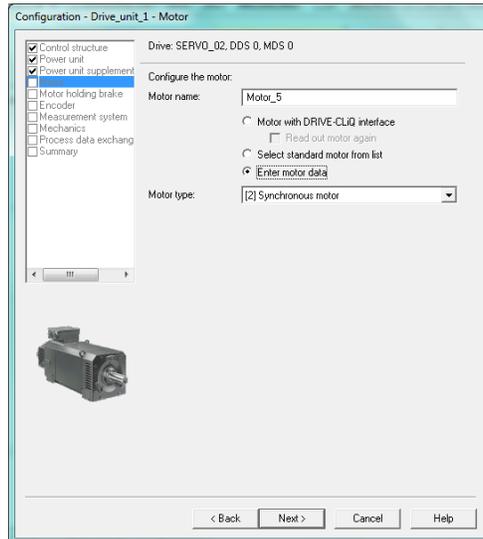


ServoChoke®/Encoder Configuration Using a Siemens Drive



Contents

1	Hardware and Software Integration Setup	2
2	Setting Up a New Project	3
2.1	Creating a New Project	3
2.2	Selecting Accessible Drive Nodes	3
2.3	Bringing the Drive Online	5
2.4	Configuring the Drive	6
2.5	Opening the Drive Tree	8
2.6	Entering Motor Data	10
2.7	Configuring the Encoder	12
2.8	Downloading Data to Target Device	15
3.	Tuning	16
3.1	Adjusting the P Gain	16
3.2	Stationary Measurement	20
3.3	Encoder Adjustment	24

1 Basic integration of a Siemens Drive to a Tolomatic ServoChoke®/SICK encoder combination

Please note: This tech note and associated testing was developed using Siemens Sinamics S120 version: 04703562. Using an older version of the firmware on the control unit and accompanying modules may result in faulty operation.

Hardware:	Software
<ul style="list-style-type: none"> • Tolomatic ServoChoke • Siemens Control Unit (CUA31) • Siemens Encoder Module (SMC20) • Siemens Power Module (PM240-2) • Line Reactor • SICK Encoder • PC 	<ul style="list-style-type: none"> • Sinamics STARTER

Siemens Encoder Module	Sick Encoder
1	Red
2	Blue
3	Gray
4	Green
5	-
6	Pink
7	Black
8	-
9	-
10	Yellow
11	-
12	Violet
13	-
14	Jump to Pin 1
15	White
16	Jump to Pin 2
17	-
18	-
19	-
20	-
21	-
22	-
23	Brown
24	-
25	-
SH	Shield

Siemens Power Module/CU	ServoChoke
U2	White
V2	Red
W2	Black
	Shield/Ground
V+	+24V Brake
0V	0V Brake

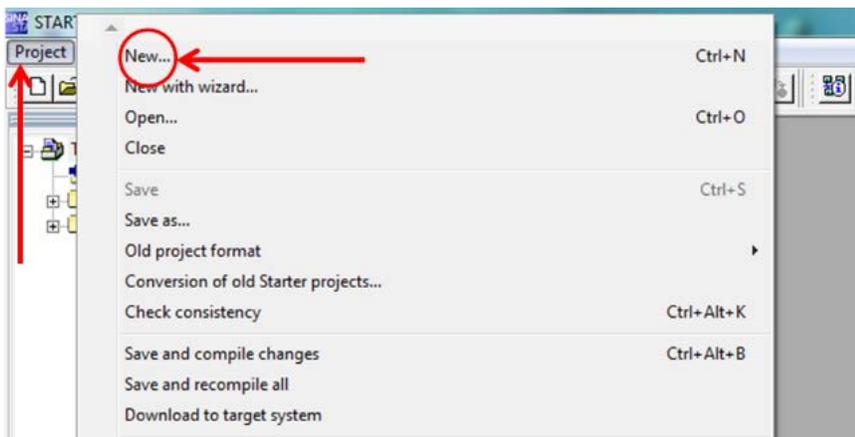
2 Setting up a new project

2.1 Creating a new project

Open the Siemens Starter software.

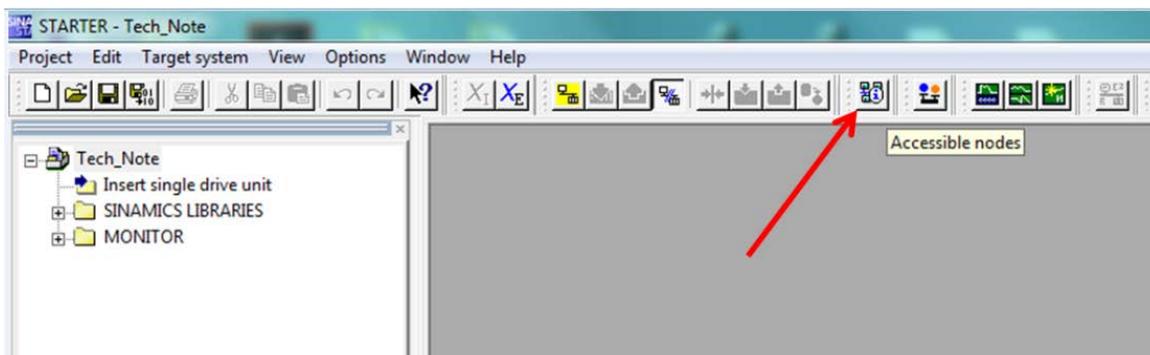


Click on "Project", select "New...".

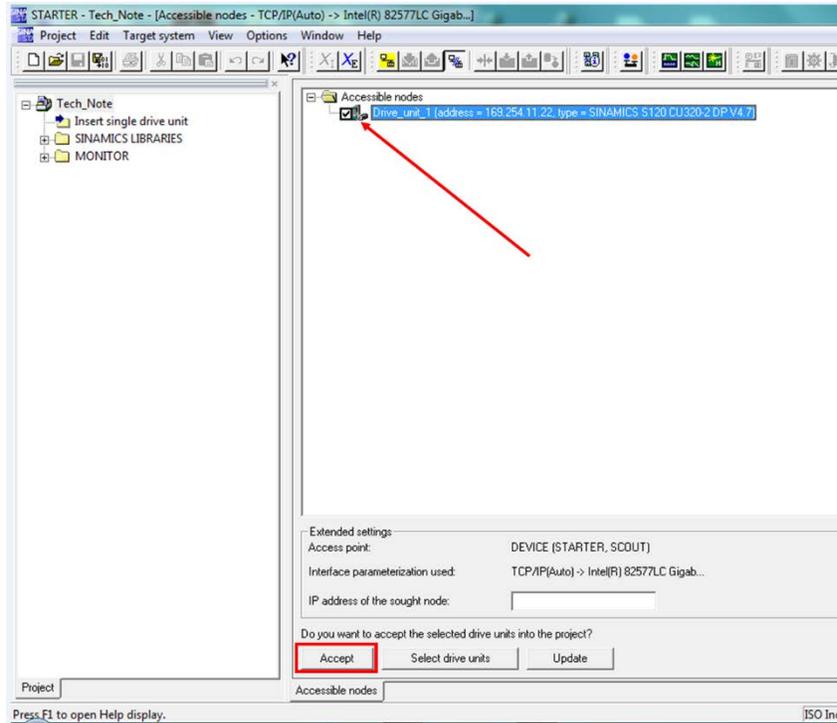


2.2 Selecting "Accessible nodes"

From the menu bar, select the "Accessible nodes" icon.



A list of Accessible Nodes will populate the window. Select the intended Drive, and then click "Accept".



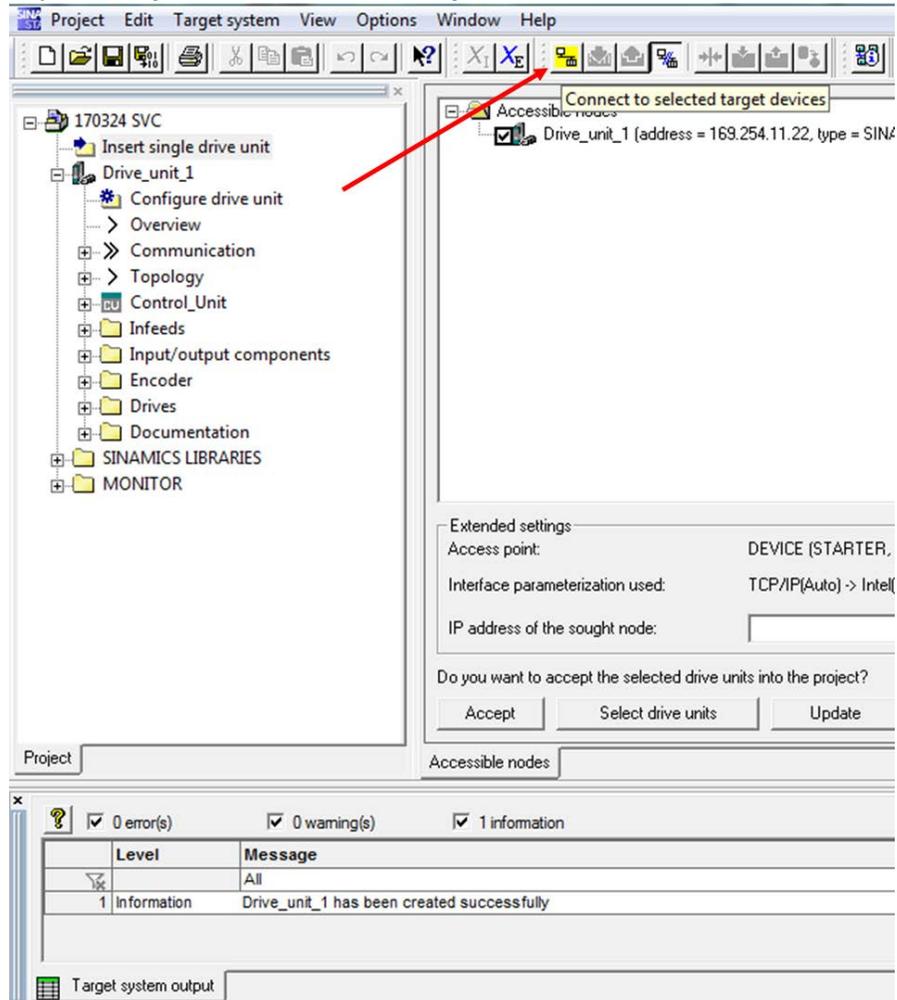
*Note: you may need to disable your firewall in order to view the drive

The Software will verify that the drive units have been transferred to the project.

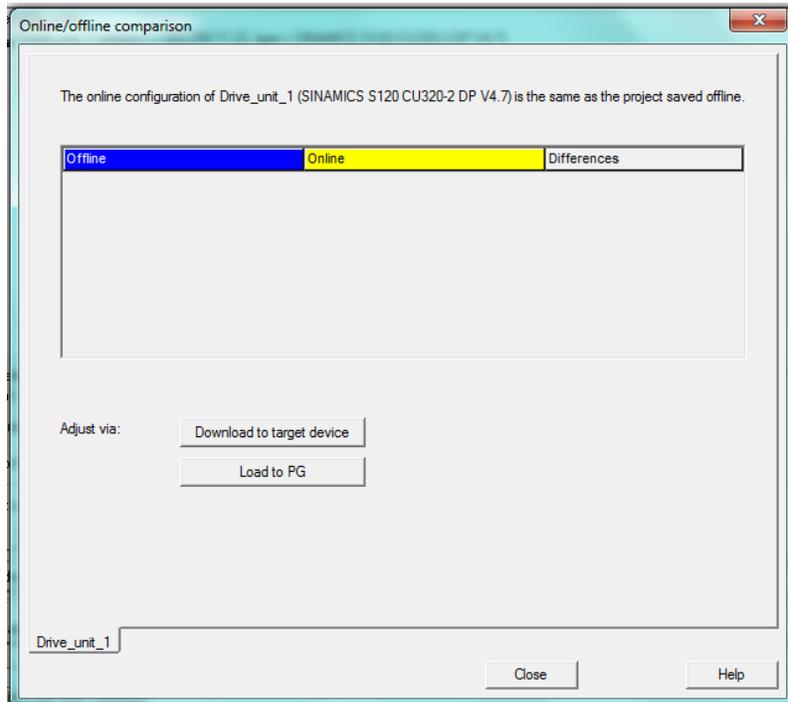


2.3 Bringing the drive online

Bring the drive online by selecting “Connect to selected target devices” icon.

