Step-by-step set-up procedure for Hardware Configuration between Beckhoff PLC CX2020 and IAI controllers for EtherCAT Motion control

Version 1 / 01.06.2022

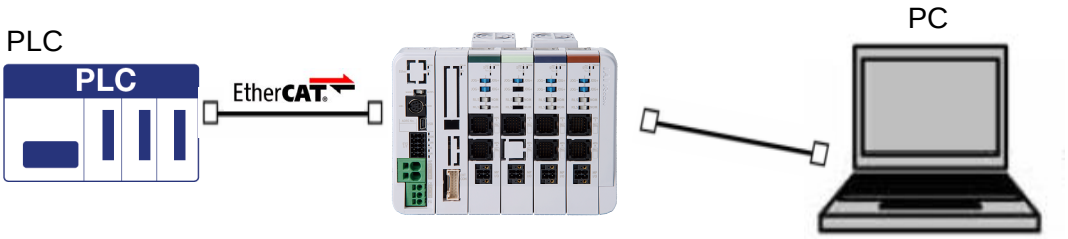
Note: The procedure will be shown with the following devices.

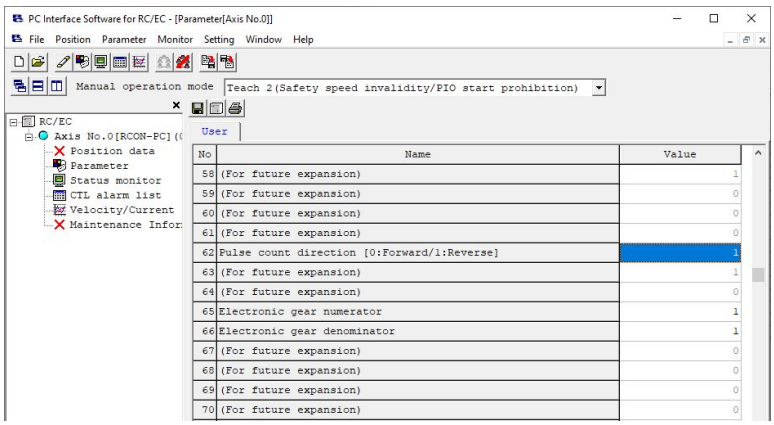
PLC: Beckhoff CX2020
Software: TwinCAT 3

1. Parameter setting of IAI controller

IAI controller needs to be set up properly in the parameter setting before starting setting of the PLC.
The procedure of the parameter setting in detail depends on the controller model.
Configuration of IAI controller can be done in the PC Interface Software and Gateway Parameter Configuration Tool with the communication cable.
The parameters must be set for EtherCAT Motion communication as follows. Please refer to the operation manual for details.

The MANU/AUTO switch on IAI controller should be turned to MANU.





1-1: SCON controller

SCON controller (SCON-CB/CGB-ECM)

Open the PC Interface Software and set the parameters as following.

i. Parameter No. 5 (Home direction)

5	Home direction [0:opposite/1:default]	1

Set the home position to either motor side or opposite side of motor.
Home direction should be same as pulse count direction (parameter No. 62) normally. Otherwise, operating coordinate of PLC does not match the mechanical coordinate of the actuator (refer to the operation manual for EtherCAT Motion).

ii. Parameter No. 62 (Pulse count direction)

62	Pulse count direction [0:Forward/1:Reverse]	1

Set the same value as the one of parameter No. 5.

iii. Parameter No. 65 and 66 (Electronic gear, numerator and denominator)

65	Electronic gear numerator	1
66	Electronic gear denominator	1

Keep the factory setting.

iv. Parameter No. 85 (Feldbus node address)

85	Fieldbus node address	0

Keep the factory setting.

v. Parameter Nr. 87 (Network type)

87	Network type	12

Keep the factory setting.

Note: Don’t change the value.

1-2: MCON controller

If you use MCON controller, you need to configure the controller by using

1-2-1: "PC Interface Software"
1-2-2: "Gateway Parameter Configuration Tool".

Please see the detail relating to the set-up in the manual.

MCON controller (MCON-C/CG-ECM)

1-2-1: PC Interface Software

Open the PC Interface Software and set the parameters as following.

i. Parameter No. 5 (Home direction)

5	Home direction [0:opposite/1:default]	1

Set the home position to either motor side or opposite side of motor.
Home direction should be same as pulse count direction (parameter No. 62) normally. Otherwise, operating coordinate of PLC does not match the mechanical coordinate of the actuator (refer to the operation manual for EtherCAT Motion).

ii. Parameter No. 62 (Pulse count direction)

62	Pulse count direction [0:Forward/1:Reverse]	1

Set the same value as the one of parameter No. 5.

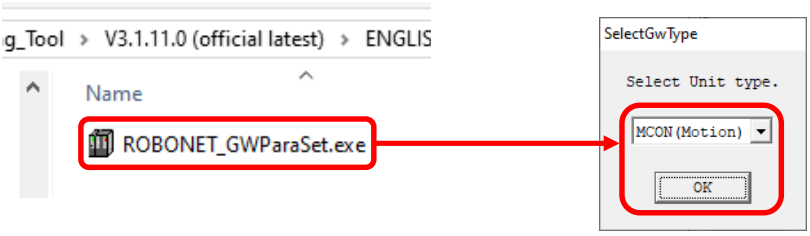
iii. Parameter No. 65 and 66 (Electronic gear, numerator and denominator)

65	Electronic gear numerator	1
66	Electronic gear denominator	1

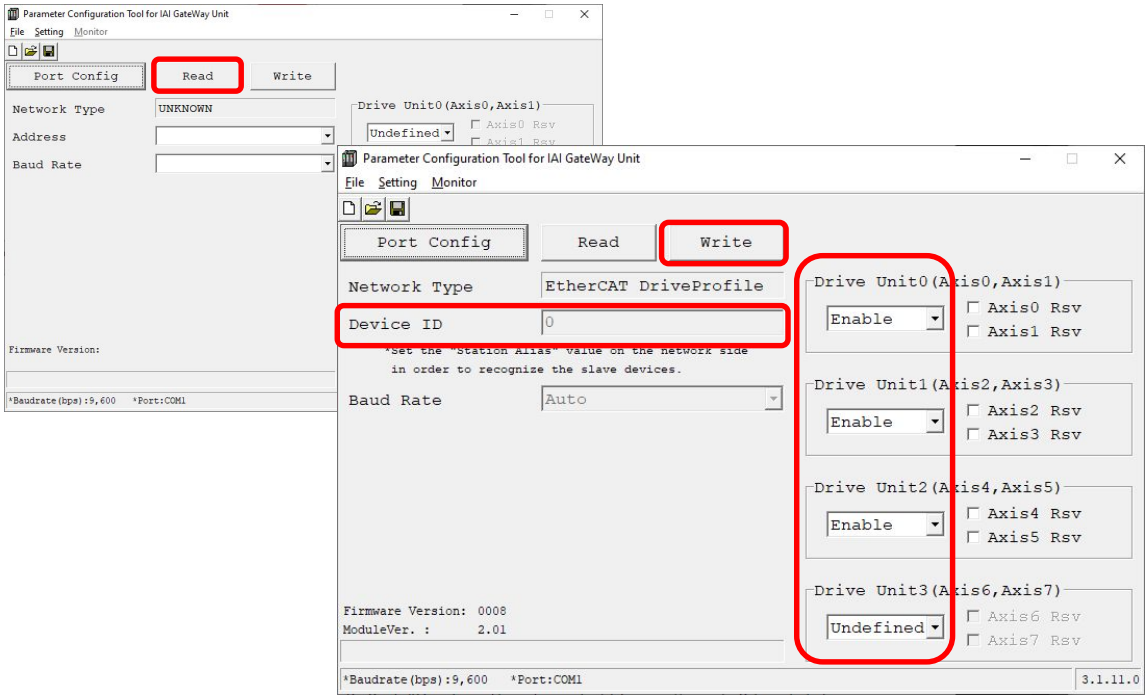
Keep the factory setting.

1-2-2: Gateway Parameter Configuration Tool

Open the Gateway Parameter Configuration Tool by selecting “MCON (Motion)”.



