Technical Note

Controlling MS300 with AX308 PLC via EtherCAT, using DIA Designer

Delta Electronics (Netherlands) BV Helmond, Netherlands
Technical Support contact: iatechnicalsupport@deltaww.com
www.delta-emea.com

History

Rev.	Comments	Authors	Date
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1 Introduction

The CMM-EC01 EtherCAT module is an optional device for Delta MS drives, which enables the connection of the drive to an EtherCAT network.

Through the EtherCAT module, you can:

- give control commands to the drive (for example, Start, Stop, Run, enable)
- feed a motor speed to the drive
- read status information and actual values from the drive
- change drive parameter values
- reset a drive fault

This Application Note contains:

- Information on configuring the drive for operation with the Ethercat Module (CMM-EC01)
- Drive Specific instructions on starting up the drive with the Ethercat Module
- Example of configuring the Delta-AX Series Ethercat master station for communication with the Ethercat Module

Related Documents:

- CMM-EC02 EtherCAT Communication Card Operation Manual
- MS300 User Manual
- DiaDesigner-AX User Manual

1.1 Hardware and Software List

Following products were used for this application:

Device / SW	Model	Version	Fw
CMM-EC01	CMMEC01W20130003		
MS300	VFD1A6MS21AFSAA	1.07	1.09
AX-3	AX-308EA0MA1T		1.0.5.8
Dia Designer AX		1.4	

1.2 System Configuration Example

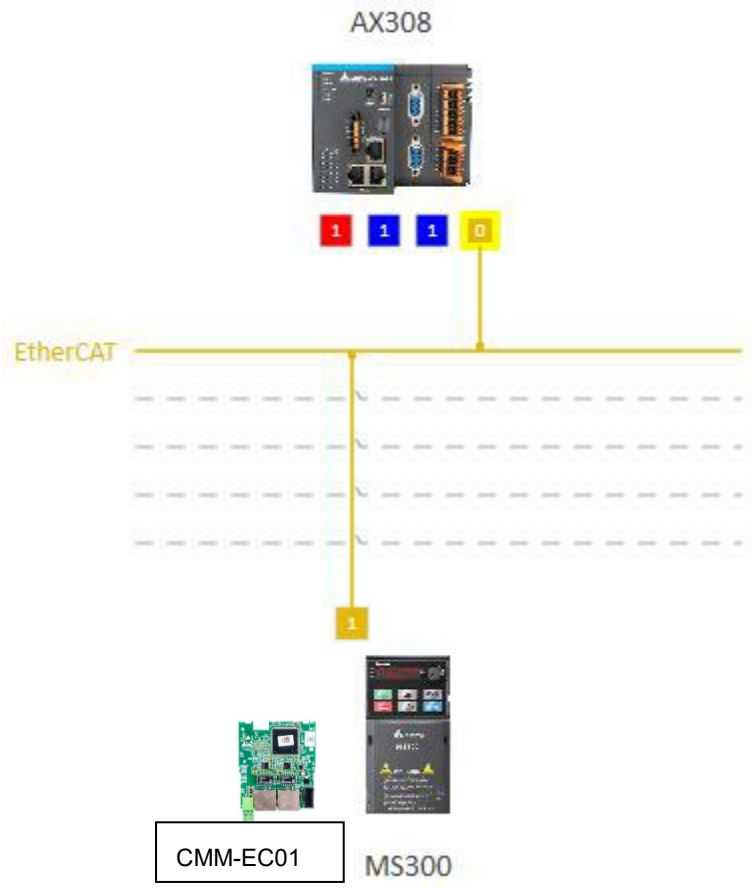


Figure 1.1 Network Structure

1.3 Basic Procedure for System Setup

Drive Setup

- Mounting of Ethercat Comm. Unit
- Wiring of Ethercat Comm. Unit
- Checking LEDs

Drive Parameter Settings:

- Checking Option Card Module and Version
- Setting RUN Command & Frequency Setting

Master Unit Settings:

- Hardware Configuration

Network Setup:

- Scan or Add Ethercat devices
- PDO Mapping (can be used default settings like in this document)
- Checking Communication
- Checking Operation

2 Setting up MS300 Drive Parameters and CMM-EC01

After Ethercat communication module has been mechanically and electrically installed according to the instructions in user manual of CMM-EC01, the drive must be prepared for communication with the module.

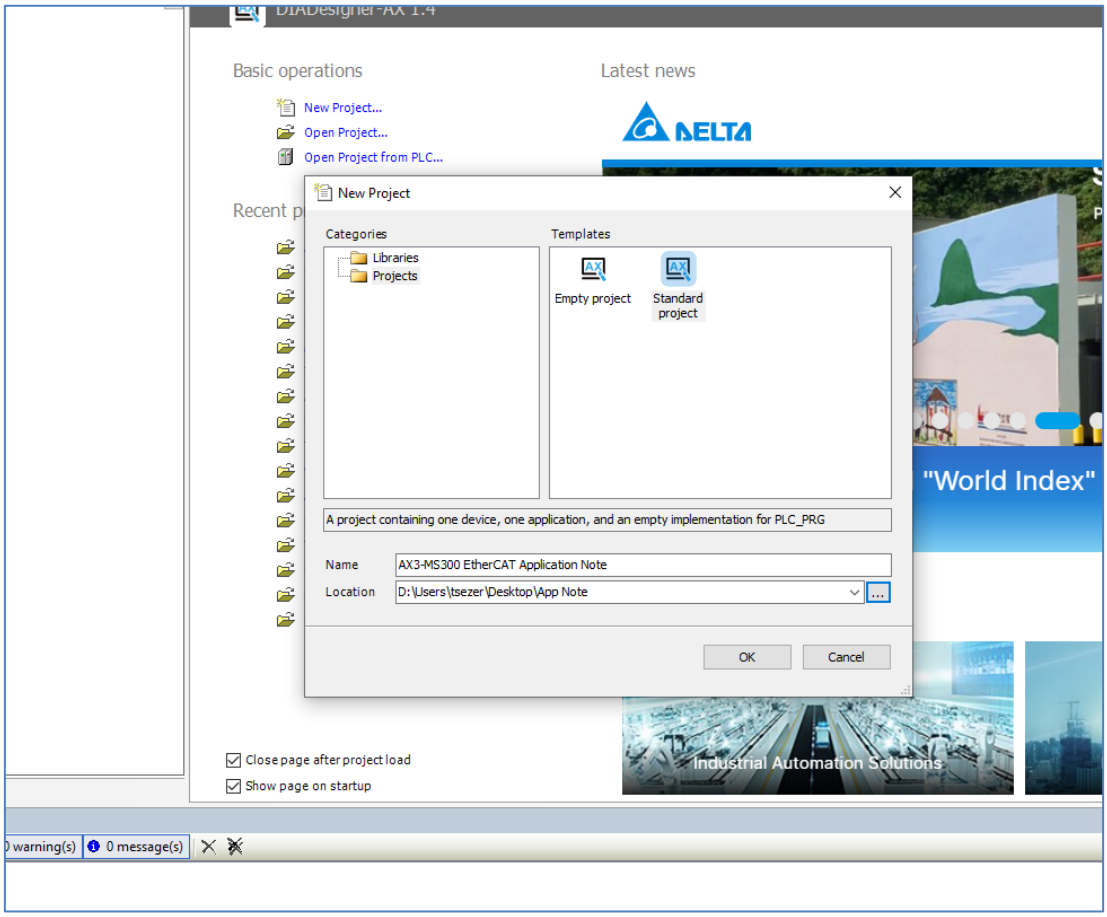
Once communication between the drive and the adapter module has been established, there are several parameters to identify and configure the setting. These parameters are shown in the tables below and must be checked first and adjust where necessary.

