

# Setup Instructions for TwinCAT3 with the AKD

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2/23/16

Setting up TwinCAT3 for operation with the AKD drive is almost identical to TwinCAT2. Some of the terminology is different and the xml file goes in a different location. But the general process is the same.

There are two XML files for the AKD drive. One is for TwinCAT version 2 and the other is for version 3.

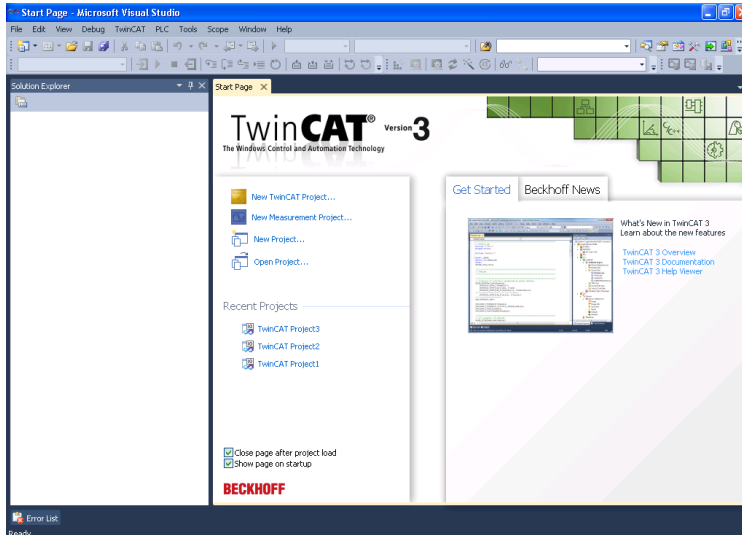
TwinCAT 2 XML file: “AKD\_TwinCAT.xml”

TwinCAT 3 XML file: “AKD EtherCAT Device Description.xml”

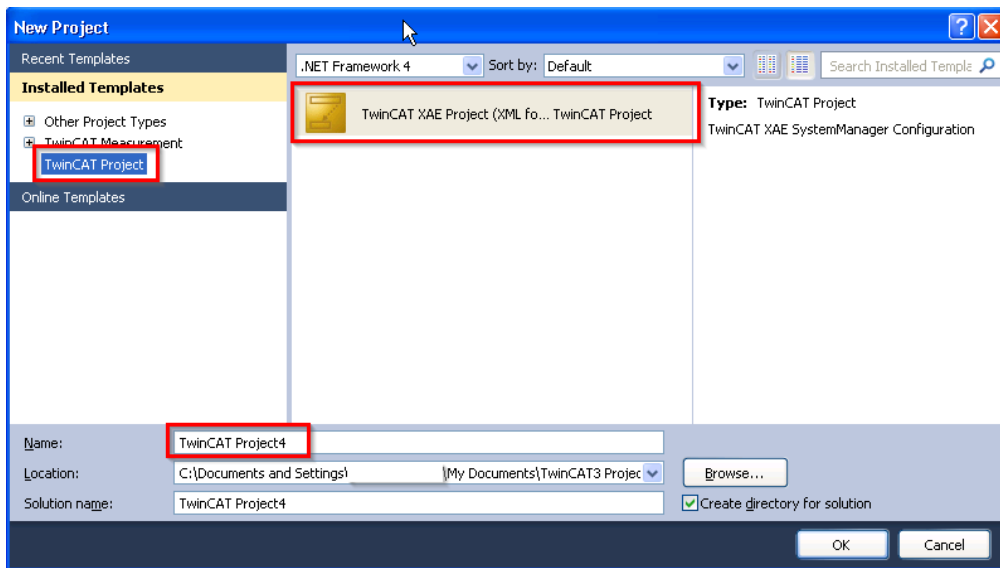
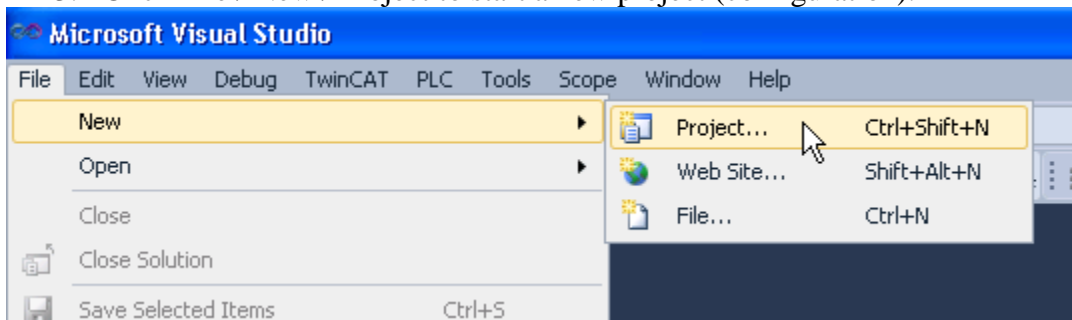
1. Place the xml file called “AKD EtherCAT Device Description.xml” in the directory, “C:\TwinCAT\3.1\Config\Io\EtherCAT.”
2. Click on the TwinCAT icon in the system tray and click “TwinCAT XAE” to start the TwinCAT software. This is equivalent to the System Manager in TwinCAT2.



