TwinCAT 3 PLC Training

Module 3 – First Project

Overview of Course

BECKHOFF

Introduction and Quick Start

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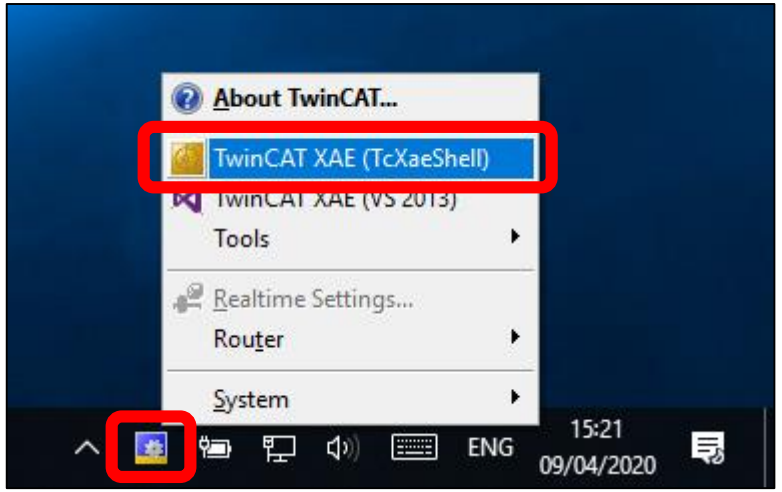
2. TwinCAT 3.1 Installation
3. **First Project**
4. Setting the Cycle Time

3.1 Introduction to TcXAEShell

BECKHOFF

- After installation of TwinCAT 3.1 is complete and the computer has rebooted, the Cog is added to your System Tray.



- This provides a convenient shortcut menu to interact with TwinCAT, and to start up TcXAEShell, which is the development environment used to develop TwinCAT applications.

- Click on the Cog and select TwinCAT XAE (TcXaeShell).

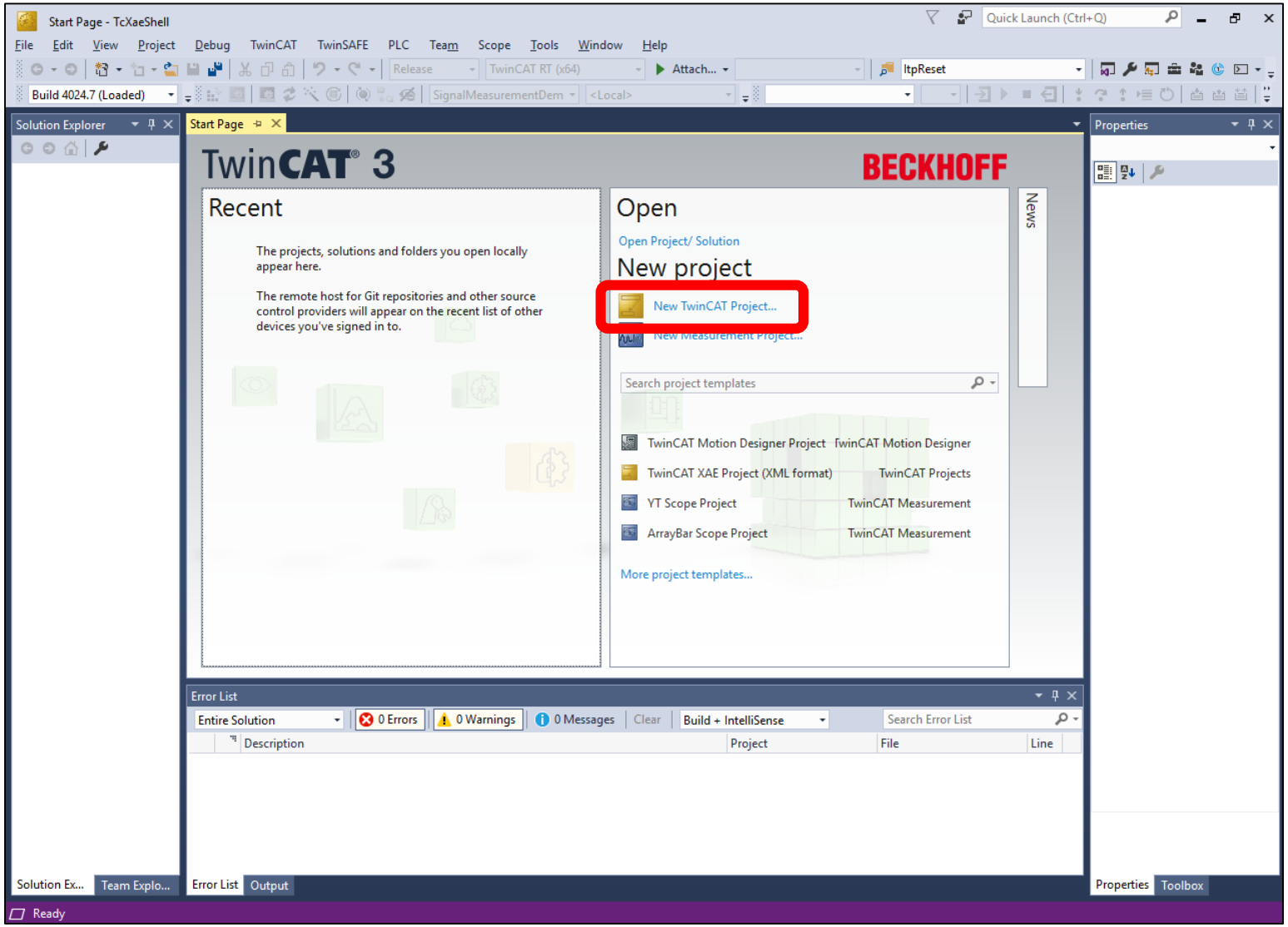
3.1 Introduction to TcXAEShell

BECKHOFF

After a few seconds, TcXaeShell will open to the start page, allowing easy access to the last few projects.

On the right hand side, select

New TwinCAT Project.



3.1 Introduction to TcXAEShell

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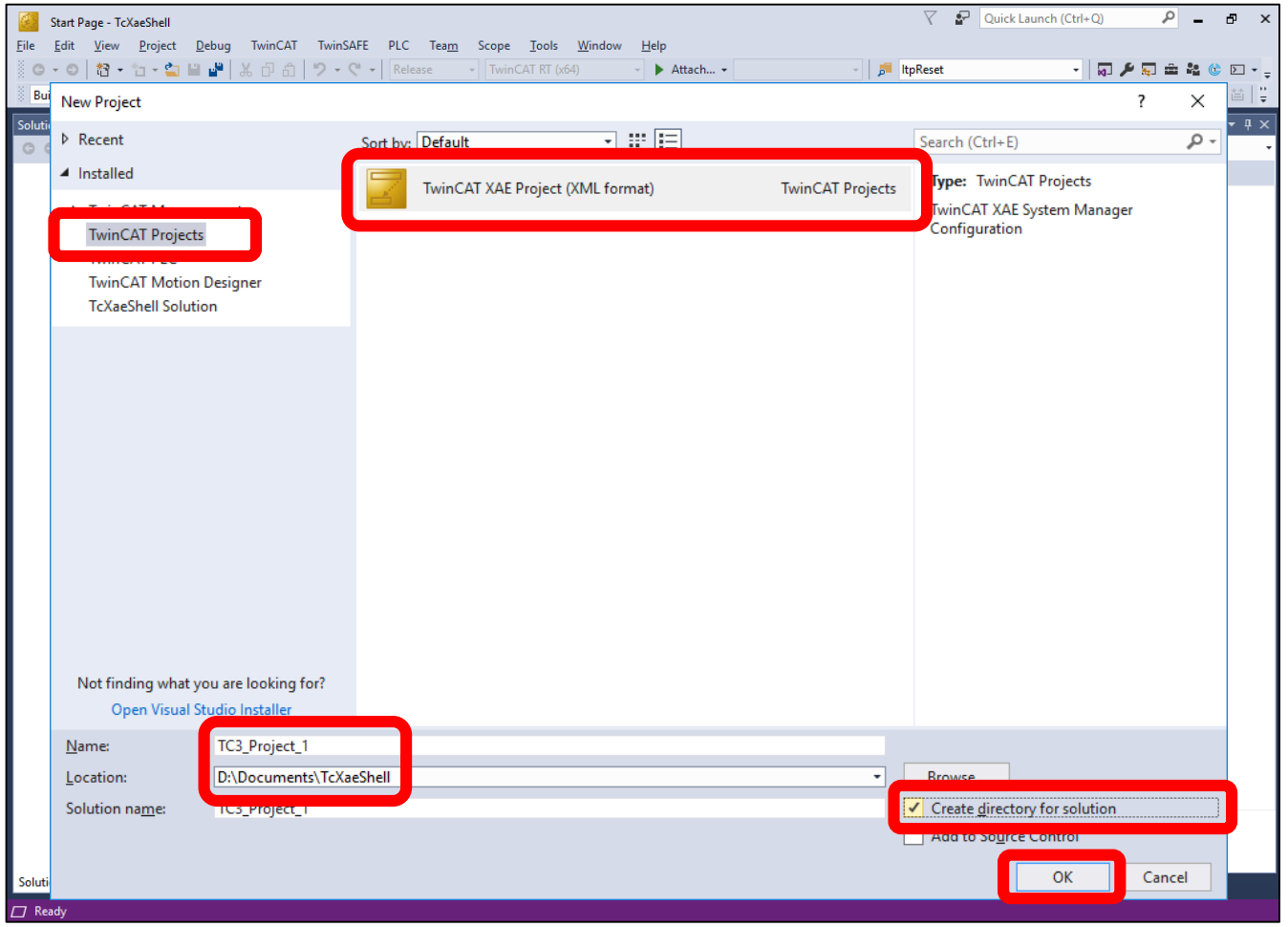
The New Project Wizard will open

1. Select TwinCAT Project in the collection on the left-hand side.
2. Select TwinCAT XAE Project (XML Format) on the right-hand side.
3. Give your project the name TC3_Project_1.
4. Tick the Create directory for solution checkbox.
5. Click on OK.