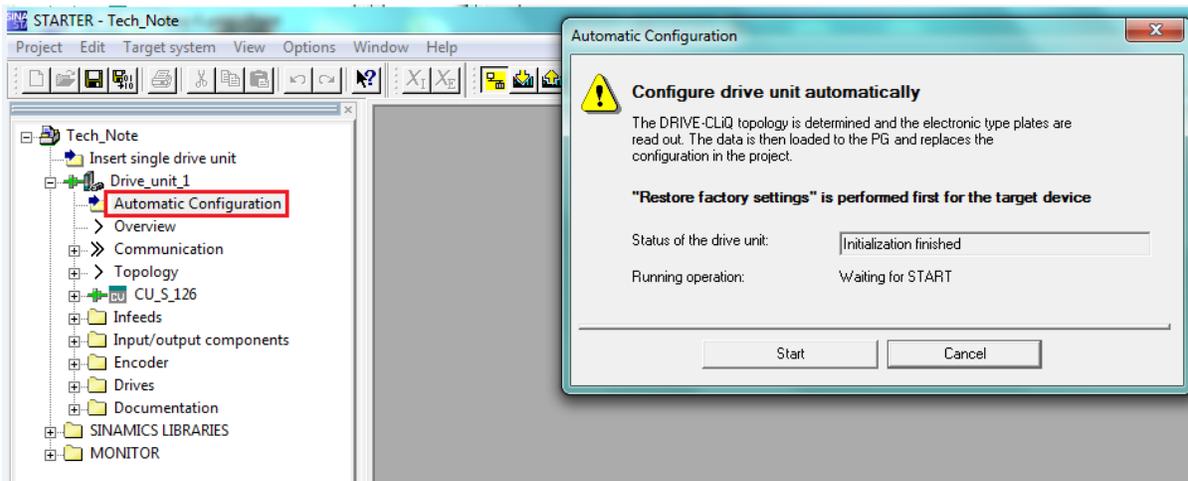


Select "Download to target device" to move forward with setting up the new project. *Please note: this will overwrite any configuration currently present on the drives memory. Make sure to save the present configuration to a separate file if you intend to use it again in the future.

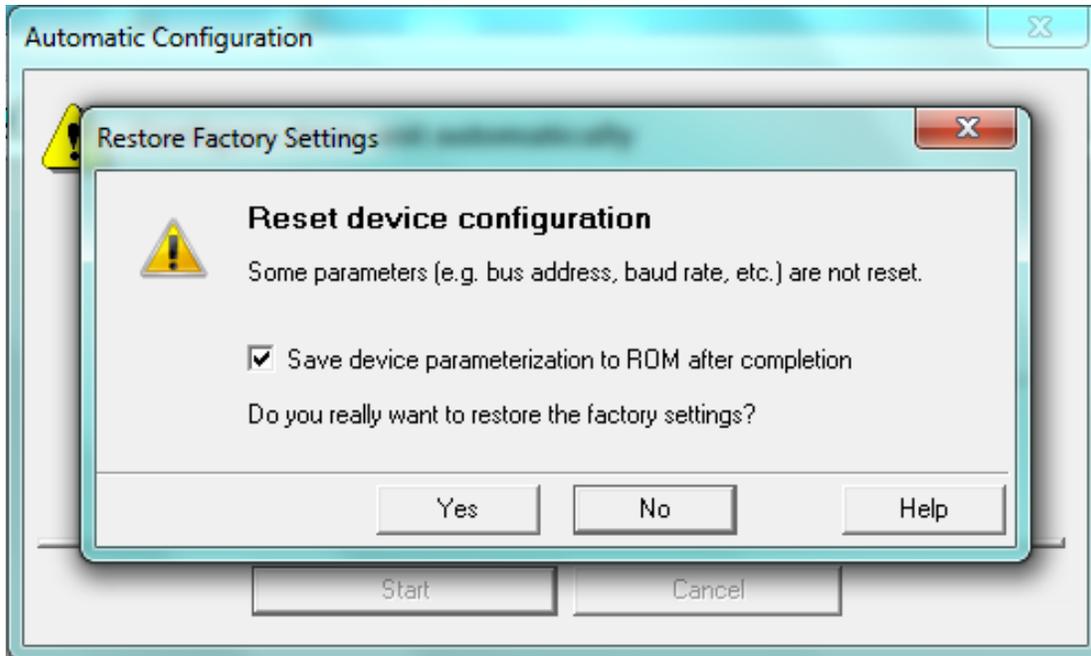


2.4 Configuring the drive

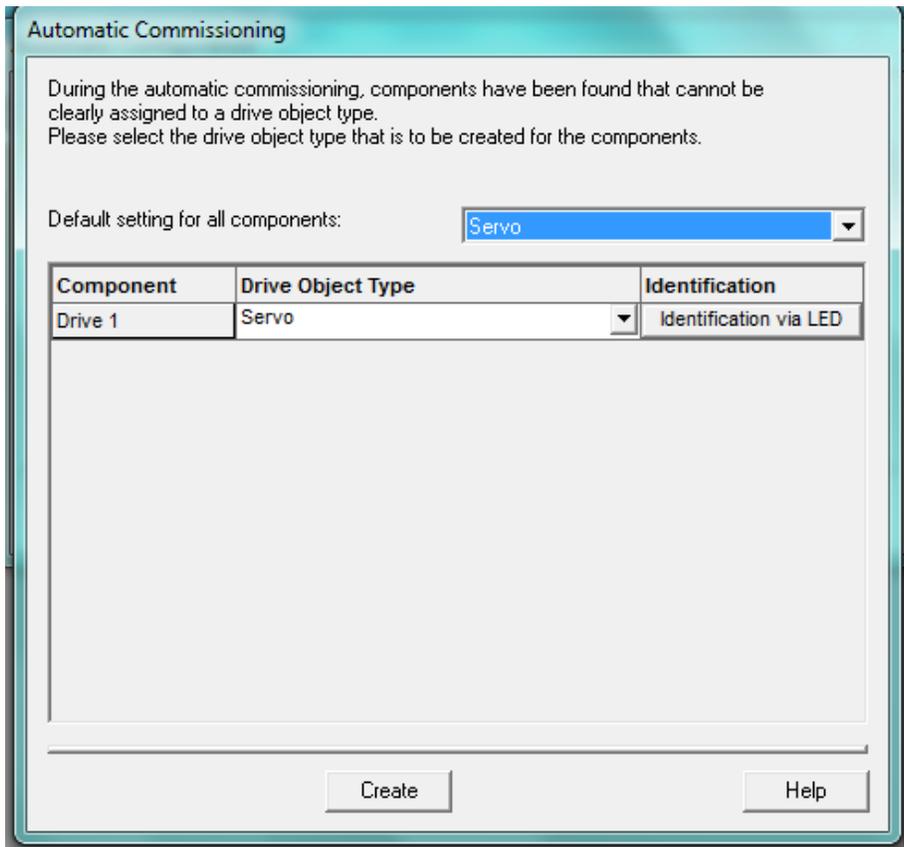
First double click the "Automatic Configuration" tab; using Drive Cliq, to locate compatible Siemens devices connected to the system.



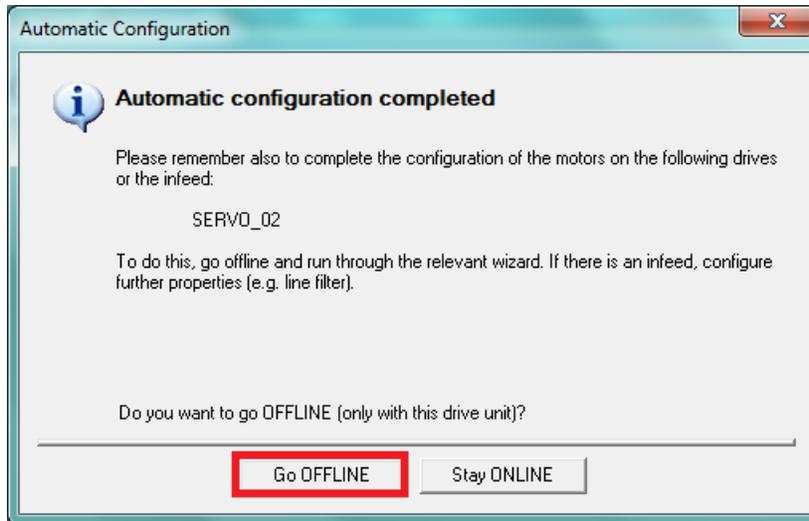
You will receive a prompt: "Reset Device Configuration?" Select "Yes". This will reset any internal DRIVE-CLIQ device topology that is currently saved in the drive.



Select "Servo" as the default setting in the Automatic Commissioning drop down; click create.

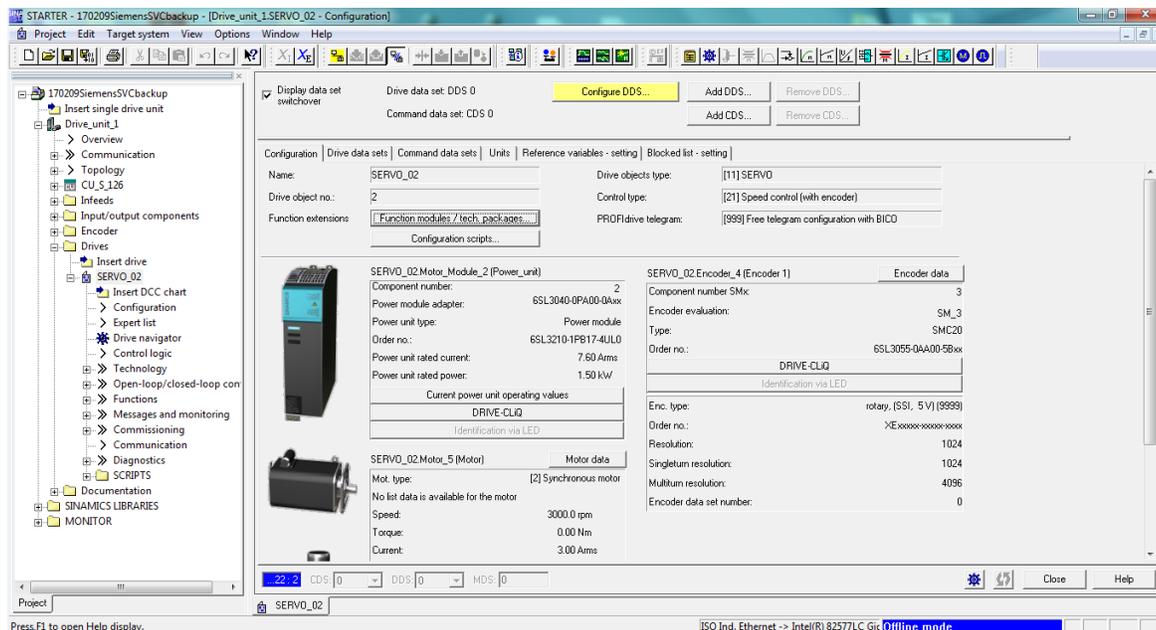


Then, follow the prompts to bring the drive offline.