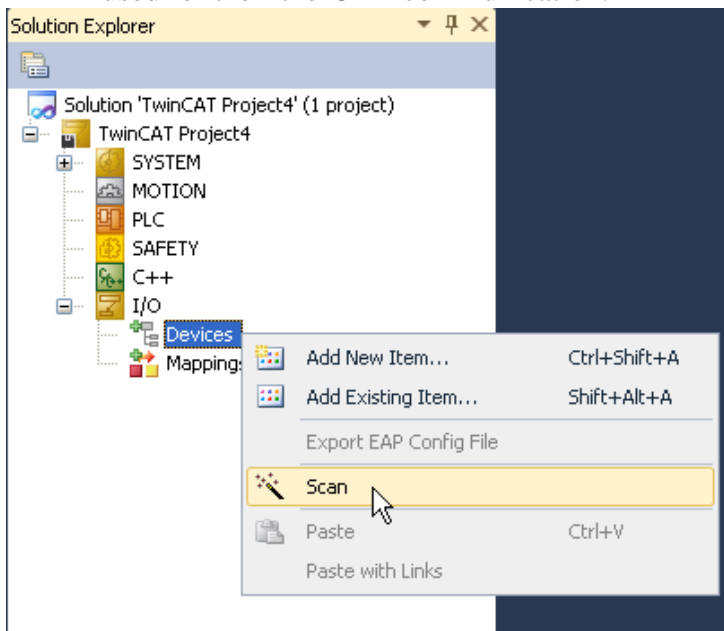
## Start screen of TwinCAT3



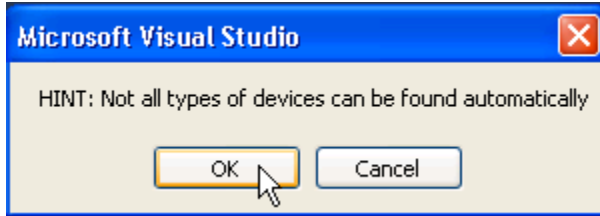
3. Click File / New / Project to start a new project (configuration).



