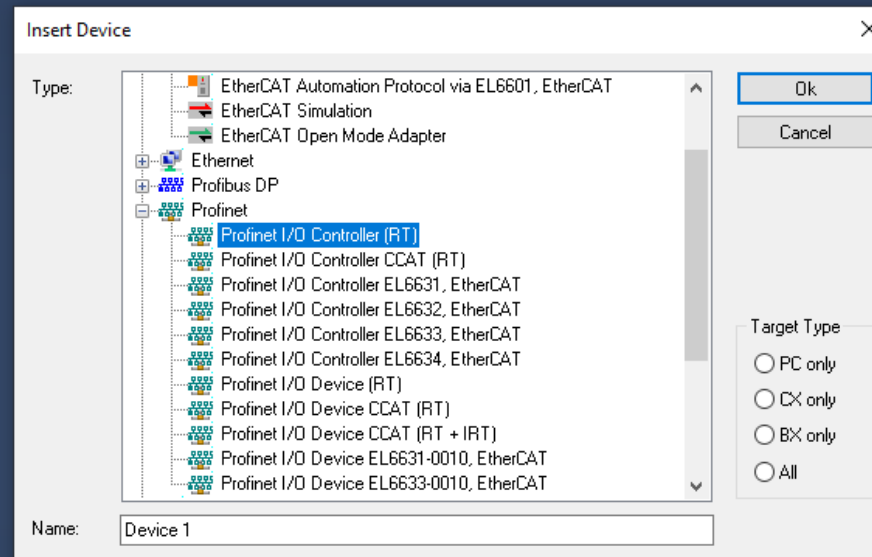
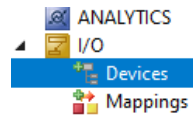
Description	Project	File	Line
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# Config for profinet controller (RT)