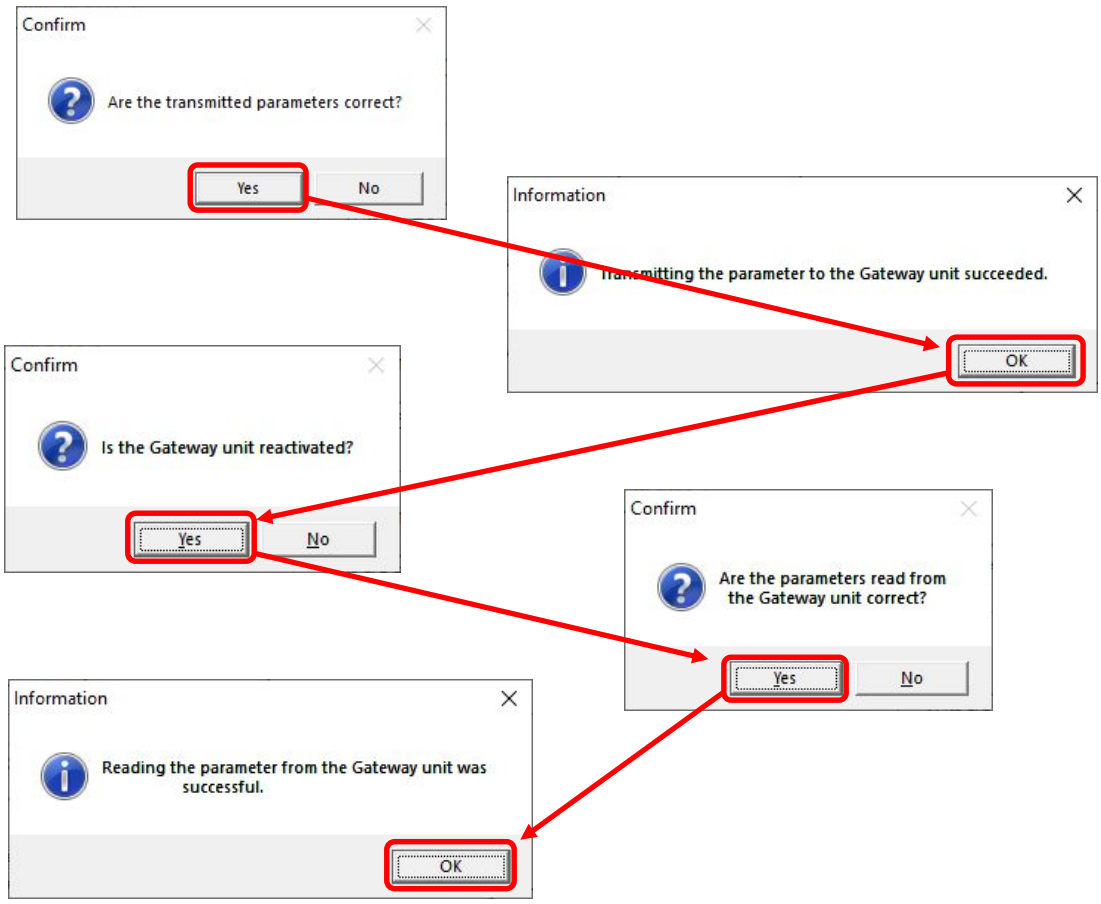
When you open the Gateway Parameter Configuration Tool, click the “Read” button to see the current setting.

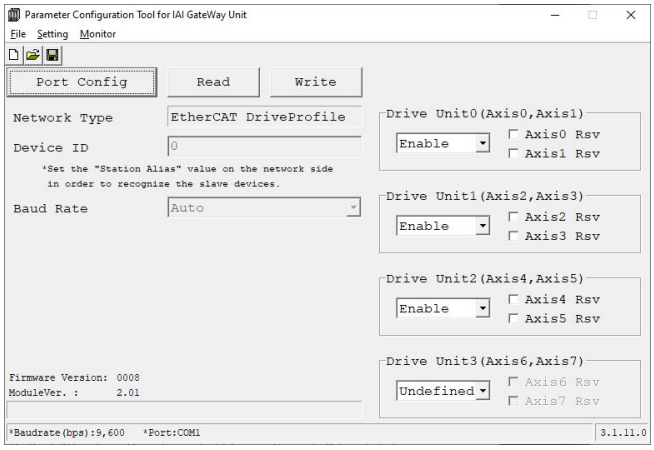


Enable the actuators correctly. Please refer to the operation manual for details about the set-up.
Ex.) Number of axes: 6 with axis No. 0 to 5

Device ID cannot be assigned here (from firmware version of gateway unit of V0008).

After completing the set-up, click the “Write” button to transfer into the gateway unit of the controller. Confirm whether the pop-up warning information is correct as you require.





After reading the setting from the gateway unit automatically, if the parameter setting you have done is not correct, please set the parameter again correctly.

1-3: RCON controller

If you use RCON controller, you need to configure the gateway unit by using

1-3-1: "PC Interface Software"
1-3-2: "Gateway Parameter Configuration Tool".

Please see the detail relating to the set-up in the manual.

RCON gateway unit (RCON-GW/GWG-ECM)

1-3-1: PC Interface Software

Open the PC Interface Software and set the parameters as following.

i. Parameter No. 5 (Home direction)

5	Home direction [0:opposite/1:default]	1

Set the home position to either motor side or opposite side of motor.
Home direction should be same as pulse count direction (parameter No. 62) normally. Otherwise, operating coordinate of PLC does not match the mechanical coordinate of the actuator (refer to the operation manual for EtherCAT Motion).

ii. Parameter No. 62 (Pulse count direction)

62	Pulse count direction [0:Forward/1:Reverse]	1

Set the same value as the one of parameter No. 5.

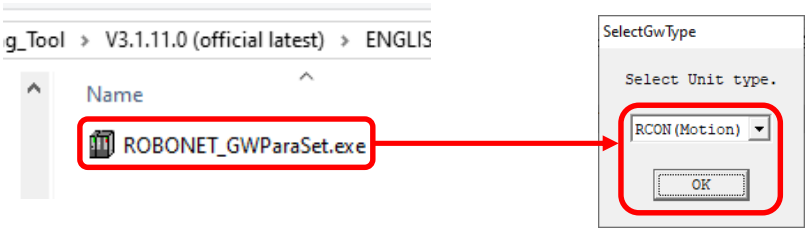
iii. Parameter No. 65 and 66 (Electronic gear, numerator and denominator)

65	Electronic gear numerator	1
66	Electronic gear denominator	1

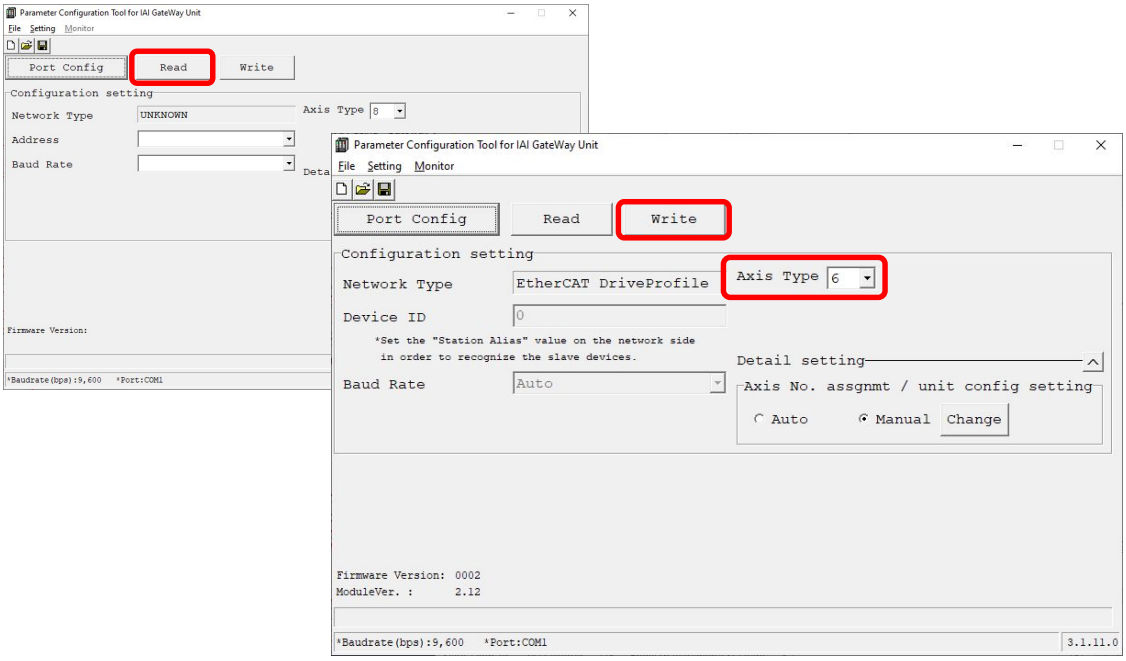
Keep the factory setting.

1-3-2: Gateway Parameter Configuration Tool

Open the Gateway Parameter Configuration Tool by selecting “RCON (Motion)”.

