Index:
TwinCAT Overview .................................................................................................................................................. 3
1. Open System Manager & Scan I/O’s .................................................................................................................. 4
2. Start a new NC program .................................................................................................................................... 6
3. Configuring Encoder, Driver & Controller ..................................................................................................... 7
4. NC task & Axis settings ..................................................................................................................................... 9
5. PLC task ............................................................................................................................................................ 11
6. Scope View ...................................................................................................................................................... 14
7. Adding Library .................................................................................................................................................. 16
**TwinCAT Overview**

The TwinCAT software is the master application for EtherCAT. It consists of three different programs:

**System Manager:**
The TwinCAT System Manager is the central tool for the configuration of the TwinCAT System.
The inputs and outputs of the participating software tasks and the physical inputs and outputs of the connected field busses are managed by the TwinCAT System Manager. Additionally the online values of the active configurations can be regarded.
The logical inputs and outputs are assigned to the physical ones by logically linking variables of the software tasks and variables of the field busses.

**PLC Controller:**
TwinCAT PLC Control is a complete development environment for your PLC. Use of the editors and debugging functions is based upon the proven development program environments of advanced programming languages.

**Scope View:**
TwinCAT Scope View is an analysis tool providing graphical display of the variables related to various PLC- and NC tasks.
1. Open System Manager & Scan I/O’s

Open *System Manager* via taskbar icon.

Open a *New* program

Scan Devices:
Right-click on *I/O Devices* → *Scan Devices…*

Select which network card you are using for EtherCAT.

Choose: “Yes” Scan for boxes

Choose: “Yes” Activate Free Run

Now all the Terminals that were found during the scanning are displayed.
View Encoder Value:

Incremental Encoder Interface:

Via the Online Tab is it possible to view the current value of the Incremental Encoder.

EL5101
  → Input
  → Value  (*Online Tab*)
2. Start a new NC program

Append a new NC task:
Right-click on NC-Configuration⇒
Append Task

- Choose another name or just click OK

NC task:
SAF: Controller (cycle time, Priority and other settings)
SVB: Coupling (cycle time, Priority and other settings)
Image:
Table: used for making/configure CAM design
Axes: used for making/configure Axes

Append a new Axis:
Right-click on Axes and Append Axes.

Name: axis name
Type: Continuous Axis

Axis Options:
Each axis consists of various elements, depending on the axis type. These elements include the encoder, the drive, the controller and the set value generator.

Axis: configure profile, manual P2P, coupling, etc..
Enc: encoder terminal has to be linked, resolution factor and other settings.
Drive: drive terminal/channel has to be linked and other analog settings.
Ctrl: Controller settings. (P,PID)
Input & Output: If PLC is used; it has to be linked to the PLC task.
3. Configuring Encoder, Driver & Controller

*Before you can begin to configure the terminals, you have to Scan for Devices

Encoder:
Choose Type:
- Simulation encoder (simulation without terminals)
  OR
  - Encoder EL5101

*Choosing Encoder terminal:
If an Encoder Terminal is used, it has to be linked.

Encoder settings:

Factor: resolution factor

Example (per resolution):
4th order: \(1/2000\text{pulse}=0.0005\)
XY-table: \(1/4000\text{pulse}=0.00025\)

Driver:
Choose type & *output Terminal.
(not necessary for Simulation)

Change Motor Polarity if needed.
4de model: True
XY-table: True
Controller:
Here is it possible to configure the controller.

Option for: P, PID, .....

PID configuration:
Example:

\[ G(s) = K_p \left( 1 + \frac{1}{T_v s} + \frac{T_d s}{1 + T_d s} \right) \]

Example D-controller:

\[ G(s) = \frac{T_v s}{1 + T_d s} = \frac{s}{1 + \frac{T_d}{T_v} s} \]

Tv=1
Td=-100 \rightarrow 0.01
4. NC task & Axis settings

Dynamics (Axis profile):
Here is it possible to adjust the profile for the axis.
Example: Acceleration, Deceleration and Jerk settings (time and characteristic)

Global:
Her is it possible to adjust the global setting.
Example: Max. velocity, acc, dec, jerk

*(ENABLE: Position Lag Monitoring → False
Change it to False for manual controlling. If you receive an error )

Now you can begin to Run the program:

- 1. Map the SW with the HW.
- 2. Check Configuration.
- 3. Activate de configuration.
- (RUN/START TwinCAT)
Click on **OK**

Enable **All** (Manual control)

**Function:**
1. Set Absolute Position to ‘0’ if needed
2. Choose **Start Mode**
3. Set Position(s)
4. Set Velocity
5. **Start** the Function
5. PLC task

**TwinCAT PLC Control**

- Open the **.PRO** file
- Compile the PLC project via menu *Project - Rebuild All.* (or *Built*)

(TwinCAT PLC control will compile/make an **.tpy** file in the same folder)

**TwinCAT System Manager.**

- Open the **.WSM** file or a new one.
- Make sure you have Scanned for Devices (terminal). Or if you only going to simulate it is not necessary.
- Configure the Encoder and Drive (Type, Link To..)
Open the PLC project in System Manager

Right-click on **PLC-Configuration** → **Append PLC Project**

Insert the **.tpy** file

The next step is to Link the **PLC Inputs & Outputs** to the Axis

Now you can Run the program:

- 1. Map the SW with the HW.
- 2. Check Configuration.
- 3. Activate de configuration.
- (RUN/START TwinCAT)
Open TwinCAT Scope

- Open de .SCP file
- Start recording via het menu of via F5 key.

TwinCAT PLC Control

- 1- Load PLC the project. *(Online - Login)*
- 2- Start the program. *(Online – Run)*

Now the system is running!!!

- 3. Stop the program
- 4. Logout
6. Scope View

System Manager:

- Open Scope View
- Open the .SCP file
- Start recording via Scope-menu or via F5 key.

Sample Scopes in:
- C:\TwinCAT\Scope

Or
- In the program folder

How to create a new Scope View

Scope View
First you have to go to the Axis and check if the Create symbols box is enabled. This will make the signals visible for the Scope View.

Restart the program.

Step:
1. Right-click on Scope and choose Add Scope View...
2. Right-click on Scope view 1 and choose Add Channel
Go to the Channel → Acquisition tab and Add/Change symbol (signal)

3. **Reload symbols** and choose the signal.
   - System Manager has to be in **RunTime**
   - PLC must be **Logged On** (otherwise you will receive an error)

Repeat step 2 and 3 for additional channels.

**Tab settings:**
In the Tabs you can rename, change the colors and the display bounds.
7. Adding Library

1. Go to **Resources** Tab
2. Go to **Library Manager**
3. Add Library. Right-click ➔ **Additional Library**...
4. Browse and open the Library.

Library folder is located in ➔ C:\TwinCAT\Plc\Lib or D:\TwinCAT\Plc\Lib