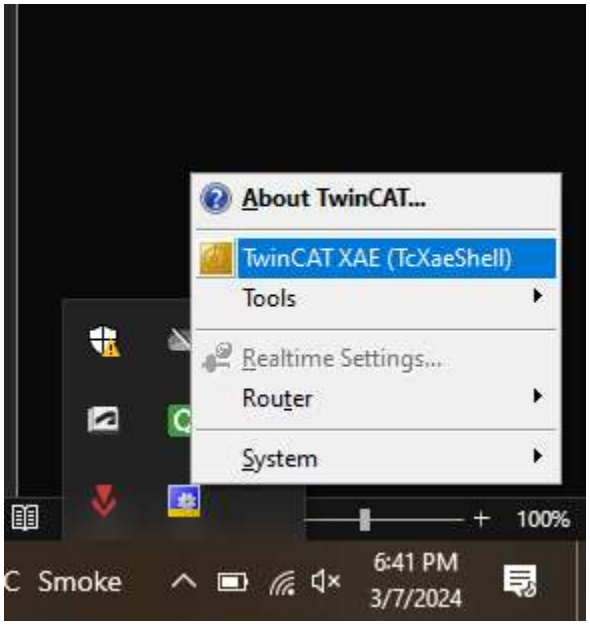
To install and open the software:

1. Go to the website: https://www.beckhoff.com/en-en/support/download-finder/search-result/?c-1=26782567

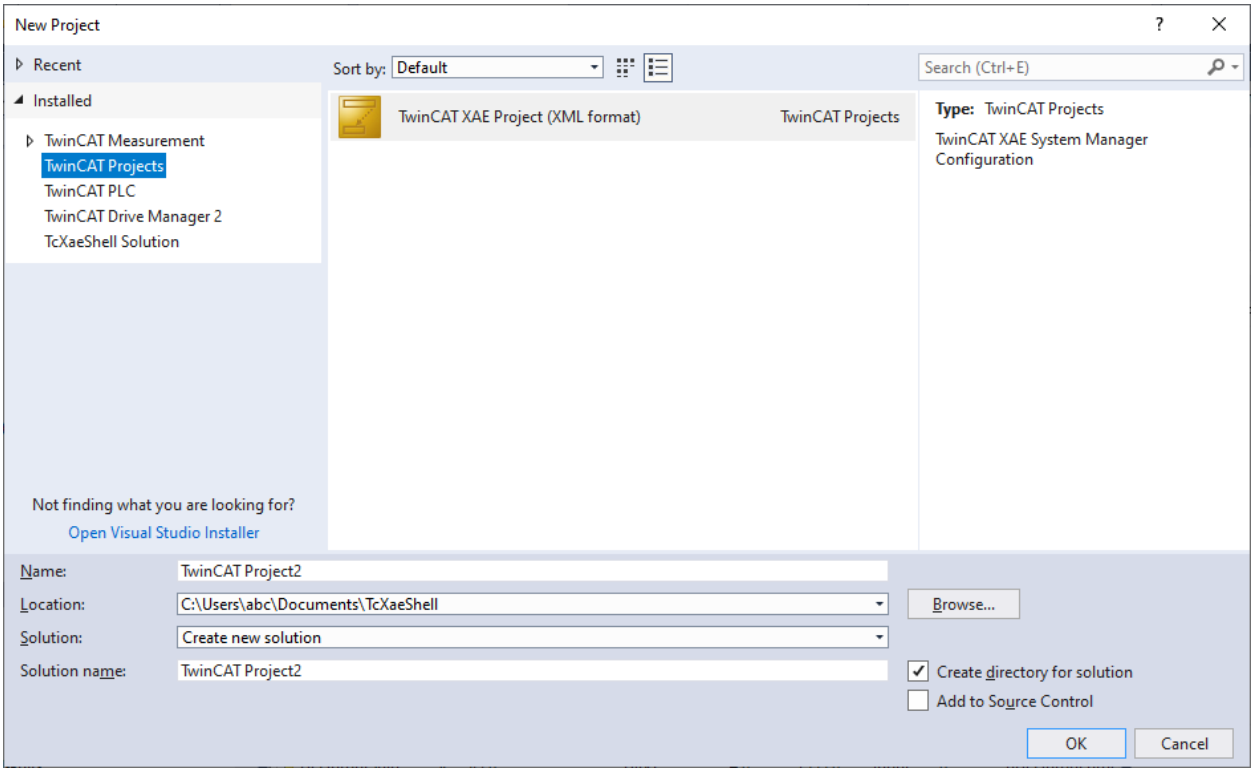
2. Make an account and download eXtended Automation Engineering and eXtended Automation Runtime.