Add new item to devices

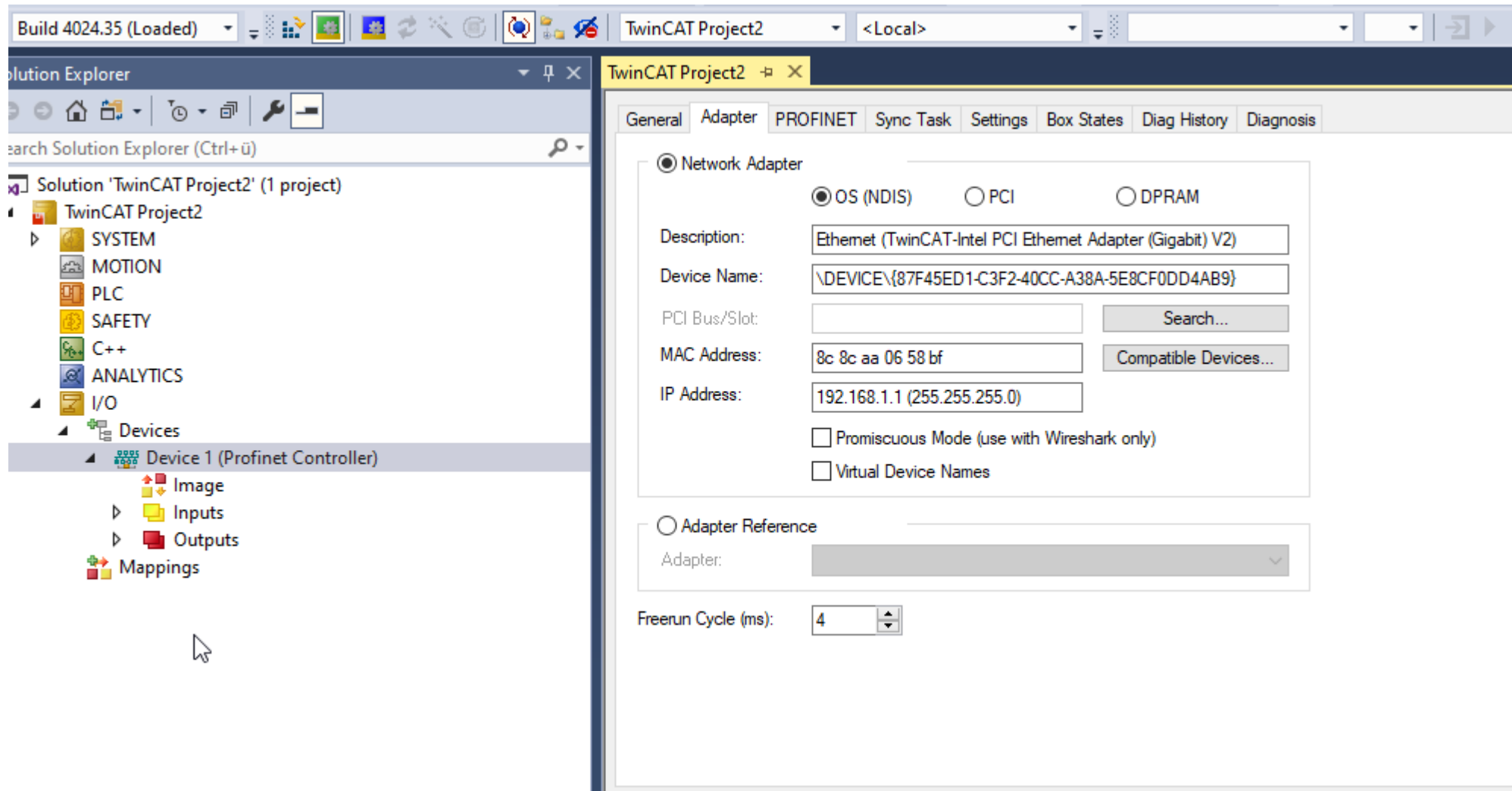


# Add profinet IO controller RT

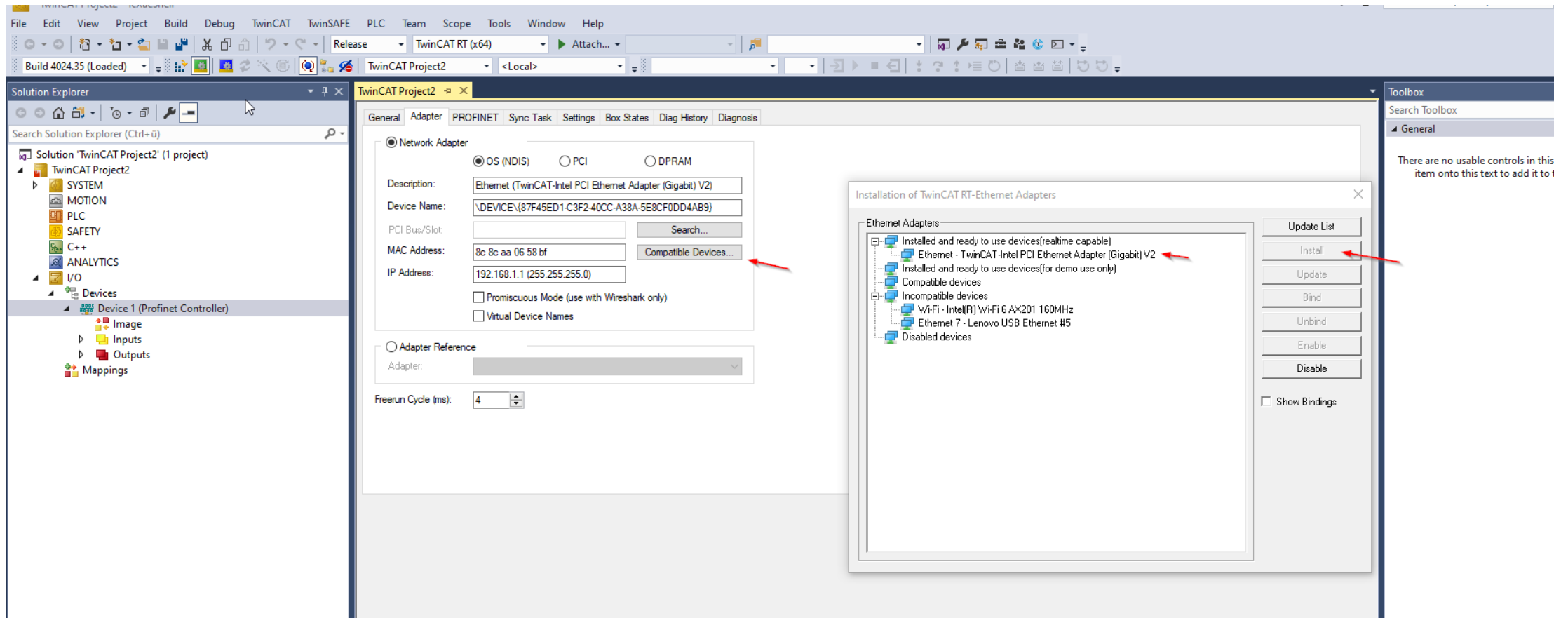




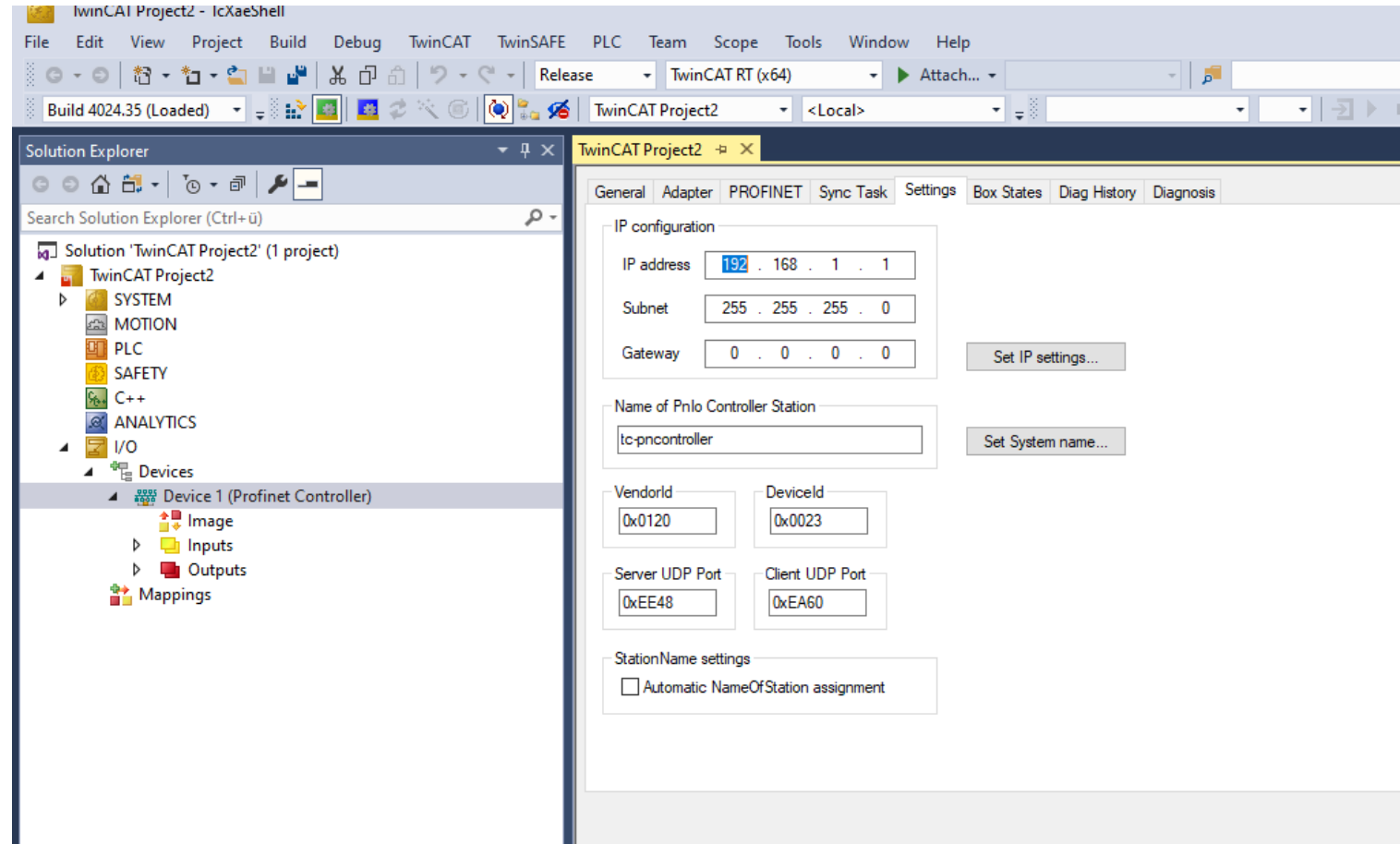
- If ethernet driver already installed choose your preferred ethernet slot (PLC/Laptop) and skip next slide
- In case it is not installed check next slide.