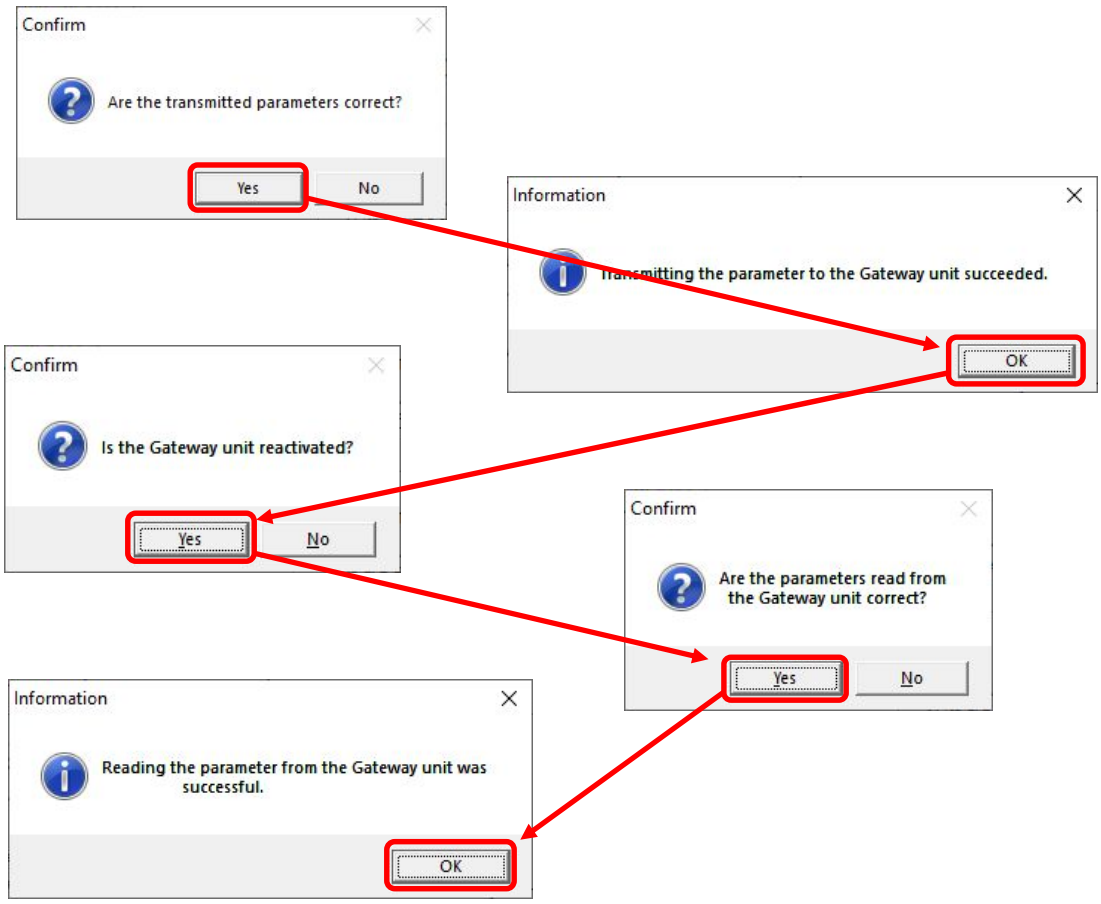


When you open the Gateway Parameter Configuration Tool, click the “Read” button to see the current setting.



Set the number of axes correctly. Please refer to the operation manual for detail about the set-up.
Ex.) Number of axes: 6

After completing the set-up, click the “Write” button to transfer into the gateway unit of the controller. Confirm whether the pop-up warning information is correct as you require.



After reading the setting from the gateway unit automatically, if the parameter setting you have done is not correct, please set the parameter again correctly.

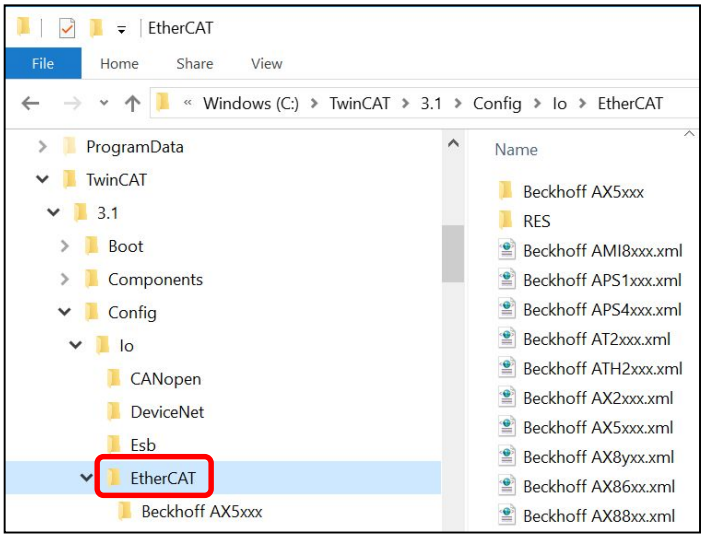
2. Configuration of Beckhoff PLC with TwinCAT 3

ESI file

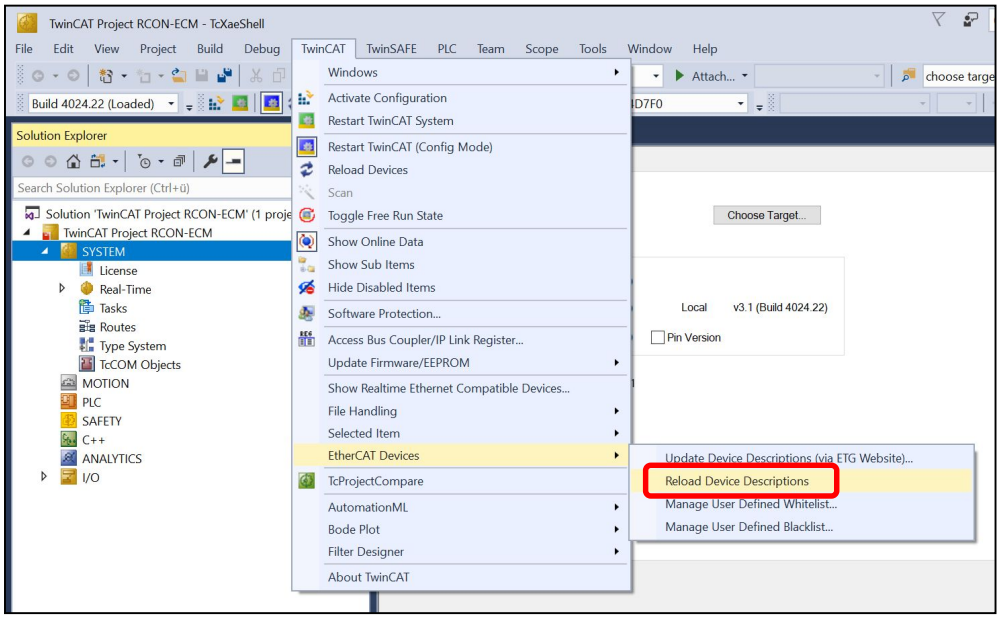
At first, it is required to prepare the appropriate ESI file for the IAI controller to configure the PLC. There are some ESI files depending on the controller types.

IAI controllers	Firmware version	ESI file
SCON-CB/CGB	independent	ESI_IAI_SCON_ECM_V_2_12_Rev_0.xml
MCON-C/CG	up to V0007	ESI_IAI_MCON_ECM_V_2_01_Rev_0.xml
	from V0008	ESI_IAI_MCON_ECM_V_2_12_Rev_0.xml
RCON-GW/GWG	independent	ESI_IAI_RCON_ECM_V_2_12_Rev_0.xml

Copy the ESI file in the TwinCAT installation folder: ...\TwinCAT\3.1\Config\Io\EtherCAT.