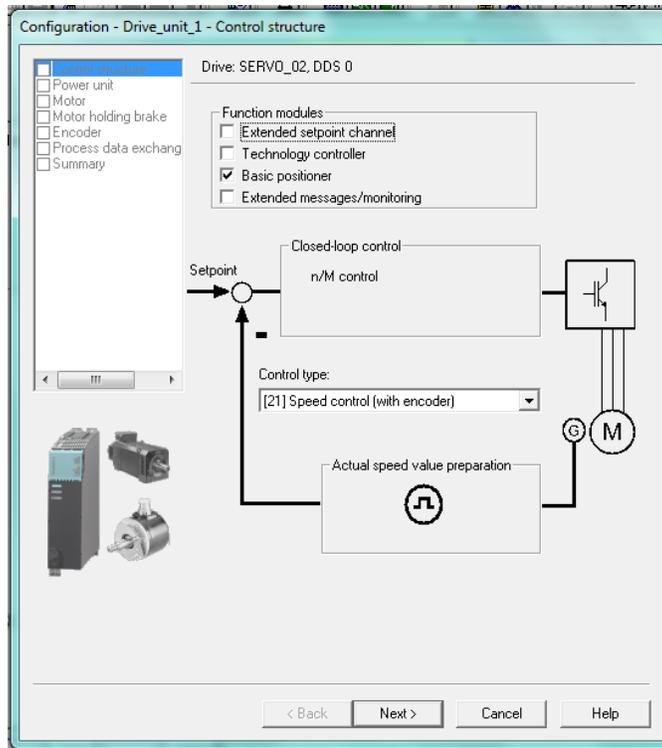


2.5 Opening the Drive Tree

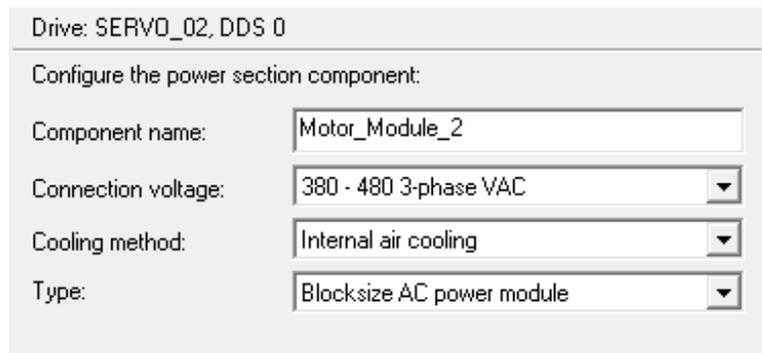
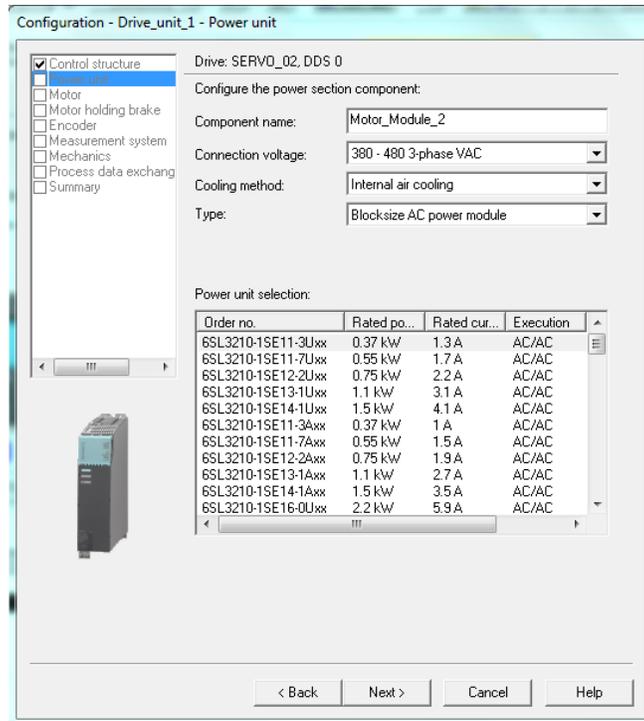
Open the “Drives” tree, then double-click on the drive folder (labeled “Servo_02” below) and select “Configure DDS”.

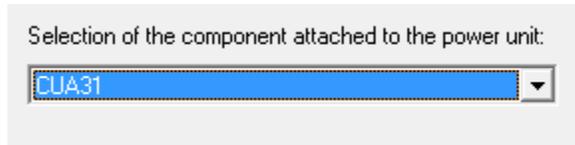
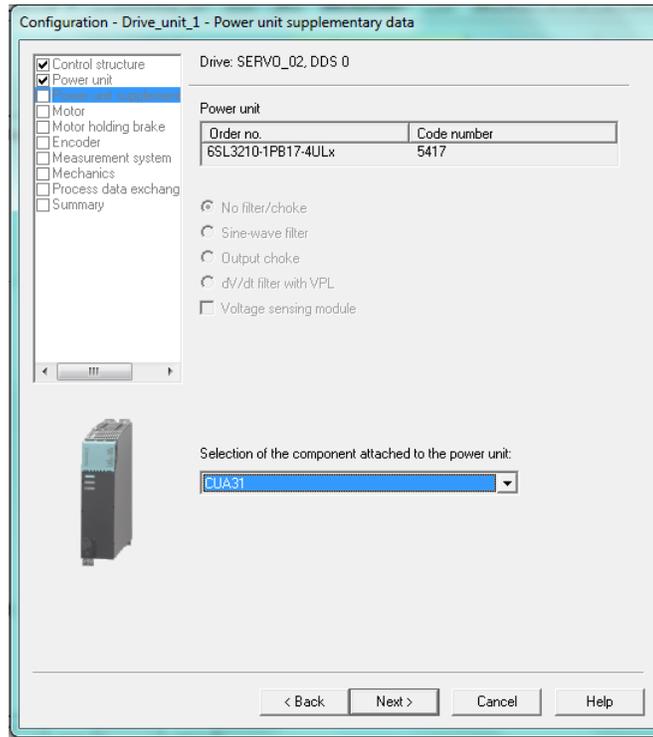


Under Function Modules select "Basic Positioner". Under Control Type, select "Speed Control (with encoder)".



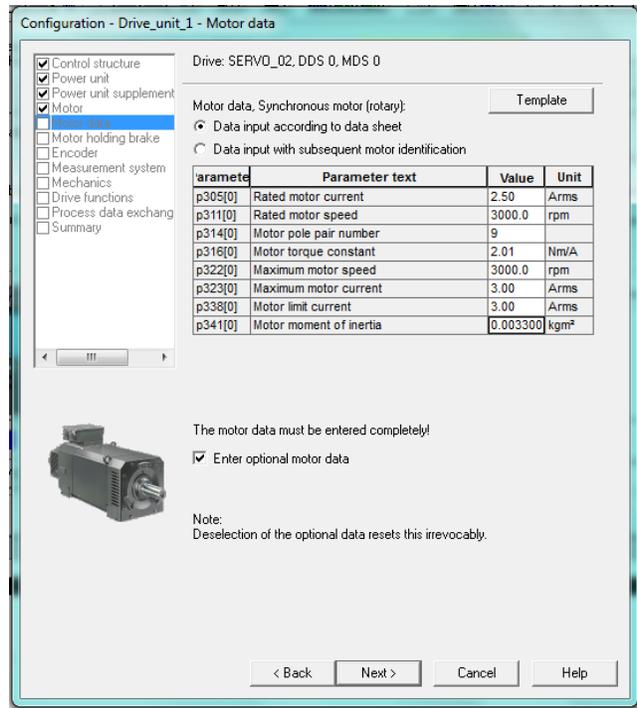
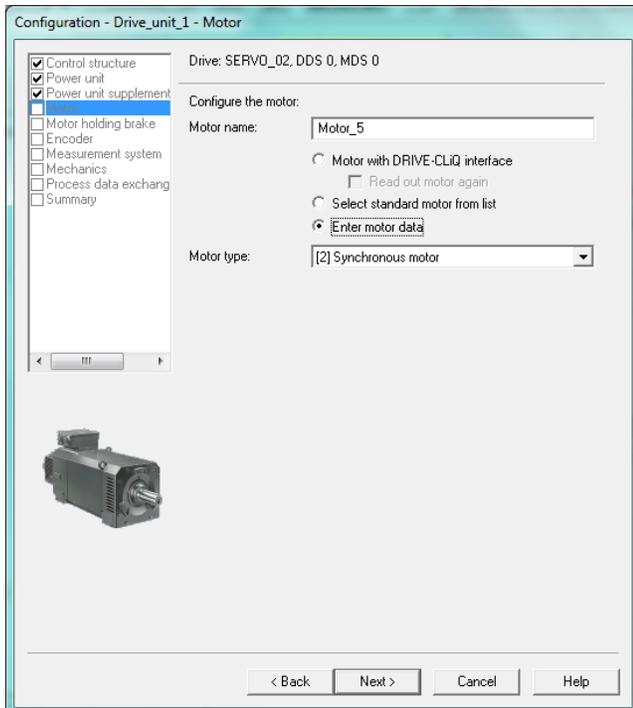
Refer to the selections below for the Tolomatic ServoChoke. Click "Next" once all of the information is correct. Repeat this step for the next page.





2.6 Entering Motor Data

Select “[2] Synchronous Motor” for Motor Type; Check the “Enter motor data” tab. Then, enter the motor data for the Tolomatic ServoChoke® unit. Refer to the table below for the specific motor data.



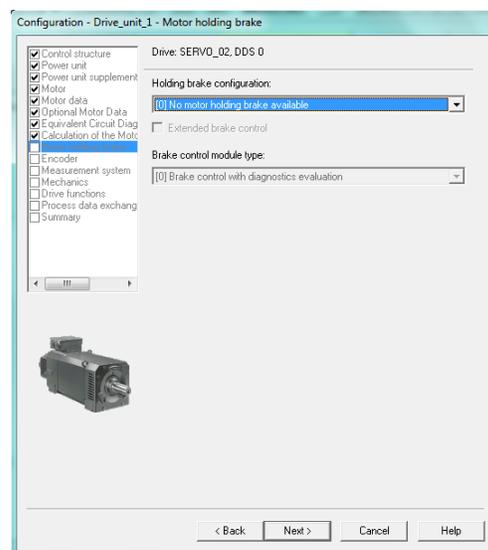
'aramete	Parameter text	Value	Unit
p305[0]	Rated motor current	2.50	Arms
p311[0]	Rated motor speed	3000.0	rpm
p314[0]	Motor pole pair number	9	
p316[0]	Motor torque constant	2.01	Nm/A
p322[0]	Maximum motor speed	3000.0	rpm
p323[0]	Maximum motor current	3.00	Arms
p338[0]	Motor limit current	3.00	Arms
p341[0]	Motor moment of inertia	0.003300	kgm ²

Next, select: "Enter the optional motor data", click "Next". Enter the motor data for the Tolomatic ServoChoke unit. Refer to the table below for the specific motor data.



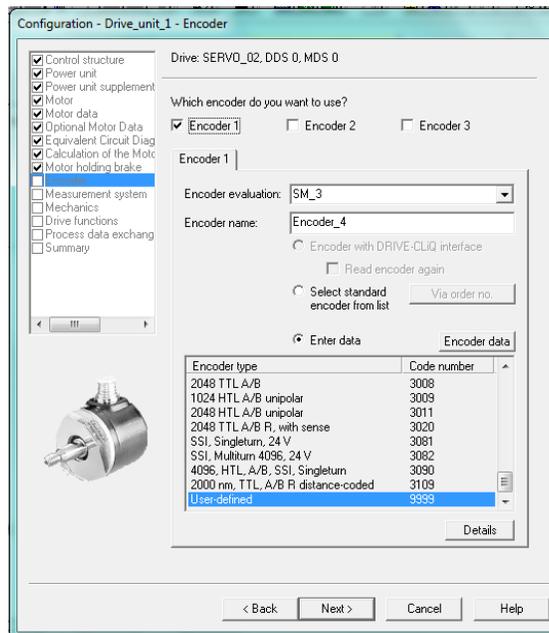
aramete	Parameter text	Value	Unit
p350[0]	Motor stator resistance cold	2.00000	ohm
p356[0]	Motor stator leakage inductance	12.20000	mH

Select "Complete calculation without..."; then, select the appropriate brake settings. Please note: Your brake settings may vary based on equipment.