3.2 First PLC Project

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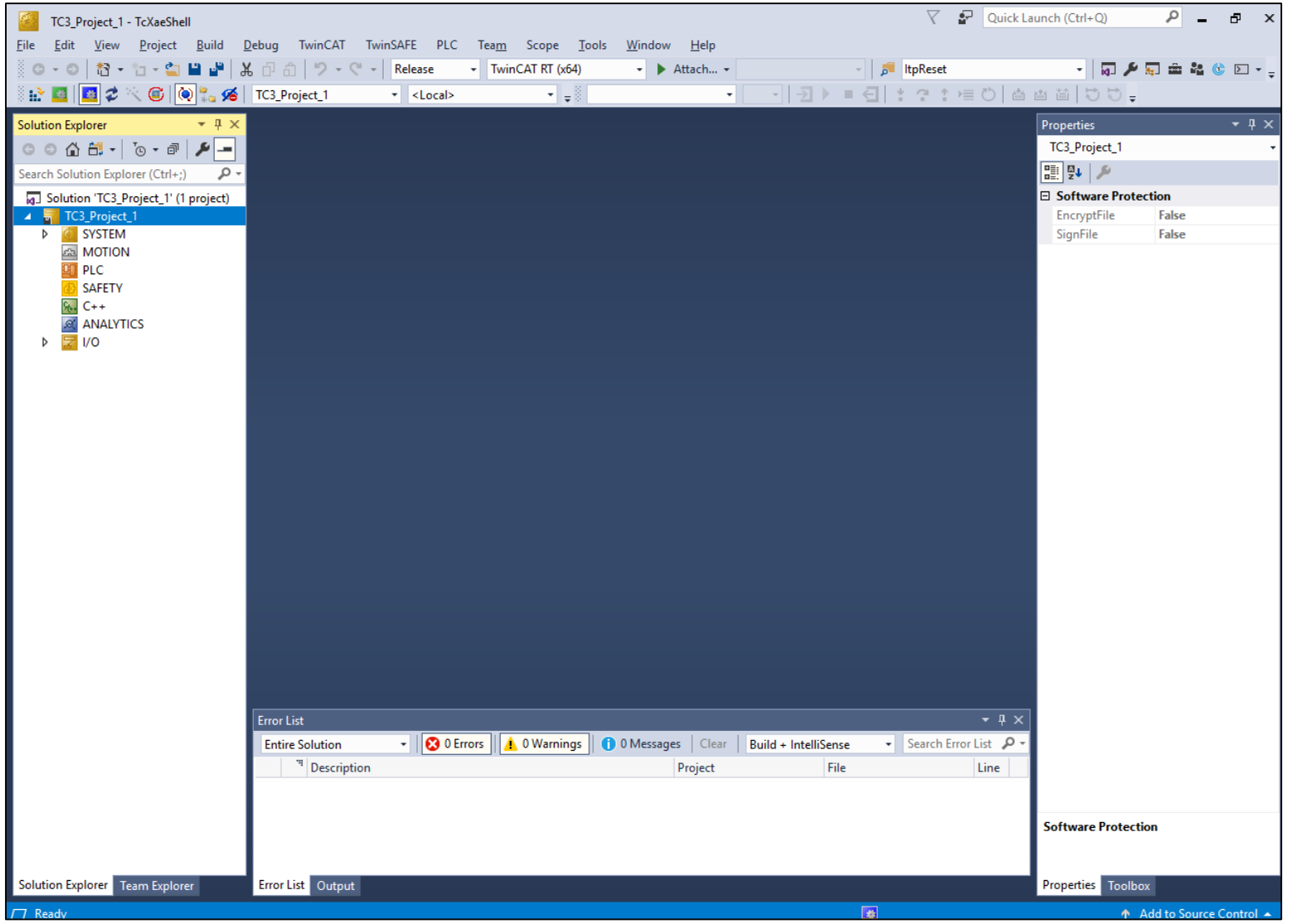
The different parts of the project are accessed in the Solution Explorer window on the left.

Compile and runtime errors are displayed in the Error List at the bottom.

Properties of selected items and the Toolbox are available in the window on the right.



3.2 First PLC Project

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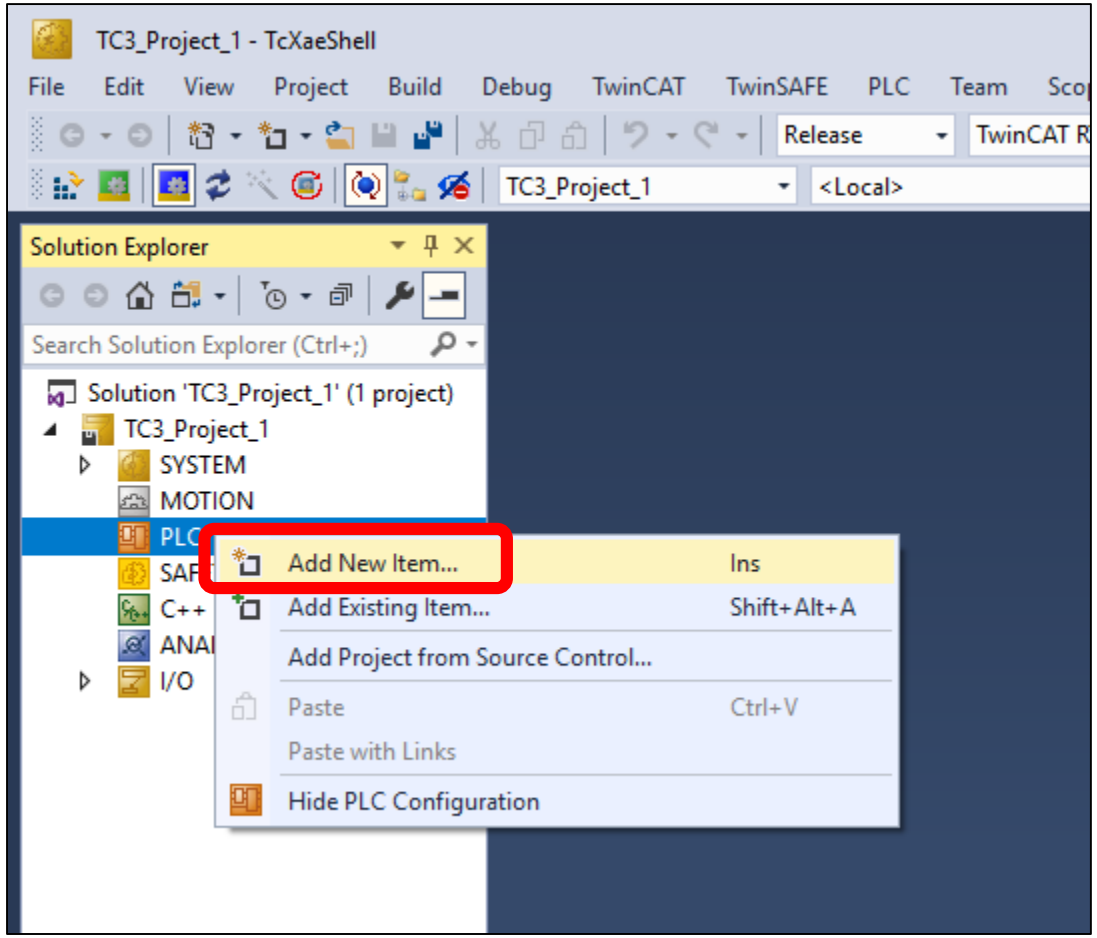
At this point, the Solution is just an empty framework, and doesn't contain a PLC project.

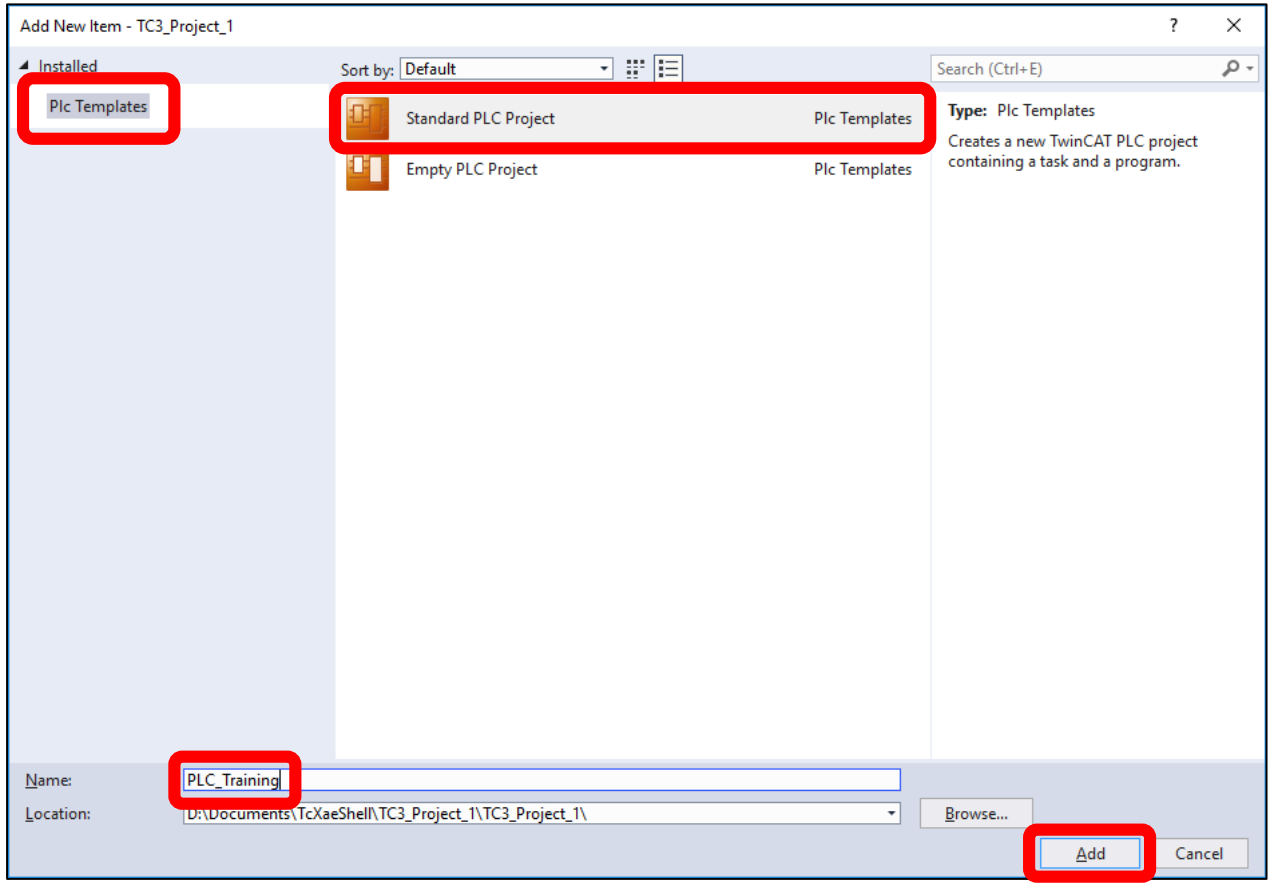
Add a PLC Project by right-clicking on PLC in the solution explorer and selecting Add New Item…