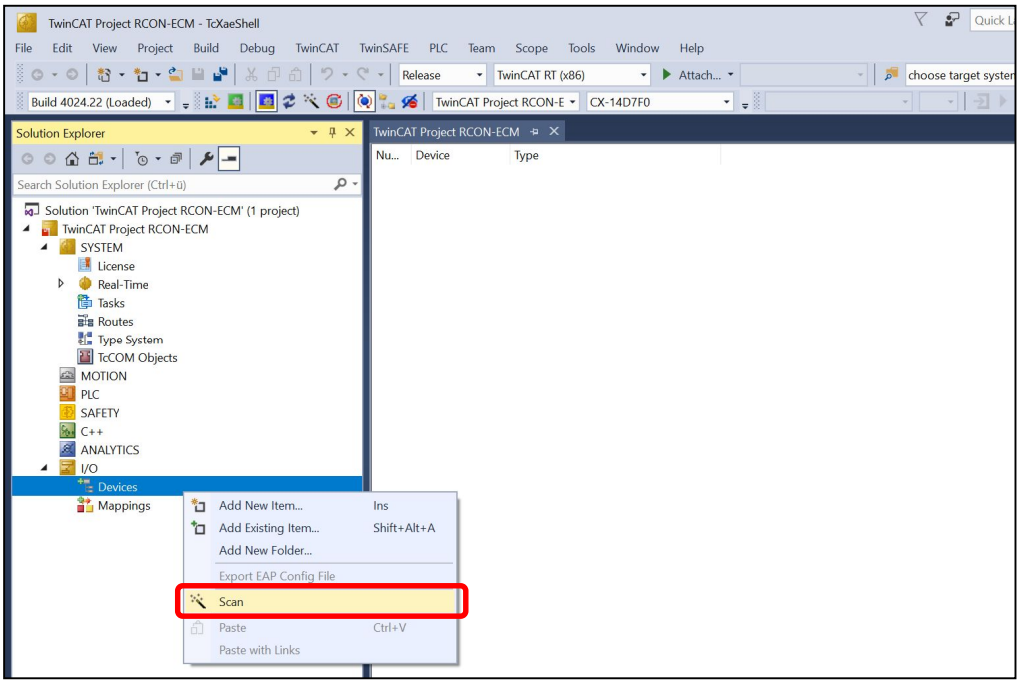


Open TwinCAT and click “Reload Device Descriptions” in the menu “TwinCAT” - “EtherCAT Devices”.

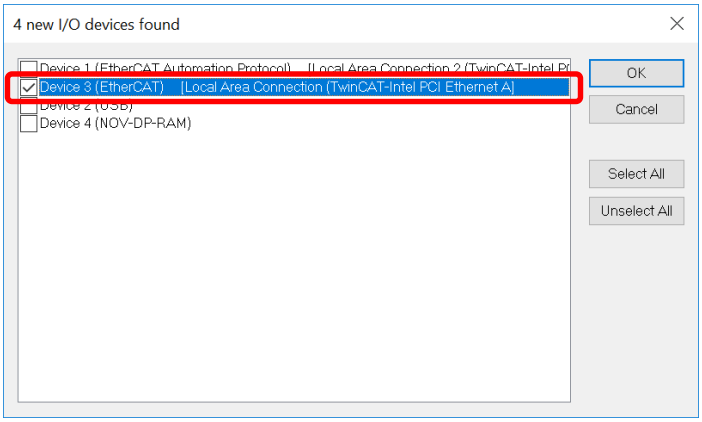


2-1: Hardware configuration for IAI controller as a slave unit

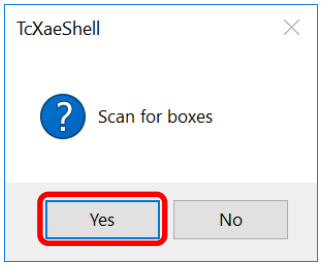
Open the section “I/O” in Solution Explorer. Click “Device” with the right mouse button and then “Scan”.



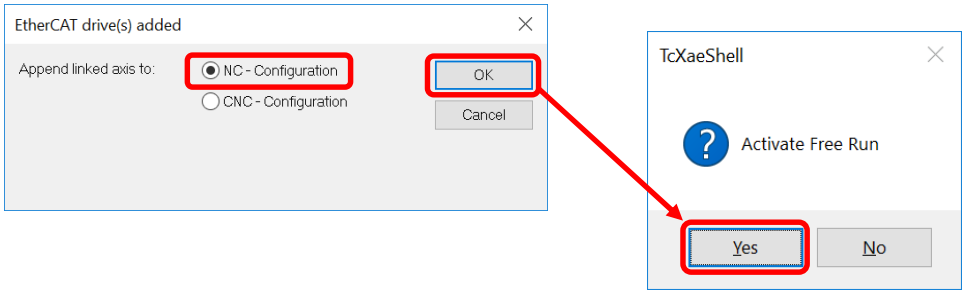
Select the device connected with IAI controller as EtherCAT slave device.



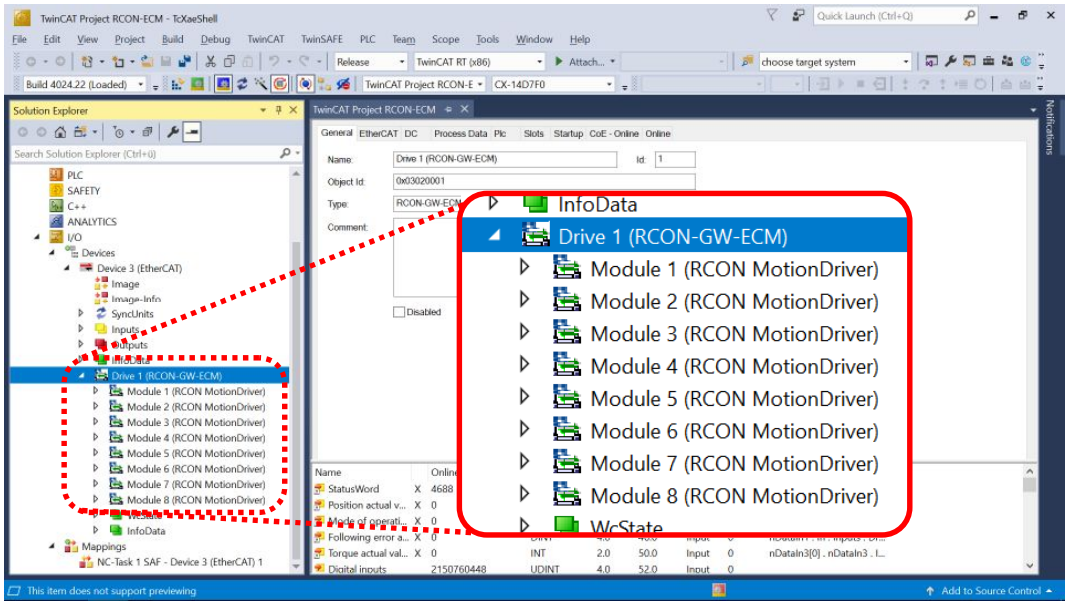
Confirm it with “Yes” in the following window to find the proper box for IAI controller automatically.

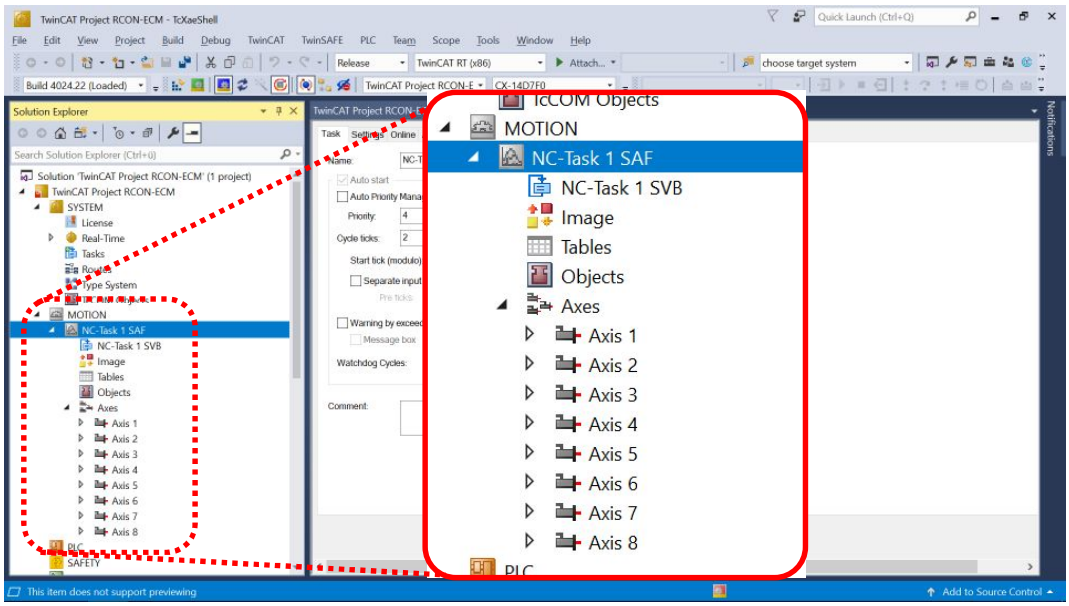


Select “NC-Configuration” and click “OK”.