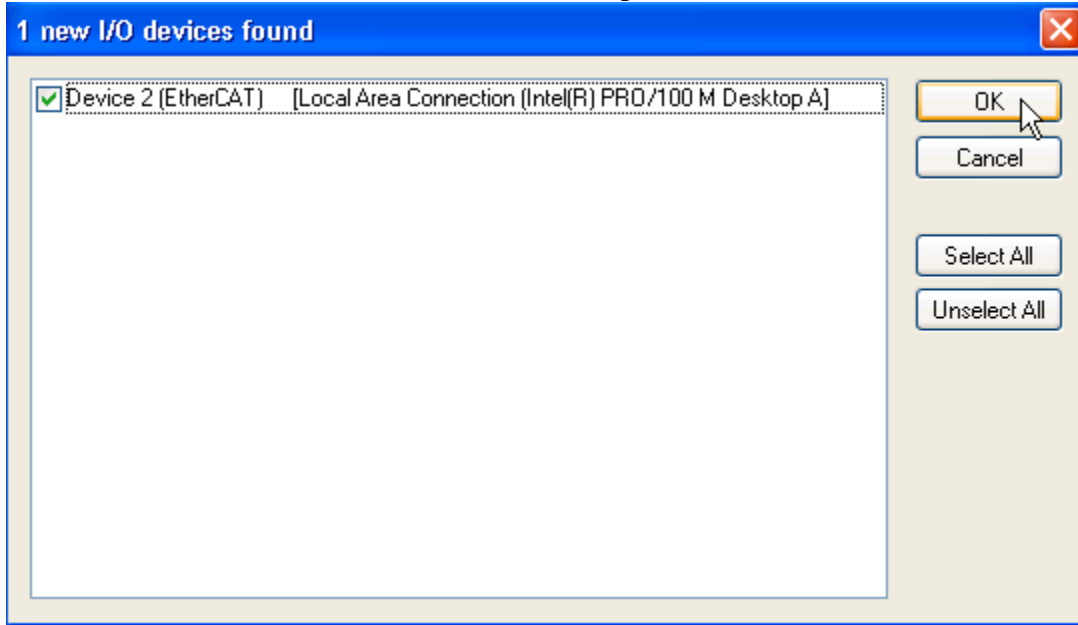
4. Right click on Devices and click Scan to scan for the Ethernet adapter that will be used for the EtherCAT communication.



5. Click OK.



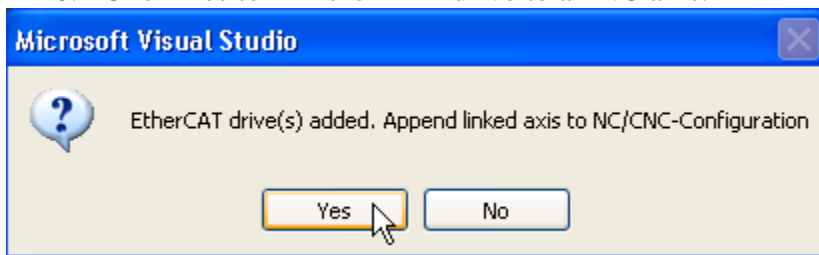
6. Select the Intel® Pro/100M network adapter and click OK.



7. Click Yes to scan for boxes (AKD drives).



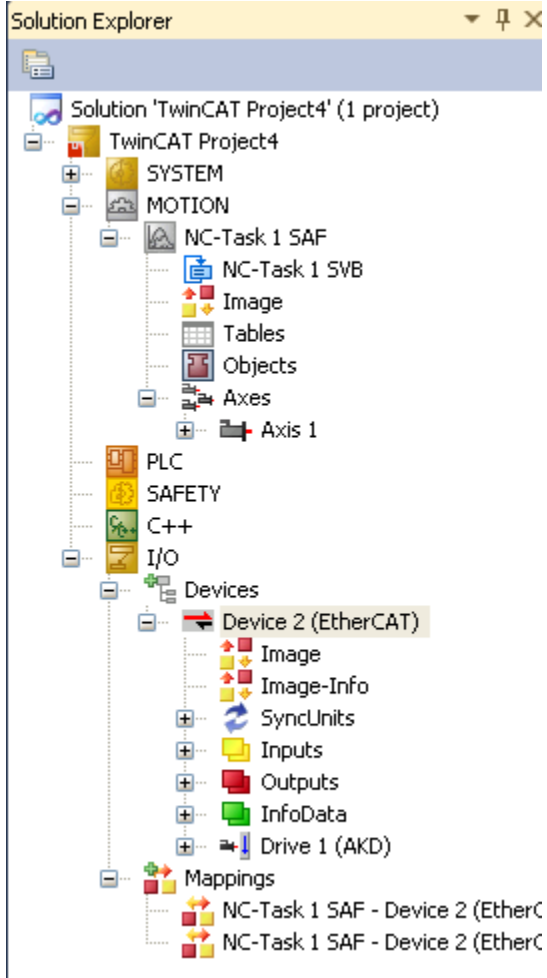
8. Click Yes to link the AKD drive to an NC axis.