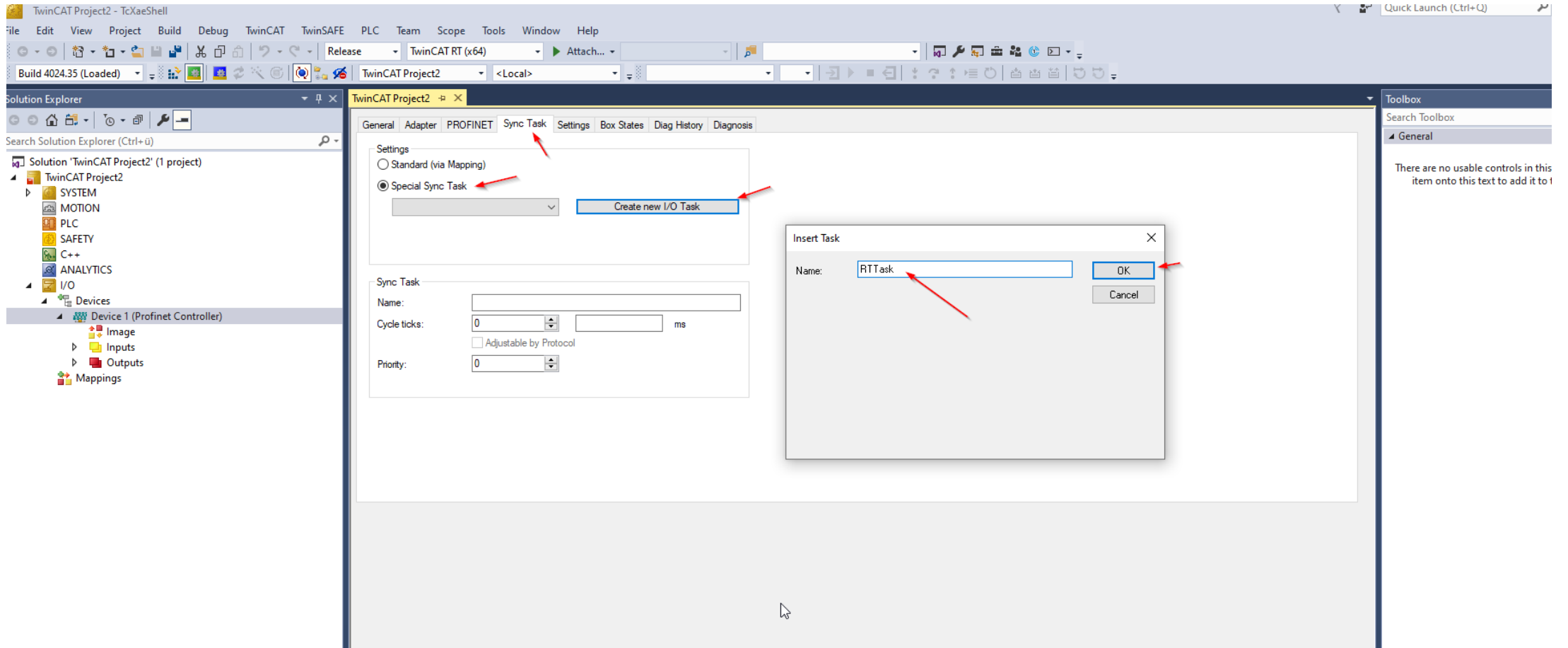
# in case driver is not installed



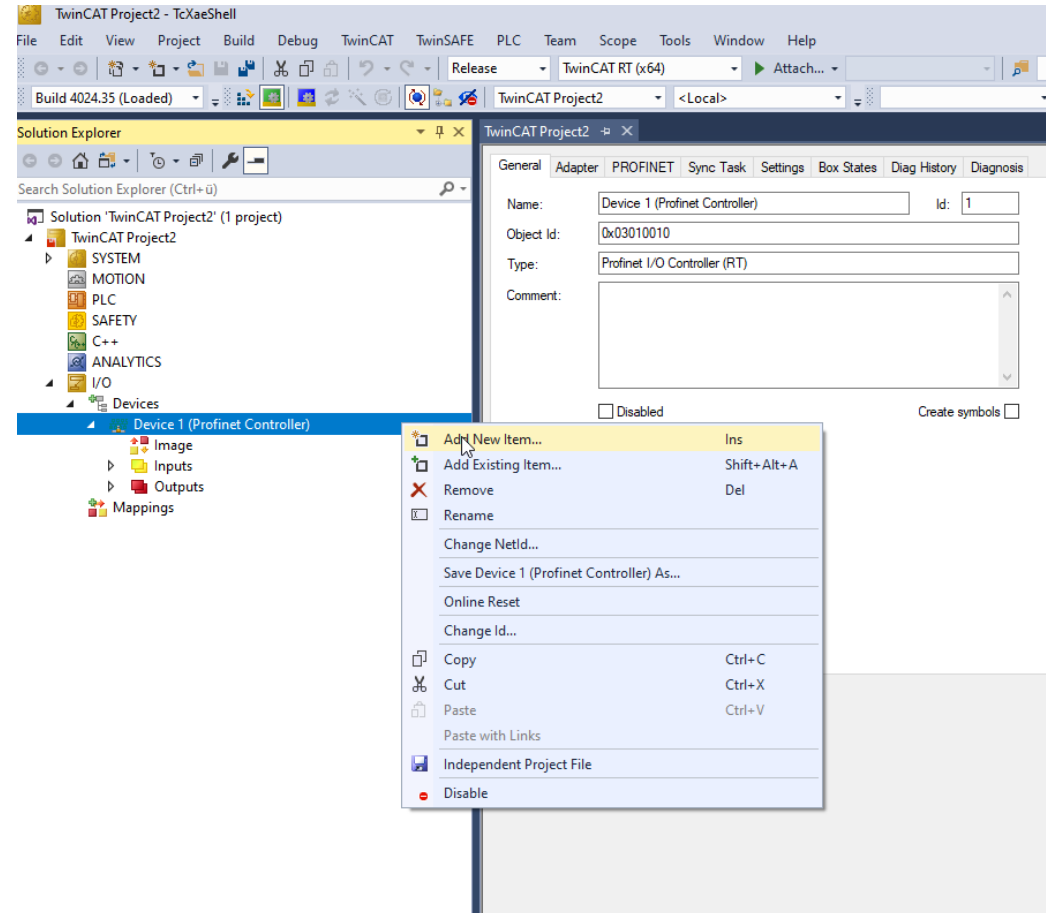
# First setup ip configs of PN Controller