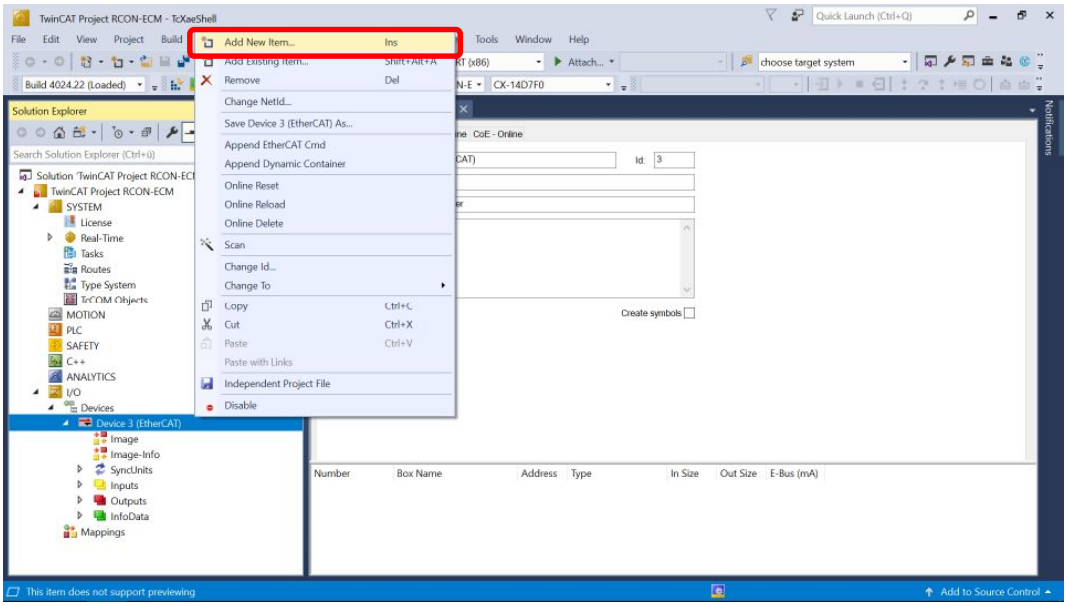
Make sure that the new box for IAI controller is shown as “Drive * (***-ECM)” (like “Drive 1 (RCON-GW-ECM)” here in example) and a new NC-Configuration has been created at the MOTION node, too.



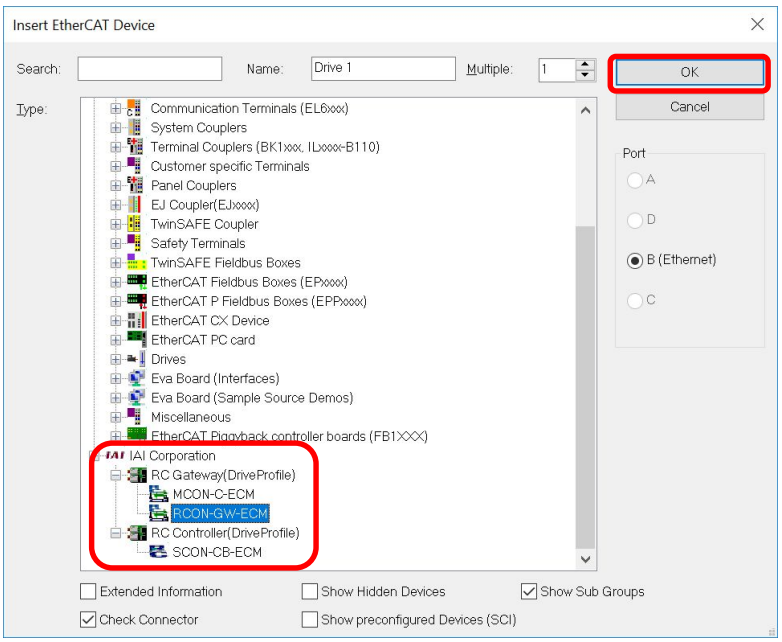


If the proper box for IAI controller is not found, add it manually as following.

Click on the device connected with IAI controller as EtherCAT slave device with the right mouse button and select “Add New Item...”.



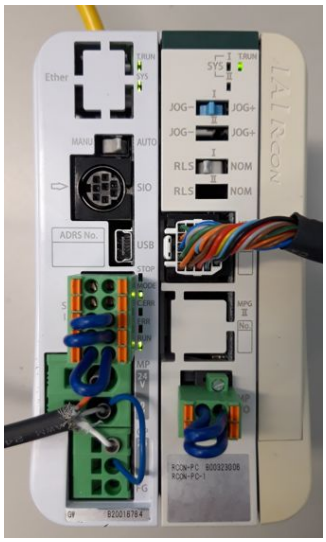
Select the proper device from the list and click “OK”.



IAI controllers	Device name
SCON-CB/CGB	SCON-CB-ECM
MCON-C/CG	MCON-C-ECM
RCON-GW/GWG	RCON-GW-ECM

Turn the MANU/AUTO switch on IAI controller back to AUTO.

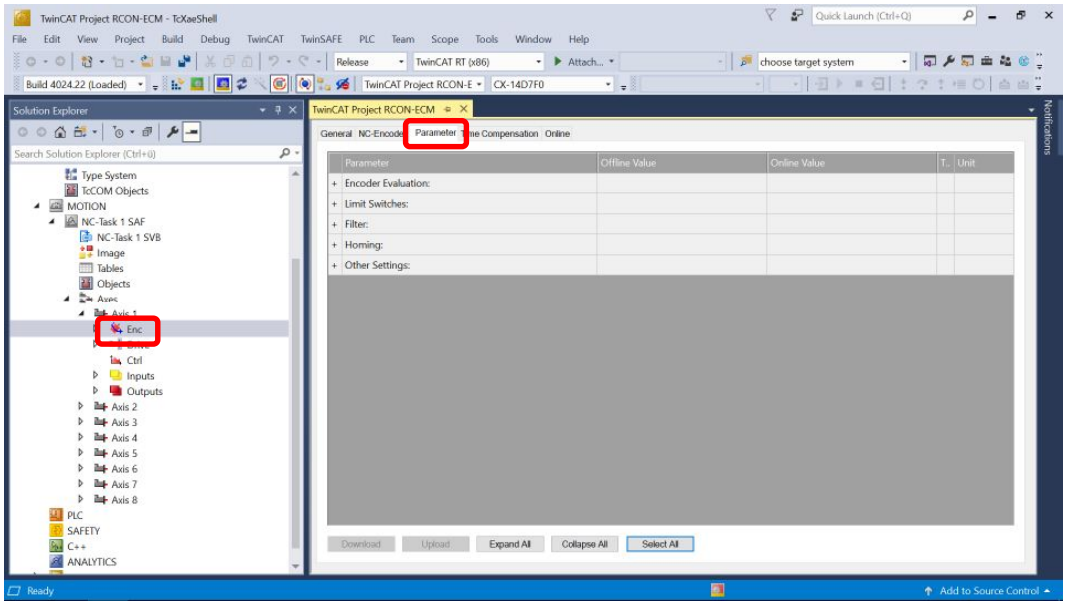
Connection between PLC and IAI controller will be established in Run mode of PLC automatically (RUN-LED on IAI controller lights up in green).



IAI controller (RCON)

2-2: Configuration of actuator

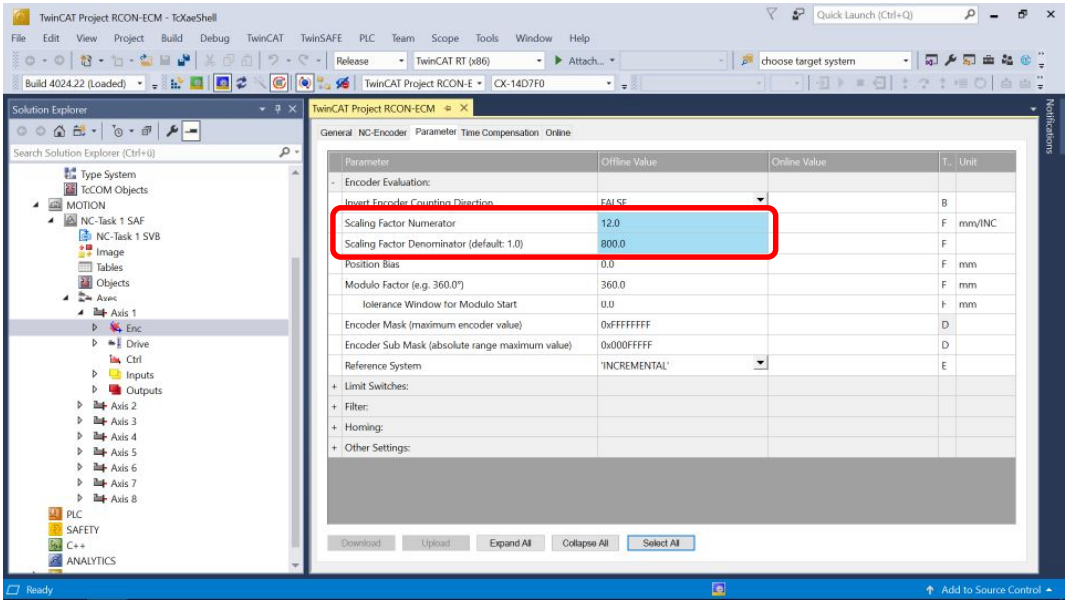
At the node “Axes” under “MOTION - NC-Task 1 SAF”, double click “Enc” of the axis, which should be configured now (in example: at Axis 1), and select the “Parameter” tab in dialog window.