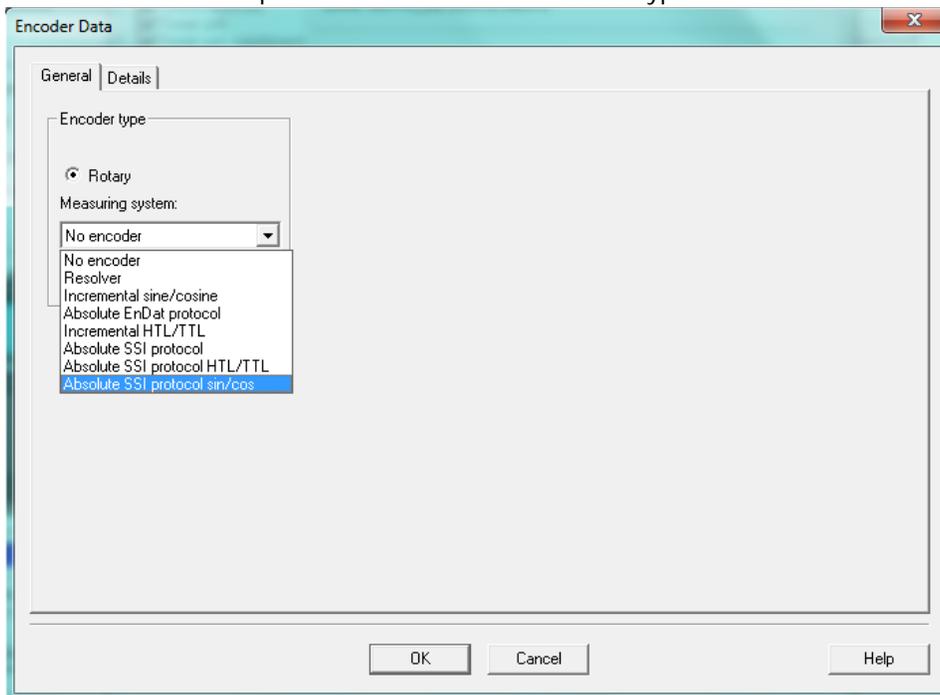


2.7 Configuring the Encoder

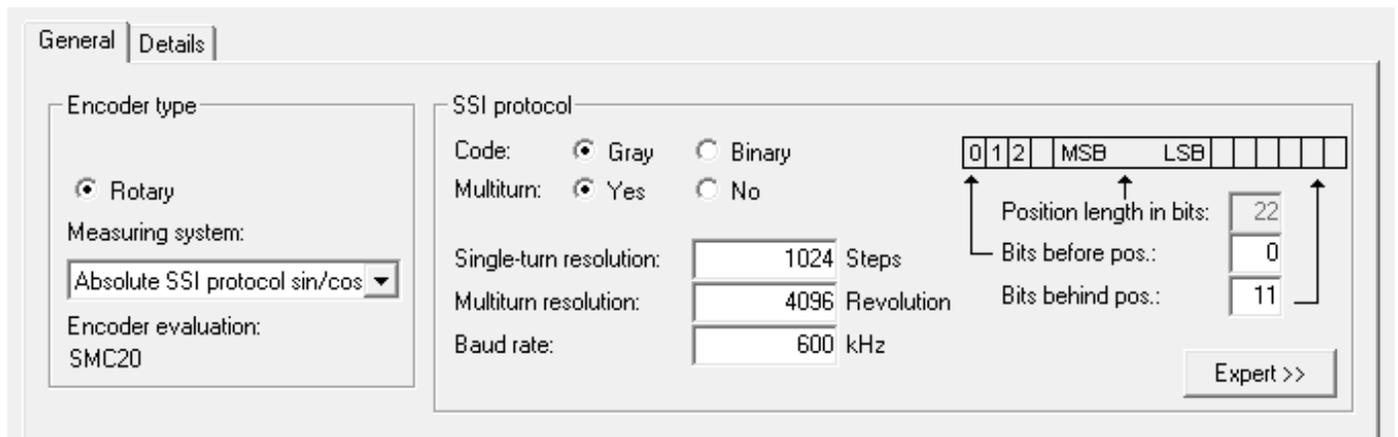
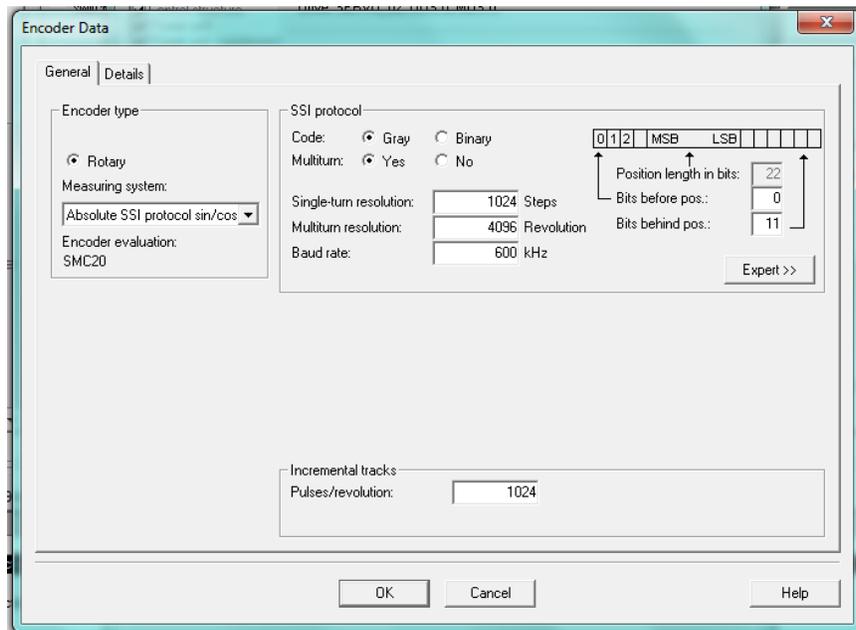
To configure the encoder, select “Enter Data” on the window below. Then, click “Encoder Data”.



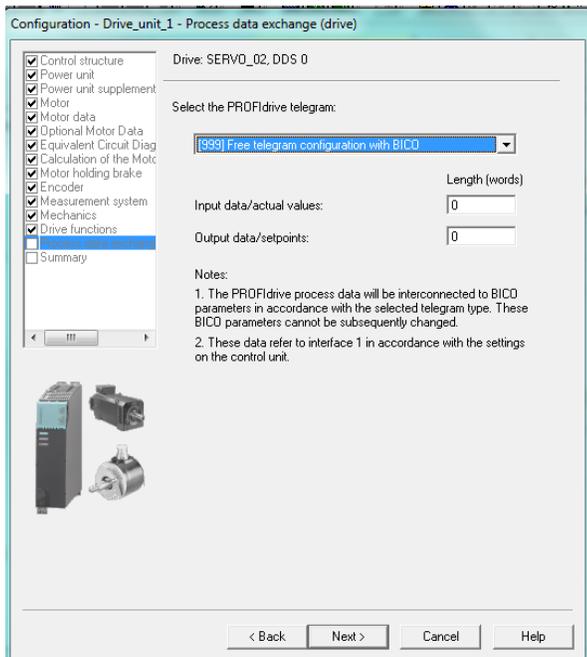
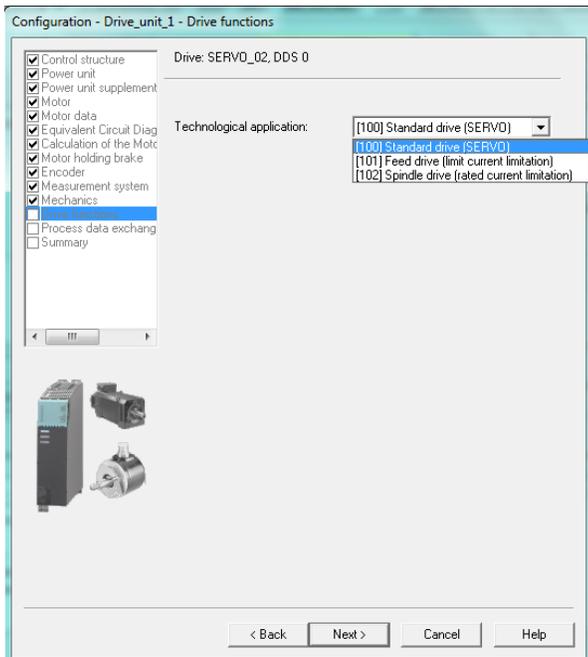
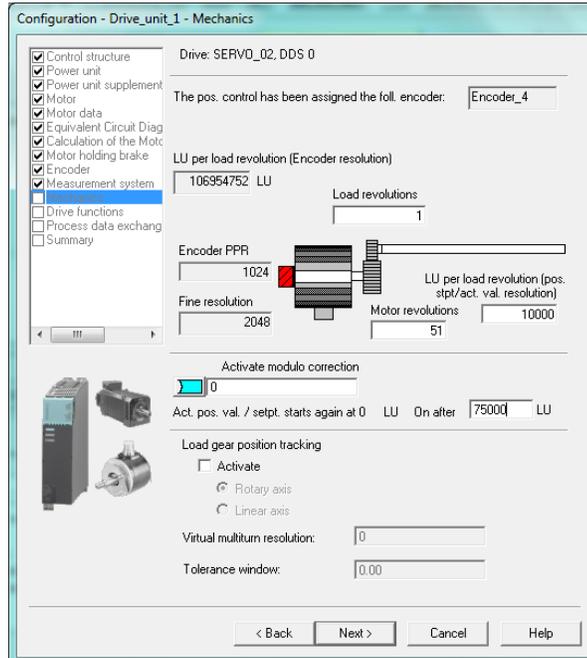
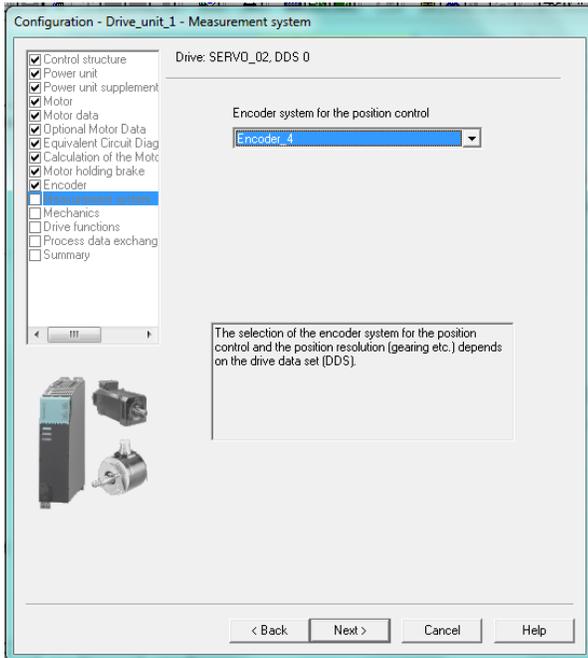
Select: “Absolute SSI protocol sin/cos” for the encoder type.

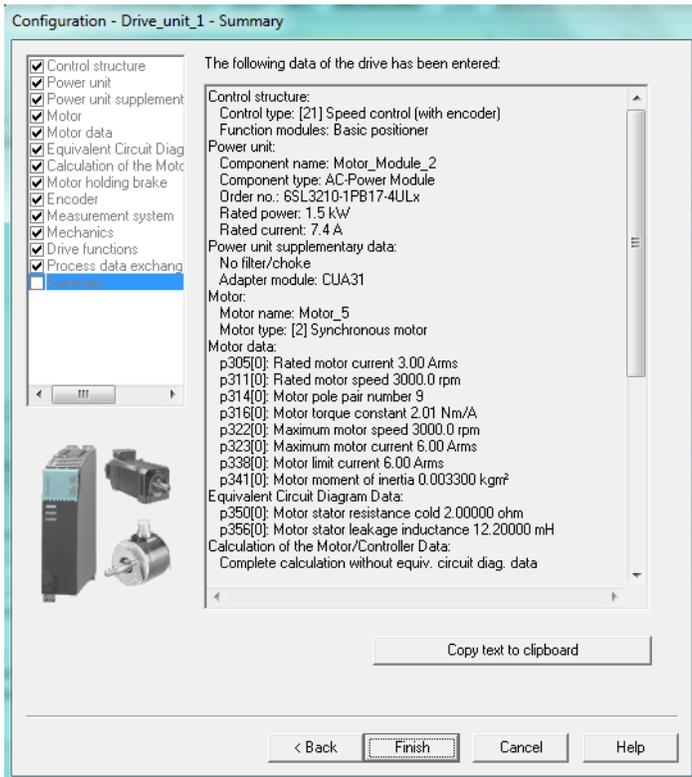


Enter the encoder data as it is listed in the graphic below.

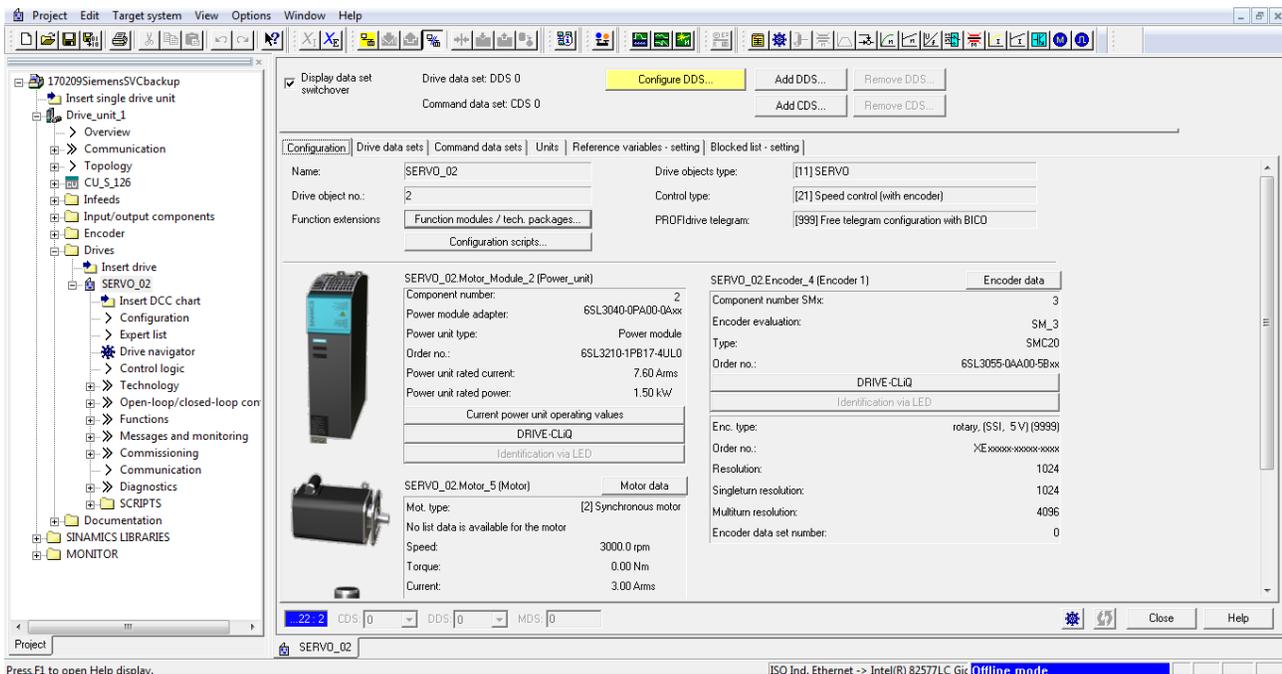


Click the Next button at the bottom of the screen a series of times to verify that the information shown in the screens below are correct.