Parameters	Description	Setting	Remark
P9-60 (Read Only)	Option	6	It must be 6 for Ethercat Module, if not, Check the mounting
P9-61 (Read Only)	Firmware version for comm. card	-	
P00-20	Source of the frequency command	8	
P00-21	Source of the Operation Command	5	
P9-30	Communication Decoding Method	1	Refer to address: 6000h–60FFh

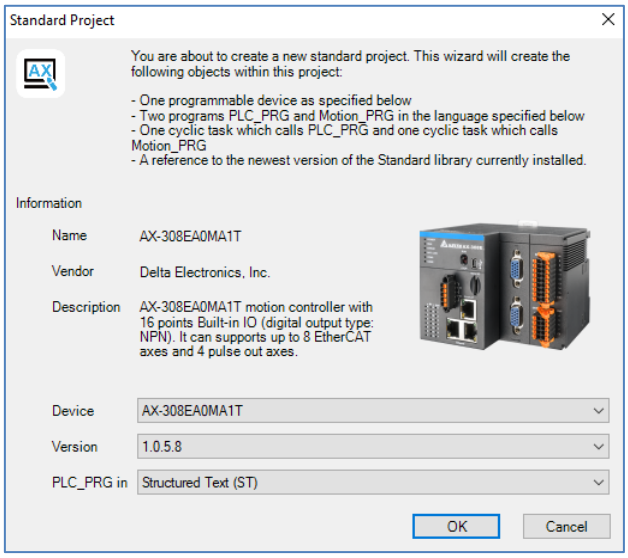
3 Starting New Project and Setting up Master Device

Before the start, make sure that you have downloaded the latest DIADesigner-AX, from Download Center in the Delta web site.

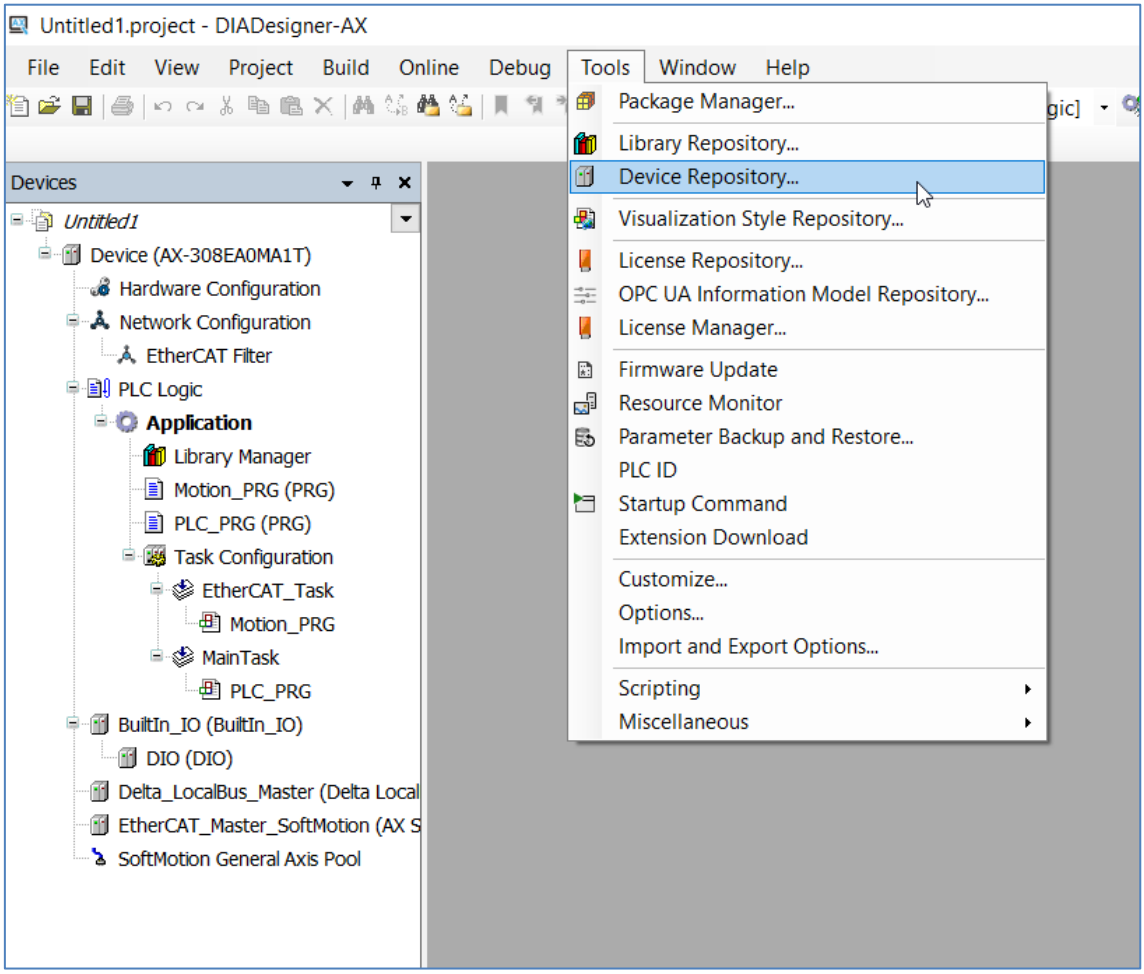
Step1: Start DIADesigner-AX and create a new standard project