Open the parameter group “Encoder Evaluation” and set the following parameters according to specification of the actuator connected with IAI controller.

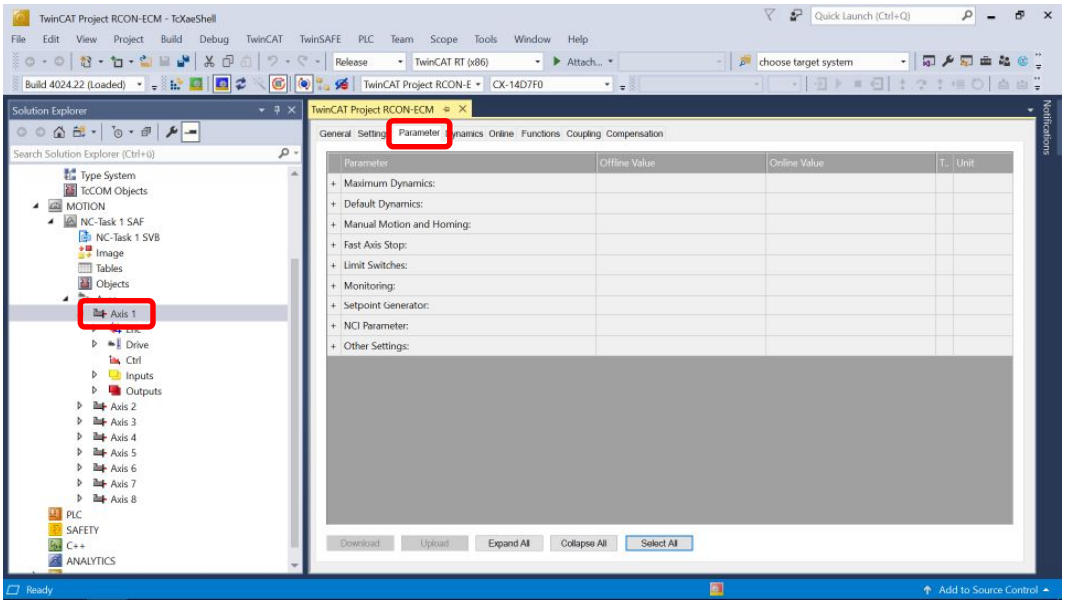
- Scaling Factor Numerator (mm/INC): screw lead (mm/rev)
- Scaling Factor Denominator: encoder resolution (pulse/rev)

Ex.) Parameter for RCP4-SA6C-I-42P-12-100-***
- Scaling Factor Numerator (mm/INC): <u>12 (mm/rev)</u>
- Scaling Factor Denominator: <u>800 (pulse/rev)</u>

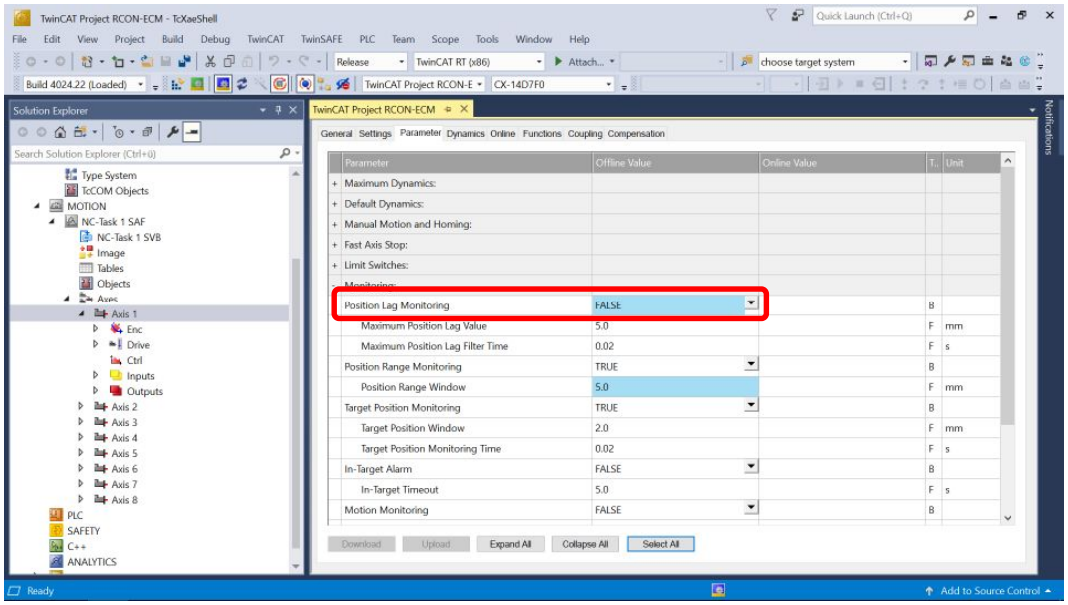


<u>Note: Encoder resolution is different depending on actuator types. Please refer to the operation manual for details.</u>

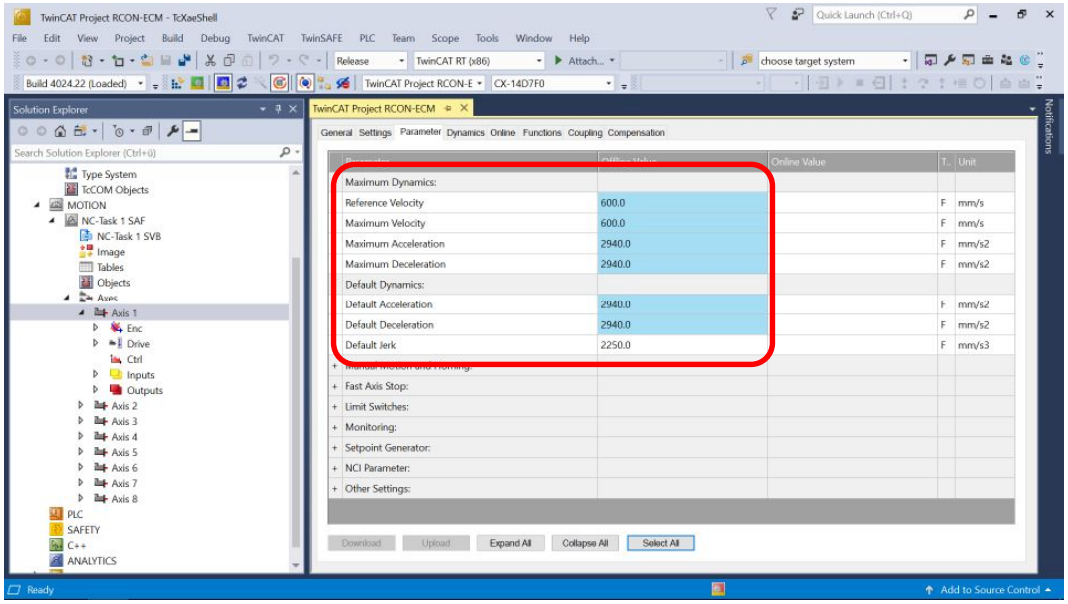
Click on the axis (in example: “Axis 1”) and select the “Parameter” tab in dialog window.