3. After the download is complete, run the installation wizard and follow the steps.
4. To open the software, open notification center. Right click on TwinCAT config mode. Click on the Twin CAT XAE shell.

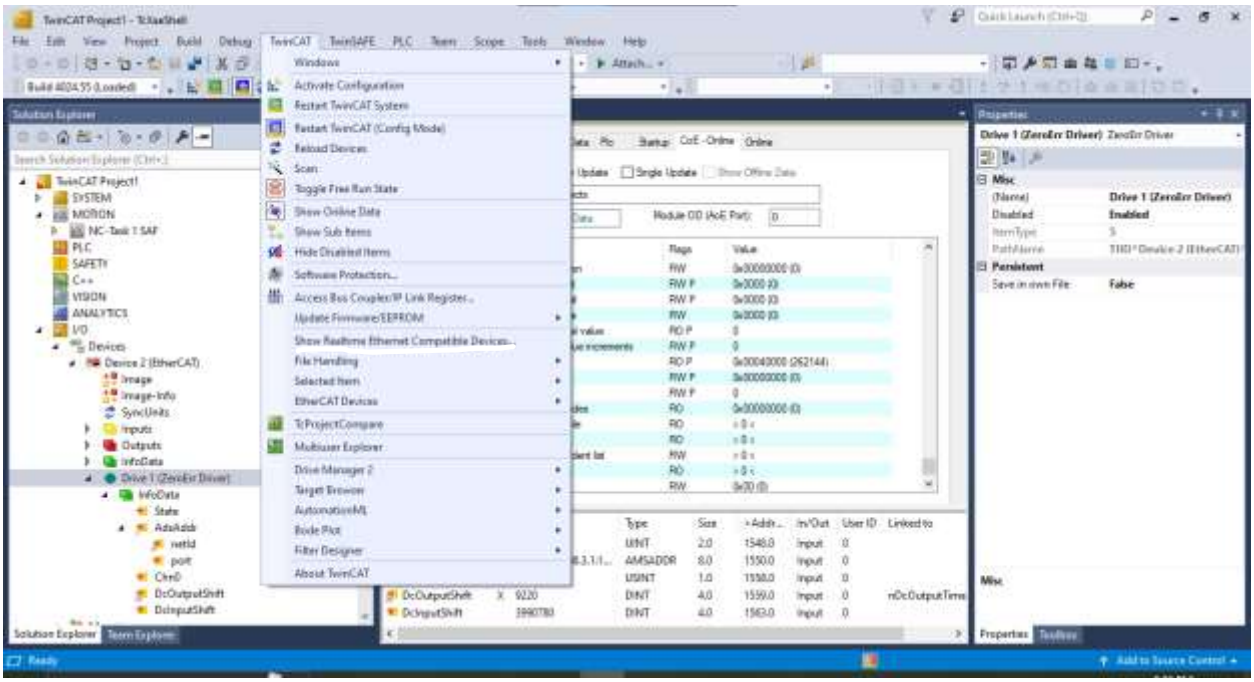


To run a single motor:

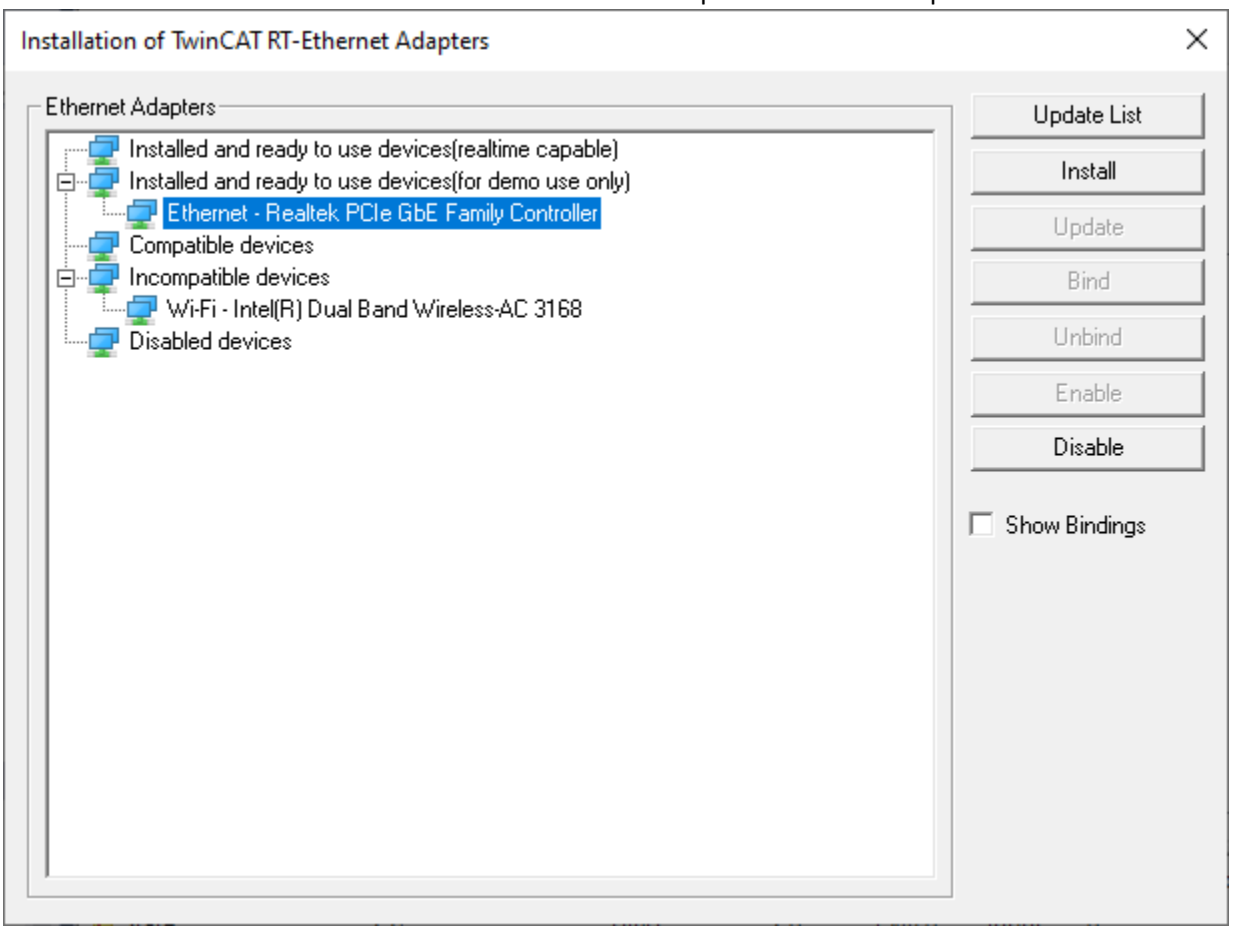
1. After opening the TwinCAT, go to file section and create a new project by selecting below option (TwinCAT XAE Project XAML).