BECKHOFF

This opens up the Add New Item wizard

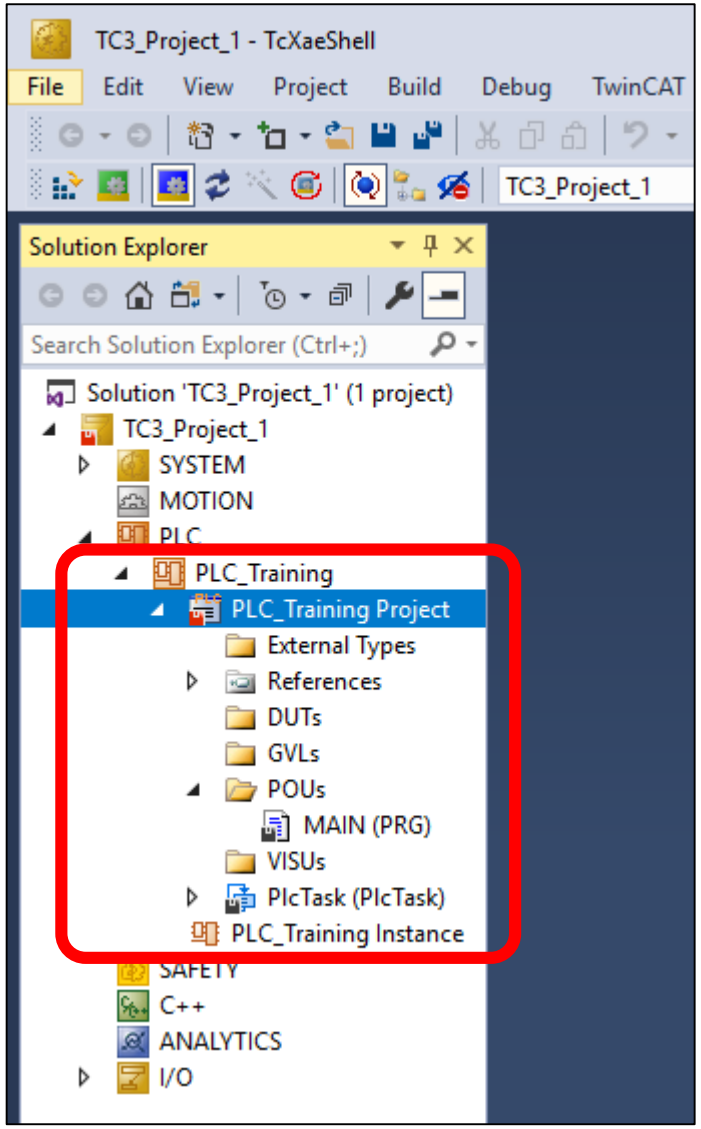
1. Select Plc Templates in the collection on the left-hand side.
2. Select Standard PLC Project on the right-hand side.
3. Give the PLC project the name PLC_Training.
4. Click the Add button.



Your Solution should now contain a PLC Project framework.

The various items in the tree can be expanded by clicking on the arrow to the left of the collapsed item.

The PLC Project contains everything we need to run PLC code, including an empty Program called Main.



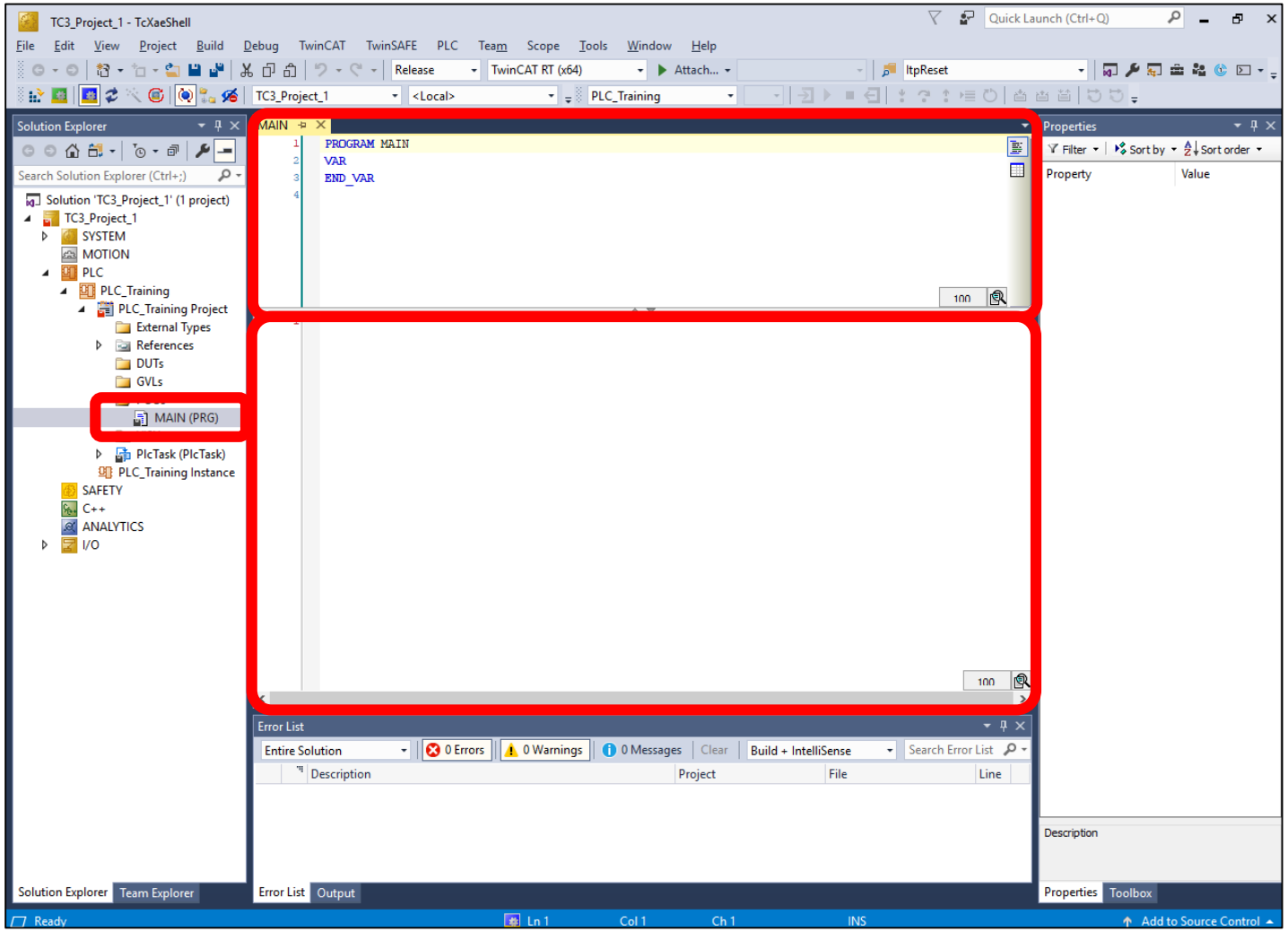
BECKHOFF

Double-click MAIN (PRG) to reveal the coding interface in the middle window.

The coding interface is separated into two halves:

- The top half is for declaring variables.
- The bottom half is for editing program logic.

Before we write any logic, we are going to declare some Global Variables that represent some digital inputs.