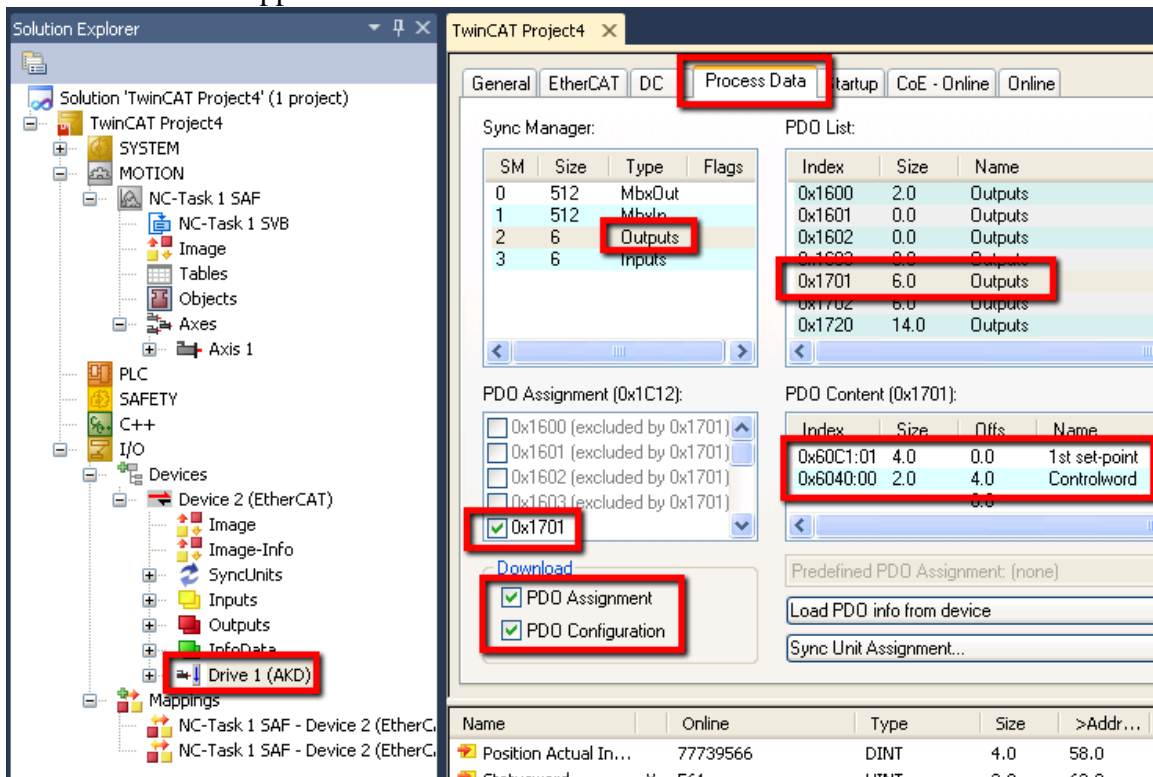
9. Click Yes to activate free run mode.