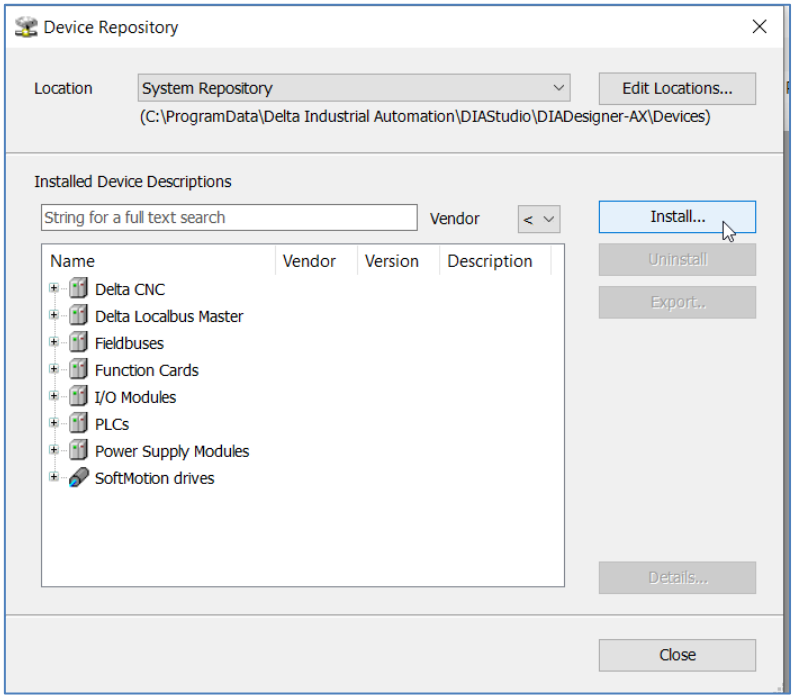
Step 2: Chose Controller Device



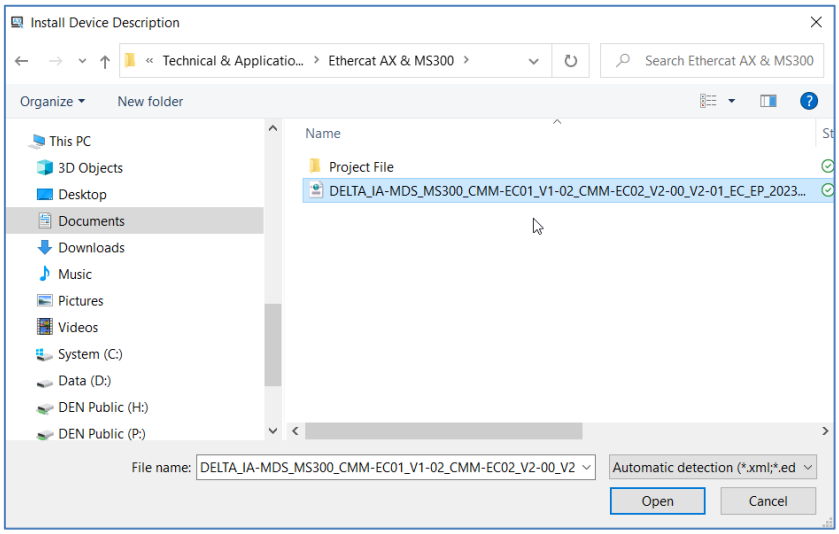
Step 3: Click on Tools and chose Device Repository