3.2 First PLC Project

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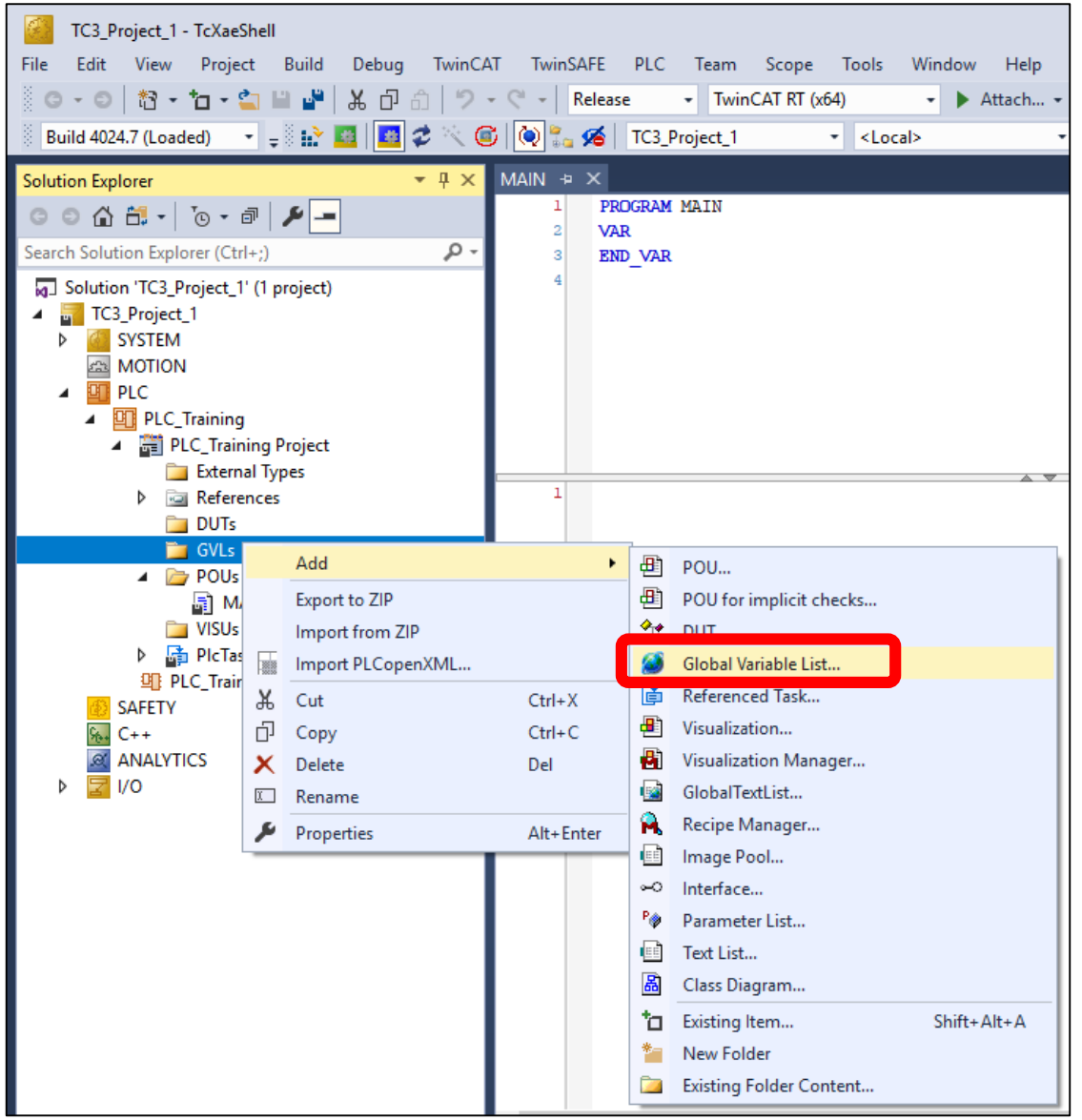
Global Variables are declared and stored in a Global Variable List, or GVL.

To add a GVL:

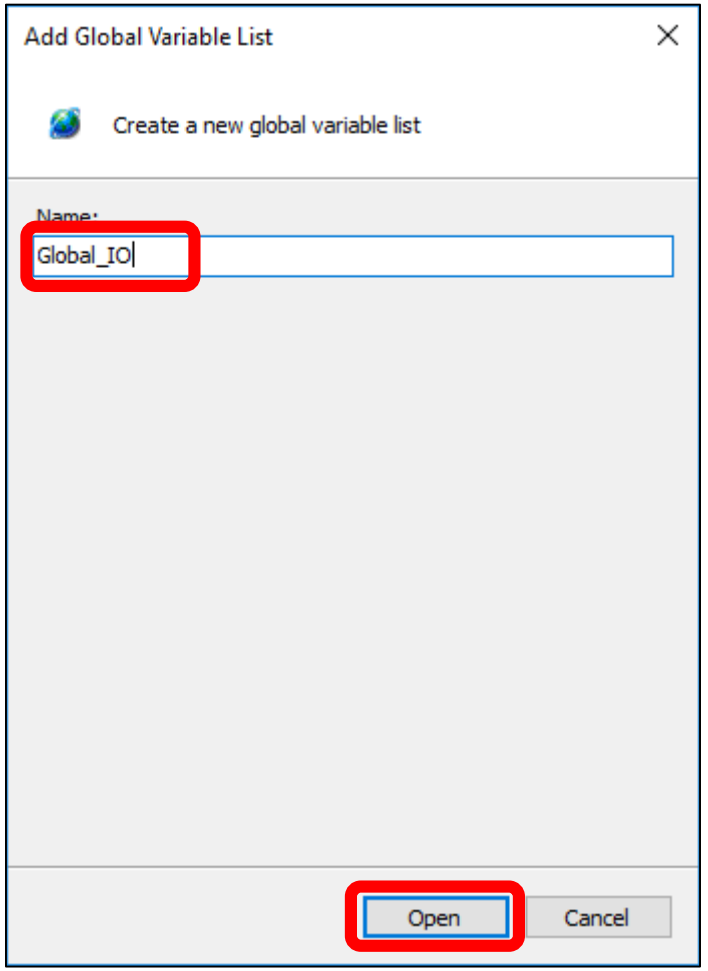
- Right-click on the GVLs folder.
- Select Add → Global Variable List.



BECKHOFF

When the Add Global Variable List wizard appears:

- Set the name to Global_IO.
- Click Open.



3.2 First PLC Project

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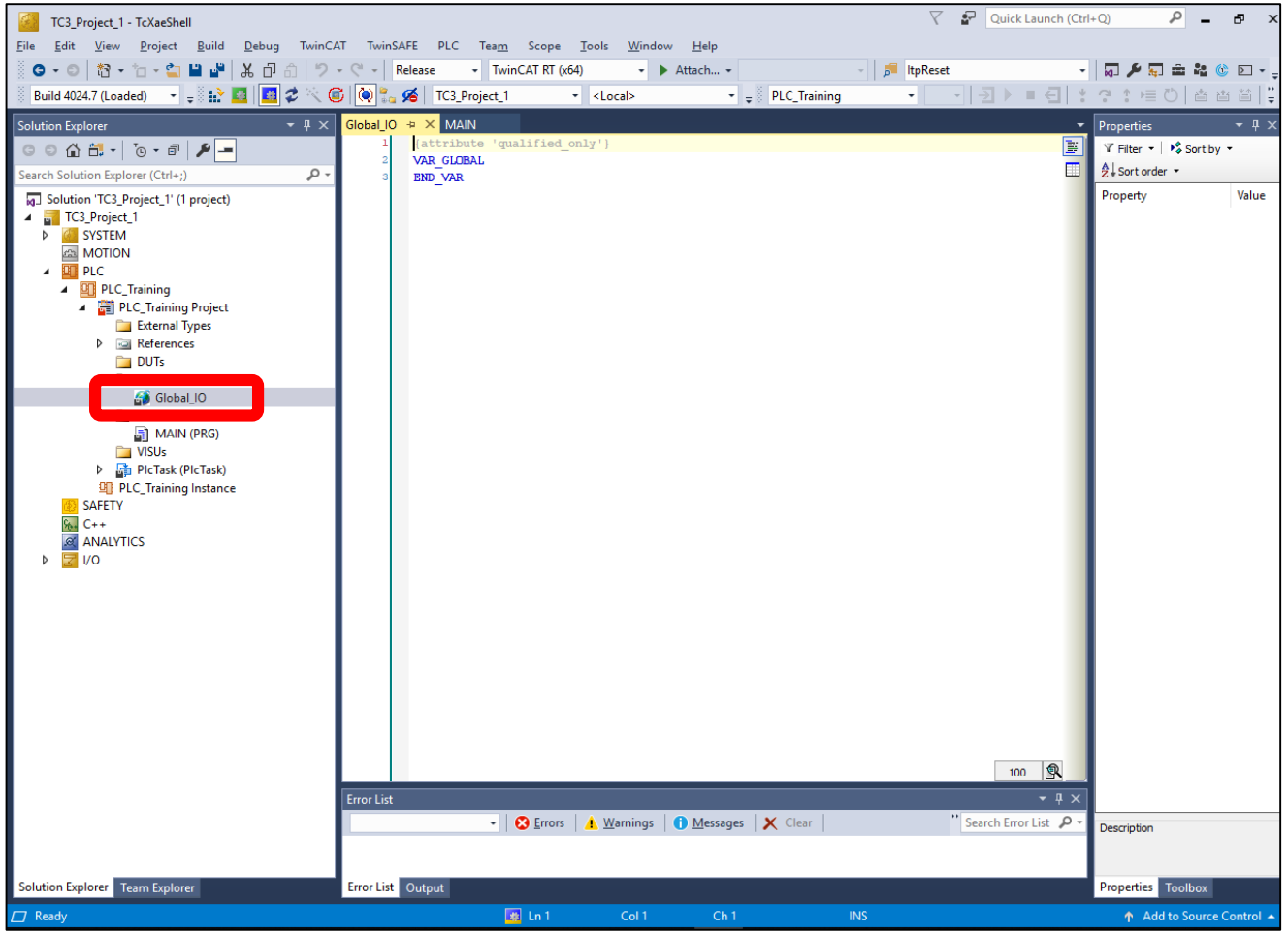
The new Global Variable List is automatically opened after being created.

If you want to access it in the future, simply double-click on the Global_IO node in the GVLs folder in the Solution Explorer.