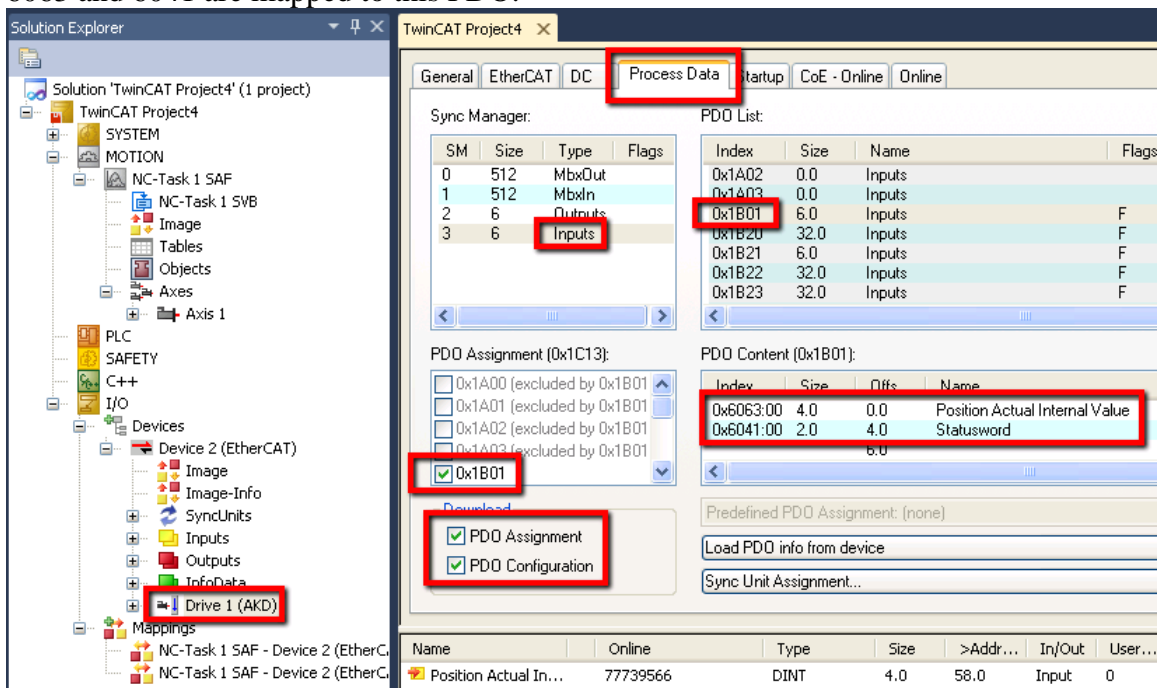
Navigation tree with NC-Task, Axis, and Drive 1 (AKD).



10. Double-click on “Drive 1 (AKD)” and click on the Process Data tab. Check both boxes for PDO Assignment and PDO Configuration. The default output assignment of 0x1701 is the one you need. Notice the objects 60C1sub01 and 6040 are mapped to this PDO.



The default input PDO assignment of 0x1B01 is the one you need. Notice the objects 6063 and 6041 are mapped to this PDO.



## 11. Link a data word to the Position Actual Internal Value PDO.

The screenshot shows the TwinCAT Project4 interface. On the left, the Solution Explorer displays a project tree with the following structure:

- MOTION
  - NC-Task 1 SAF
  - NC-Task 1 SVB
    - Image
    - Tables
    - Objects
    - Axes
      - Axis 1
- PLC
- SAFETY
- C++
- I/O
- Devices
  - Device 2 (EtherCAT)
    - Image
    - Image-Info
    - SyncUnits
    - Inputs
    - Outputs
    - InfoData
    - Drive 1 (AKD)
      - Position Actual Internal Value
      - Statusword
      - Outputs
        - 1st set-point
        - Controlword
      - WcState

The Variable Properties dialog for 'Position Actual Internal Value' is open on the right. The 'Variable' tab is selected. The following fields are visible:

- Name: Position Actual Internal Value
- Type: DINT
- Group: Inputs
- Address: 58 (0x3A)
- User ID: (empty)
- Linked to...: (button)
- Comment: (empty)
- ADS Info: Port: 11, IGrp: 0x3040010, IOffs: 0x80000C
- Full Name: TIID^Device 2 (EtherCAT)^Drive 1 (AKD)^

The screenshot shows the 'Attach Variable Position Actual Internal Value (Input)' dialog. The dialog is titled 'Attach Variable Position Actual Internal Value (Input)'. The left pane shows a tree view of the project structure, with the following items highlighted:

- Axis 1
  - Enc
- nDataIn1 > IB 128.0, UINTARR2 [4.0]

A red box highlights the 'Enc' item with the text: "Link the 'Position Actual Internal Value' to this." Another red box highlights the 'nDataIn1' item.