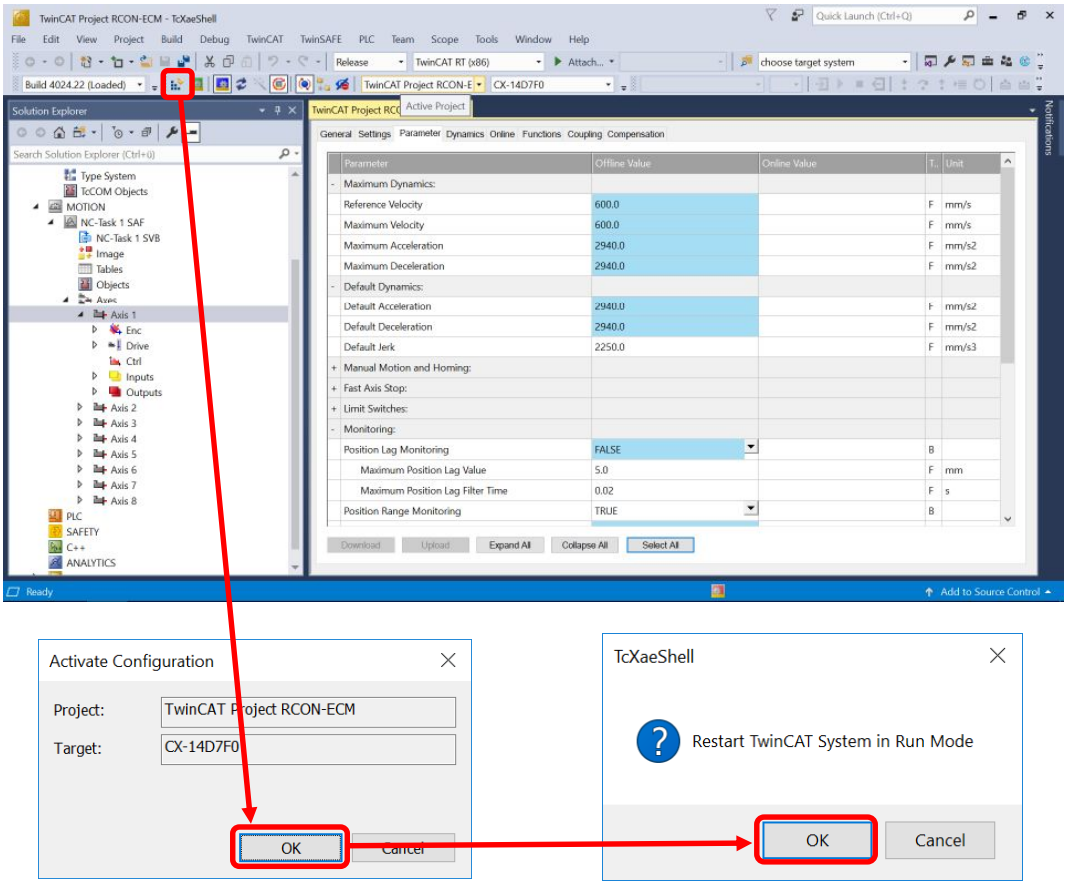
Open the parameter group “Monitoring” and set the parameter “Position Lag Monitoring” to “FALSE” to be able to execute the homing of the actuator with mechanical end without problem.

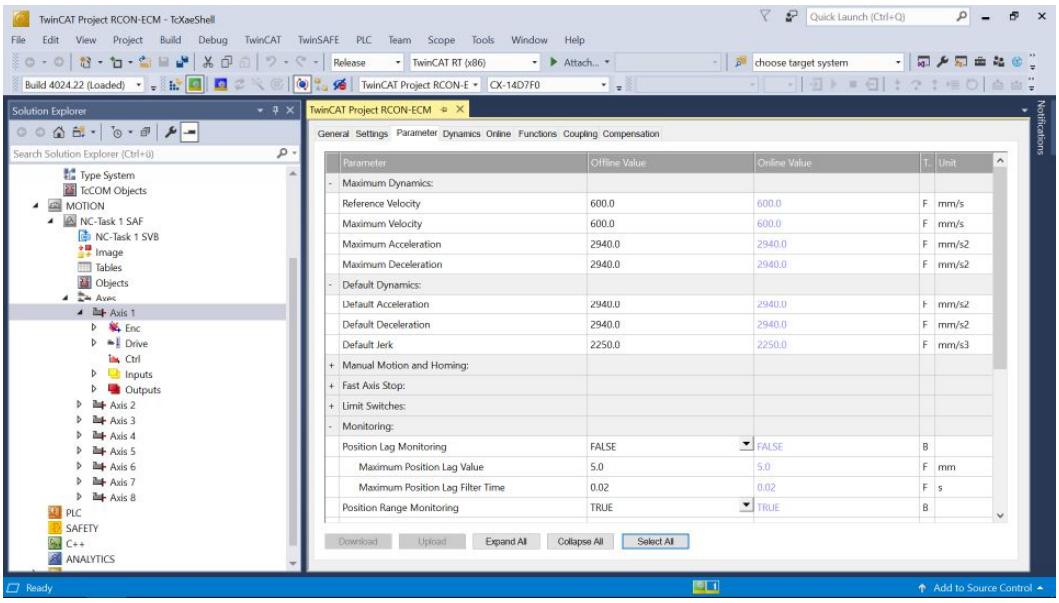


It is recommended that values of some important parameters of the actuator, such as maximum velocity/acceleration/deceleration, will be set to the values specified in the catalogue correctly in order to avoid unexpected movement of the actuator, which could cause a product damage as a result.



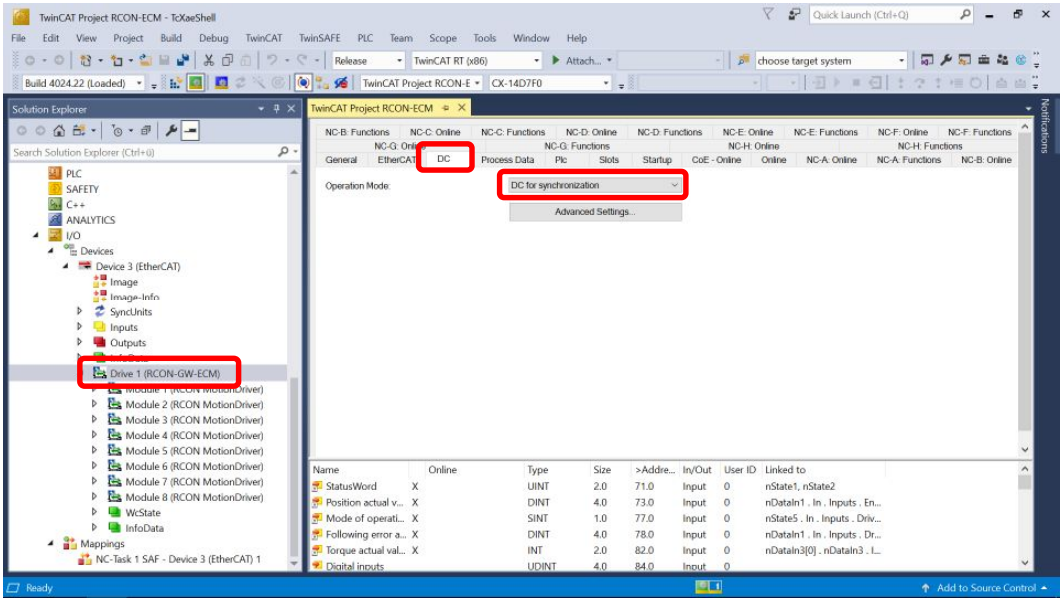
After all parameters are set correctly, click the icon “Activate Configuration” to make the setting valid now.





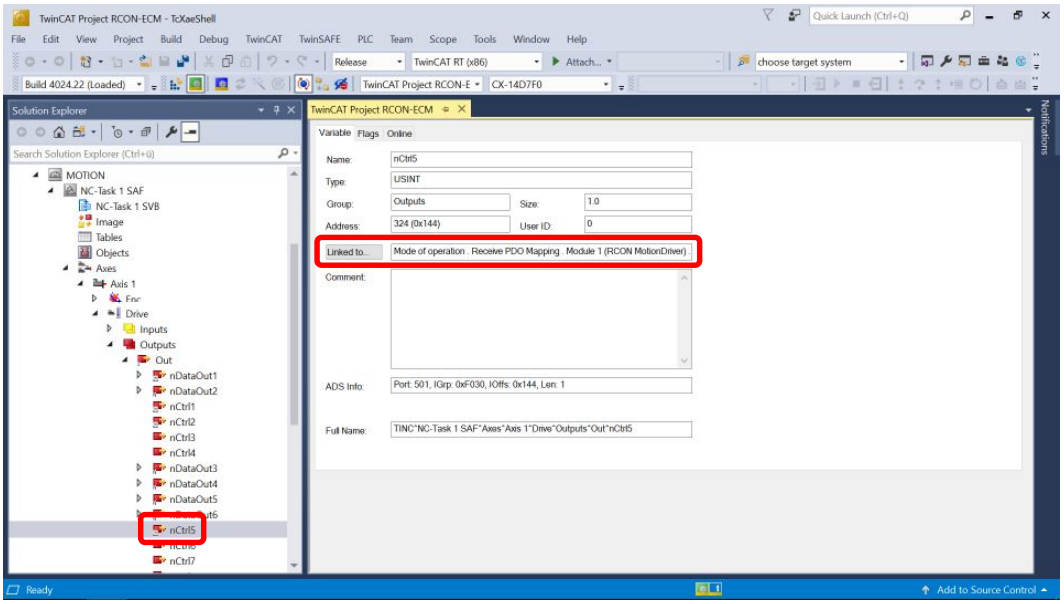
2-3: Move actuator manually

Set the operation mode to “DC for synchronization” at the “DC” tab of the box for IAI controller “Drive * (***-ECM)” under “I/O - Devices - (device name)” (in example: “Drive 1 (RCON-GW-ECM)” under “I/O - Devices - Device 3 (EtherCAT)”).