2. Go to TwinCAT tool bar and click on “Show real time Ethernet compatible device”

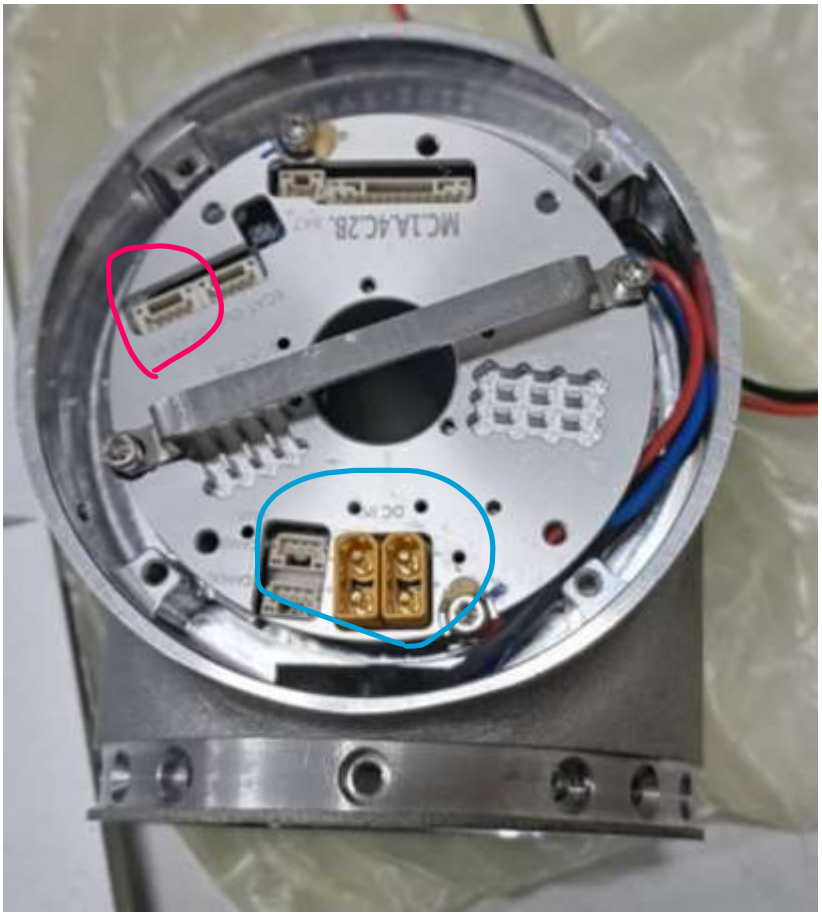


3. Select the below selection and click on install. It should be present under Compatible devices.

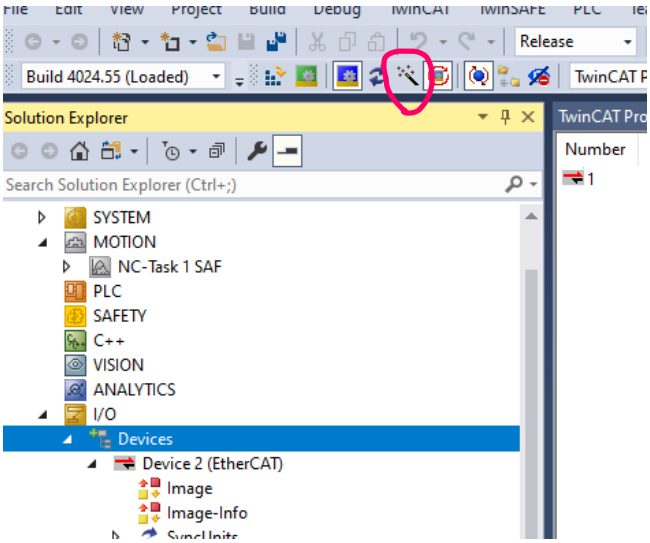


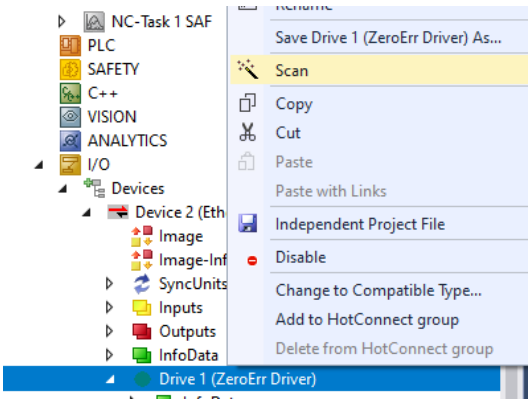
4. <u>Please note that steps 2 and 3 have to be done only once. After that, no need to follow the steps.</u>