The right pane contains the following options:

- Show Variables
  - Unused
  - Used and unused
  - Include disabled
  - Include other Devices
  - Exclude same Image
  - Show Tooltips
  - Sort by Address
- Show Variable Types
  - Matching Type
  - Matching Size
  - All Types
  - Array Mode
- Offsets
  - Continuous
  - Show Dialog
- Variable Name
  - Hand over
  - Take over

Buttons: Cancel, OK

## 12. Link a data word to the 1<sup>st</sup> set-point PDO.

The image shows two screenshots from the TwinCAT software interface. The top screenshot displays the 'Variable' configuration window for a variable named '1st set-point'. The variable is of type 'DINT', belongs to the 'Outputs' group, and has an address of '58 (0x3A)'. The 'Linked to...' field is empty. In the Solution Explorer on the left, the '1st set-point' object under 'Drive 1 (AKD)' is highlighted with a red box.

The bottom screenshot shows the 'Attach Variable 1st set-point (Output)' dialog box. The dialog lists various data words under the 'Drive' object. A red box highlights the 'Out' data word, with a red callout box containing the text: "Link the '1st set-point' object to this." The 'OK' button at the bottom right of the dialog is also highlighted with a red box.

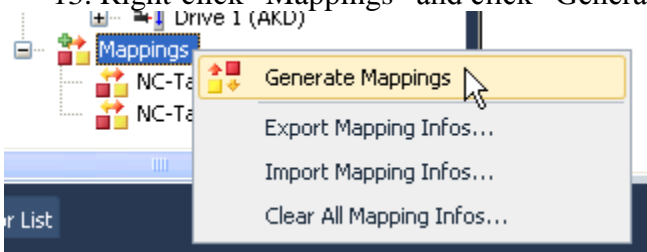
**Variable Configuration:**

Field	Value
Name	1st set-point
Type	DINT
Group	Outputs
Address	58 (0x3A)
Linked to...	
Comment	
ADS Info	Port: 11, IGrp: 0x3040
Full Name	TIID^Device 2 (EtherCAT)

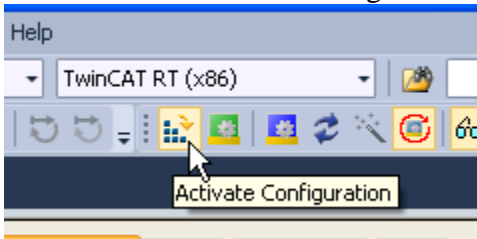
**Attach Variable Dialog Data Words:**

Object	Data Word	Address
Drive	nDataOut1	QB 256.0, UINTARR2 [4.0]
	nDataOut2	QB 260.0, UINTARR2 [4.0]
	nDataOut3	QB 268.0, UINTARR2 [4.0]
	nDataOut4	QB 272.0, UINTARR2 [4.0]
	nDataOut5	QB 276.0, UINTARR2 [4.0]
	nDataOut6	QB 280.0, UINTARR2 [4.0]
ToPlc	StateDWord	QB 0.0, MC.NCTOPLC_AXIS_R
	ErrorCode	QB 4.0, UDINT [4.0]
	AxisState	QB 8.0, UDINT [4.0]

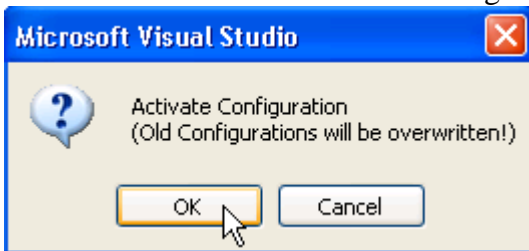
13. Right-click “Mappings” and click “Generate Mappings.”