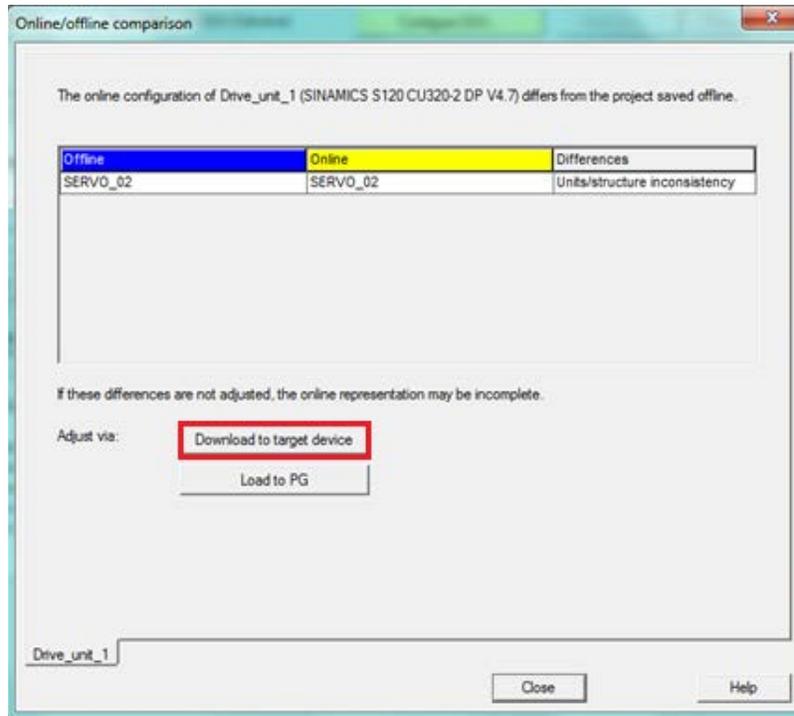


Click finish and select "Go Online".

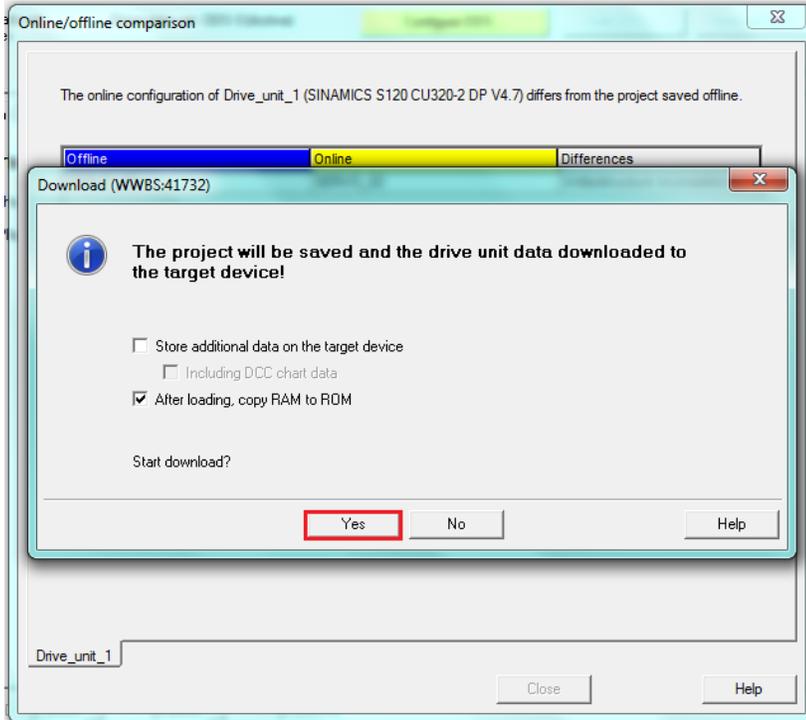


2.8 Downloading Data to Target Device

Select "Download to target device" in order to save the new information to the drive.



Follow the prompt below and select “Yes”



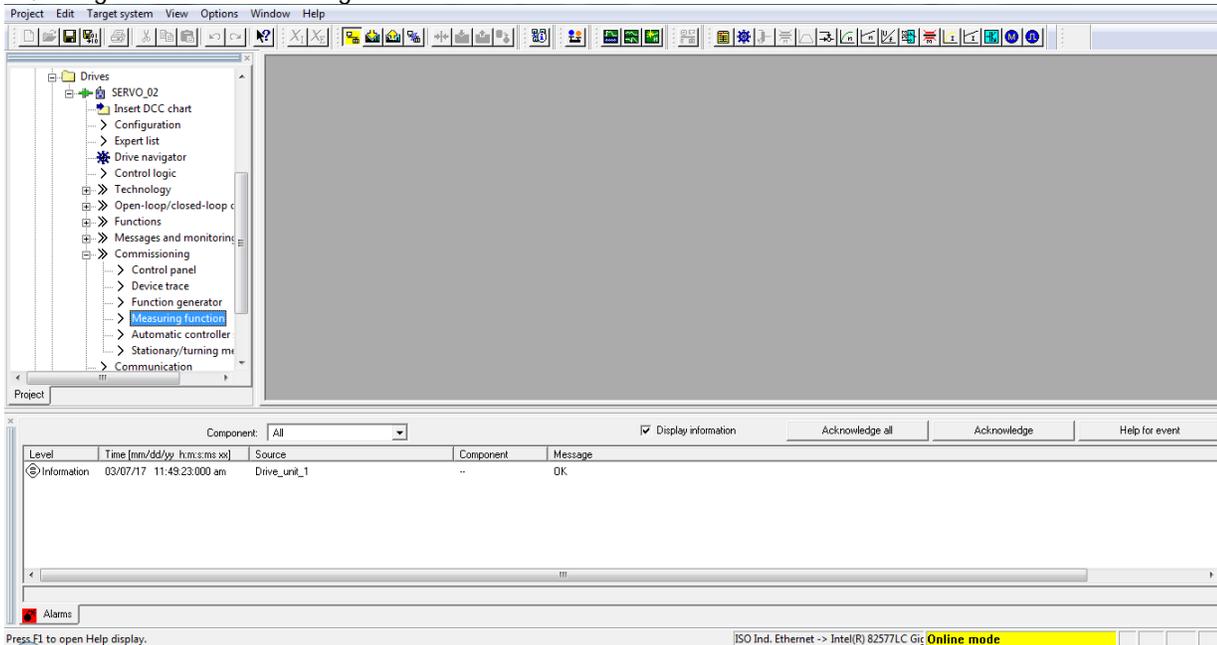
After downloading to the target device, take the drive “offline”. Then, perform a complete power cycle on the drive. The power must remain off for a minimum of 15 seconds to dissipate any remaining internal charge. Once it has powered back up, bring the drive back online.

The ServoChoke unit is now ready for motor and encoder tuning.

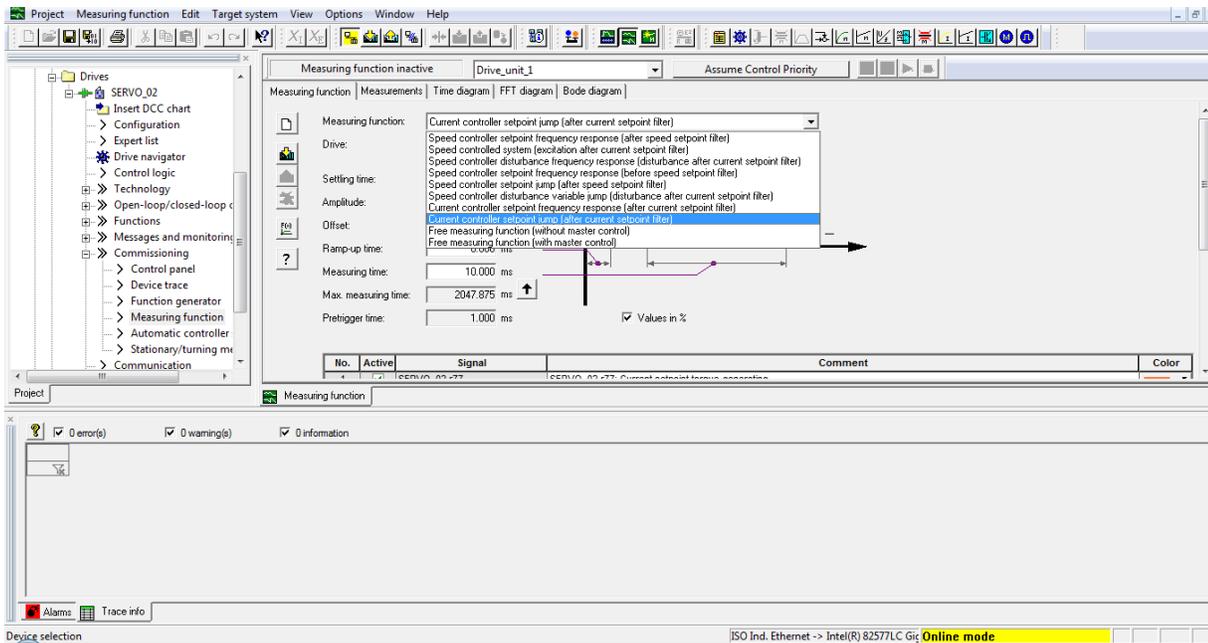
3 Tuning

3.1 Adjusting the P Gain

Please Note: The ServoChoke brake must be powered and disengaged prior to tuning. In order to ensure proper operation, it is necessary to first properly adjust the P Gain feedback of the system. First, navigate to the 'Measuring Function' within the drive tree.