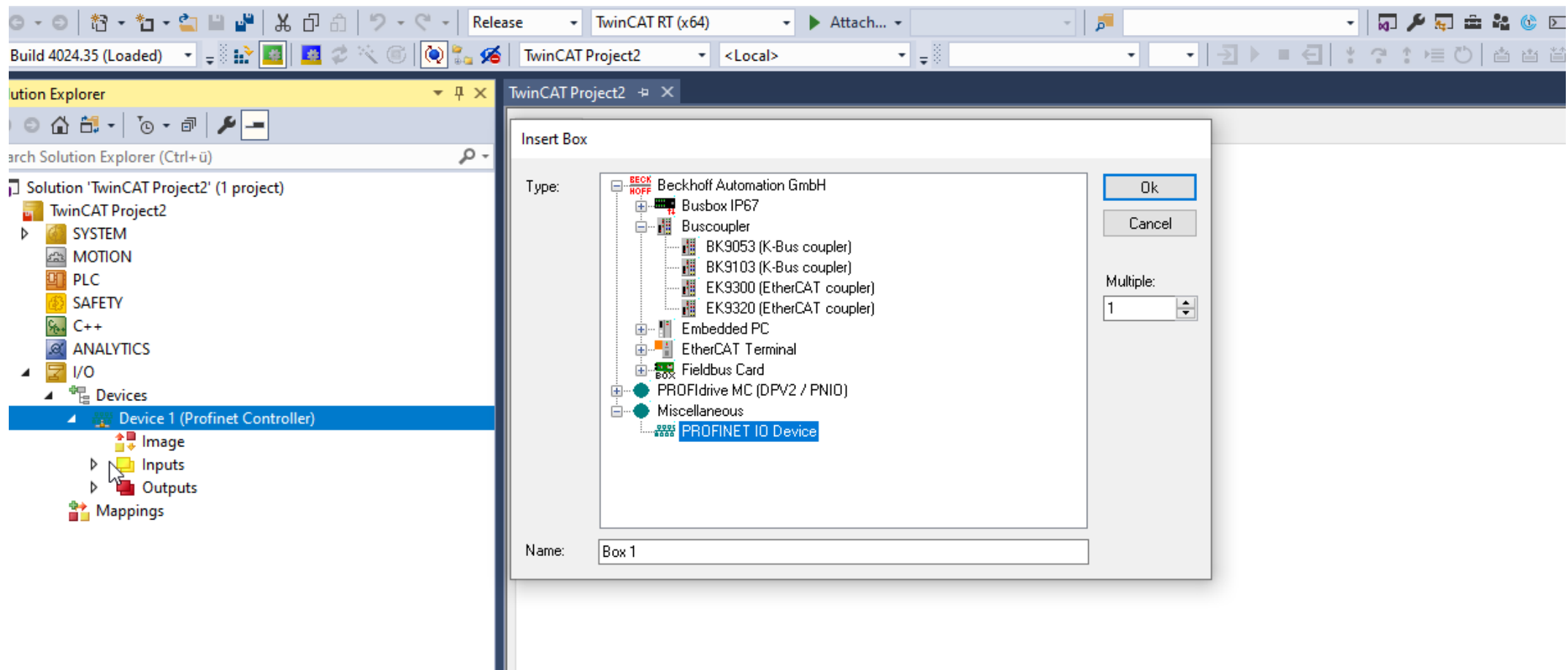


# Create new task

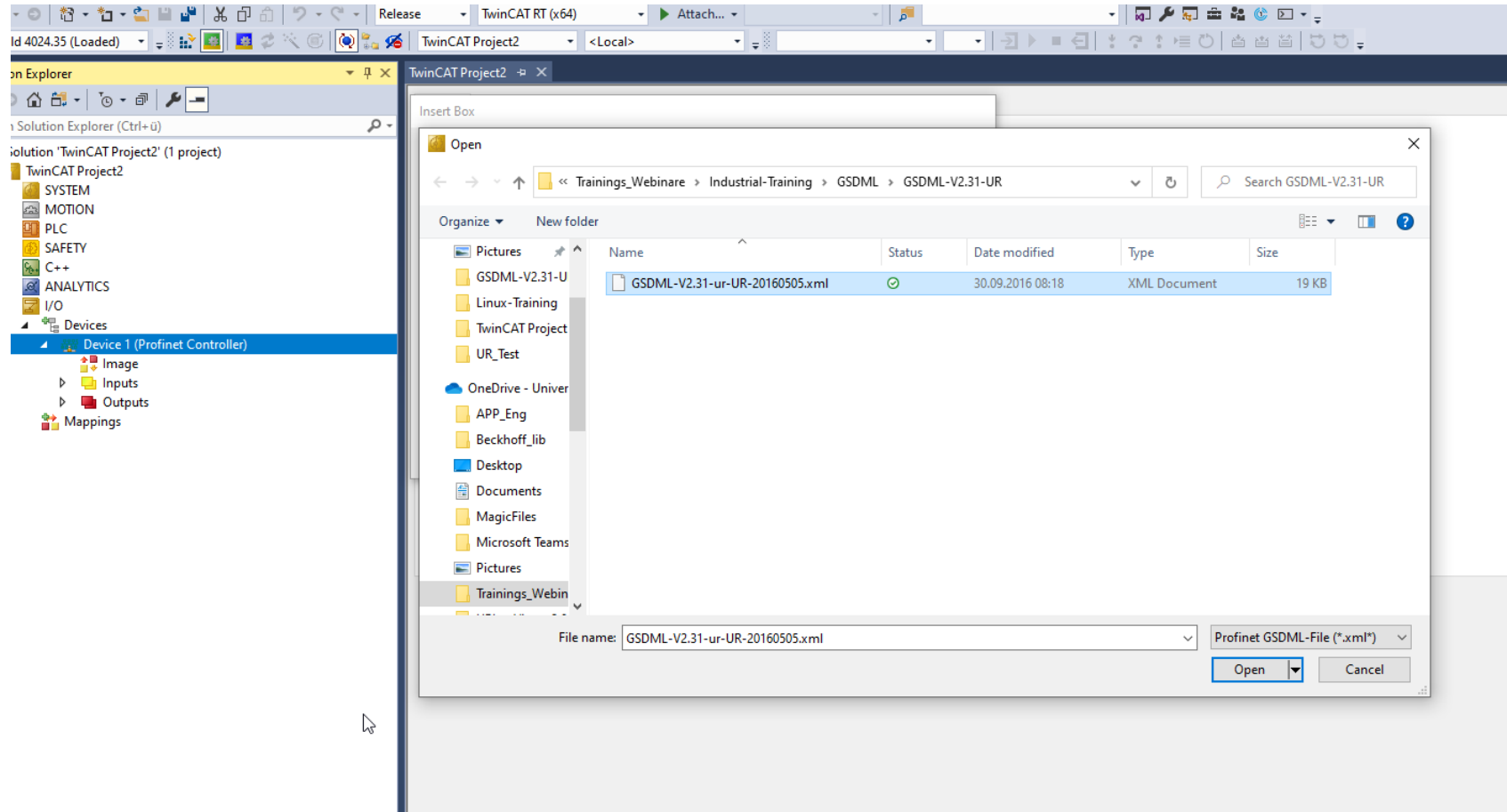


# Add new IO Device (UR robot)





# UR GSDML



# Device config. Choose all of them

The screenshot displays the TwinCAT Project2 interface with the following components:

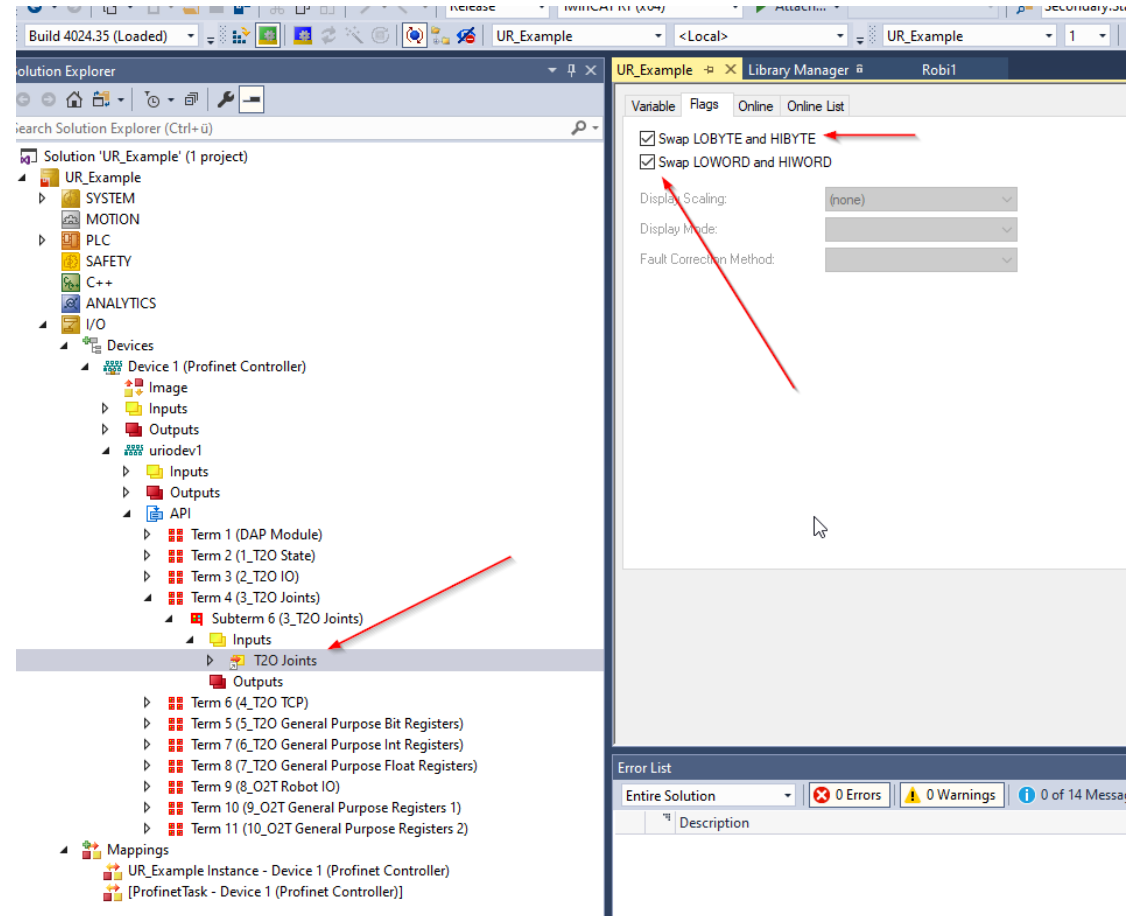
- Solution Explorer:** Shows the project structure for 'TwinCAT Project2'. The 'Devices' folder is expanded, showing 'Device 1 (Profinet Controller)' with sub-items: 'Image', 'Inputs', 'Outputs', and 'API'. The 'API' folder is further expanded, listing 'Term 1 (DAP Module)' and its subterms: 'Subterm 1 (V1.0)', 'Subterm 2 (Interface)', and 'Subterm 3 (RJ45 10/100 Mbit/s)'. Below these are 'Term 2 (1\_T2O State)', 'Term 3 (2\_T2O IO)', 'Term 4 (3\_T2O Joints)', 'Term 5 (4\_T2O TCP)', and 'Term 6 (5\_T2O General Purpose Bit Registers)'.
- General Tab:** Contains fields for 'Stationname' (beckhofftestdavid), 'Vendor ID' (0x0361), 'Device ID' (0x0001), 'HW Version' (1.00), and 'SW Version' (V 5.12). It also includes 'IP configuration' fields for IP address (192.168.1.2), Subnet (255.255.255.0), and Gateway (0.0.0.0). The 'Instance Properties' section shows 'Instance ID' (0x0001), 'Frame ID' (0x8000), 'MaxLengthIn' (1440 Byte), 'MaxLengthOut' (1440 Byte), 'ActLengthIn' (3 Byte), and 'ActLengthOut' (3 Byte).
- Device Configuration Dialog:** A modal window with a table of slots and modules. Red arrows point from the 'Term 1 (DAP Module)' in the Solution Explorer to the 'Term 1 (DAP Module)' in the table, and from the 'Subterm 1 (V1.0)', 'Subterm 2 (Interface)', and 'Subterm 3 (RJ45 10/100 Mbit/s)' in the Solution Explorer to their respective rows in the table. A text box with 'Double click....' is overlaid on the dialog. The 'Others' list on the right includes: '1\_T2O State', '2\_T2O IO', '3\_T2O Joints', '4\_T2O TCP', '5\_T2O General Purpose Bit Registers', '6\_T2O General Purpose Int Registers', '7\_T2O General Purpose Float Registers', '8\_02T Robot IO', '9\_02T General Purpose Registers 1', and '10\_02T General Purpose Registers 2'. The 'ModuleInfo' section at the bottom right of the dialog reads: 'ModuleInfo 'DAP Module': OrderNumber: 00000 UR IO device, for PNIO controller with PDev'.