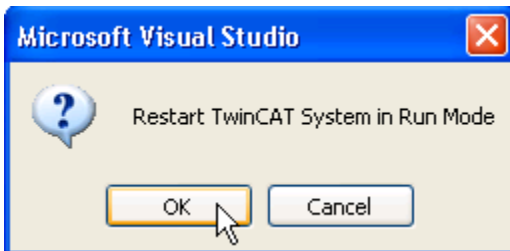
14. Click Activate Configuration.



15. Click OK to activate the configuration.



16. Click OK to start run mode.



The TwinCAT3 icon in the system tray will turn green for run mode.





## Main motion control interface for NC-Task Axis 1.

The screenshot shows the TwinCAT motion control interface for Axis 1. The 'Online' tab is selected, displaying the following parameters and controls:

- Position:** 0.0000 mm
- Actual Velocity:** 0.0000 mm/s
- Setpoint Position:** 0.0000 mm
- Setpoint Velocity:** 0.0000 mm/s
- Override:** 0.0000 %
- Total / Control Output:** 0.00 / 0.00 %
- Error:** (empty)
- Status (log):**
  - Ready
  - Calibrated
  - Has Job
  - NOT Moving
  - Moving Fw
  - Moving Bw
- Status (phys.):**
  - Coupled Mode
  - In Target Pos.
  - In Pos. Range
- Enable:**
  - Controller
  - Feed Fw
  - Feed Bw
- Controller Kv-Factor:** 1 mm/s/mm
- Reference Velocity:** 2200 mm/s
- Target Position:** 0 mm
- Target Velocity:** 0 mm/s
- Buttons:** Jog negative (F1), Jog positive (F2), Start Position Move (F5), Reset, Home, F6, F8, F9.

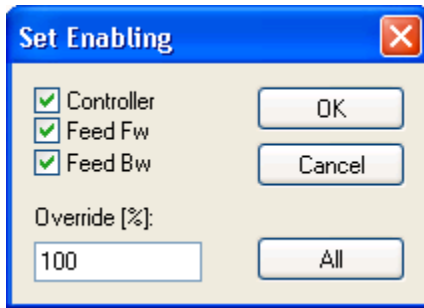
## 17. Disable the position error monitoring.

The screenshot shows the TwinCAT parameter configuration interface for Axis 1. The 'Parameter' tab is selected, displaying the following table of parameters:

Parameter	Offline Value	Online Value
- Maximum Dynamics:		
Reference Velocity	2200.0	2200.0
Maximum Velocity	2000.0	2000.0
Maximum Acceleration	15000.0	15000.0
Maximum Deceleration	15000.0	15000.0
- Default Dynamics:		
Default Acceleration	1500.0	1500.0
Default Deceleration	1500.0	1500.0
Default Jerk	2250.0	2250.0
+ Manual Motion and Homing:		
+ Fast Axis Stop:		
+ Limit Switches:		
- Monitoring:		
Position Lag Monitoring	FALSE	FALSE
Maximum Position Lag Value	5.0	5.0
Maximum Position Lag Filter Time	0.02	0.02
Position Range Monitoring	FALSE	FALSE
Position Range Window	5.0	5.0
Target Position Monitoring	FALSE	FALSE
Target Position Window	2.0	2.0
Target Position Monitoring Time	0.02	0.02
In-Target Alarm	FALSE	FALSE

At the bottom of the interface, there are buttons for 'Download', 'Upload', 'Expand All', 'Collaps All', and 'Select All'. The 'Download' button is highlighted with a red box.

18. Enable the drive.



19. Start a position move. Position scaling for 60C1sub01 and 6063 is based on  $2^{(FB1.PSCALE)}$  per revolution. Default value is 20, so  $2^{20}$  counts per rev.