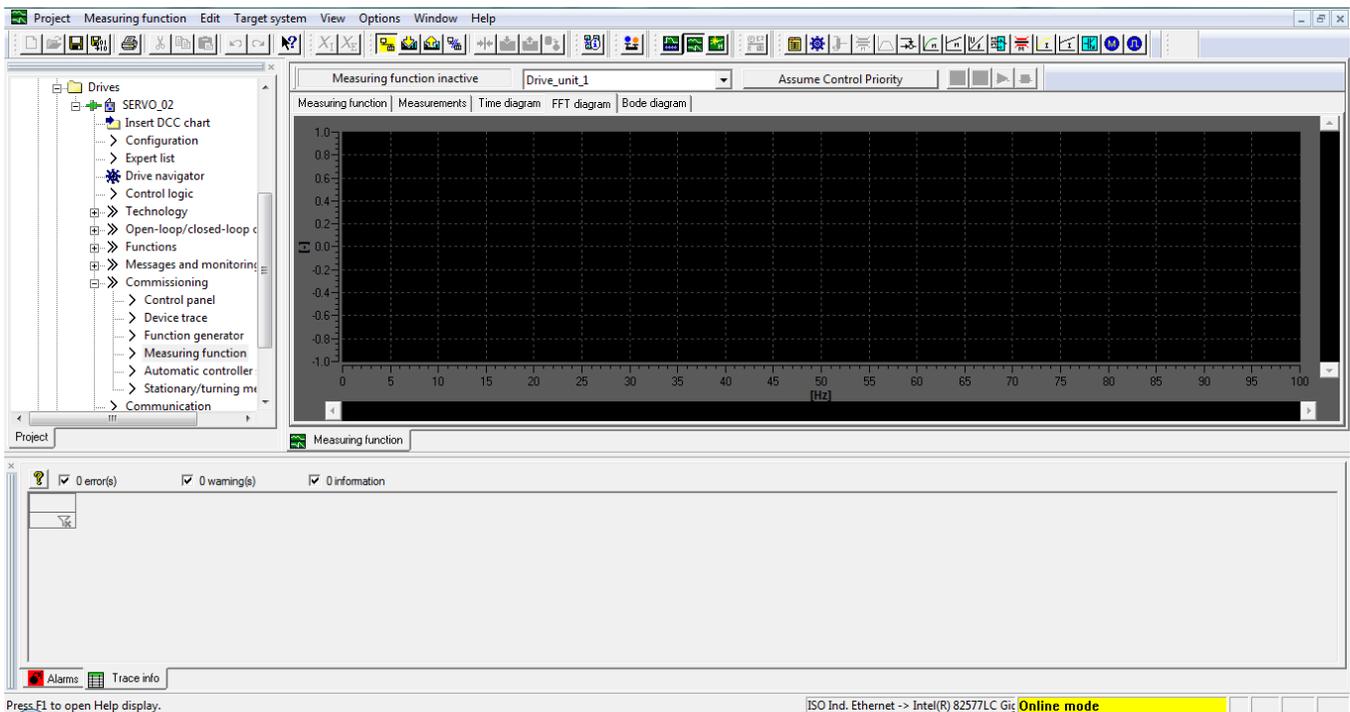
Next, under Measuring Function select: 'Current controller set point jump (after current setpoint filter)'



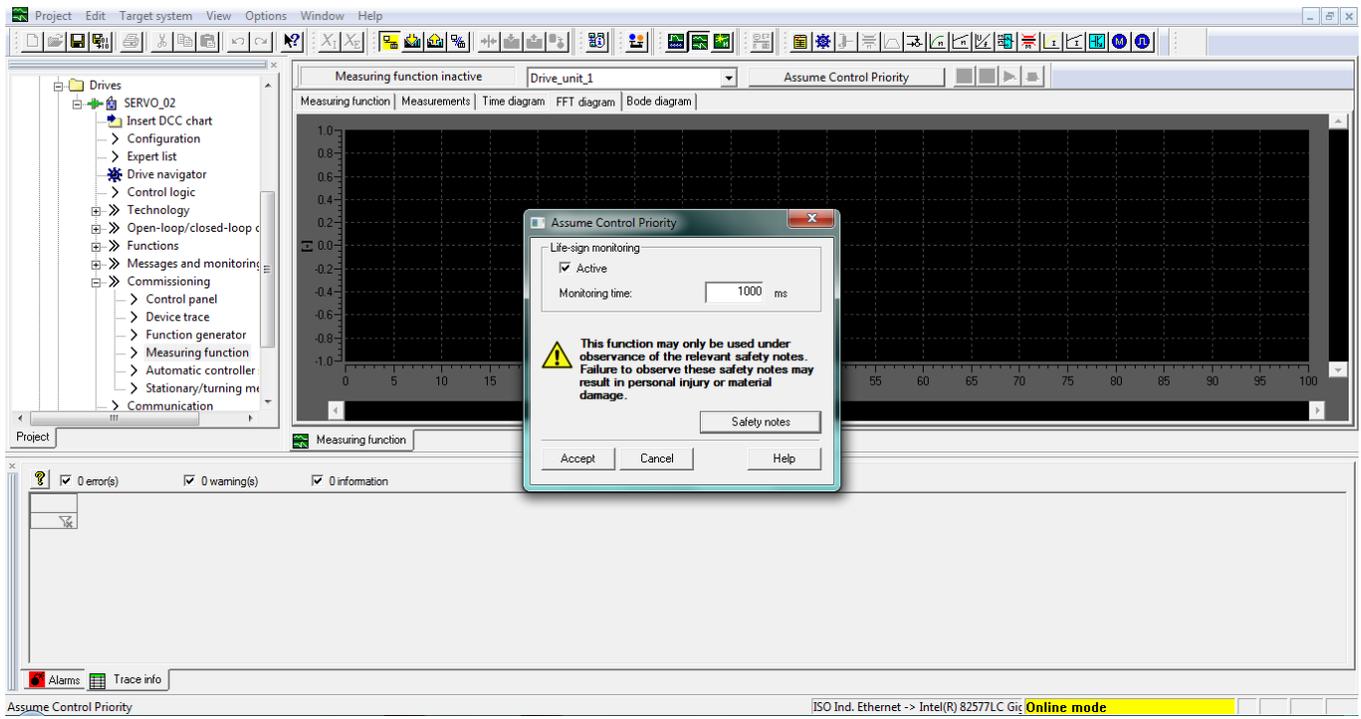
170514

AJR Siemens ServoChoke F14

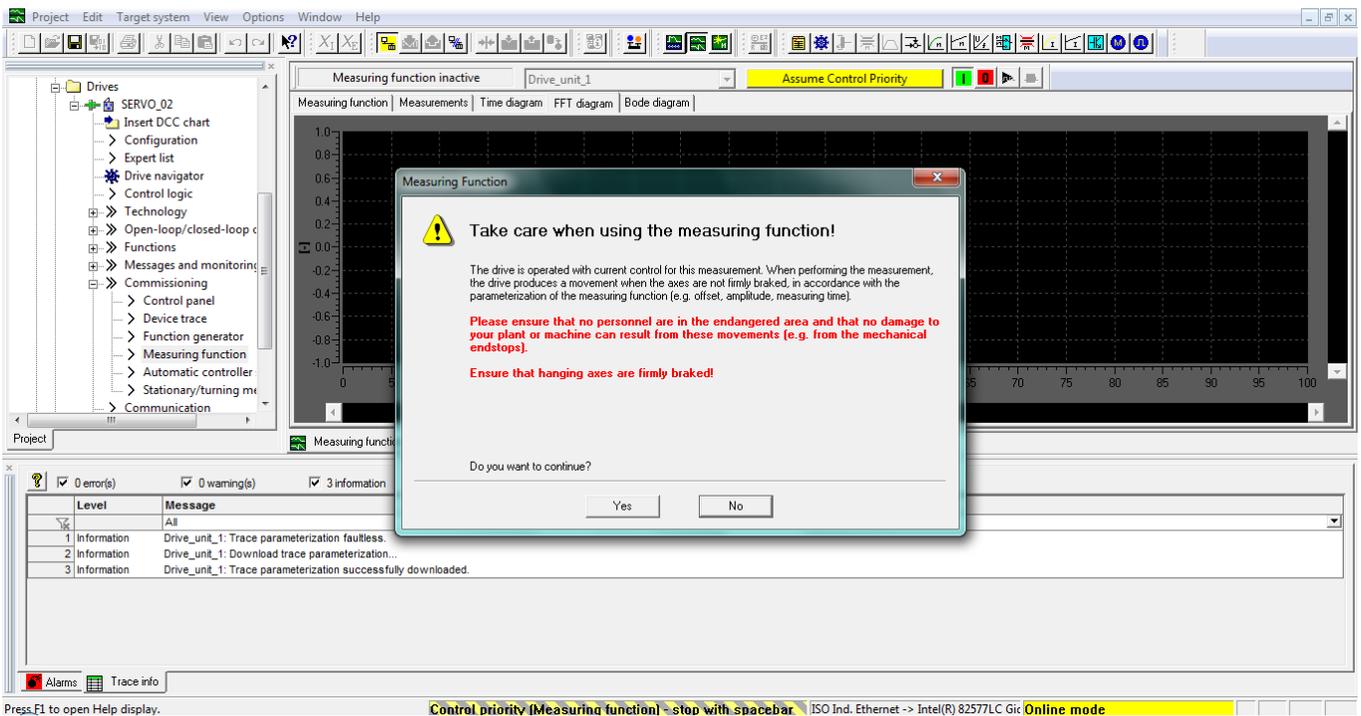
Navigate to the 'FFT Diagram' tab on the top of the current screen.



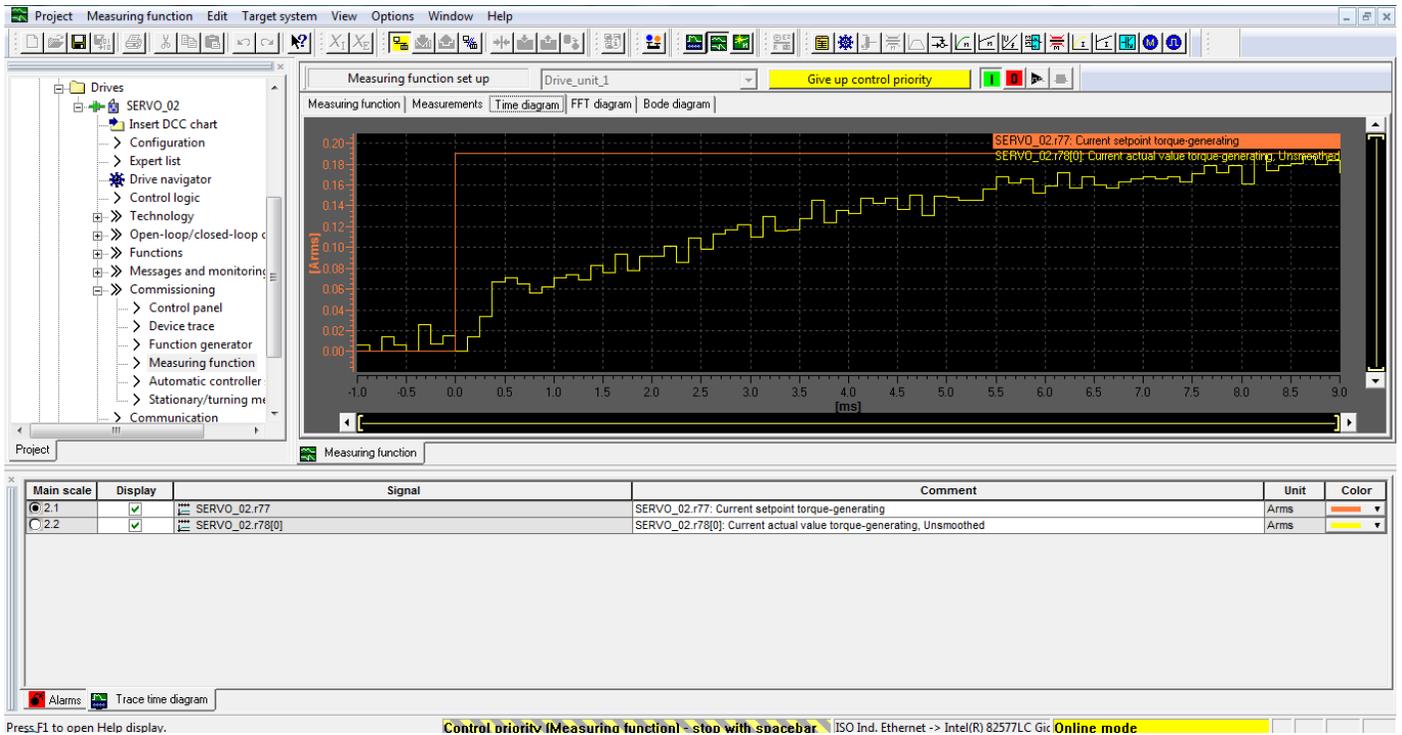
Assume Control Priority of the system.



Enable the Drive, and select 'Yes' after reviewing the prompt.



Resulting graph should appear similar to the illustration below.



Press.F1 to open Help display.

Control priority (Measuring function) - stop with spacebar ISO Ind. Ethernet -> Intel(R) 82577LC Gig Online mode

If graph does not appear to match, adjust the P gain in the motor menu until the measurement produces sufficient results.