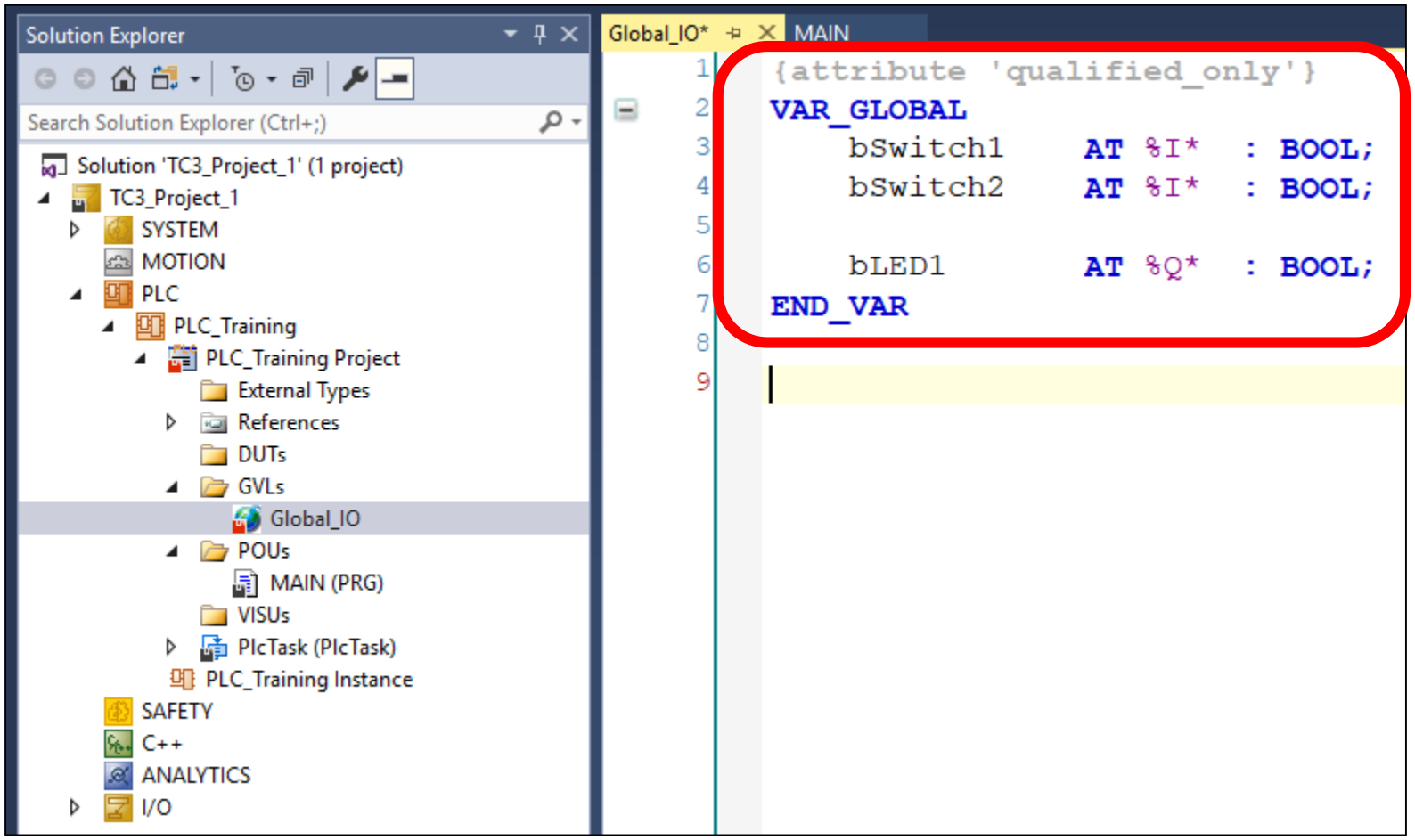


BECKHOFF

Add two new Input variables, taking care to copy the syntax exactly.

These two variables will be accessible from anywhere in our PLC code.

The {attribute ‘qualified_only’} at the top means that the variable names must be prefixed with the GVL name Global_IO whenever we reference them.



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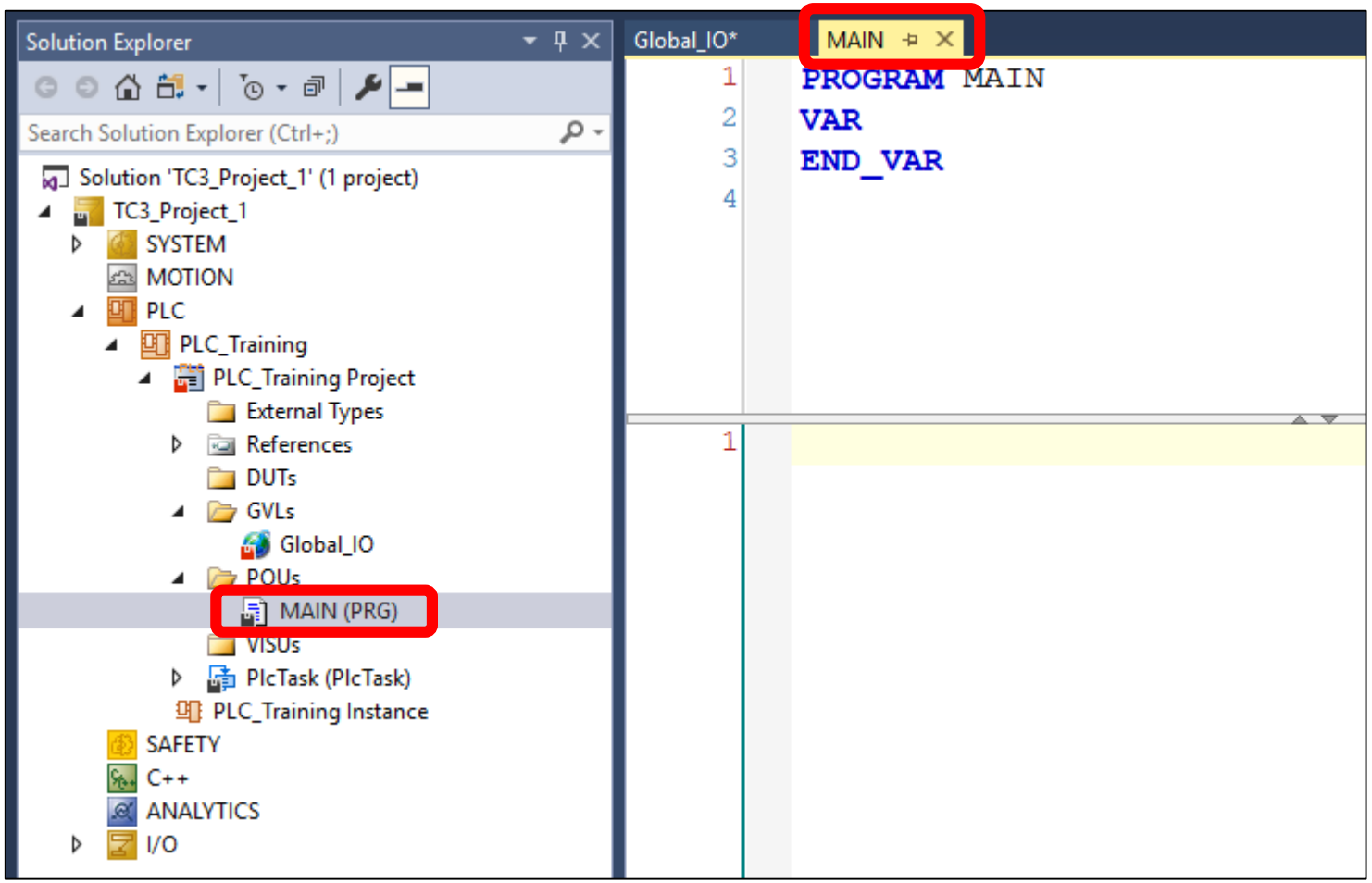
Go back to your MAIN program by double-clicking the node in the Solution Explorer, or by selecting the open tab at the top of the Editing Window.



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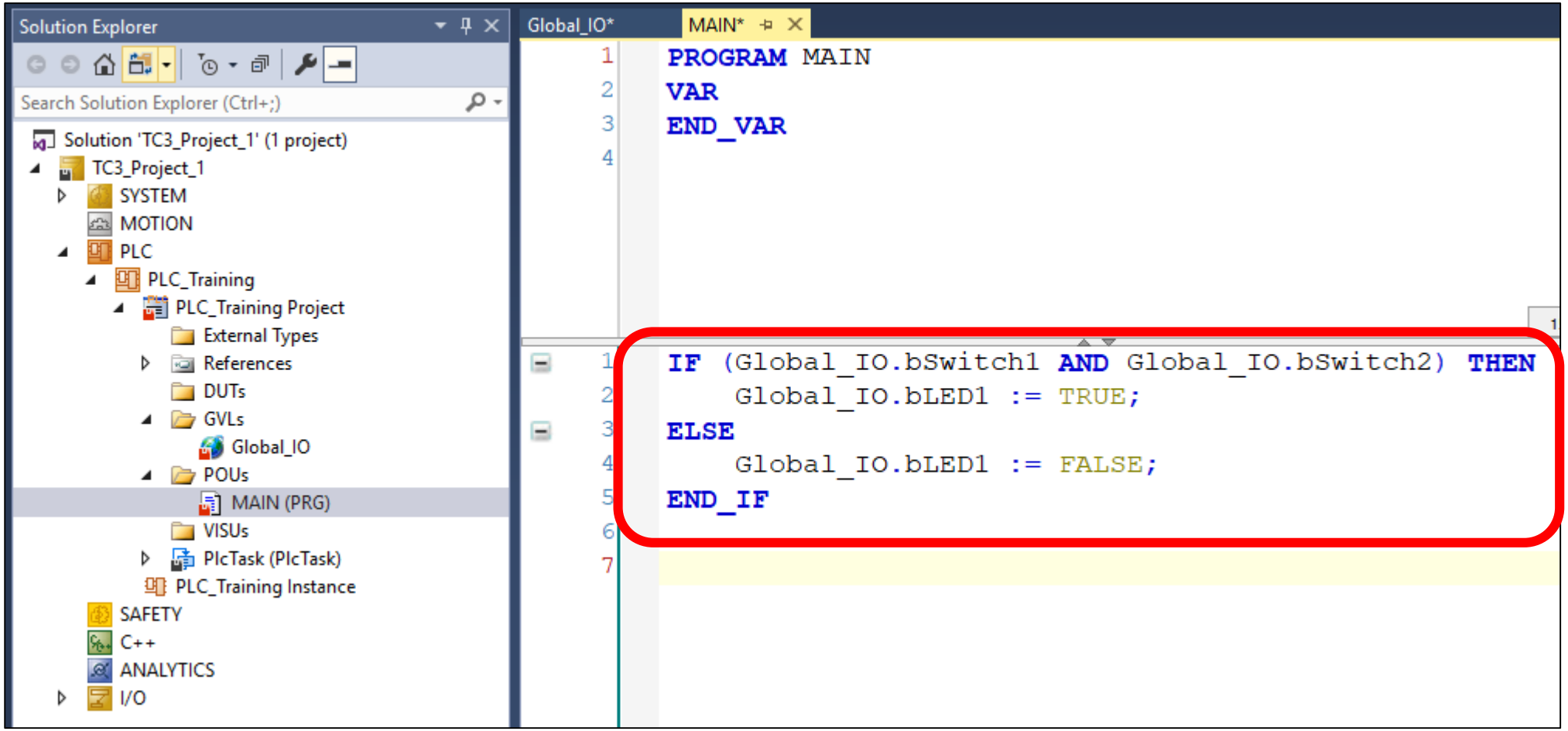
Add the code to implement an AND gate shown below into the bottom window within the MAIN program.