5. Connect the motor to the laptop using the ethernet cable (at the ECAT In Port) and make sure the motor has the required power supply (any of the 2 ports will do). ECAT In port is highlighted in pink while the DC port is highlighted in blue. It is not necessary to connect 3.6V battery.

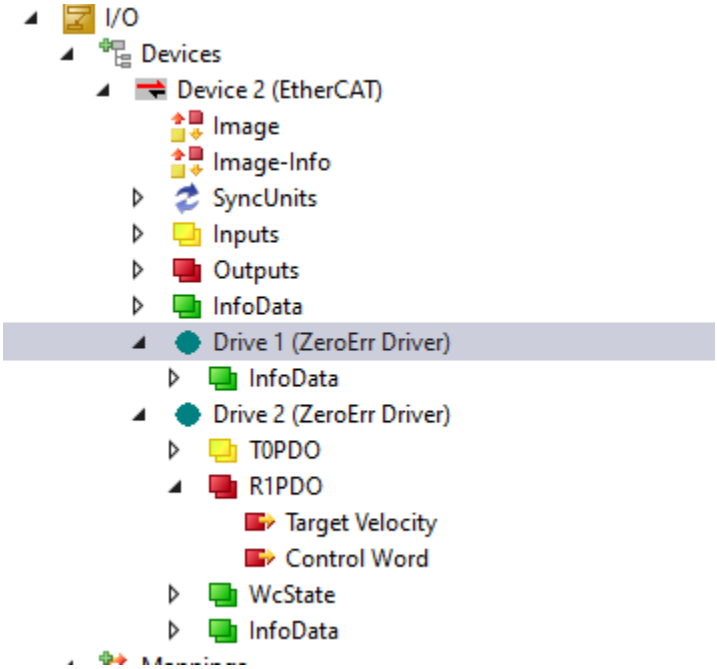


6. After making the connections, click on devices and click on scan. Alternatively, you can right click on devices and click on scan.

