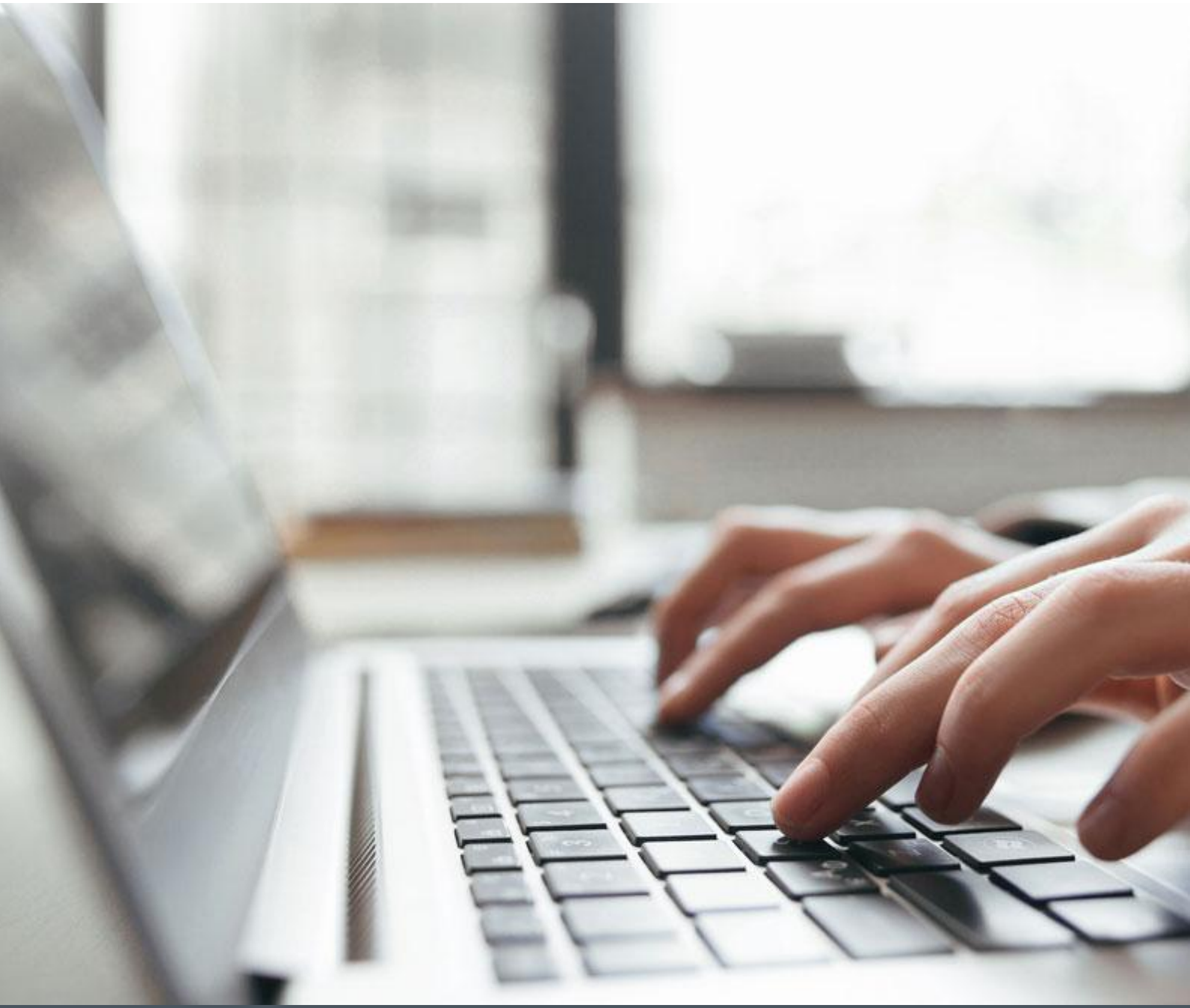


Application Note

How to start up a Nanotec controller / drive with Siemens S7-1500 with PROFIdrive

Version 1.0.0

www.nanotec.com

Contents

1 Intended use and audience

Based on two example projects, this application note shows you how to start up a Nanotec controller / drive with Siemens S7-1500 (CPU 1516-3 PN/DP) in *TIA Portal*. For due safety, follow valid OEM instructions. All products required in this document are for use by trained experts only. Before product use, please ensure that all users read, understand and follow the instructions in this document fully.

2 Requirements

NOTICE

Malfunction from incompatibility! The products required here come in various versions. Duly select / install / configure the correct products in advance.

- ► Fulfil the requirements.
- ► Use compatible equipment only.
- ► Follow valid OEM instructions.

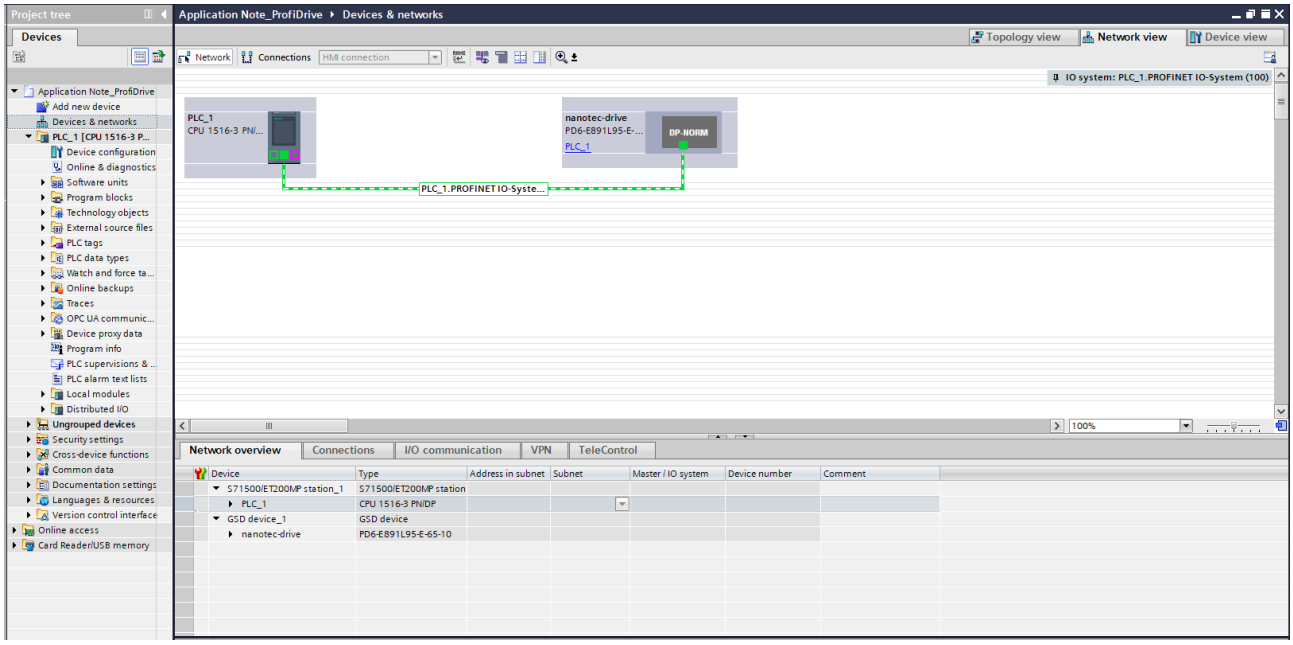
You must ensure proper operation of motor and slave drive before you can use our example projects.

1. Configure the slave drive (= Nanotec controller) in advance.
2. Keep controller / drive operation unhindered by any stand-alone program (NanoJ) running on the slave etc.