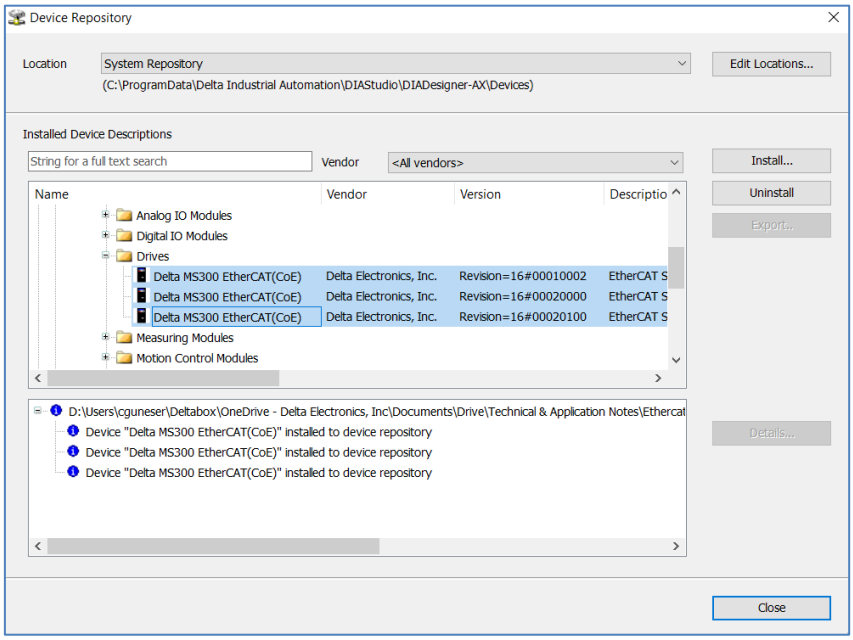
Click Install



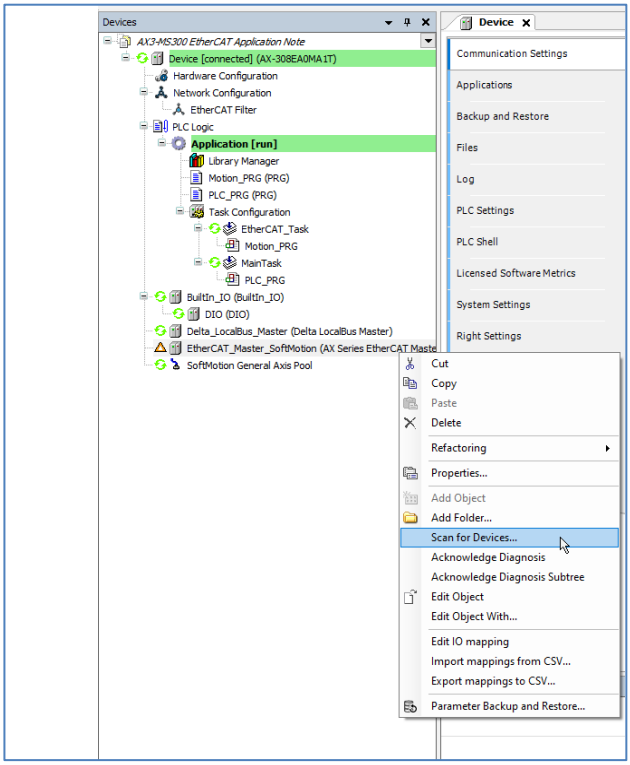
Choose ESI file for MS300

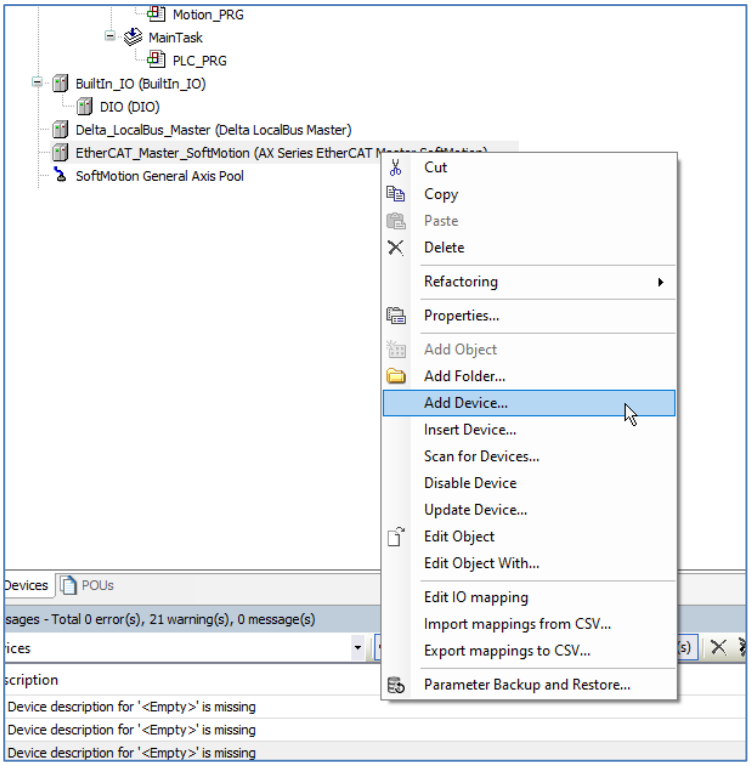


You can see Delta MS300 in Drives folder in Device Repository.

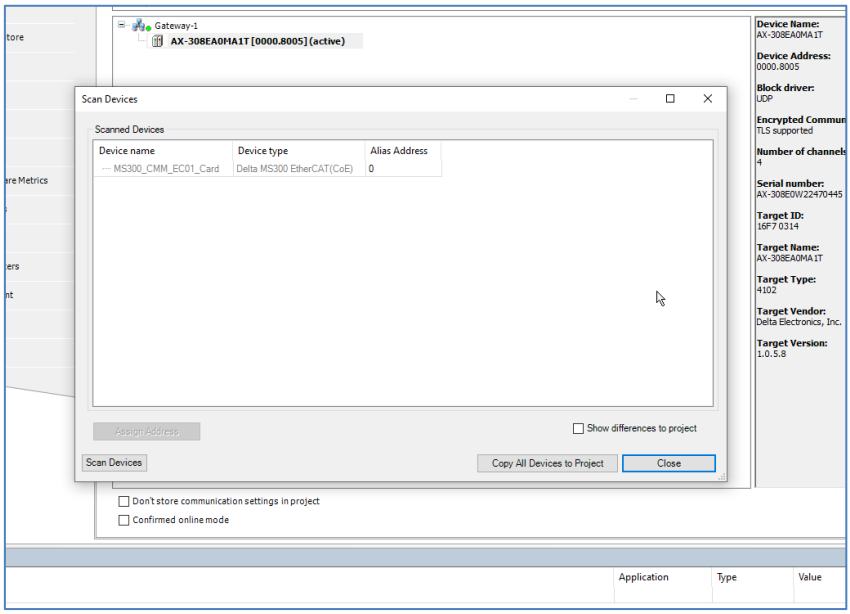


Step 4: Right click on EtherCAT Master device to scan device or add device from product list.