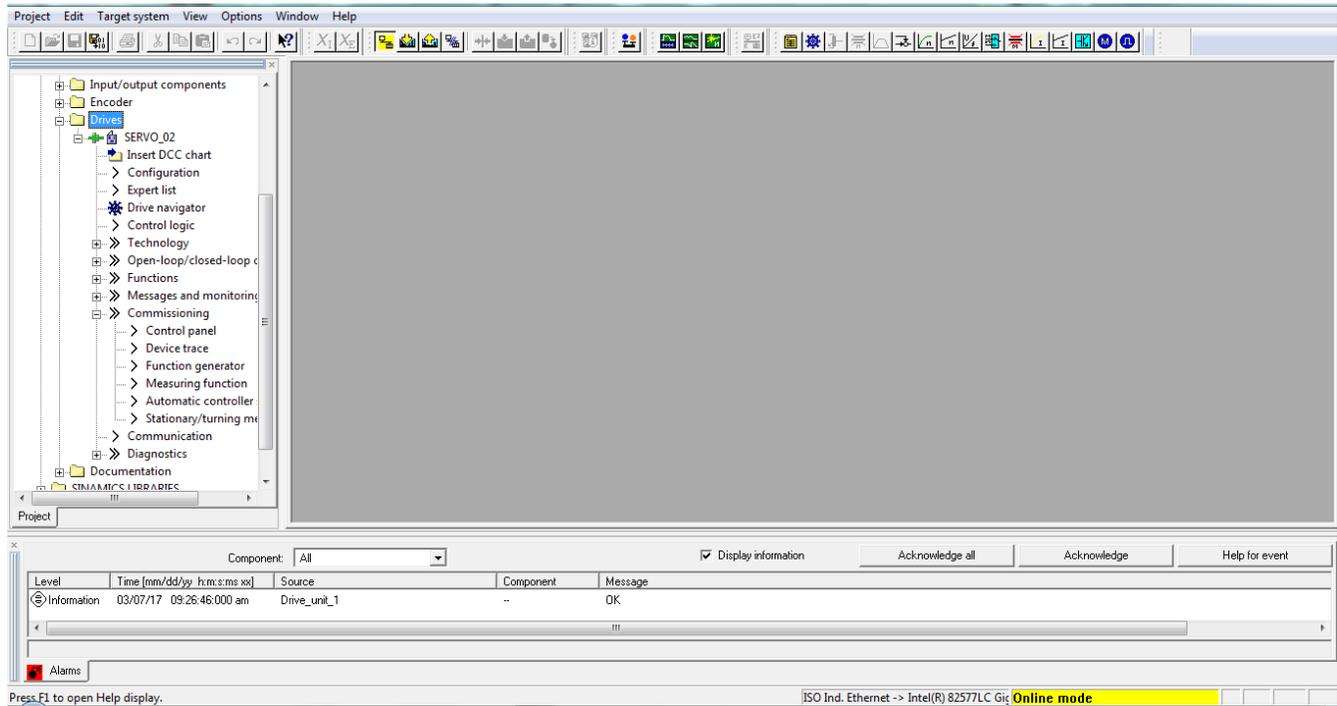
The screenshot displays a 'Current controller' configuration window. Key parameters include a 'Reset time' of 2.00 ms and a 'P gain' of 4.000 V/A. The diagram shows an 'Adaptation' block and an 'L_max controller' block. Inputs include 'Id_set' and 'I', and outputs include 'V_set' and 'Phi_set'. A table at the bottom provides signal details:

Main scale	Display	Signal	Comment	Unit	Color
2.1	<input checked="" type="checkbox"/>	SERVO_02.r77	SERVO_02.r77: Current setpoint torque-generating	Arms	Orange
2.2	<input checked="" type="checkbox"/>	SERVO_02.r78[0]	SERVO_02.r78[0]: Current actual value torque-generating, Unsmoothed	Arms	Yellow

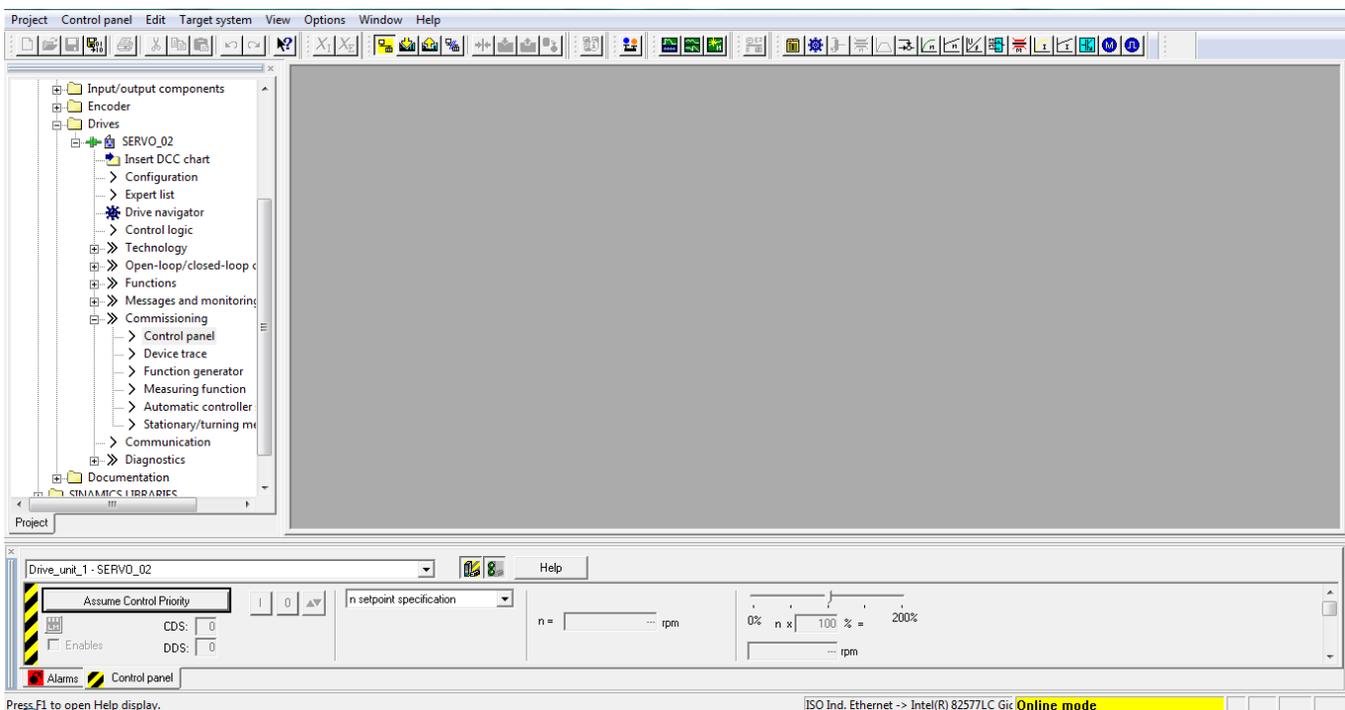
Once the P gain has been properly adjusted, we are ready to move on to tuning.

3.2 Stationary Tuning

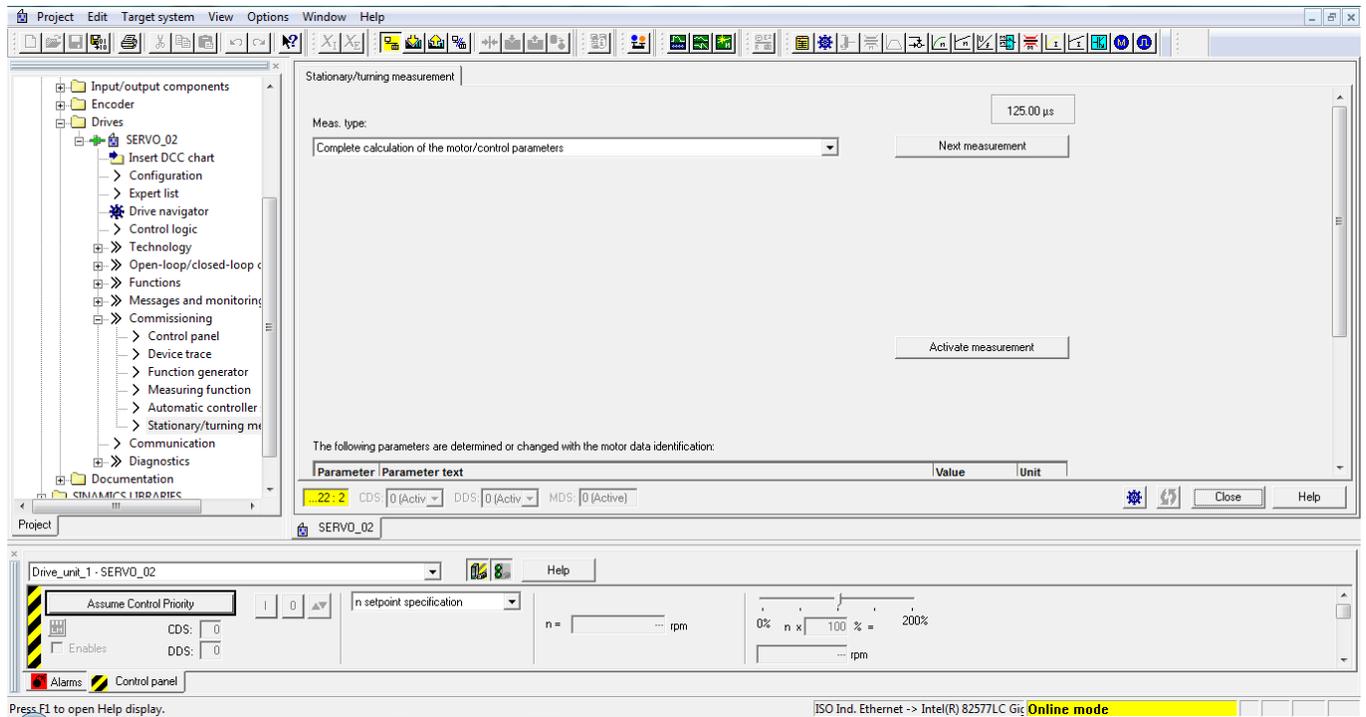
In the project tree, navigate to the 'Commissioning' tab.



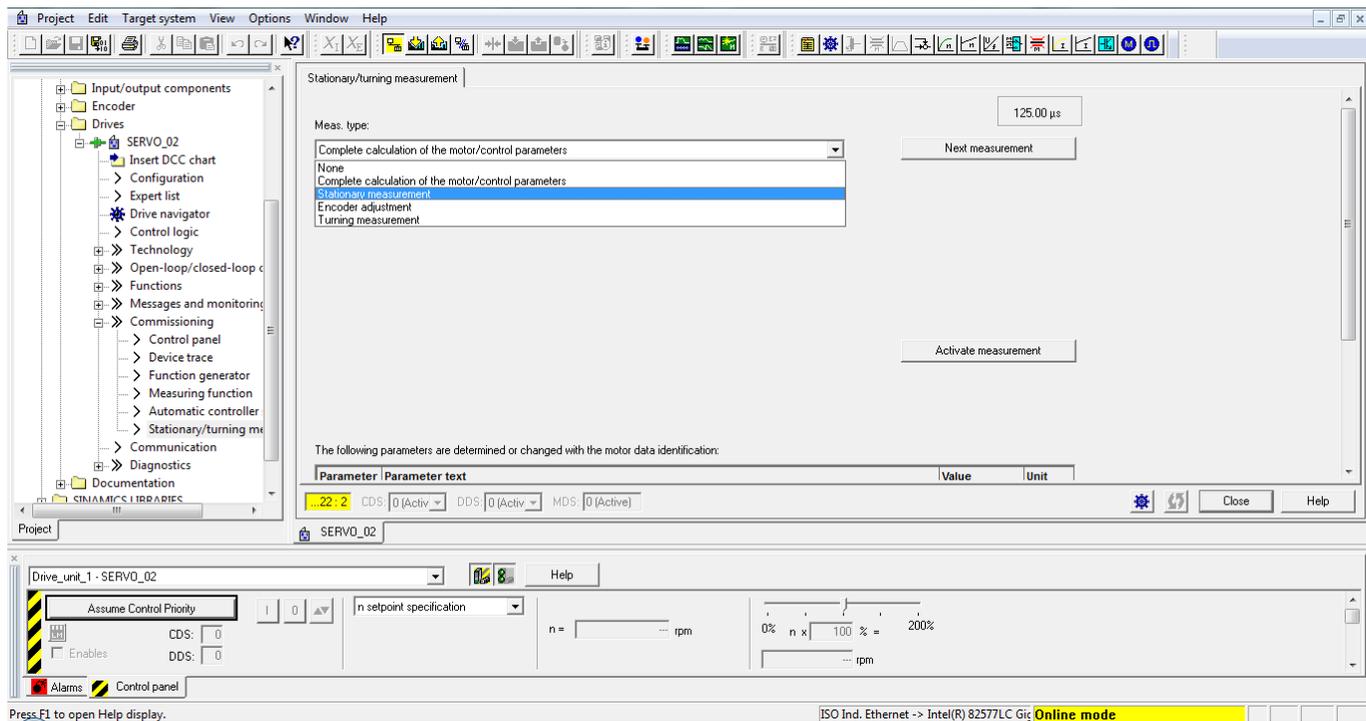
In the project tree within the 'Commissioning' tab, double-click on 'Control panel' to open the control panel menu.