Hardware	• Siemens S7-1500 (CPU 1516-3 PN/DP), Hardware Version 3, Bootloader Version V 2.2.1, Firmware Version V 02.06.00 • PD6-E891L95-E-65-10, Firmware Version FIR-v2417-B1058532
Software	• TIA Portal V16, STEP 7 Professional V16

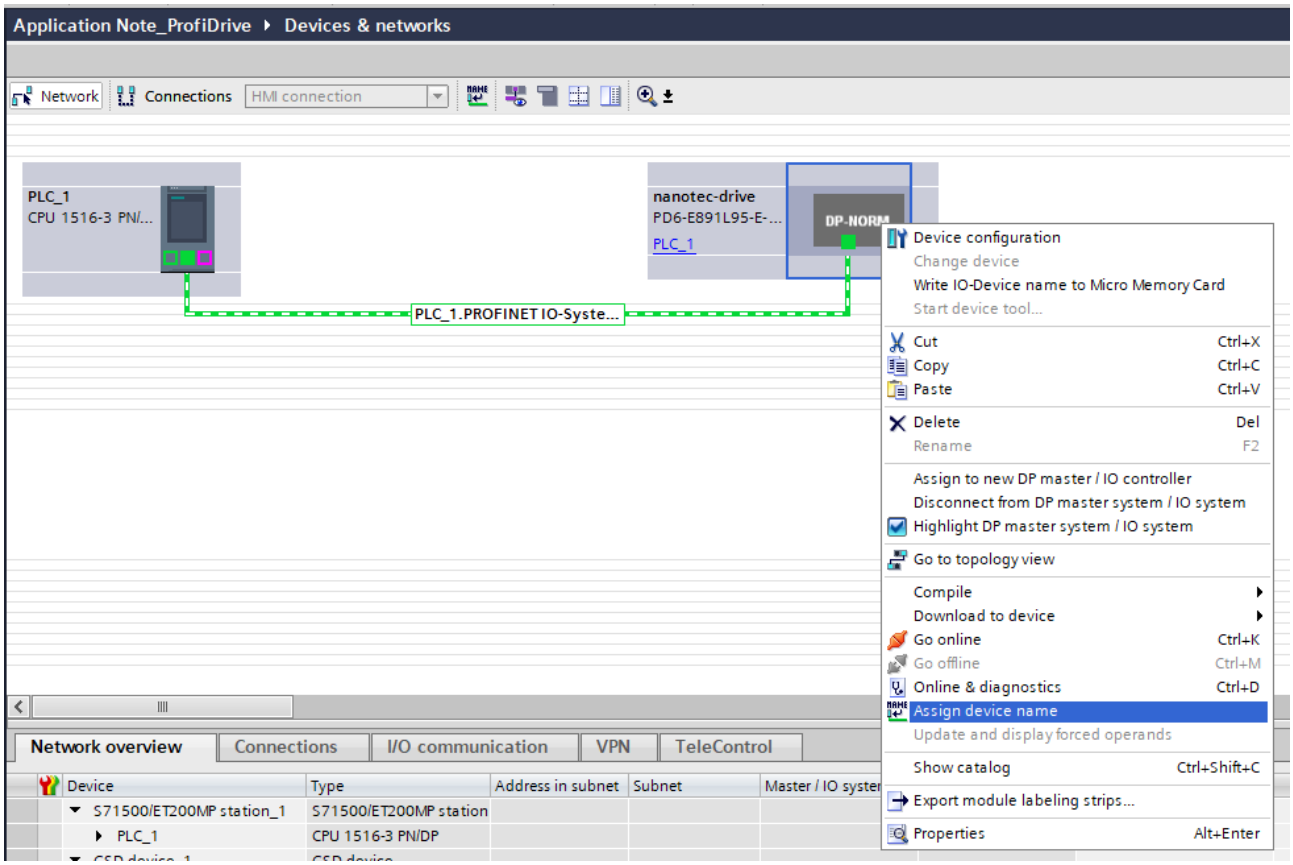
3 Creating a new project and setting up communication

To get communication up and running, follow the basic instructions for adding a GSD file and adding a slave device in the device manual. After you have successfully done the GSD file installation and set up the basic connection, your system should look like this:

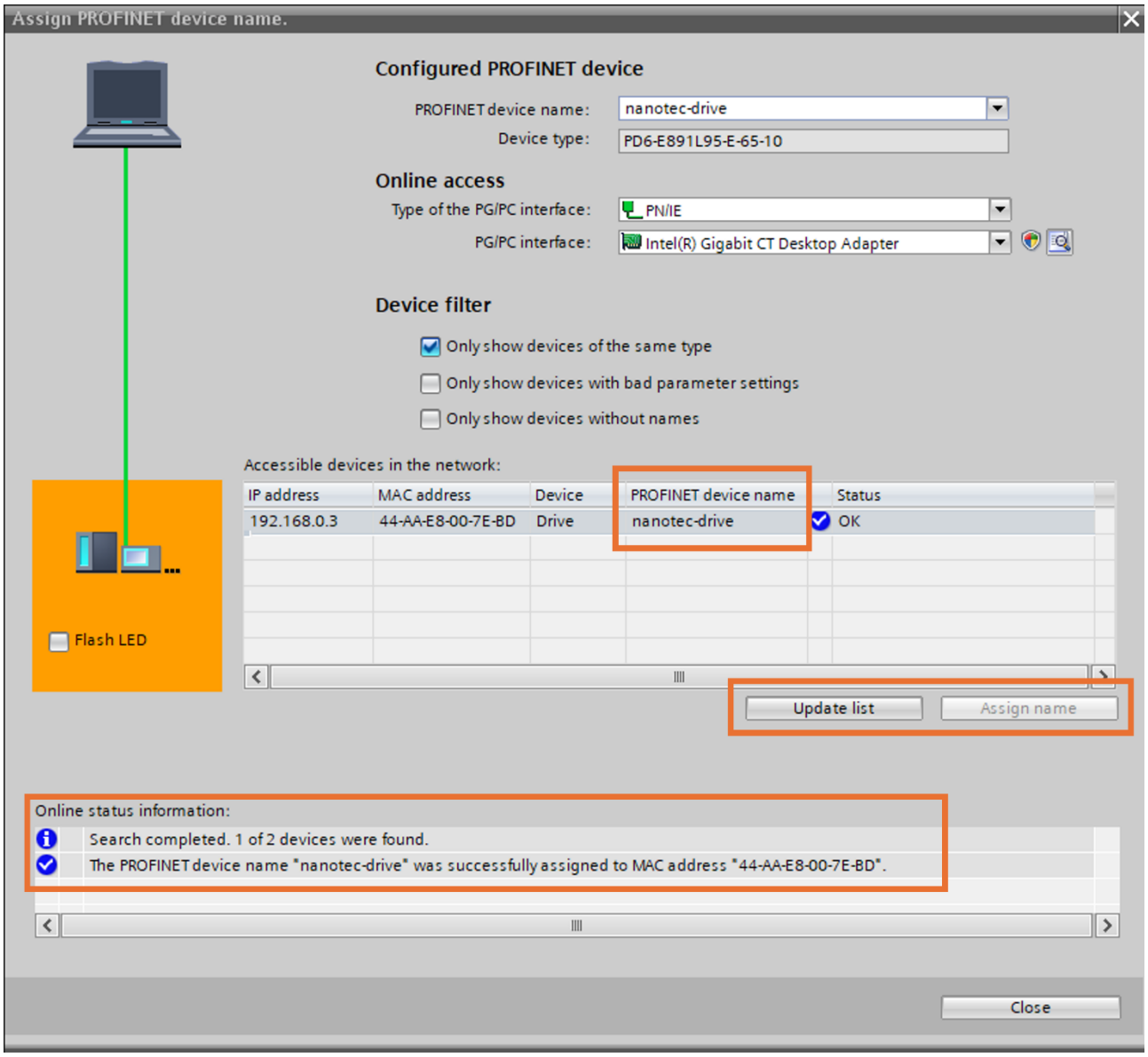


To set up the basic communication:

1 Right-click on the slave in the area marked with “DP-NORM” and left-click on “Assign device name”.

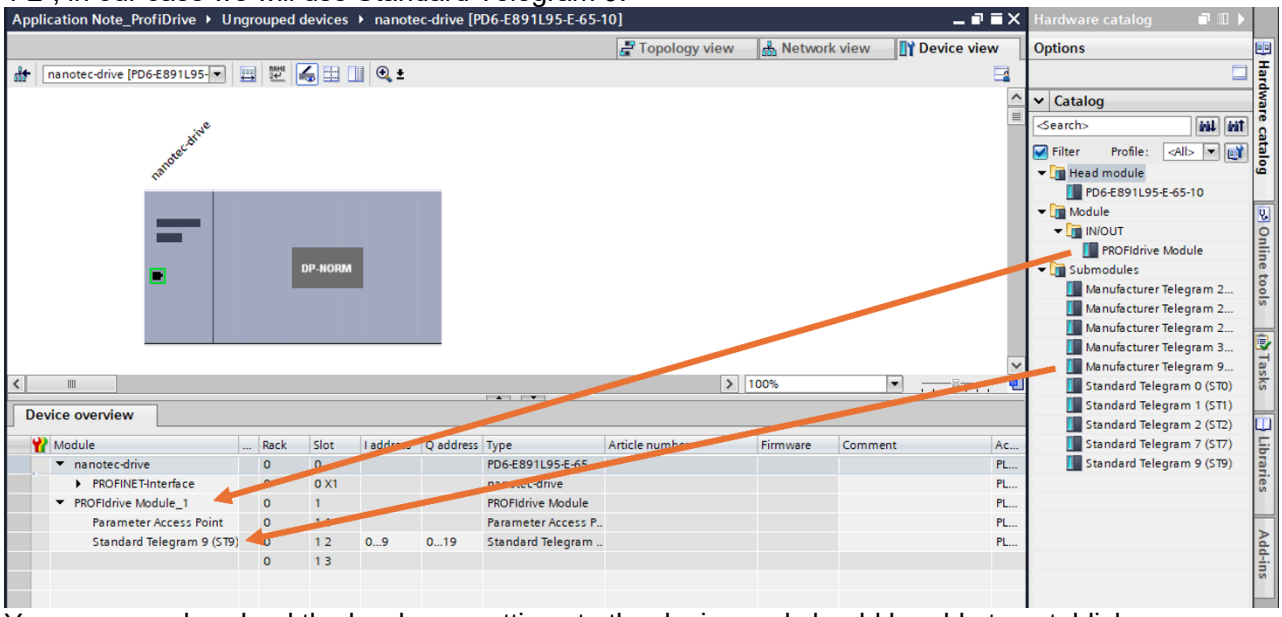


2 Click on “Update list” to show all available devices.
3 Assign a device name, in our example we will use the name “nanotec-drive”. You should see an info-message that the name was successfully assigned.

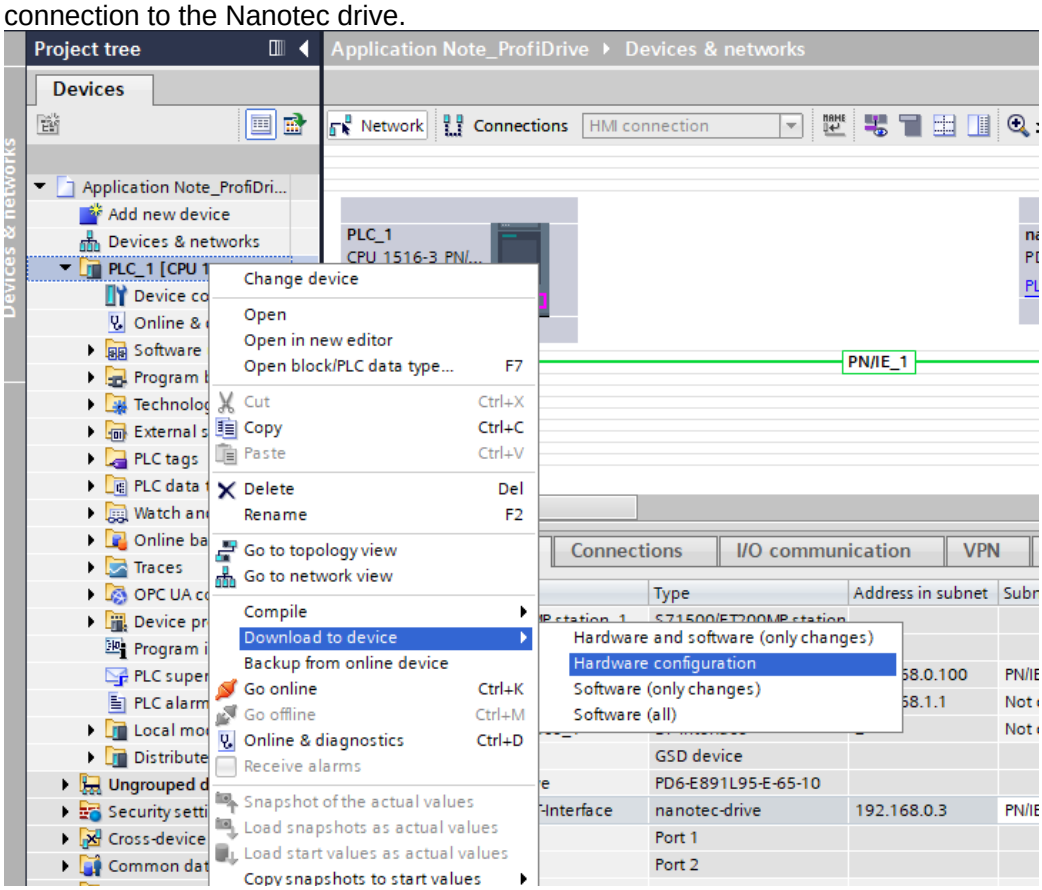


4 Close the dialogue window afterwards.
5 Open the device view for the nanotec-drive by double clicking on the device.
6 From the hardware catalog, drag & drop the PROFIdrive Module into the free “Slot 1” under “Device overview”.

7 Afterwards you may drag & drop the Submodule for the Telegram you want to use into the free “Slot 1 2”; in our case we will use Standard Telegram 9.



8 You can now download the hardware settings to the device and should be able to establish connection to the Nanotec drive.



9 You should now be able to go online and have connection to the device.

4 Setting up a positioning application with Standard Telegram 9

This example shows you how to use the positioning mode in a TIA Portal ladder program with the PROFIdrive Standard Telegram 9. You can simply import the example project and adjust your communication settings.

With Standard Telegram 9 you have two ways to start a movement:

The first option is to use the Traverse Records. These records have to be set up beforehand, e.g. with Plug & Drive Studio 3 (PNDS 3) or the Single Parameter Access. You can use Telegram 9 to select the desired profile and start the movement.

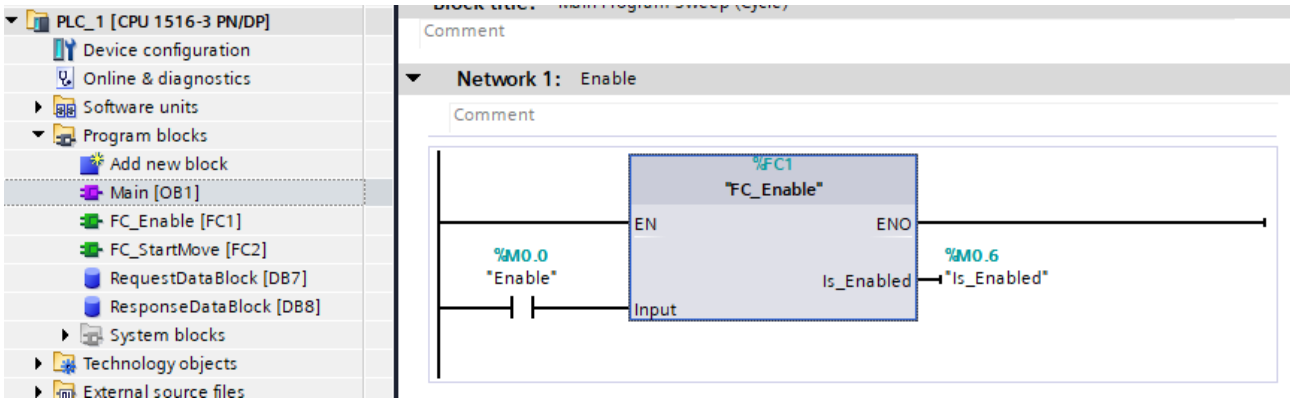
The second option is to use the MDI (Manual Data Input) mode, where you can adjust the movement parameters for position, speed, and ramps for every move.