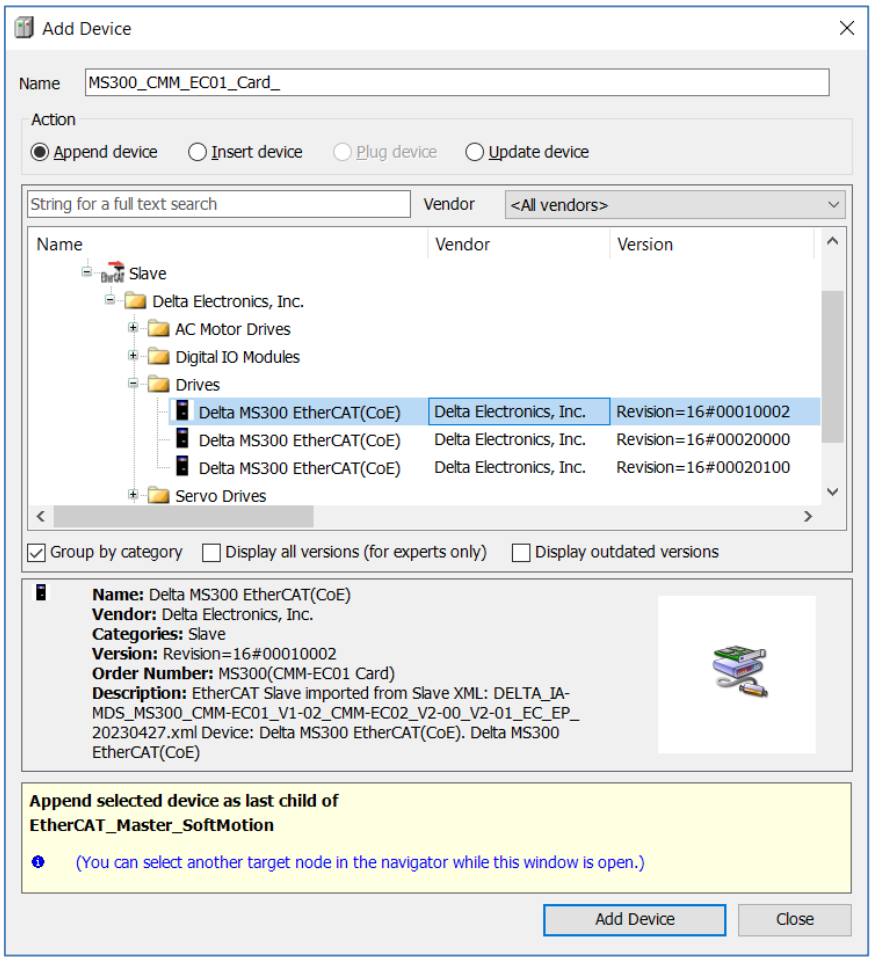




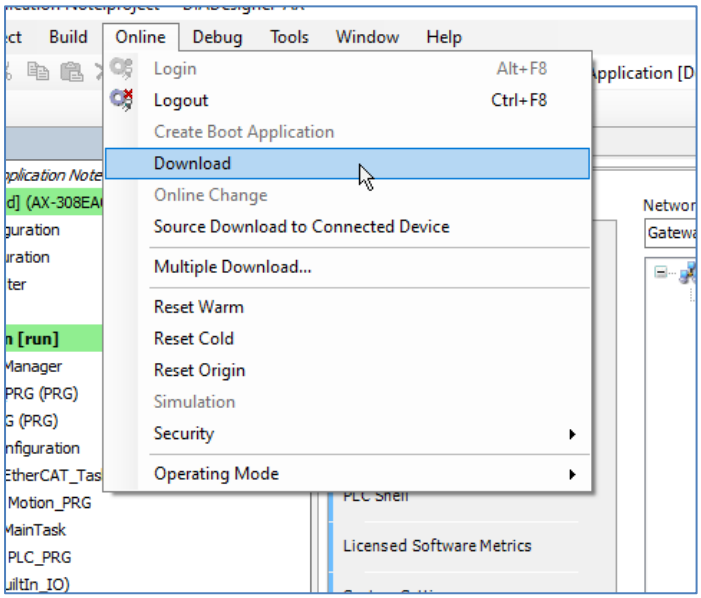
Step 5-a: Copy found device to project. (This is if you chose to scan for devices)

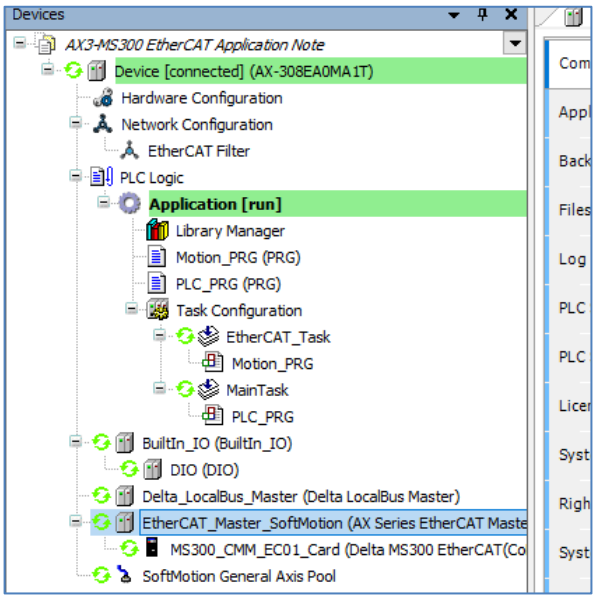


Step 5-b: Add device to project (This is if you chose to add device from list)



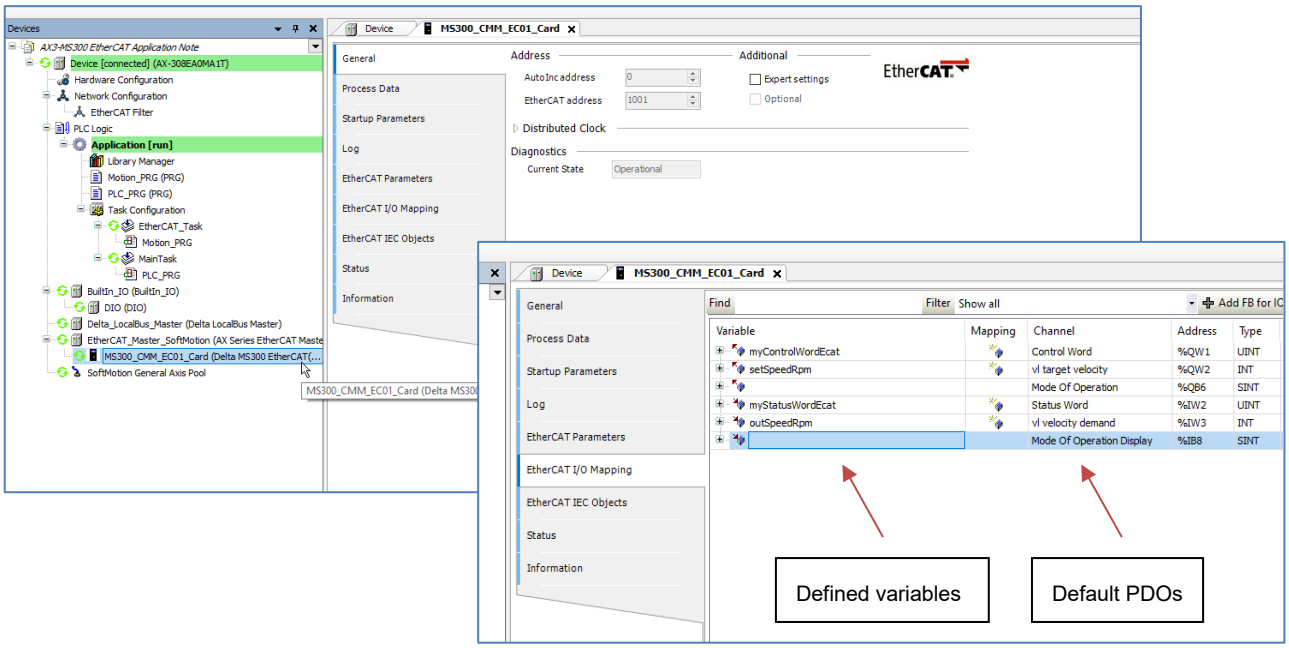
Step 6: Download project to controller. Check green circle on the left side of Device (EtherCAT_Master and MS300_CMM-EC01) to make sure if the network established successfully. To double check if EtherCAT connection established, double click on MS300 device and go to status tab.