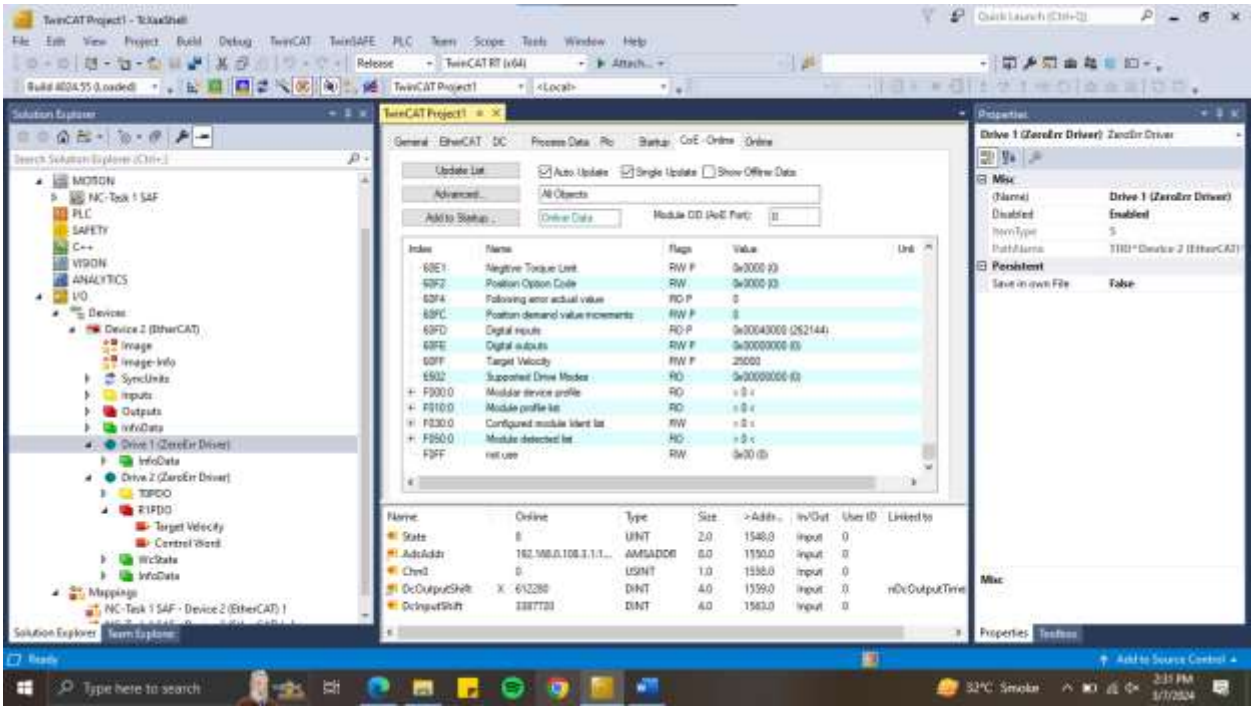




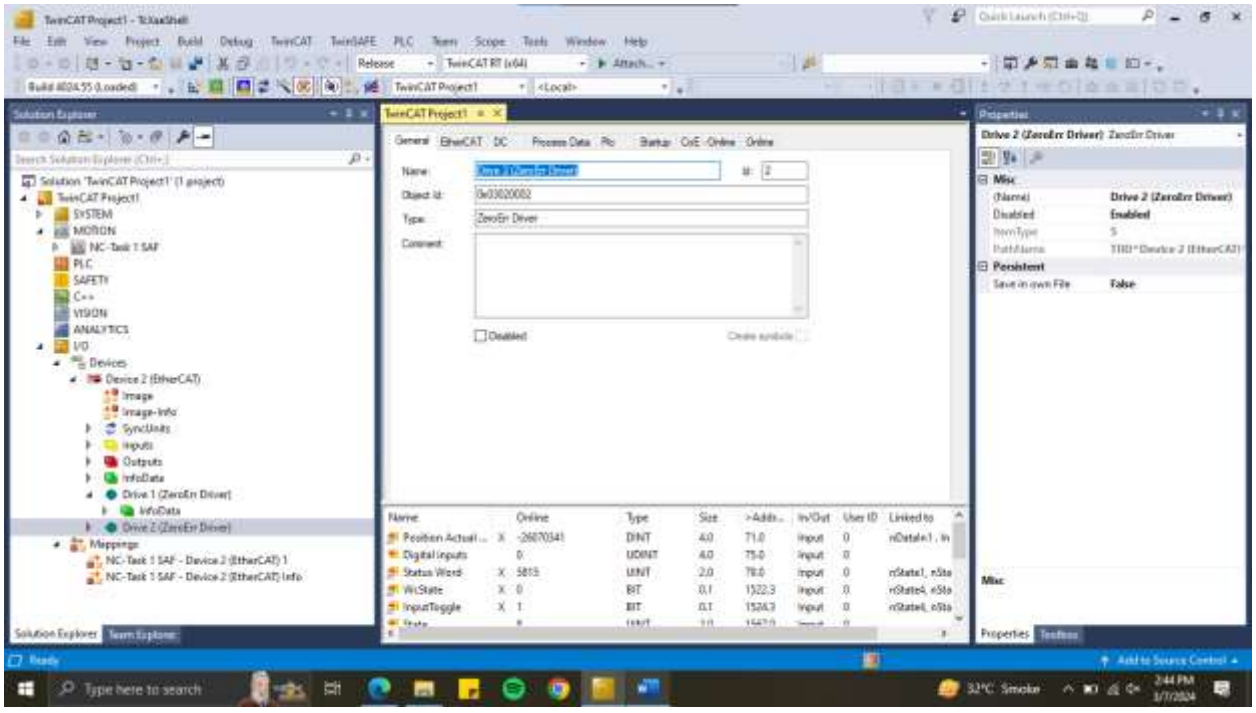
7. There will two types as indicated in the picture below. Here Drive 1 and Drive 2 are two EtherCAT devices connected.