In this example project we have implemented both ways.

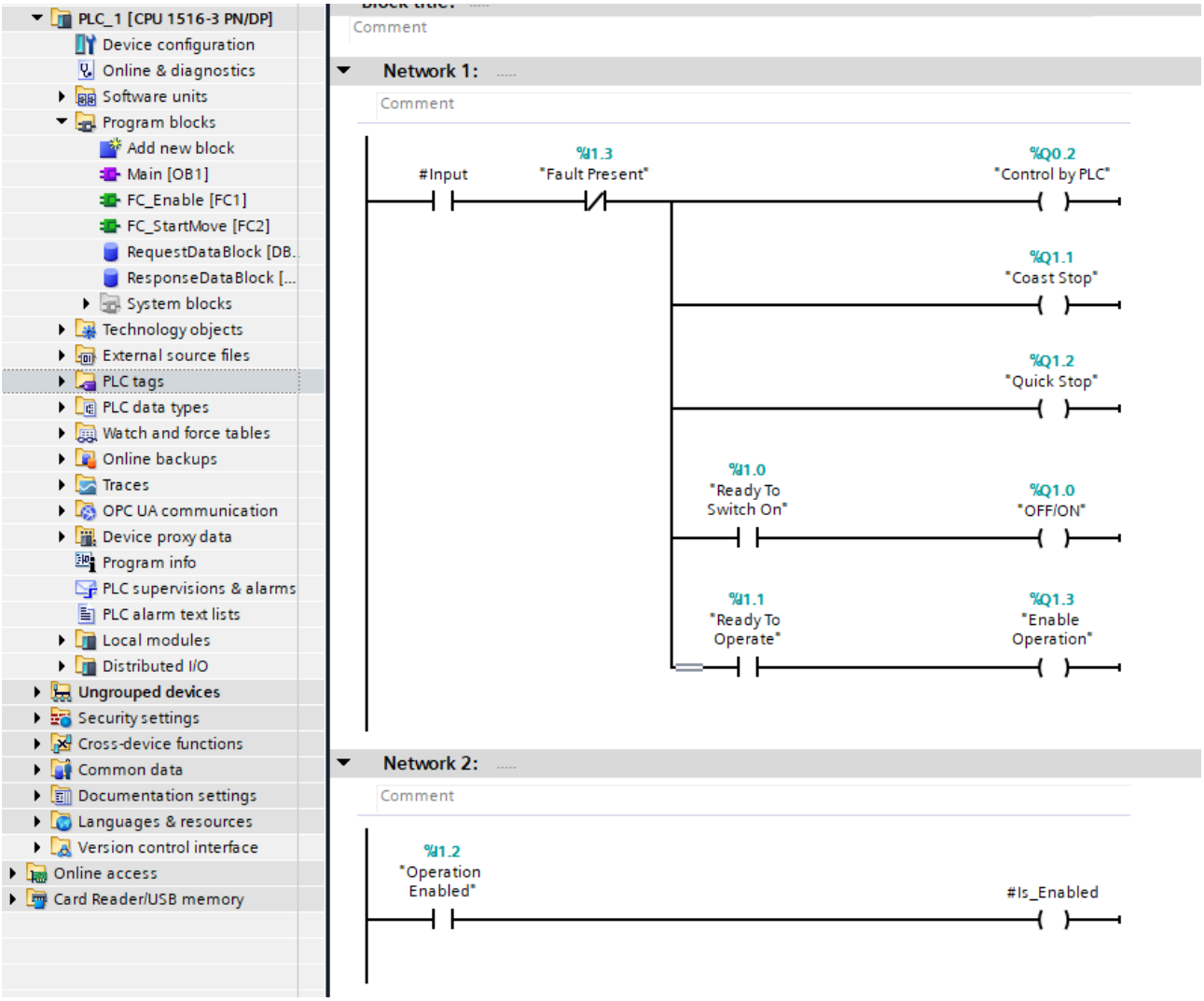
4.1 Main ladder program

In the example code there are two networks with function blocks that can be used for both options.

Network 1 only contains a function block *FC_Enable*, which is used to enable the motor.

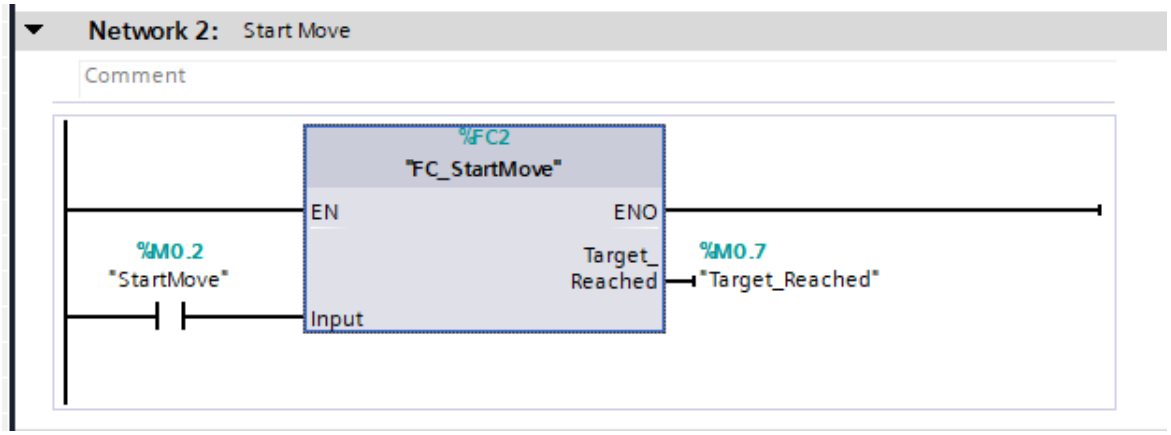


The function block *FC_Enable* reads out the bits of the ZSW1 (Status Word 1) and sets the needed bits in the STW1 (Control Word 1) according to the PROFIdrive Standard to enable the motor.