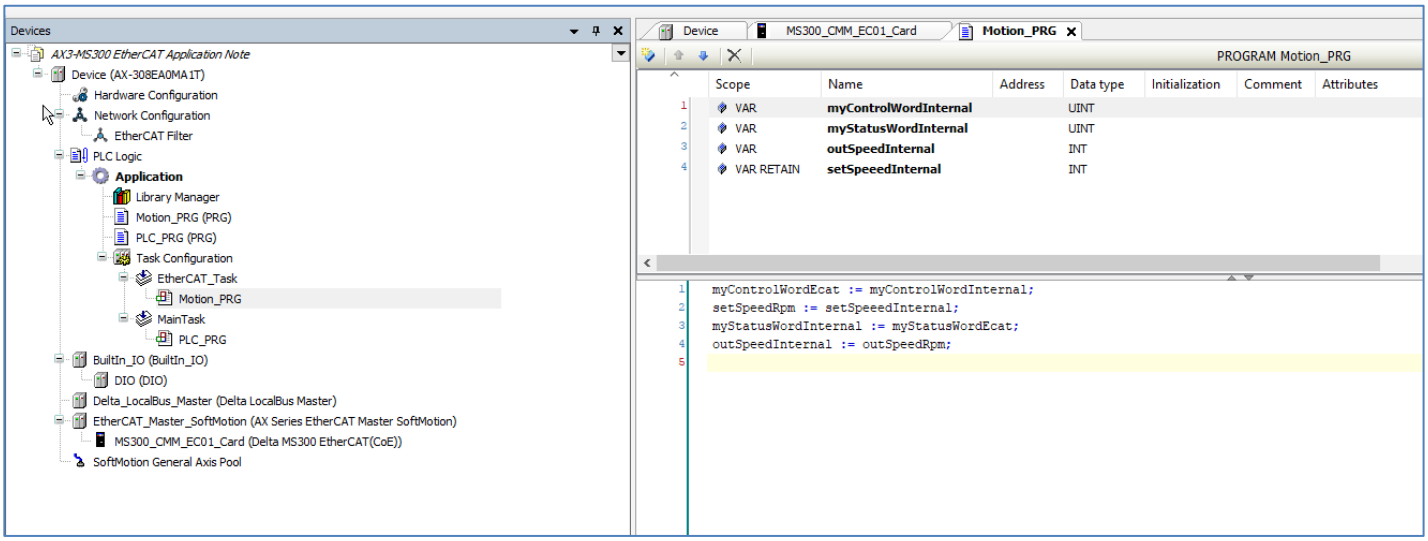


4 Structuring the variables and starting to write PLC code

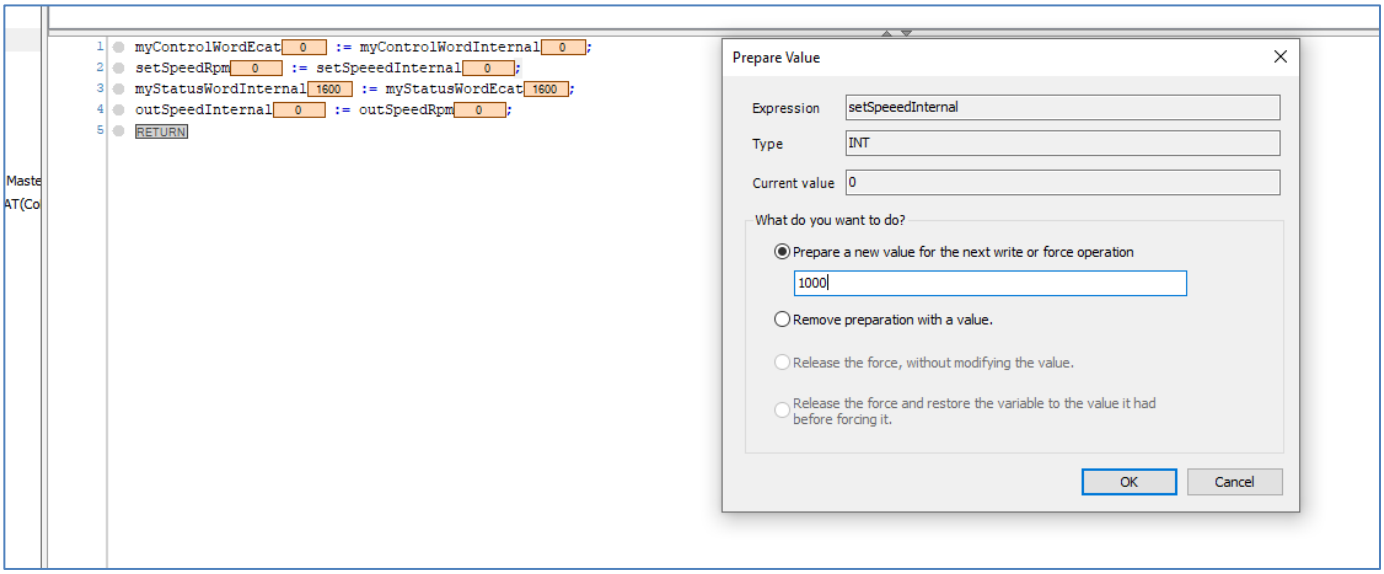
Step 1: When you double click on MS300, you can see device configuration screen. Go to EtherCAT I/O Mapping to define necessary variables for PDOs.