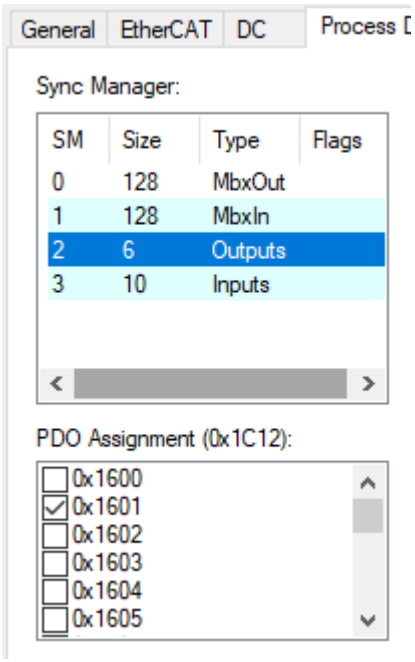
8. In case your device shows as the first type (same as Drive 1), follow the below steps to rotate the motor. Double click on Drive 1 and the screen will be as follows:

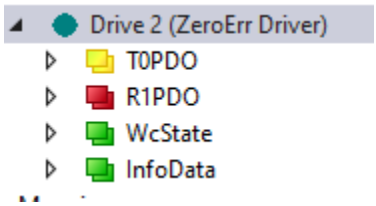


9. Click on Auto Update and make the following changes:
    1) Index 4602 (Release Brake): Make the decimal value 1. Doing so will release the brake and a distinct sound from the motor will be heard.
    2) Index 6060 (Modes of Operation): Make the decimal value 9 for Cyclic synchronous velocity mode.
    3) Index 606F (Velocity Threshold): Set the decimal value to limit the velocity of the motor. (50,000 is an apt value.)
    4) Index 60FF (Target Velocity): Set the decimal value to set the velocity of the motor (10,000 is an apt value). Make sure that the previous target velocity and target velocity does not have a huge difference as it will generate an error.
    5) Index 6040 (Control Word): Change the decimal value in the following sequence:
        i. 128 (for erasing the error code if present)
        ii. 2
        iii. 6
        iv. 14
        v. 15
10. Now your motor should start rotating. If your device shows as the second type (same as Drive 2), follow the below steps to rotate the motor. Double click on Drive 2 and the screen will be as follows:



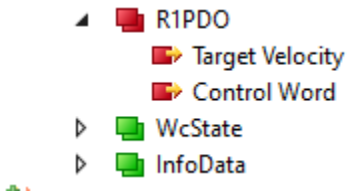
11. Go to Process data. In Sync Manager, click on Outputs. Now in the PDO assignment tab, uncheck the 0x1600 and check 0x1601. In the left column R0PD0 will disappear and R1PD1 will appear.