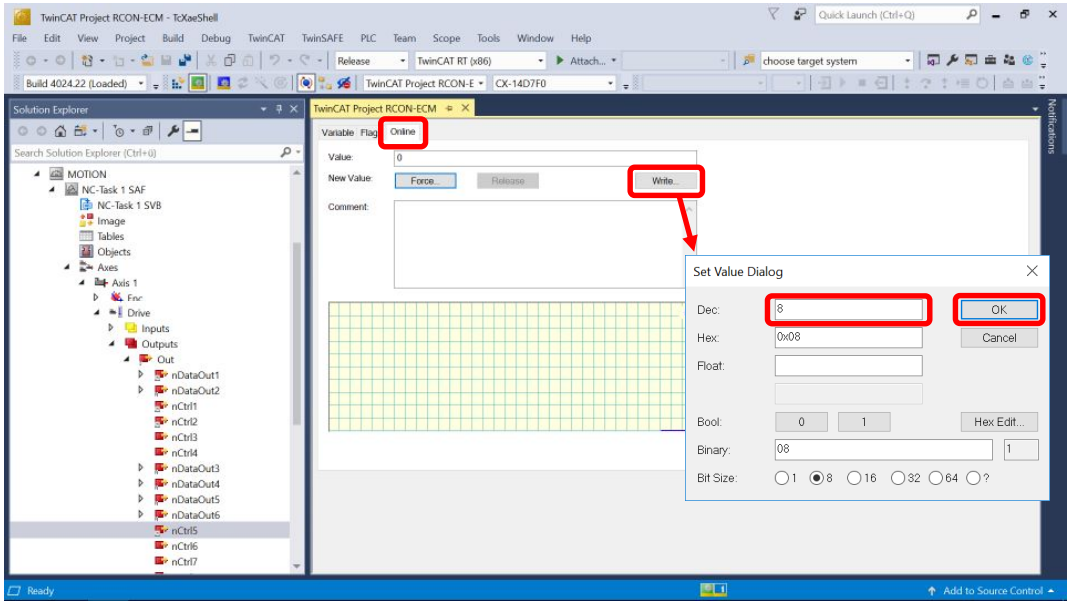


Note: It is recommended to use the operation mode “DC for synchronization” for the CSP mode to avoid unexpected movement of the actuator.

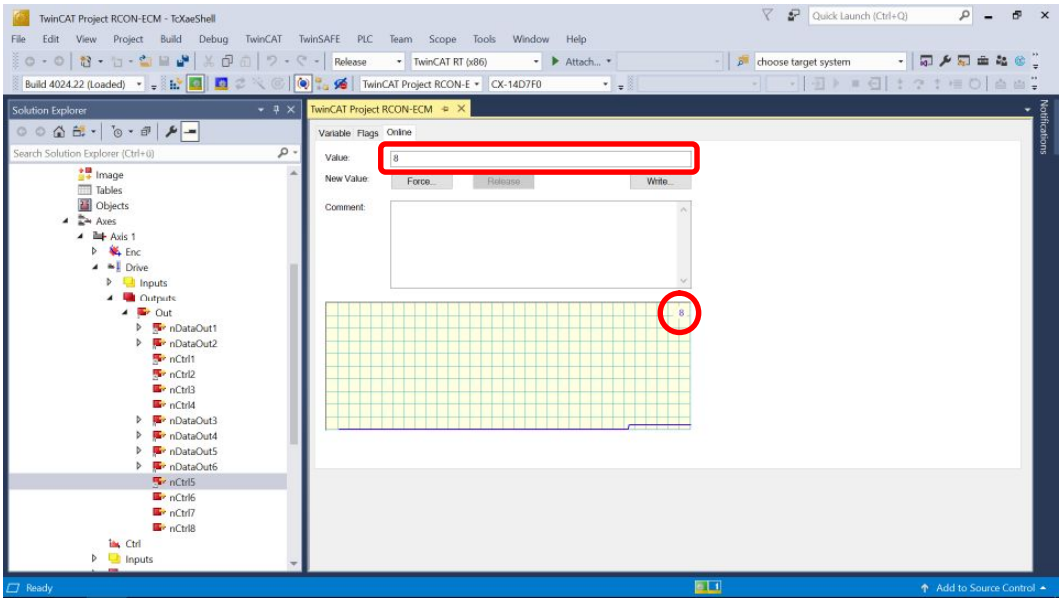
In order to move the actuator in the CSP mode from TwinCAT manually, the mode of operation must be set correctly. This is assigned to the variable “nCtrl5” under “Drive - Outputs - Out” of the axis (in example: “Axis 1”) under “MOTION - NC-Task 1 SAF - Axes” as factory setting.



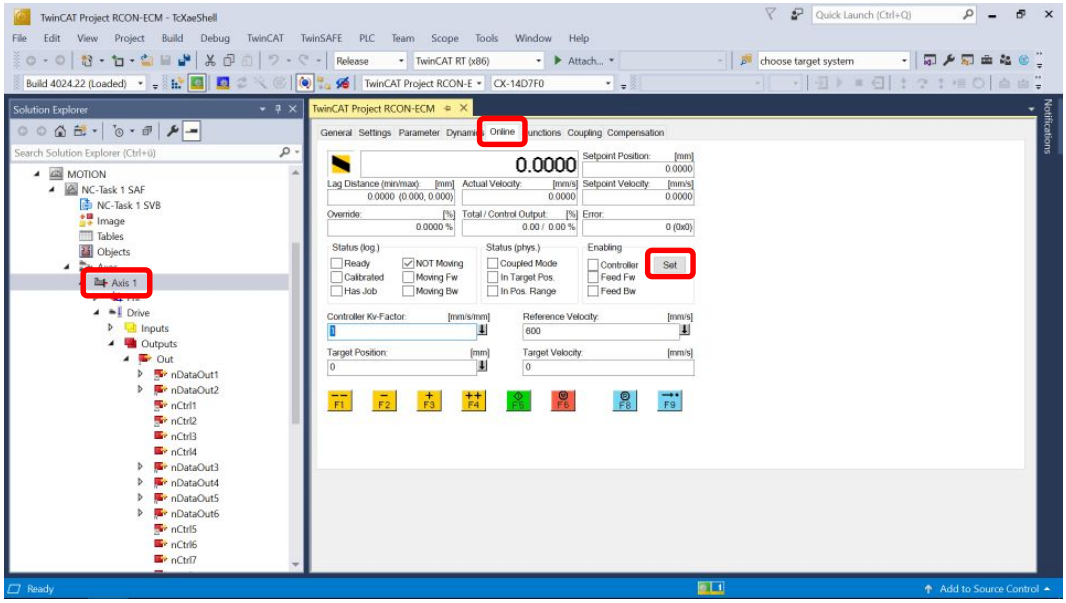
Click the “Online” tab at the variable and then “Write” to open the dialog window. Enter “8” in the “Dec” box for the CSP mode and click “OK”.



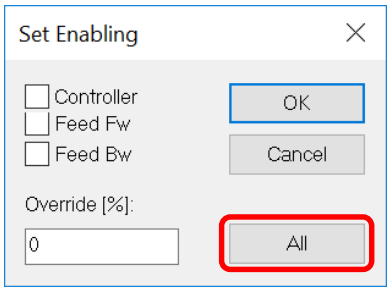
The mode of operation has been changed to the CSP mode now.



Click on the axis (in example: “Axis 1”) under “MOTION - NC-Task 1 SAF - Axes” and select the “Online” tab in dialog window. Then, click “Set” in the “Enabling” area.



Dialog window “Set Enabling” opens.
Click “All” to turn on the servo of the actuator.



The actuator is now ready for operation.