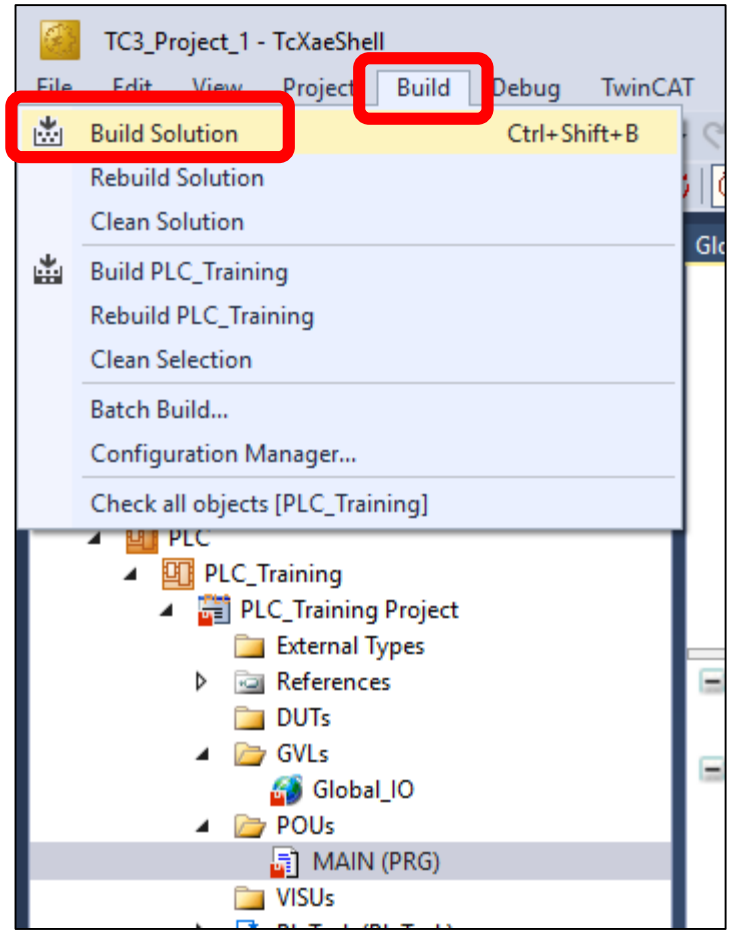


BECKHOFF

Let’s compile the code to check for errors and get it ready to be executed.

- Select Build from the menu across the top of the TcXAEShell window.
- Then select Build Solution.

An easy keyboard shortcut to use in future whenever you want to build or compile your code is Ctrl+Shift+B.

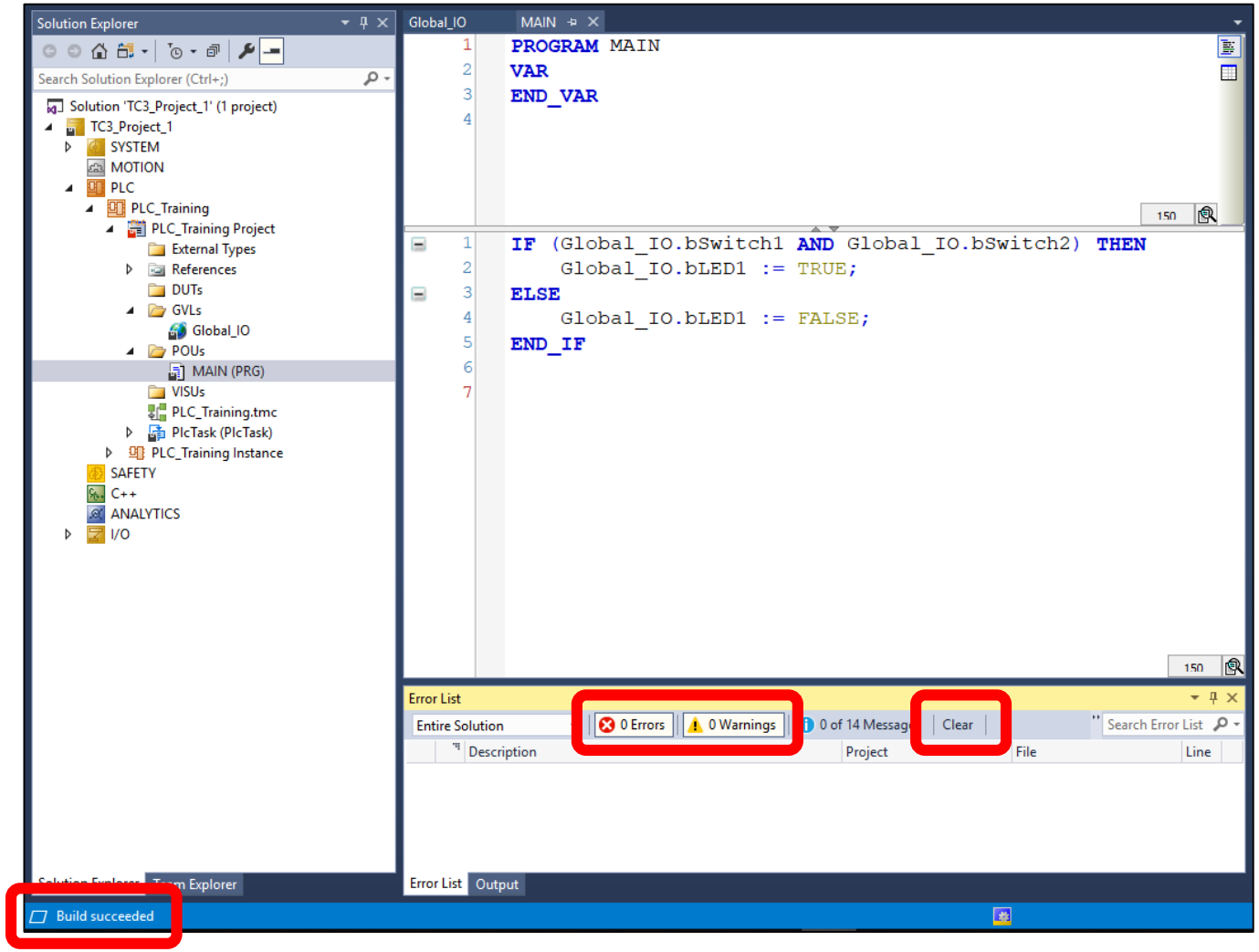


BECKHOFF

If there aren't any errors in your code, you should see "Build succeeded" in the bottom left-hand corner of Visual Studio, as well as "0 Errors" in the Error List.

If you do have errors, they will appear in the error list, and double-clicking on the error will move the editing cursor to the line of code that has the error.

Clearing the list before building helps identify compile errors, if the XAR or hardware is also reporting errors.



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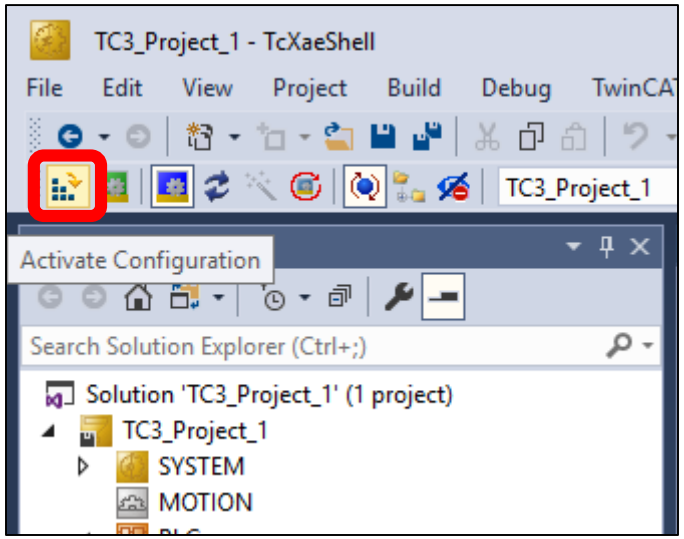
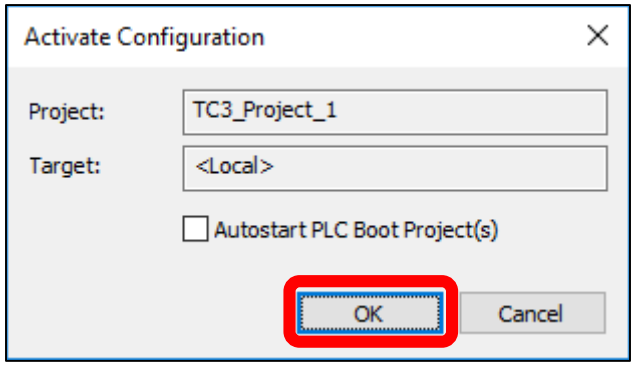
Since this is a brand new project, the project structure will need to be sent to the TwinCAT XAR which executes your application.