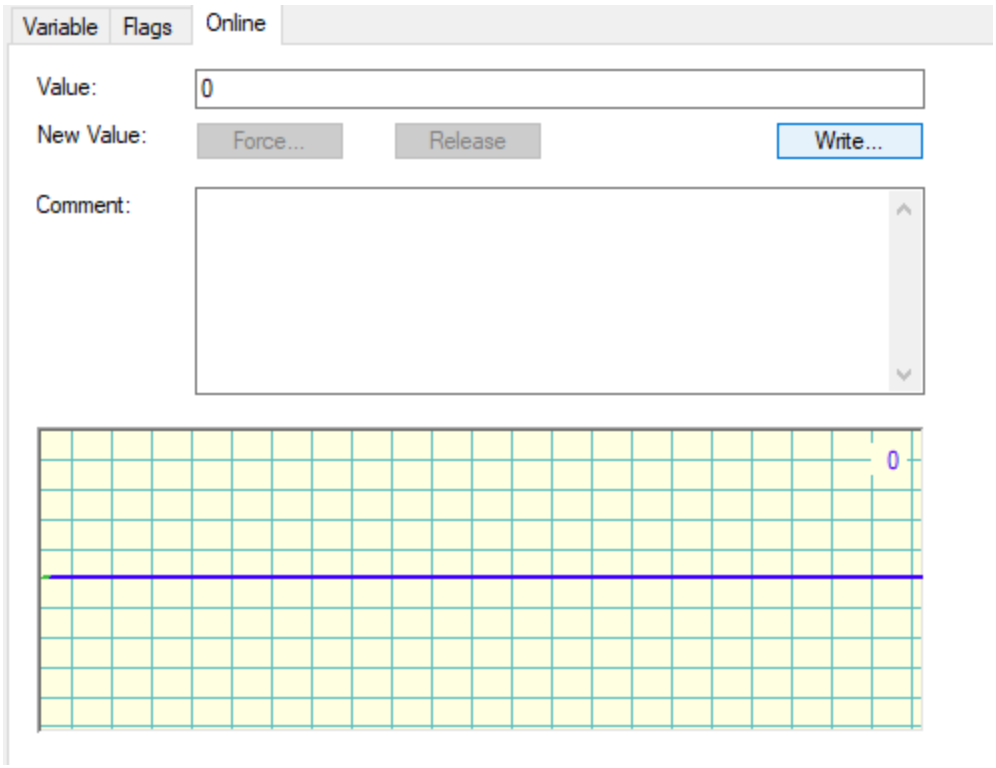


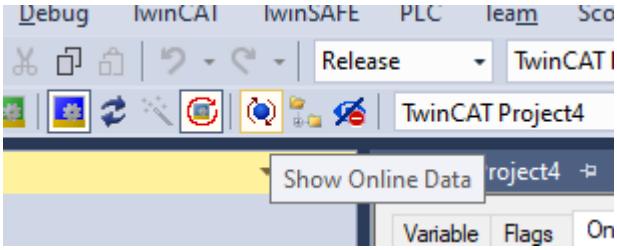
12. Now, click on **CoE – Online.** Click on Auto Update and make the following changes:
    1) Index 4602 (Release Brake): Make the decimal value 1. Doing so will release the brake and a distinct sound from the motor will be heard.
    2) Index 6060 (Modes of Operation): Make the decimal value 9 for Cyclic synchronous velocity mode.
    3) Index 606F (Velocity Threshold): Set the decimal value to limit the velocity of the motor. (50,000 is an apt value.)

13. Now, go to R0PDO in Drive 2.



14. Click on the target velocity and in the online tab click on write to write a decimal value to set the target velocity (decimal 5000 is a good value). If the tab is not visible, select Show Online Data (icon in the tool bar with blue cube and 2 arrows around it) from the tool bar.





15. In control word, write the value in the following sequence in the decimal one:
    - 128 (for erasing the error code if present)
    - 2
    - 6
    - 14
    - 15

The motor should start working now.

For Running multiple motors simultaneously:

1. For running multiple motors at once, connect the motors with one another. Connect the ECAT out port of first motor to ECAT in of second motor and so on. If 48V is connected to one DC port, then the second DC port also provides 48V. Therefore, connect this second DC port to any DC port of other motor to power both the motors from a single source.

2. Then follow the same steps as above for configuring the device. Set the velocities individually for each motor. Your multiple motors should start running simultaneously.