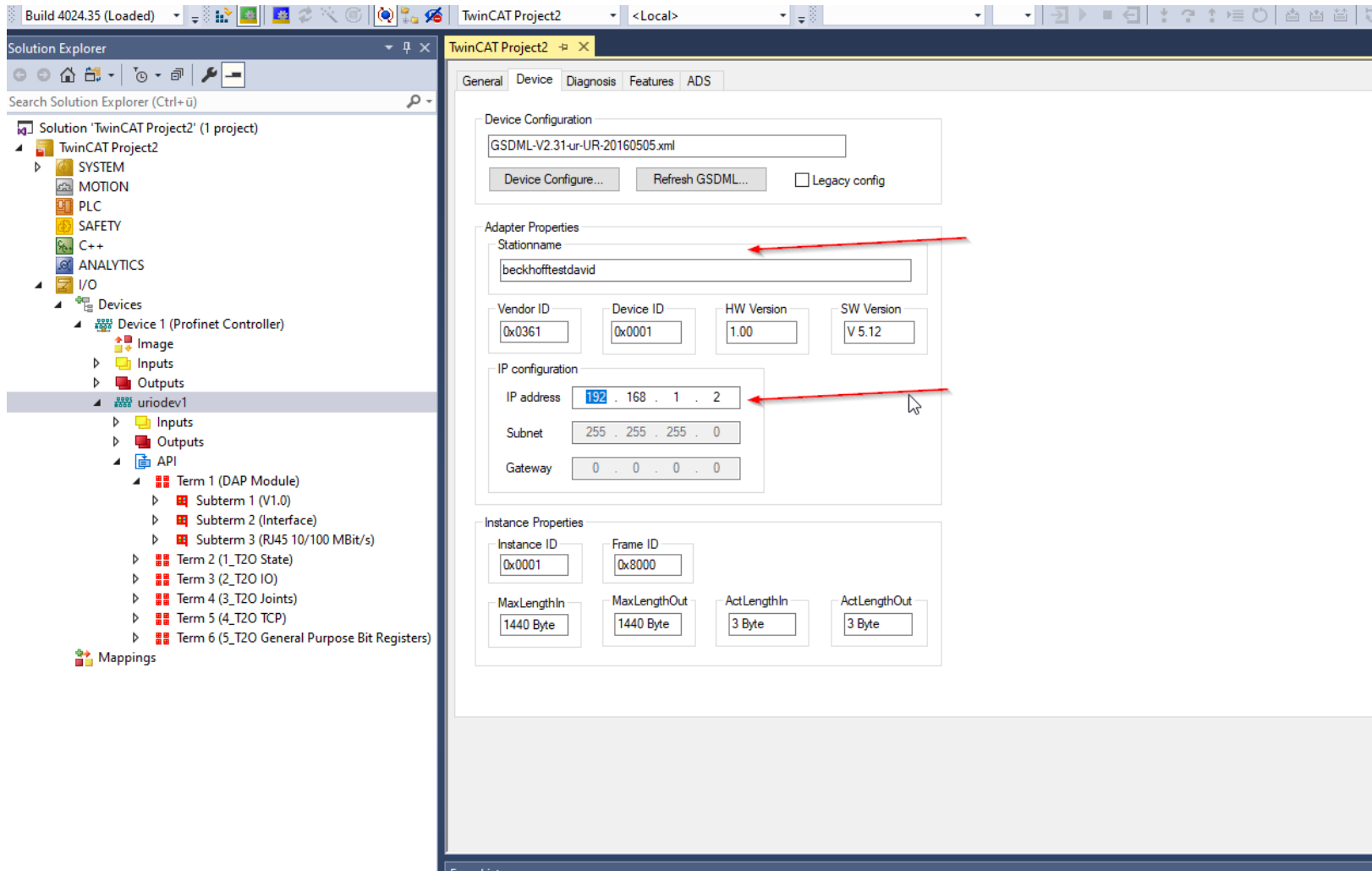
# Due to the Intel standard some registers have to be swapped to the motorola standard

Please set byte swap and word swap for the following terms. Otherwise this example will not work properly:

- Term 4 – Joints
- Term 6 – TCP
- Term 7 – Int Registers
- Term 8 – Float Registers



# IP config and choose stationname



# Search for your Robot and set configs

The screenshot shows the TwinCAT Project2 interface. The Solution Explorer on the left lists the project structure, including 'Device 1 (Profinet Controller)'. The main window displays the PROFINET configuration settings. The 'Scan Devices' dialog is open, showing a table of discovered devices. The 'Stationname' field is highlighted with a blue arrow pointing from the 'Device 1 (Profinet Controller)' entry in the Solution Explorer. The 'Set Stationname' and 'Set IP configuration' buttons are highlighted with red arrows. A text box at the bottom left states: 'Very important!! Name must have the same name as in the project otherwise it is impossible to connect!!!!'

Stationname	MAC address	IP address	Subnet
beckhofftestdavid	00:30:D6:21:C3:41	192.168.1.10	255.255.255.0