This process is called Activating, and is performed by clicking the  Activate button in the toolbar.

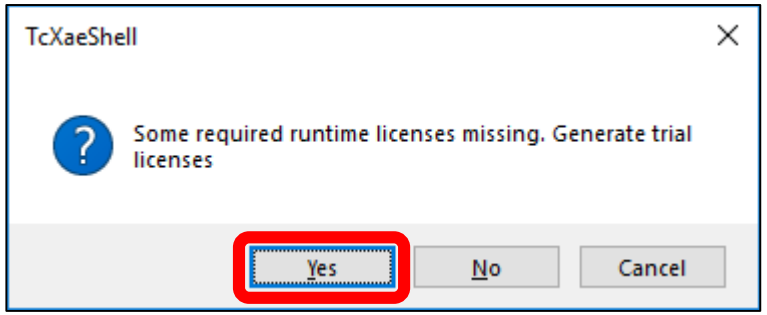


Activating your project will stop any PLC code that is running, so a warning / confirmation dialog box opens asking if you are sure you want to continue.

No PLC code is running at the moment, so click OK to continue.

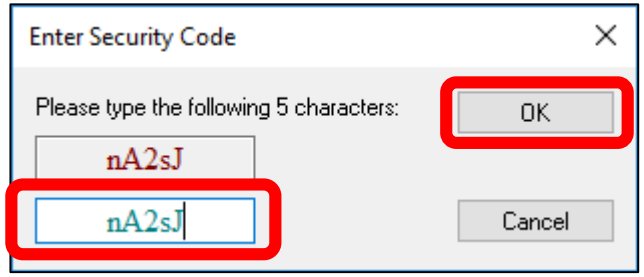


Since we're running our PLC code on a normal computer, you won't have any licenses installed.

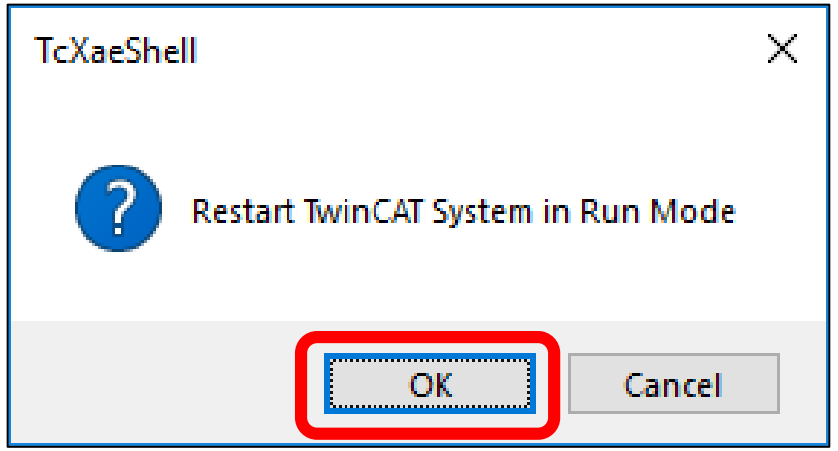


TwinCAT 3 allows the use of trial licenses that last 7 days for almost all available features. Once the 7 day trial is over, a new trial license can be generated as many times as necessary to complete development of your application.

Whenever you activate your project and XAE discovers a missing license, it will prompt you to generate a trial license, so click Yes to continue, and copy the code from the top textbox into the lower textbox exactly and click OK.



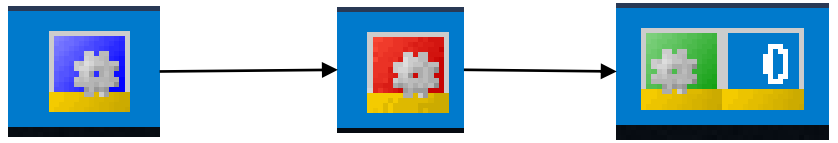
Finally, TwinCAT asks if it's OK to restart the XAR into Run Mode.



This is required in order to start up the XAR in preparation to execute your application.

Please click on OK to continue.

At the bottom of the TcXAEShell window, you should see a Blue cog icon change to Red and then Green a few seconds later. This indicates that TwinCAT XAR is in Run Mode.



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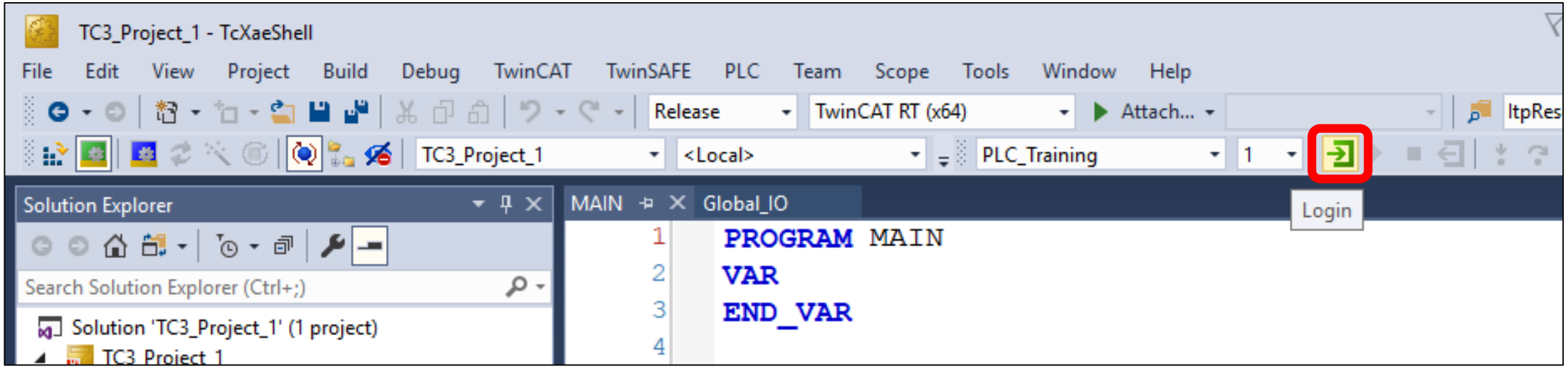
Now that the XAR is in Run Mode, we can connect and download our PLC code to the PLC software component that has been created for us inside the XAR.

This is called “Logging in”, and is done by clicking the Login button in the toolbar.



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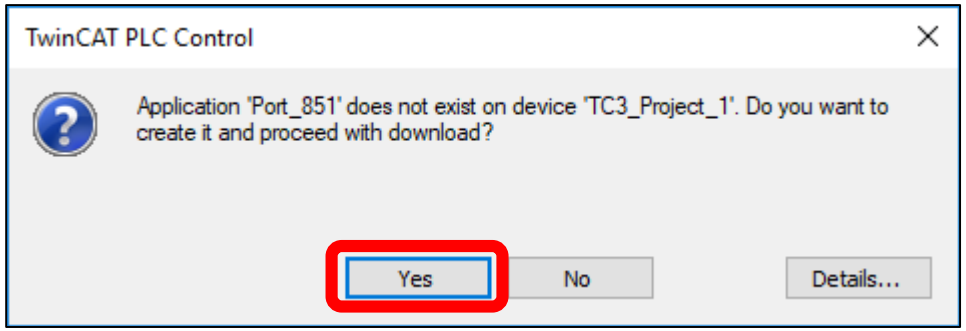
The first time we log in after activating, TwinCAT will ask to create the Application inside the PLC block.

Click Yes to continue.