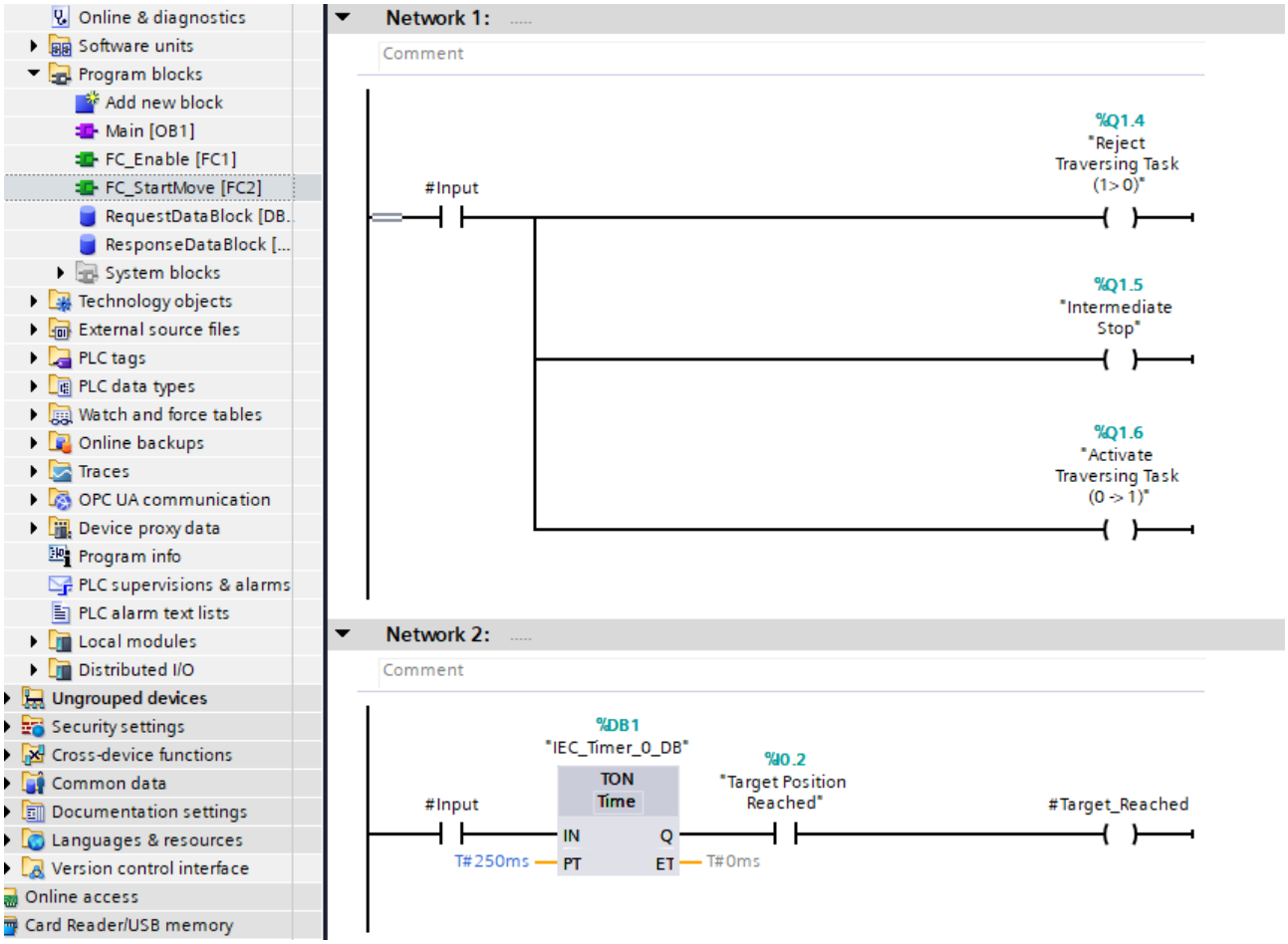


Once the *Enable* input is applied, the function block *FC_Enable* will be executed and if run successfully, the output *Is_Enabled* should become true. The motor is now powered on and has torque on the motor shaft.

Network 2 in the main ladder program is used to start a new positioning move by utilizing the function block *FC_StartMove*.

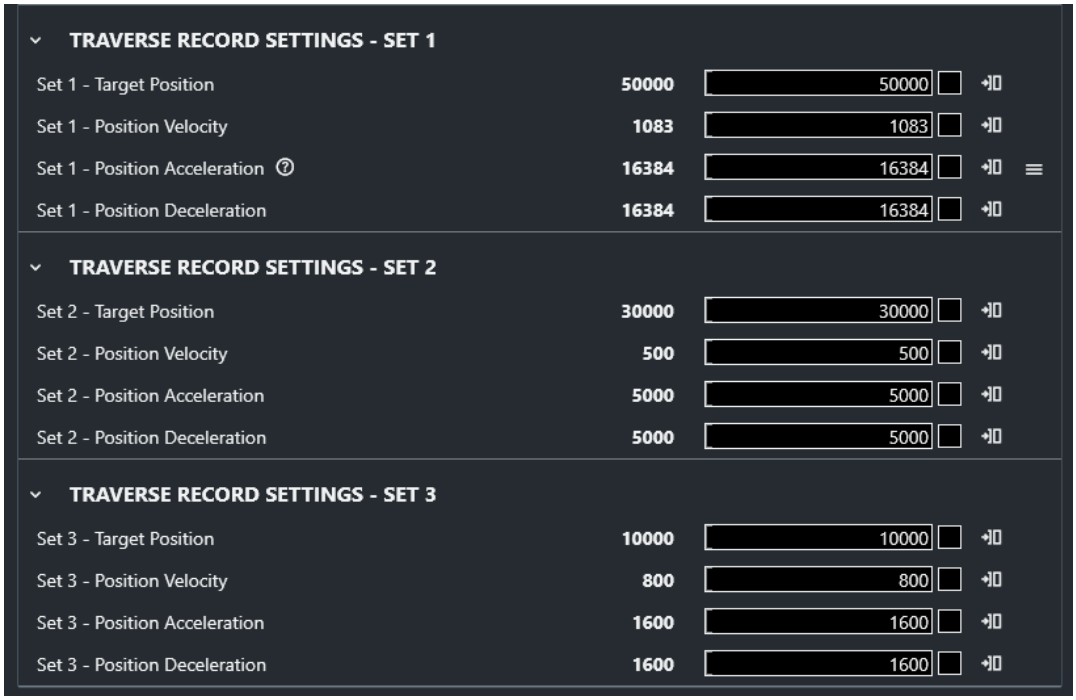


The function block *FC_StartMove* sets the bits in the STW1 (Control Word 1) that are needed to start a new movement. After a defined time, it also checks whether the target reached bit was set in the ZSW1 (Status Word 1).

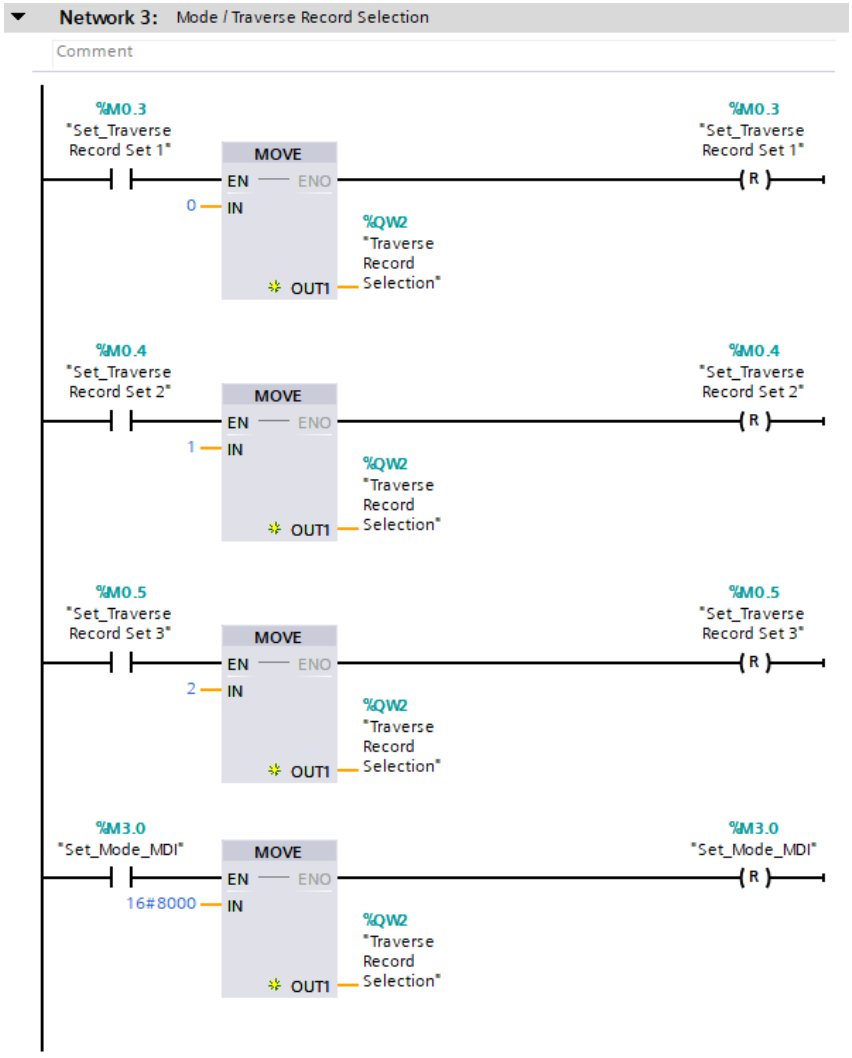


4.2 Starting a move with Traverse Records

To set up the Traverse Records you could use the Plug & Drive Studio 3 (PNDS 3) software. Here you can set the target position, velocity, and ramps for the different movements.