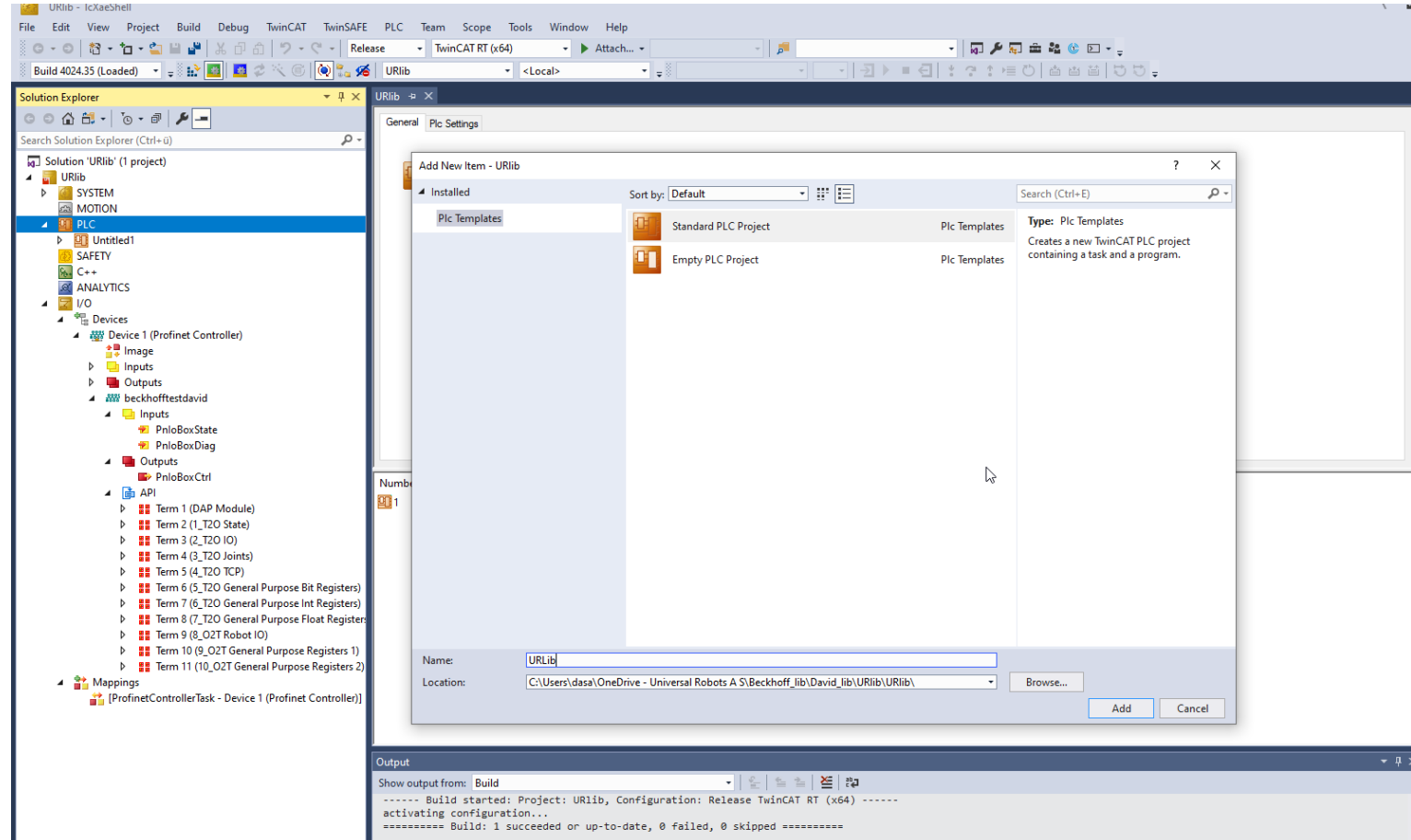
Buttons: Rescan Devices, Add Devices, Set Stationname, Set IP configuration, Start Signal, Reset to factory settings, Close Window.

IP configuration fields: IP address (192.168.1.10), Subnet (255.255.255.0), Gateway (0.0.0.0), DHCP enable (checkbox).

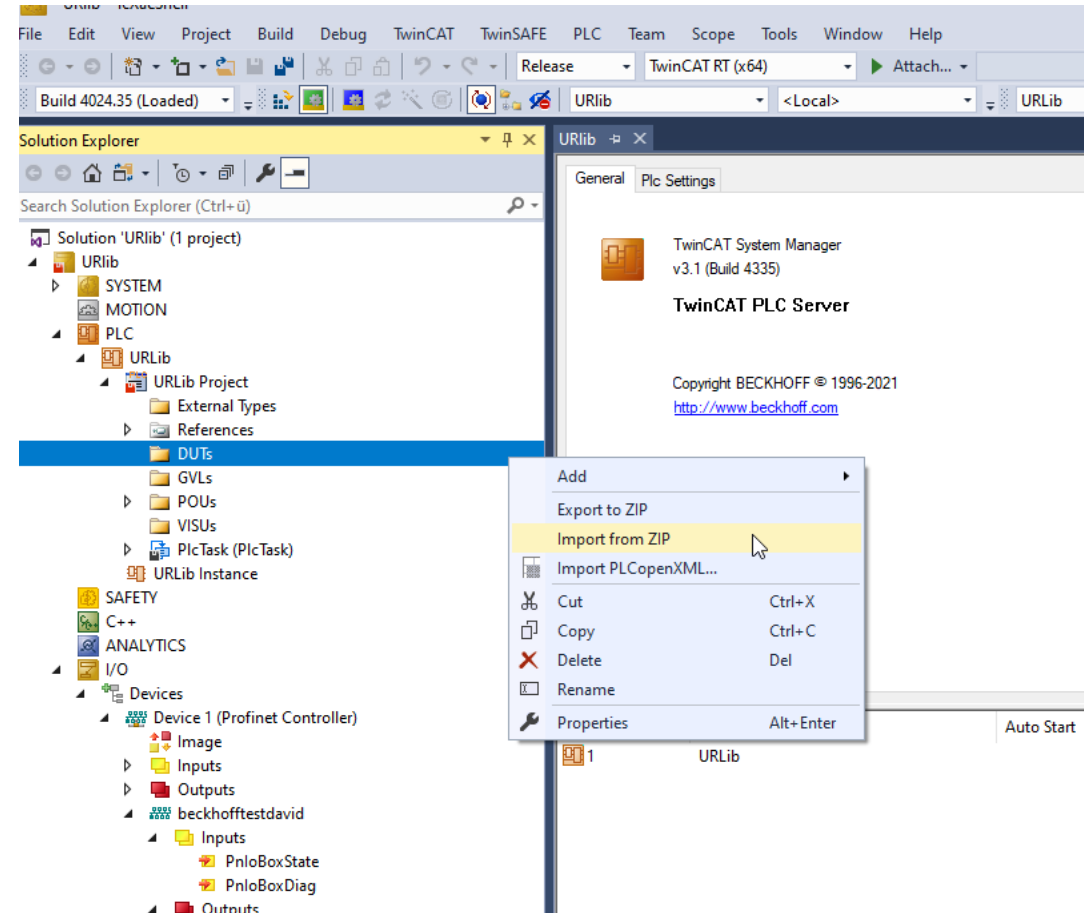
Device blink

Very important!! Name must have the same name as in the project otherwise it is impossible to connect!!!!

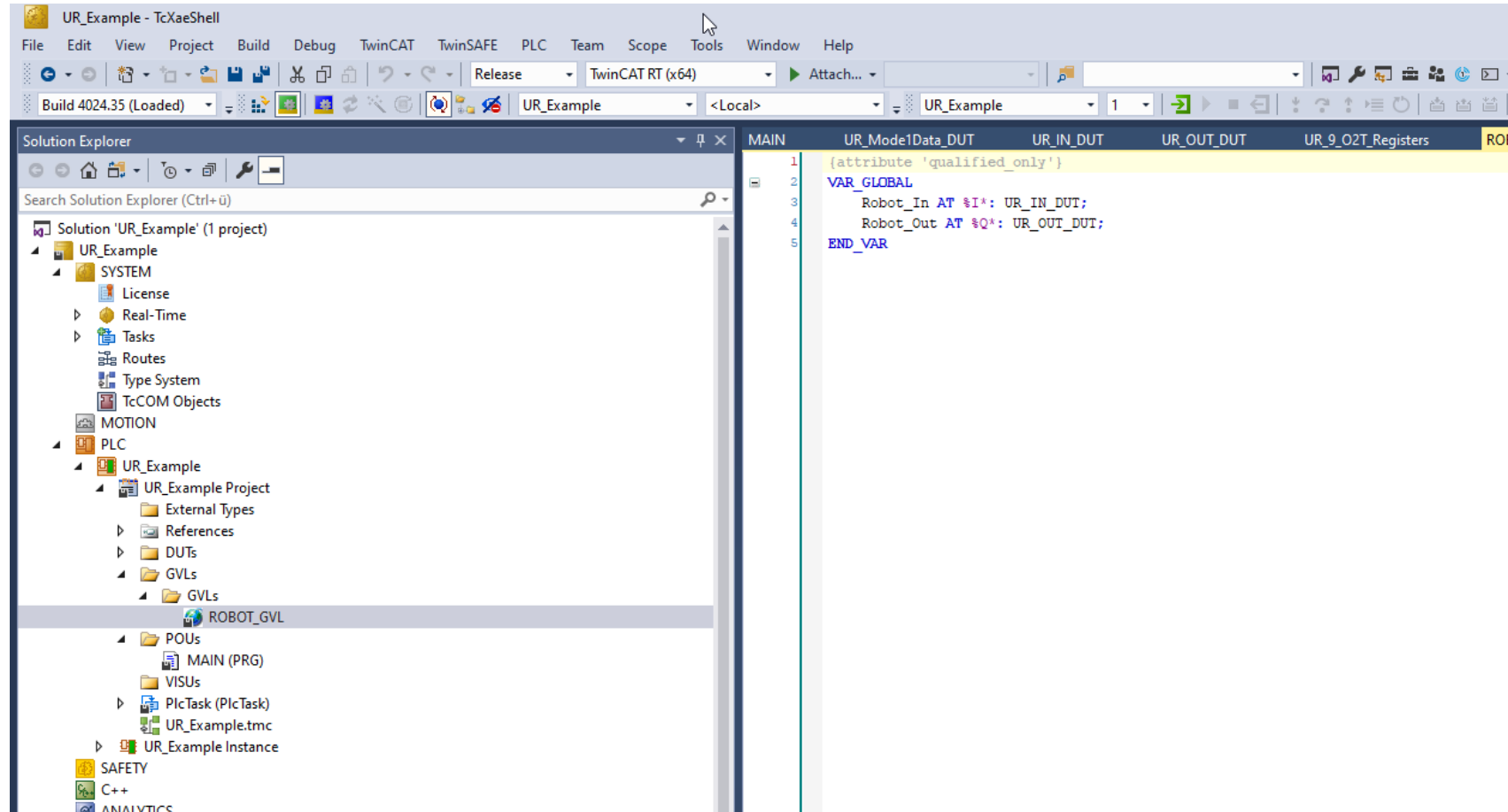
# Right click on plc and create new standard project