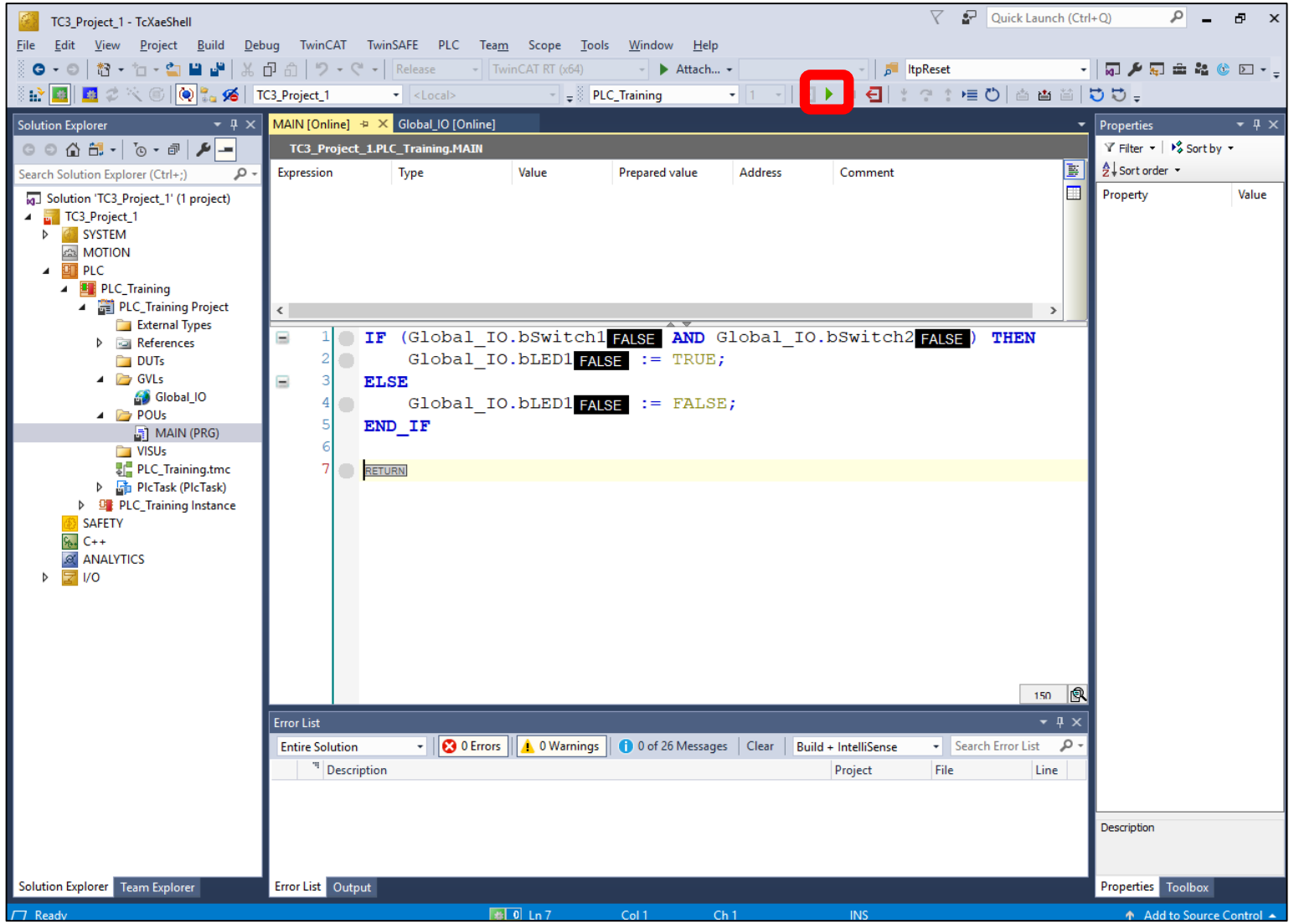


3.2 First PLC Project

BECKHOFF

After logging in, the PLC application has been downloaded into the XAR and is ready to run.

Start the PLC by clicking on the  Start button in the toolbar.



3.2 First PLC Project

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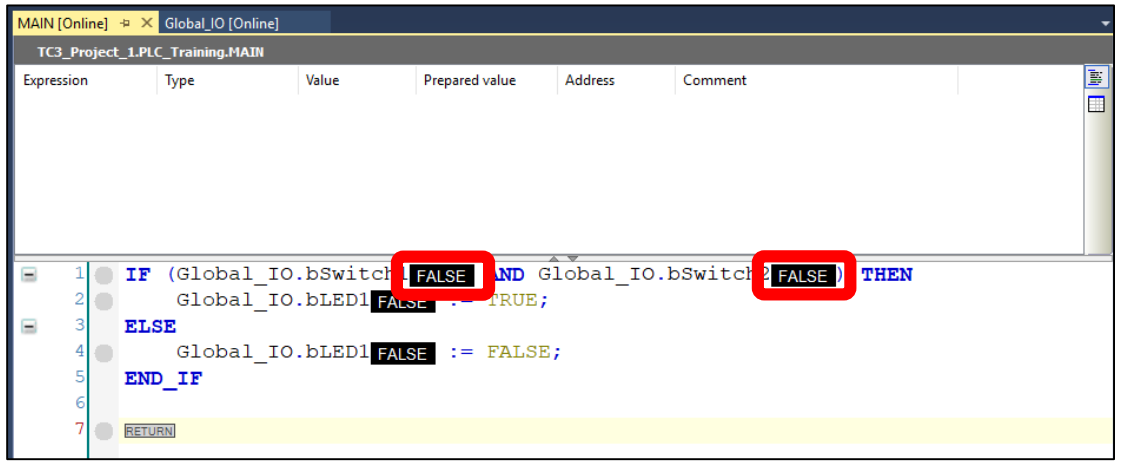
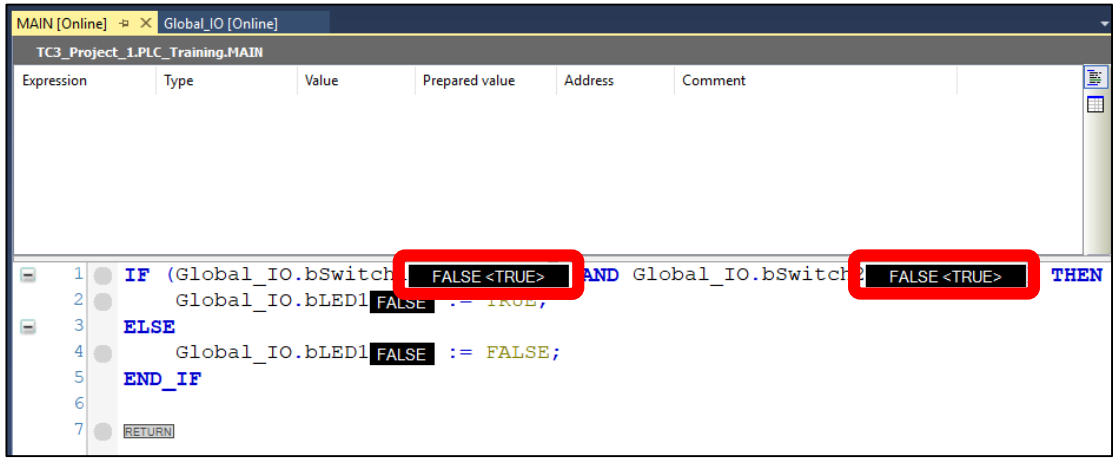
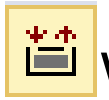
Now that you're logged in and the PLC is running, the values of the variables are displayed next to each variable.



Double clicking on the FALSE value to change it to FALSE <TRUE> shows that a modification to that value is queued up. Set both bSwitch1 and bSwitch2 to have a queued value of TRUE.



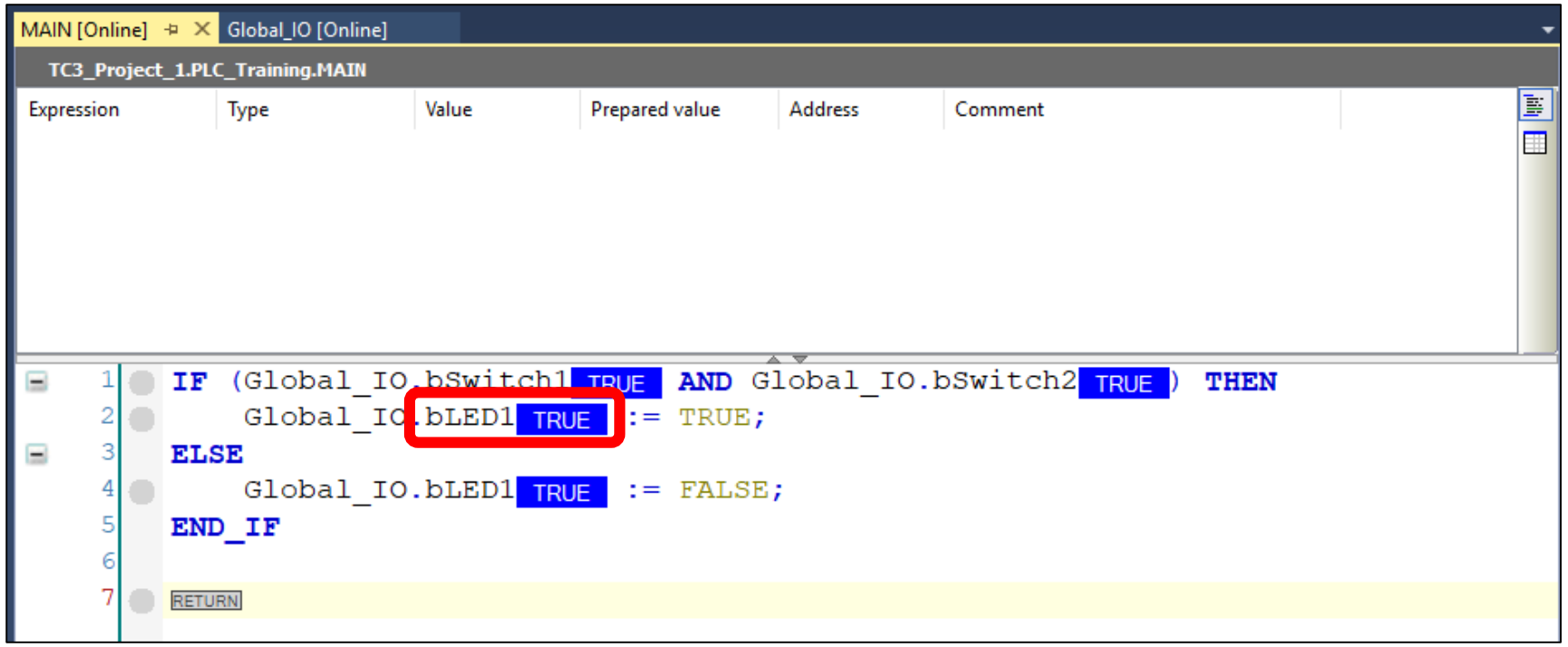
To send all the queued writes to the PLC, click on the  Write Values button in the toolbar.

BECKHOFF

Now, bSwitch1 and bSwitch2 are both TRUE, and as dictated by the logic, bLED1 turns on as well.

Experiment and validate the expected logic by setting bSwitch1 and bSwitch2 to True and False alternately.

bLED1 should only be True when both bSwitch1 and bSwitch2 are set to True.



Module 3 Recap

BECKHOFF

In this module we covered:

- Creating a new TwinCAT XAE project,
- Creating a new PLC Project,
- Adding new GVLs,
- Activating the configuration,
- Logging in,
- Running PLC code in Simulation.

Contact

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