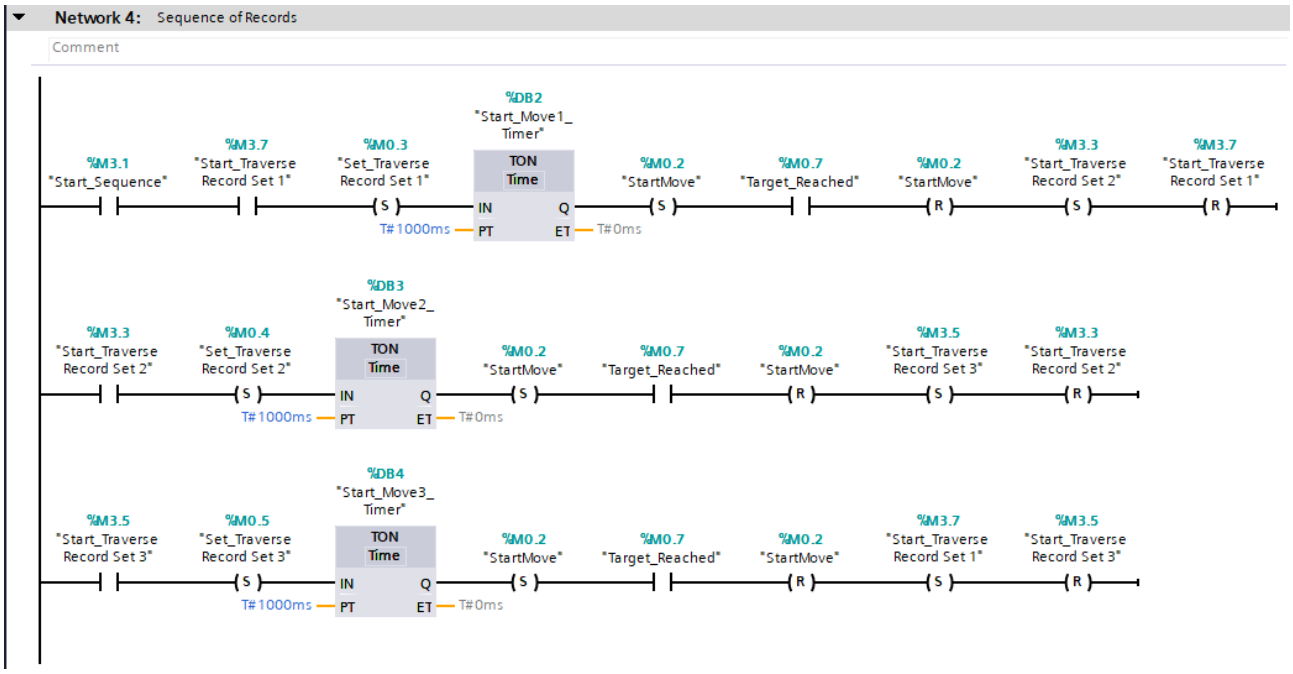


In the Main program **Network 3** you can select a specific Traverse Record.



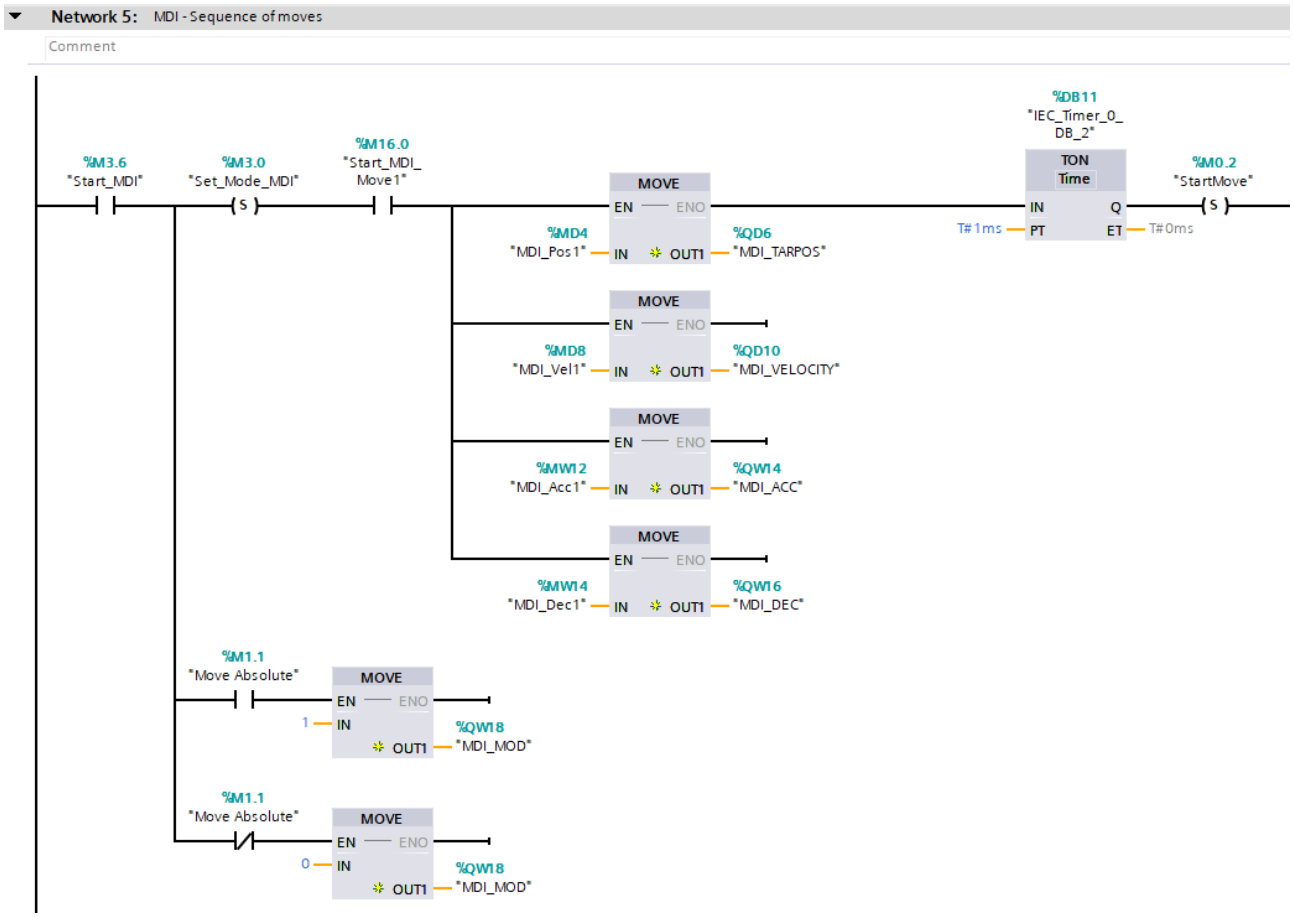
Once you have selected a Traverse Record, you can use **Network 2** to start the movement.

Network 4 shows how you could chain together multiple Traverse Records.