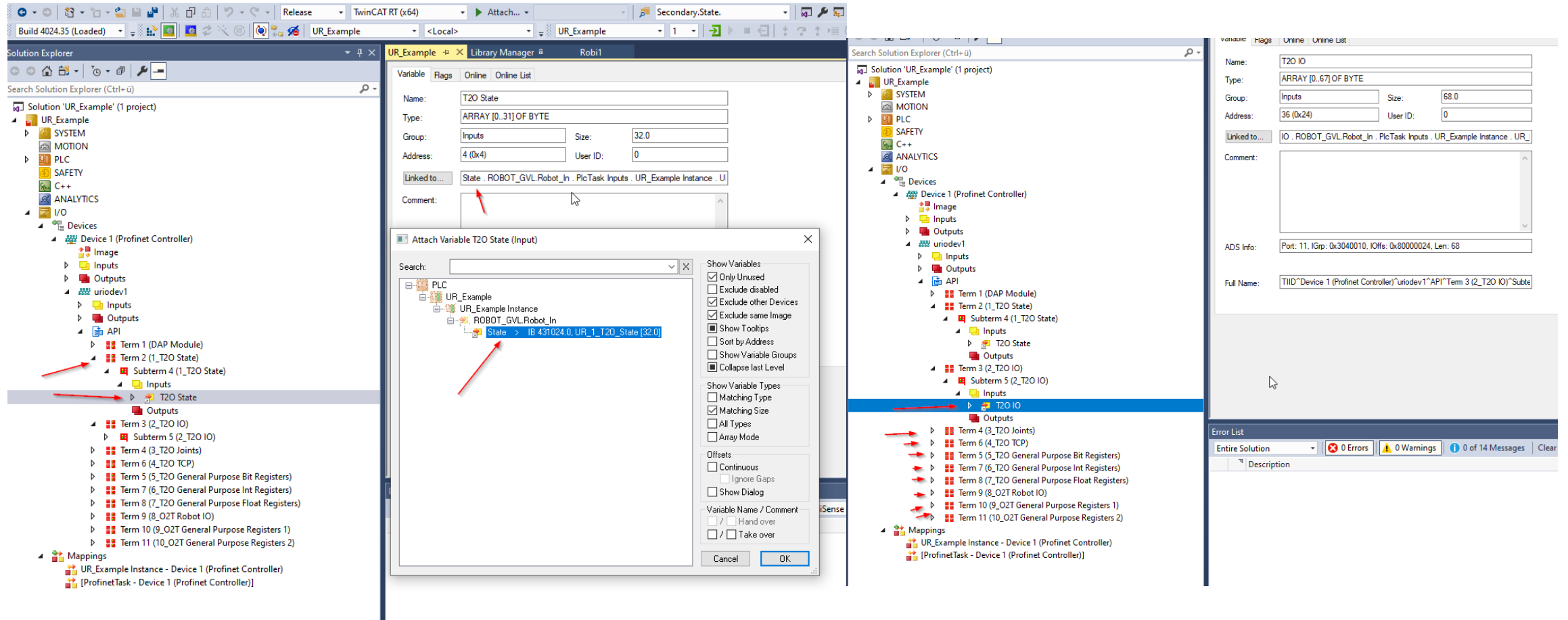
# UDT / DUTS import



# Create some variables for example in GVL



# Map all robot API Terms

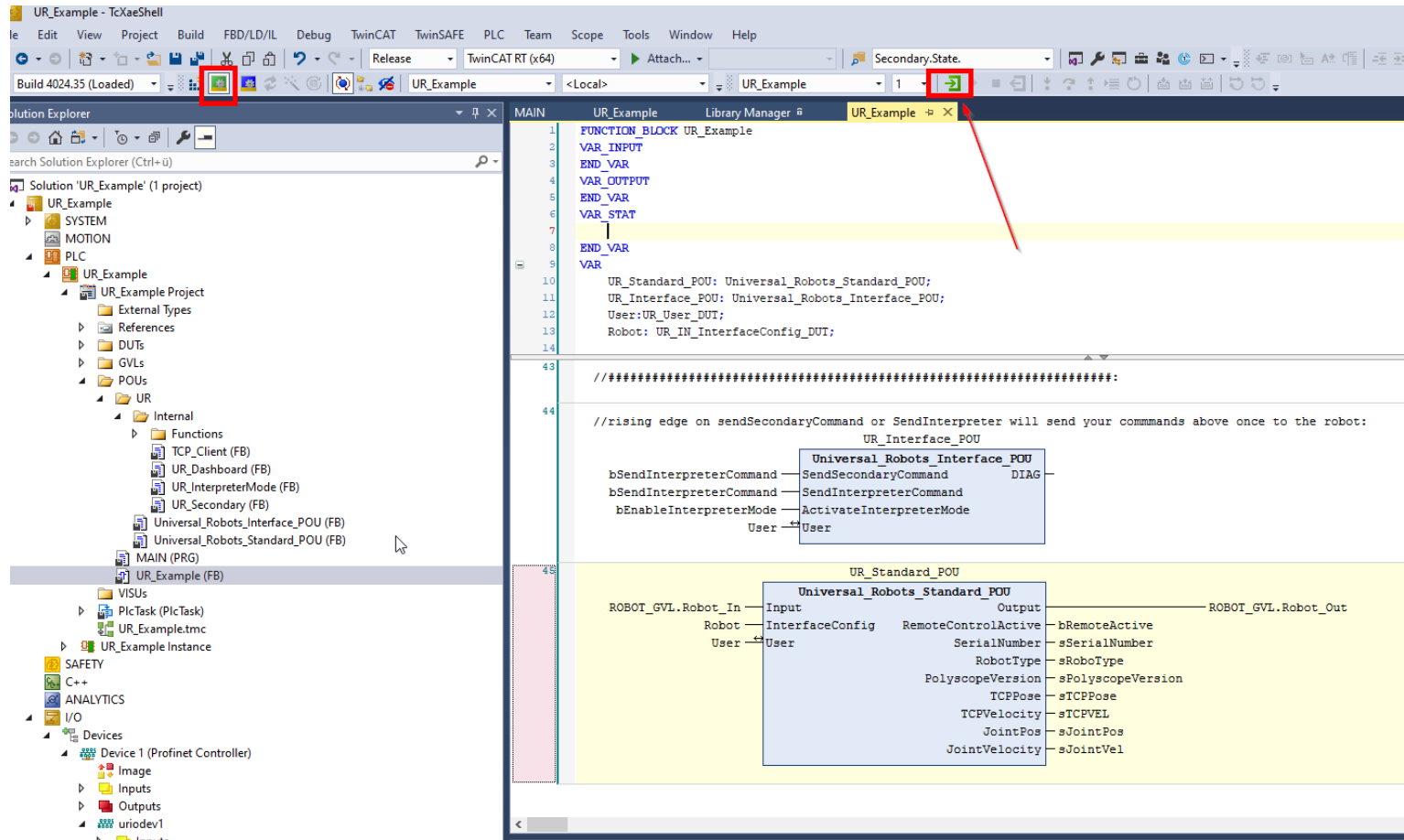


# How to use UR-Example

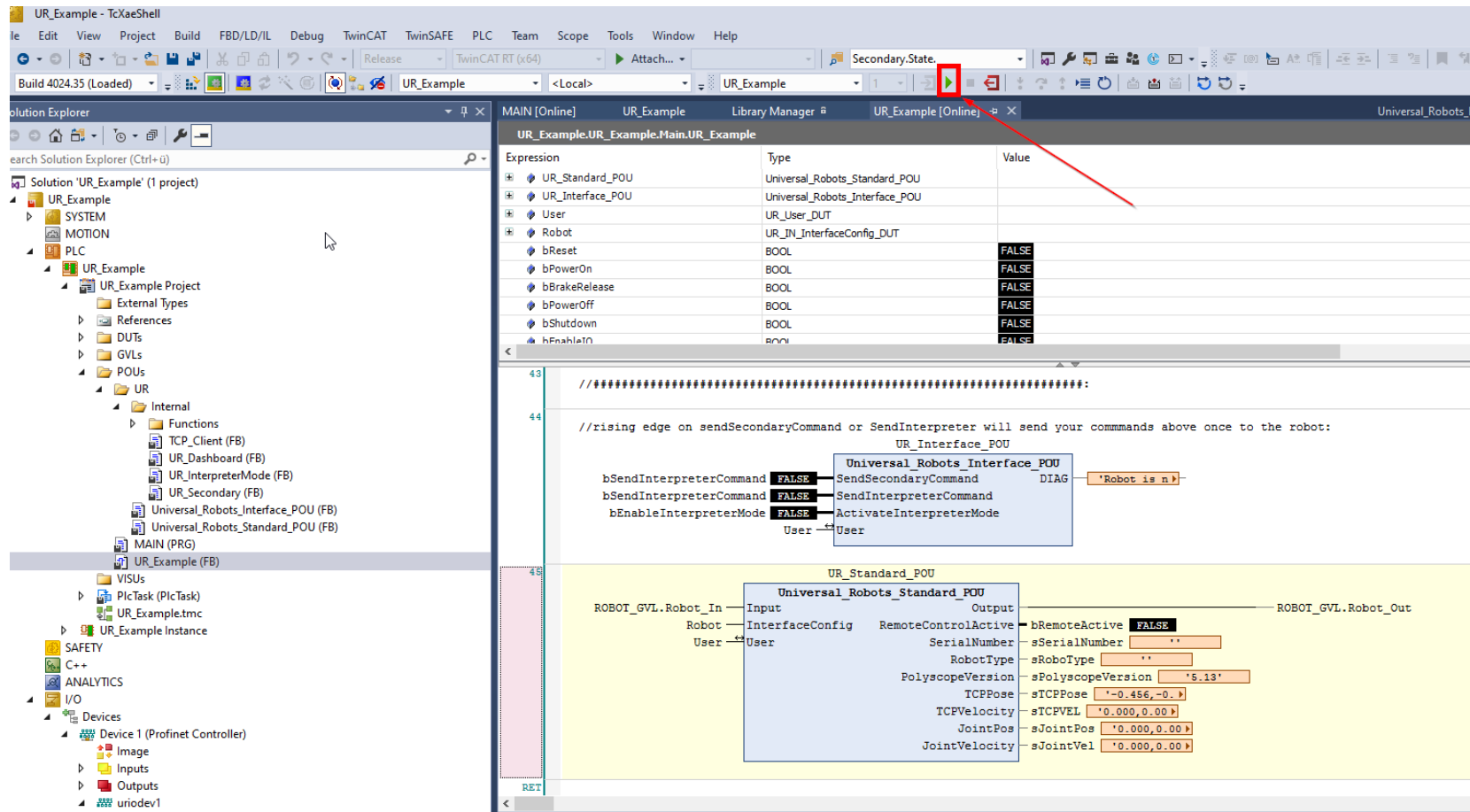
- 1. Install TF6310 as shown in (0. TCP/IP Beckhoff info)
- 2. enable Profinet at your Robot
- 3. set robot to remote control
- 4. open the project
- 5. Set up IP configuration as showed in (2. Profinet Controller settings with UR)
- 6. start the project



# Start project



# Start project



# Reset all connections

The screenshot displays the TwinCAT RT software interface. The top toolbar includes buttons for Release, TwinCAT RT (x64), Attach..., and Secondary.State. The main window shows the 'UR\_Example' project with the 'UR\_Example [Online]' tab selected. The 'Library Manager' pane on the left lists various components, including 'Universal\_Robots\_Interface\_POU [Online]'. The central workspace shows a ladder logic program with the following steps:

- Step 1: Set IP address of Robot: A 'MOVE' block is shown with 'TRUE' on the EN input and 'Robot.IPAddress' on the output. The output value is '10.10.10.1'.
- Step 2: A comment line: `//#####:`
- Step 3: Reset all robot tcp/ip connections: A yellow highlighted area containing the instruction `bReset FALSE<TRUE> bot.ResetConnections FALSE`. A red arrow points to the `FALSE<TRUE>` input.
- Step 4: A comment line: `//#####:`
- Step 5: Initialize robot bits: The instruction `bPowerOn FALSE user.Control.Initialize.PowerOn FALSE` is shown.