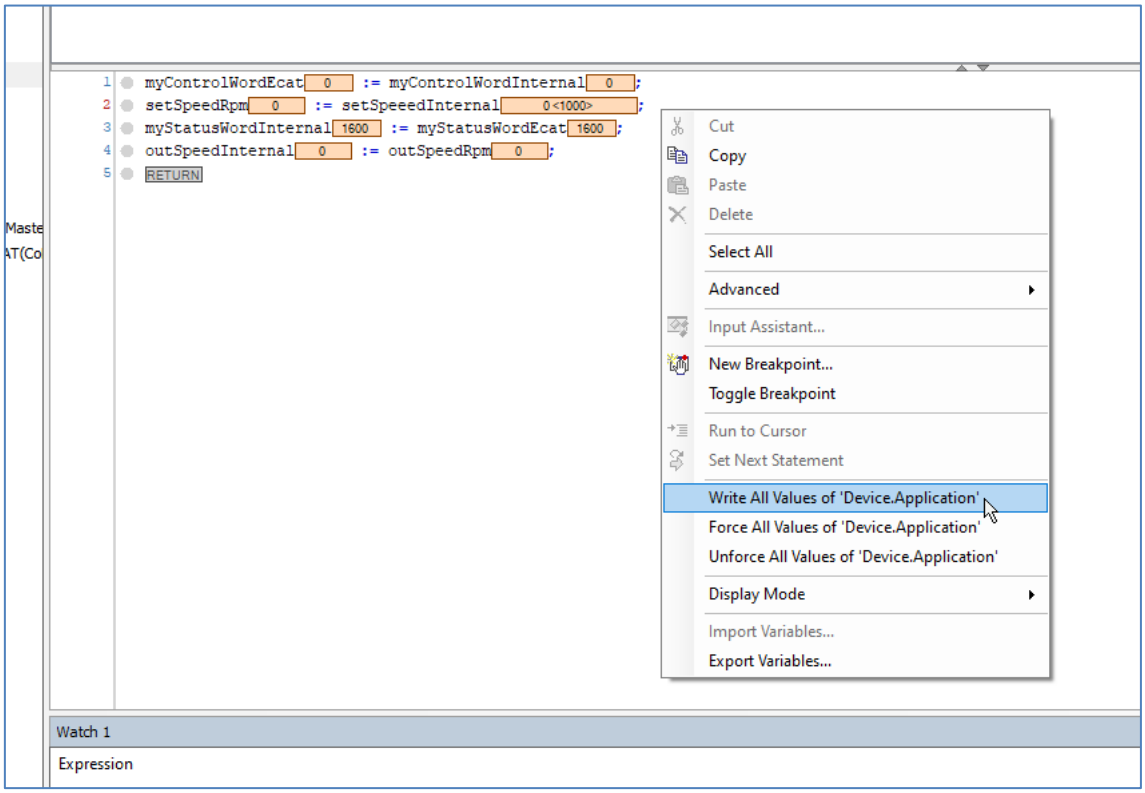


Step 2: You can use the following PLC code as an example.

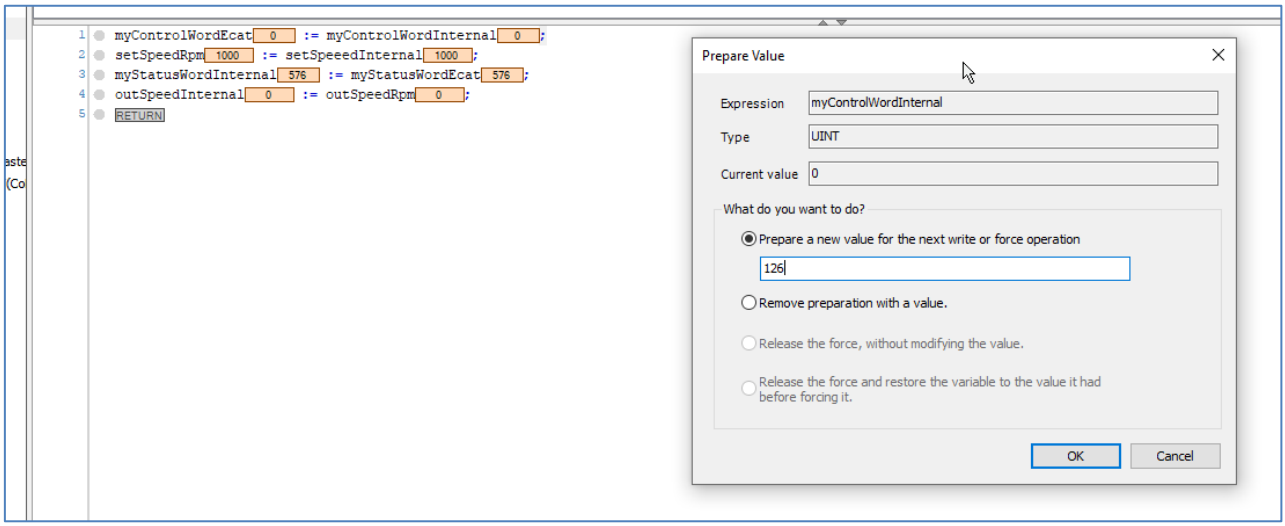


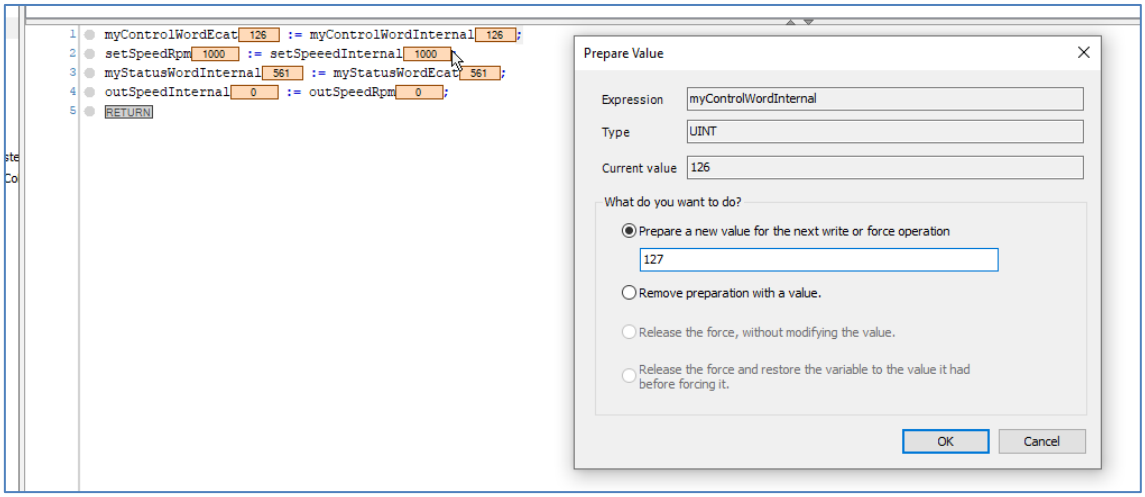
Step 3: Set motor speed (rpm) and right click on screen. Chose “write all values”