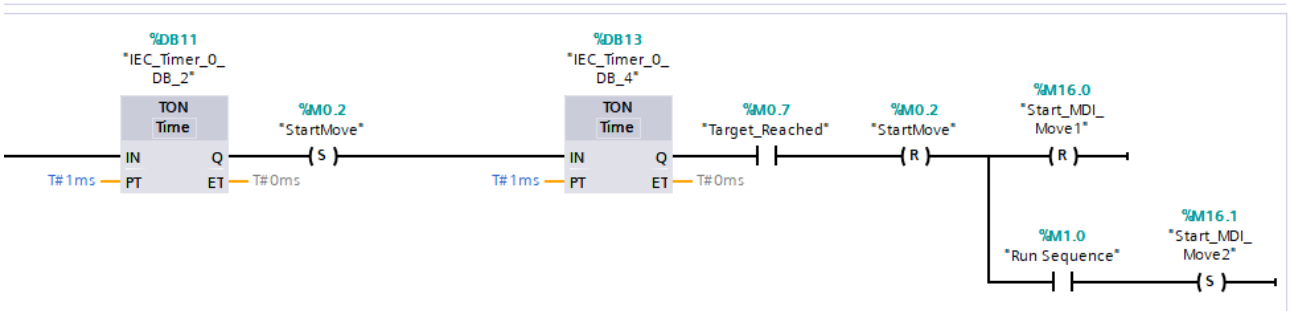


4.3 Starting a move with MDI (Manual Data Input)

With MDI you can set up the target position, velocity, acceleration, and deceleration ramps for every move before you start it. You can also choose the positioning mode (absolute or relative).
To activate the MDI mode, you need to set the bit 15 in the SATZANW (Traverse Record selection). You can do that in **Network 3** manually, but it will also be set automatically in **Network 5**.



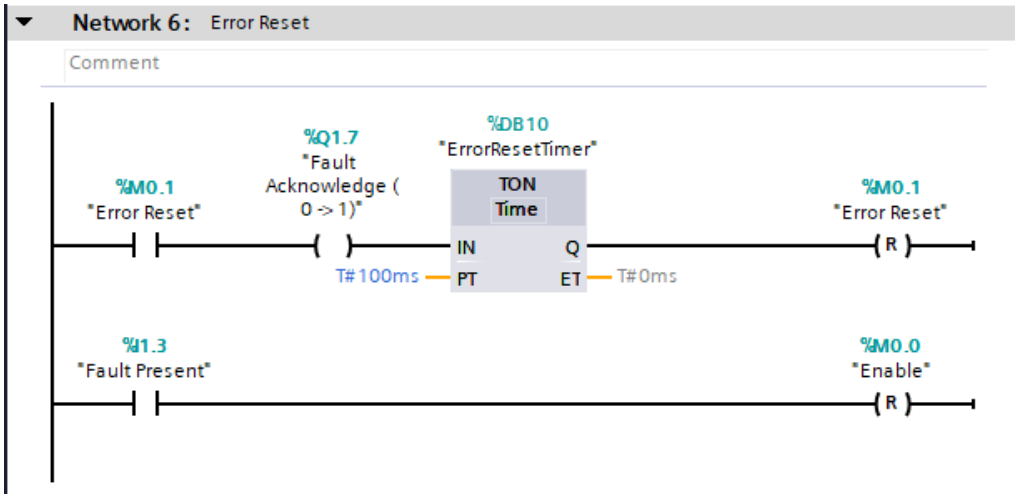
In **Network 5** you can see an example of two MDI moves. You can set up the position, velocity, and ramps for the two moves individually. The values are written to the MDI movement settings and the motor is started with the corresponding movement parameters. You can also choose whether you want to use absolute or relative positioning with the input *Move Absolute*.
To start the movement, you need to set the *Start_MDI* input.
This will automatically also set the *Start_Mode_MDI* input to set the bit 15 in SATZANW in Network 3.
Then set the *Start_MDI_Move1* input to start the first move.



Once the target is reached the *Start_MDI_Move1* input is automatically reset to not trigger the movement again.
To start the second movement, set the *Start_MDI_Move2* input.
You could also run the two moves in sequence if you set the *Run Sequence* input.
Then the two moves will just run until stopped.

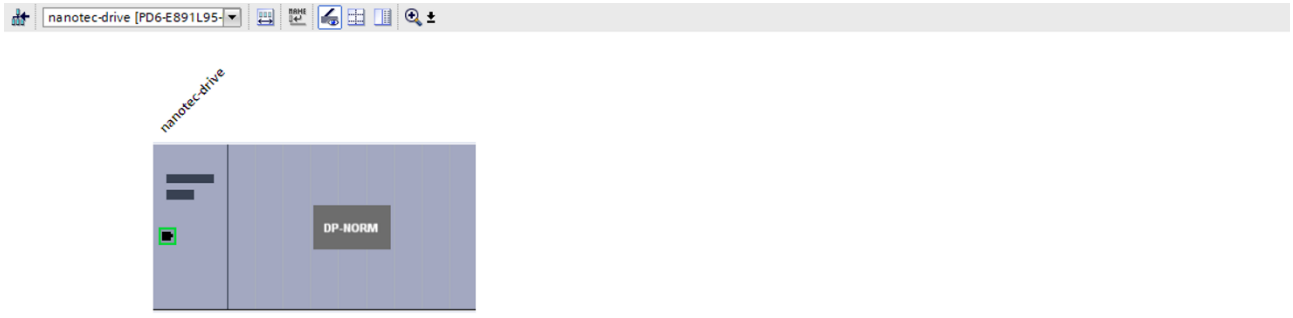
5 Fault / Error Reset

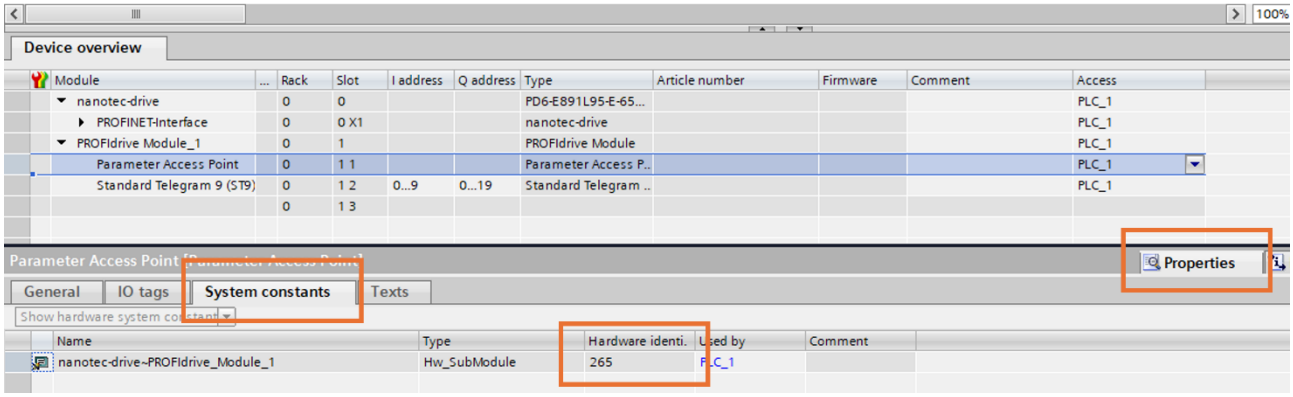
Network 6 provides the option for an Error Reset functionality. To try to reset an error, set the input *Error Reset*.