- Step 6: The instruction `bPowerOff FALSE user.Control.Initialize.PowerOff FALSE` is shown.

The 'Prepared value' column in the top right shows 'TRUE' for the 'bReset' variable. Red arrows highlight the 'bReset' input in the ladder logic and the 'Prepared value' column.

# Power on robot ( only in remote control)

The screenshot displays the TwinCAT 3 software interface. On the left, the 'Solution Explorer' shows the project structure for 'UR\_Example'. The main window displays the 'MAIN [Online]' project, which is currently in 'Remote Control' mode. The 'Library Manager' tab is active, showing the 'UR\_Example.UR\_Example.Main.UR\_Example' library. Below the library manager, a table lists the expressions and their values:

Expression	Type	Value
UR_Standard_POU	Universal_Robots_Standard_POU	
UR_Interface_POU	Universal_Robots_Interface_POU	
User	UR_User_DUT	
Robot	UR_IN_InterfaceConfig_DUT	
bReset	BOOL	FALSE
bPowerOn	BOOL	FALSE
bBrakeRelease	BOOL	FALSE

The main window also shows the 'MAIN [Online]' project code, which includes the following initialization code:

```
4 // Initialize robot bits:
5
6 bPowerOn FALSE -- user.Control.Initialize.PowerOn FALSE
7
8 bPowerOff FALSE -- user.Control.Initialize.PowerOff FALSE
9
10 bBrakeRelease FALSE -- user.Control.Initialize.BrakeRelease FALSE
11
12 bShutdown FALSE -- user.Control.Initialize.ShutDown FALSE
13
14 // Enable IO control and IO control example:
```

Red arrows point from the code to the corresponding variables in the Library Manager table.

# Connected and ready to use