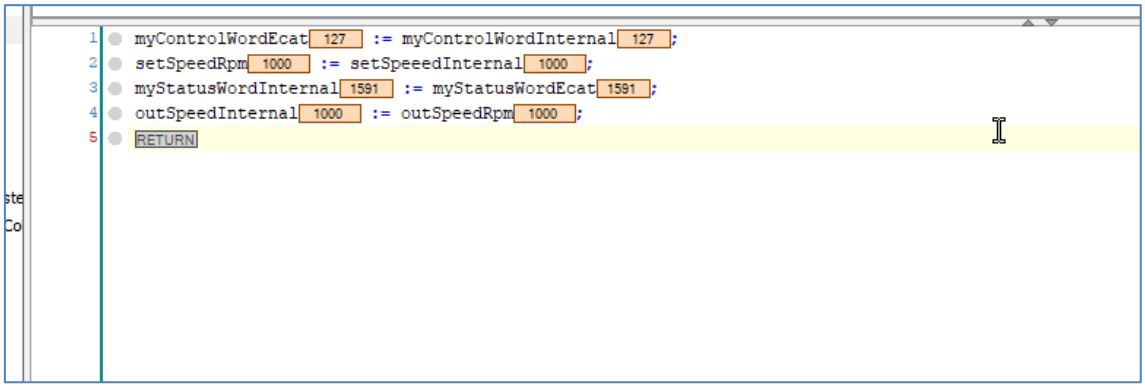




Step 4: Below values should be written to control word in order to run motor. Please refer to next section for details.

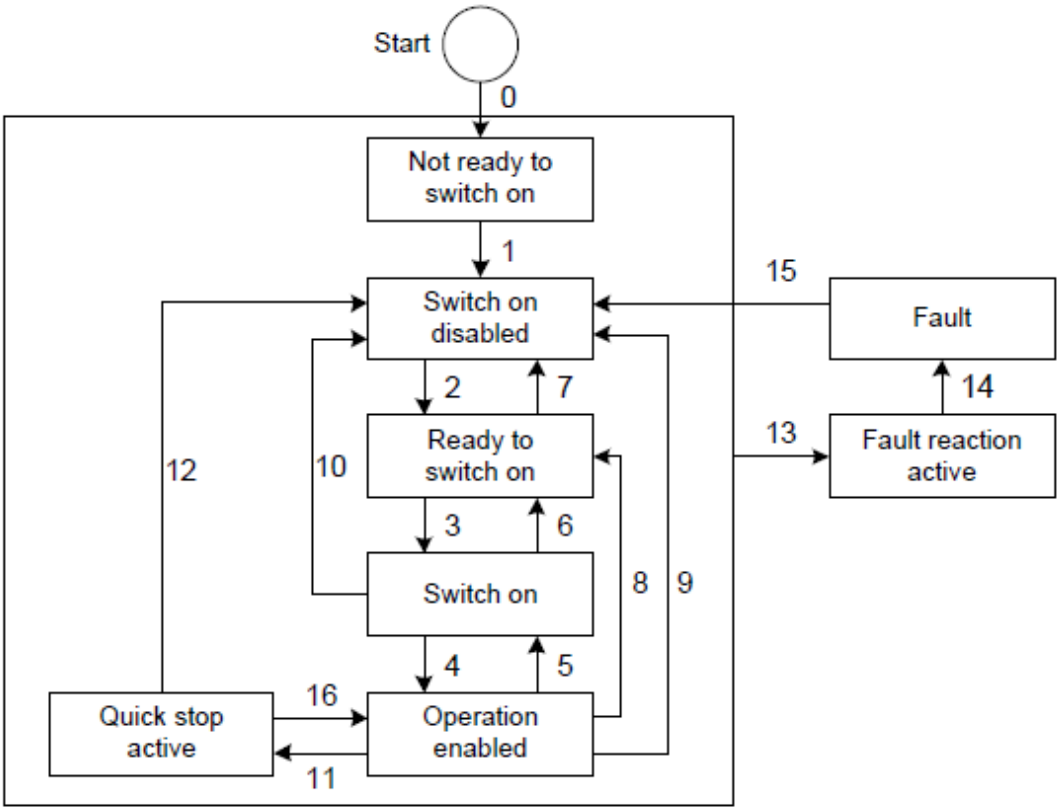






You should again write all parameters by right clicking on the screen as seen in step 3.

5 Status Switching Definition table



Status Switching Definition table

Status Switching	Event	Action
0、1	Auto run after powering on	Activate the device and initialize.
2	Shutdown command	N/A
3	Switch on command	Motor drive prepares for servo on
4	Enable operation command	Motor drive has servo on and is in operation.
5	Disable operation command	Servo has servo off.
6	Shutdown command	N/A
7	Disable voltage or Quick stop command	N/A
8	Shutdown command	Motor drive has servo off.
9	Disable voltage command	Motor drive has servo off.
10	Disable voltage or Quick stop command	N/A
11	Quick stop command	Enable Quick Stop function.
12	Disable voltage command	Motor drive has servo off
13、14	Warning / Fault codes pop up	Motor drive has servo off.
15	Warning / Fault codes clear	N/A
16	Enable operation ; no alarm command	Restart operation command.

Via Controlword (6040h), status can be changed, the commands are as follows:

Command	Bit of Controlword (6040h)					Status Change
	Bit 7	Bit 3	Bit 2	Bit 1	Bit 0	
Shutdown	0	X	1	1	0	2、6、8
Switch on	0	0	1	1	1	3
Switch on + Enable operation	0	1	1	1	1	3 + 4
Disable voltage	0	X	X	0	X	7、9、10、12
Quick stop	0	X	0	1	X	7、10、11
Disable operation	0	0	1	1	1	5
Enable operation	0	1	1	1	1	4、16
Fault reset	↑	X	X	X	X	15

NOTE: 0 = Bit is off; 1 = Bit is on; X = Bit is not affected; ↑ = positive edge triggering

For Enable Operation (drive start) Bit 4,5,6 also should be set to 1.