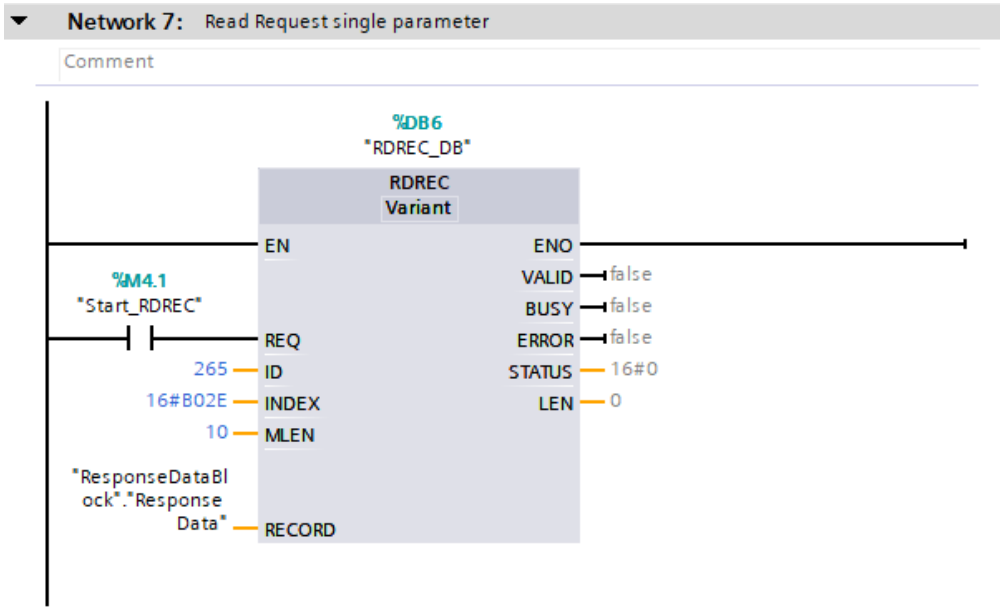
6 Reading and writing single parameters

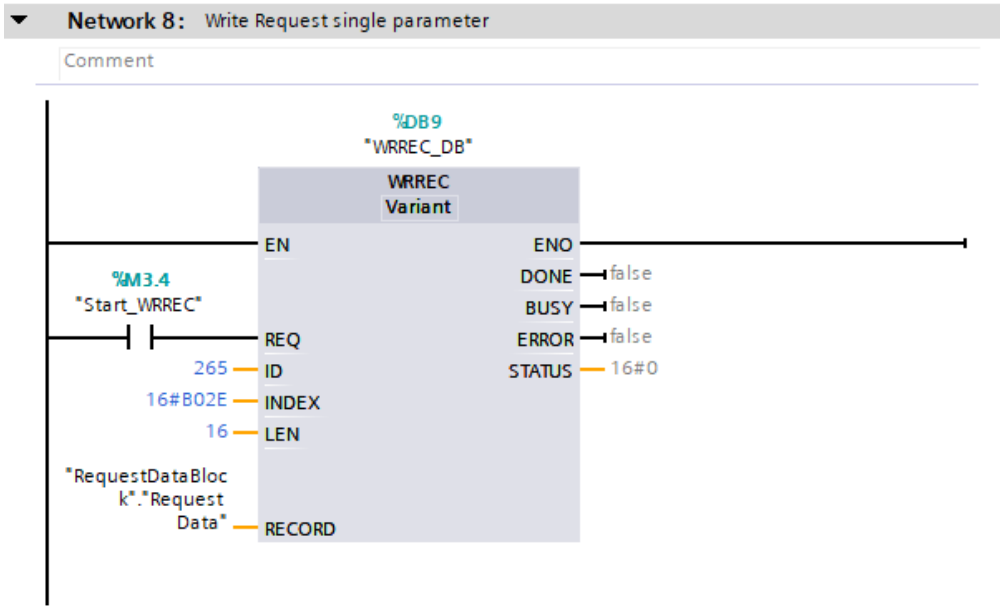
To access any object or parameter in the device (CANopen Object Dictionary Objects and Profinet Parameters), we can use the Base Mode Parameter Access. To do that you need to use a write record and a read record data block, which both use the index 0xB02E. The hardware ID is the ID of the Parameter Access Point of your device.





Networks 7 and **8** show the datablocks and relevant inputs.





The Response Datablock looks like this:

ResponseDataBlock

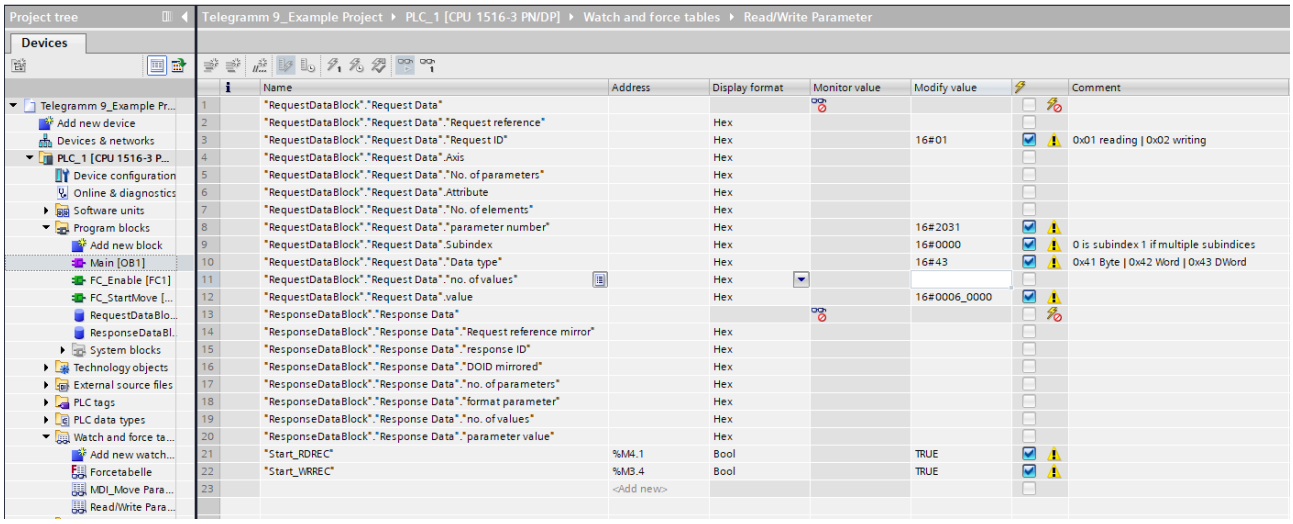
	Name	Data type	Start value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint	Supervis...	Comment
1	Static			☐	☐	☐	☐	☐		
2	Response Data	Struct		☐	☑	☑	☑	☐		
3	Request reference ...	Byte	16#0	☐	☑	☑	☑	☐		
4	response ID	Byte	16#0	☐	☑	☑	☑	☐		
5	DOID mirrored	Byte	16#0	☐	☑	☑	☑	☐		
6	no. of parameters	Byte	16#0	☐	☑	☑	☑	☐		
7	format parameter	Byte	16#0	☐	☑	☑	☑	☐		
8	no. of values	Byte	16#0	☐	☑	☑	☑	☐		
9	parameter number	DWord	16#0	☐	☑	☑	☑	☐		

The Request Datablock looks like this:

RequestDataBlock

	Name	Data type	Start value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint	Supervis...	Commen
1	Static									
2	Request Data	Struct								
3	Request reference	Byte	16#01							
4	Request ID	Byte	16#02							
5	Axis	Byte	16#0							
6	No. of parameters	Byte	16#01							
7	Attribute	Byte	16#10							
8	No. of elements	Byte	16#01							
9	parameter number	Word	16#EA60							
10	Subindex	Word	16#00							
11	Data type	Byte	16#04							
12	no. of values	Byte	16#01							
13	value	DInt	0							

To control the Parameter Access, we added the relevant data to the watch and force table in the example program:



The *Request ID* determines whether you want to read (value 0x01) or write (value 0x02) data.

In the *parameter number* you enter which object or parameter you want to interact with. In the *Subindex* you can decide which subindex you want to use if an object has multiple subindices. Value 0 does access the Subindex 1, value 1 Subindex 2, and so on.

The *Data type* determines the object data size. Please note that the value has to be written in the right position, i.e. first two characters for a Byte, first 4 characters for Word, and all 8 characters for DWord.

If you are reading data, the *parameter value* in the response contains the value of the read object.

To execute the parameter access, you need to set the *Start_RDREC* and *Start_WRREC* inputs.

7 Liability

This Application Note is based on our experience with typical user requirements in a wide range of industrial applications. The information in this Application Note is provided without guarantee regarding correctness and completeness and is subject to change by Nanotec without notice.

It serves as general guidance and should not be construed as a commitment of Nanotec to guarantee its applicability to all customer applications without additional tests under the specific conditions and – if and when necessary – modifications by the customer.

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