Next, Select 'Stationary/tuning measurement' within the commissioning tab.



Then, select 'Stationary measurement' in the drop down.



Assume Control Priority and check the 'Enables' box.

Stationary/turning measurement |

Meas. type: 125.00 µs

Stationary measurement

Next measurement

The following parameters have to be configured before the measurement:

Parameter	Parameter text	Value	Unit
p352[0]	Cable resistance	0.00000	ohm
p353[0]	Motor series inductance	0.000	mH
p640[0]	Current limit	9.50	Arms
p1909[0]	Motor data identification control word	2700H	
p1959[0]	Rotating measurement configuration	0ee7H	

Status: [0] No measurement

Activate measurement

...22: 2 CDS: 0 [Active] DDS: 0 [Active] MDS: 0 [Active]

Control priority (Drive control panel) - stop with spacebar

Click 'Activate measurement'. Review and close the prompt.

Stationary/turning measurement |

Meas. type: 125.00 µs

Stationary measurement

Next measurement

The following parameters have to be configured before the measurement:

Parameter	Parameter text	Value	Unit
p352[0]	Cable resistance	0.00000	ohm
p353[0]	Motor series inductance	0.000	mH
p640[0]	Current limit	9.50	Arms
p1909[0]	Motor data identification control word	2700H	
p1959[0]	Rotating measurement configuration	0ee7H	

Status: [0] No measurement

Activate measurement

Notes for stationary measurement with synchronous motor

A motor identification (stationary measurement) is performed once at the drive enable.

The motor is under current and may turn up to three quarters of a revolution!

Notes:

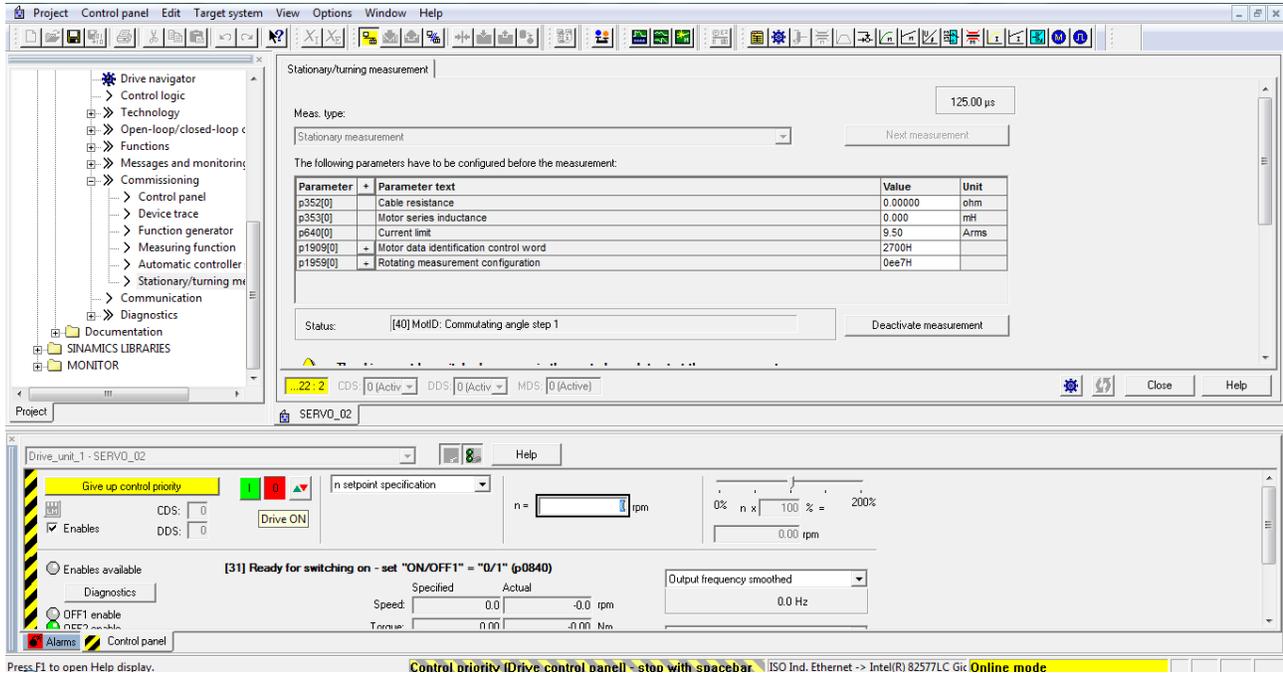
If a brake is used and the stationary measurement performed with closed brake, the commutation angle and the encoder sign alignment are not performed.

The measured commutation angle can only be taken over when the motor has been finely synchronized.

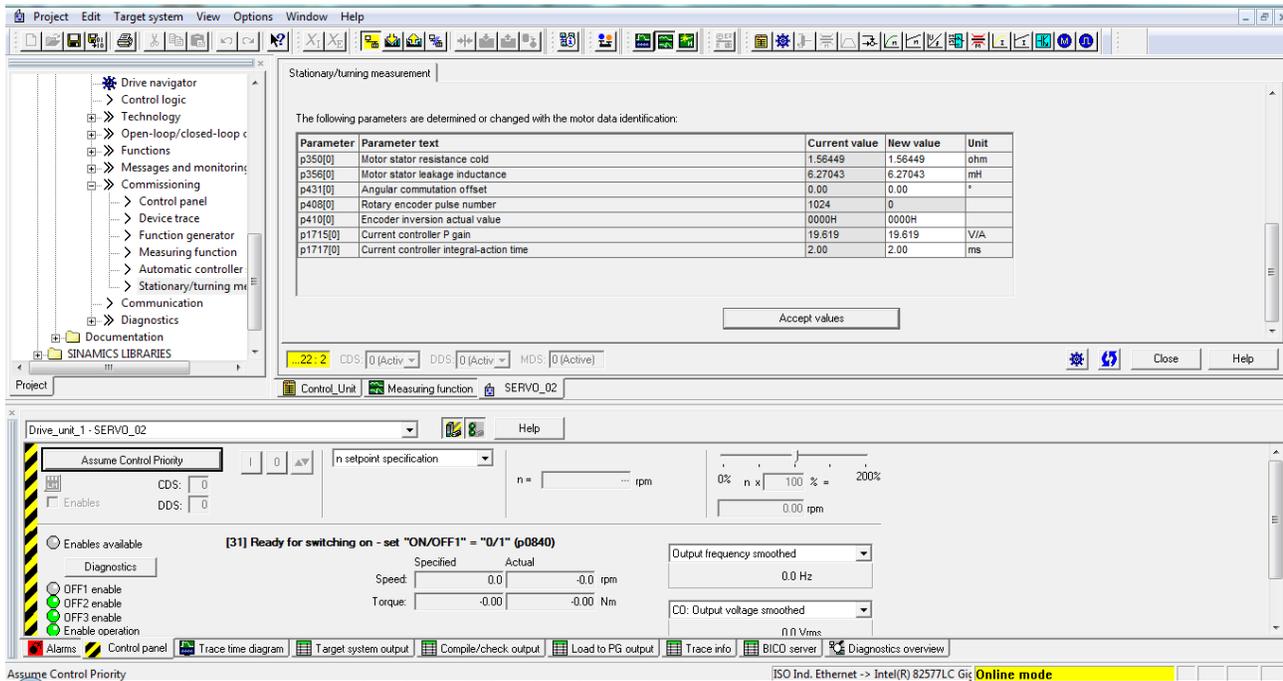
Close

Control priority (Drive control panel) - stop with spacebar

Turn the drive on by clicking the green box to perform the measurement. The drive will automatically power down after completing the measurement, this should take >5 seconds.



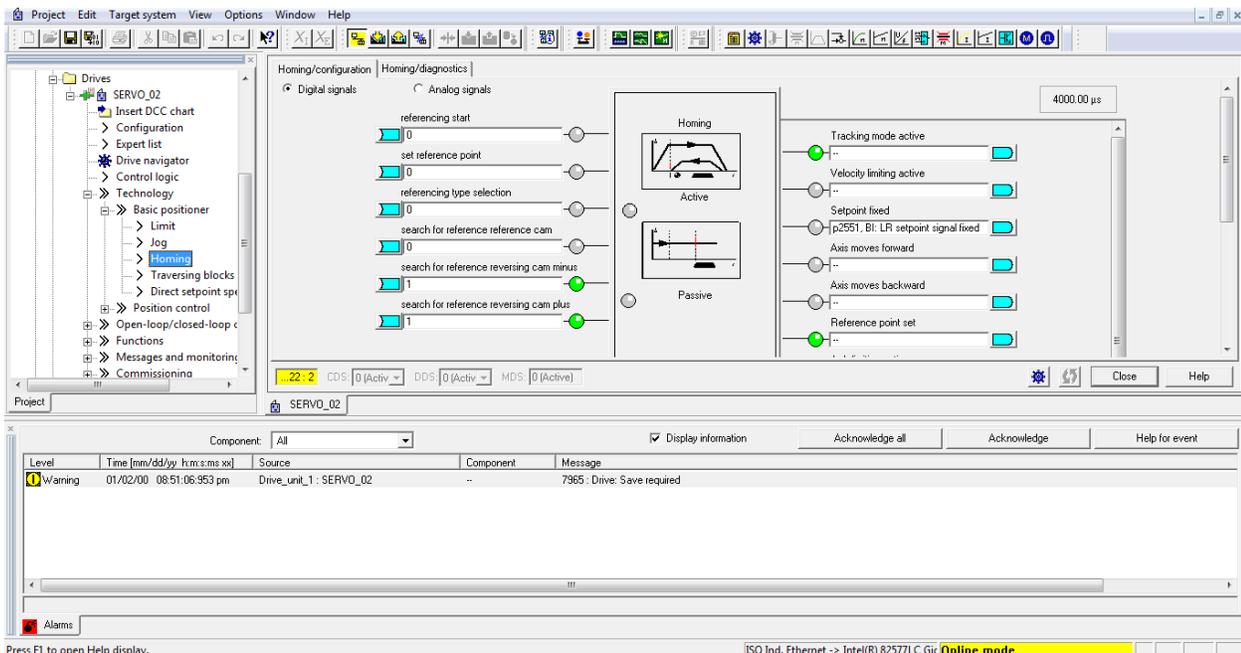
Scroll to the bottom of the measurement window and select: 'Accept values'.



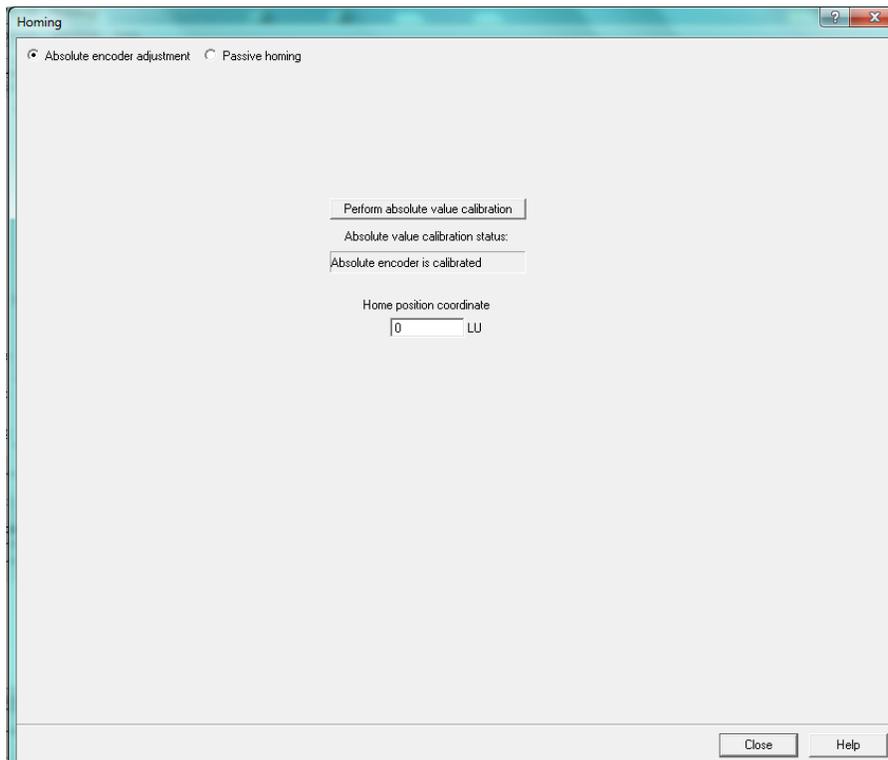
The Encoder can now be adjusted.

3.3 Encoder Adjustment

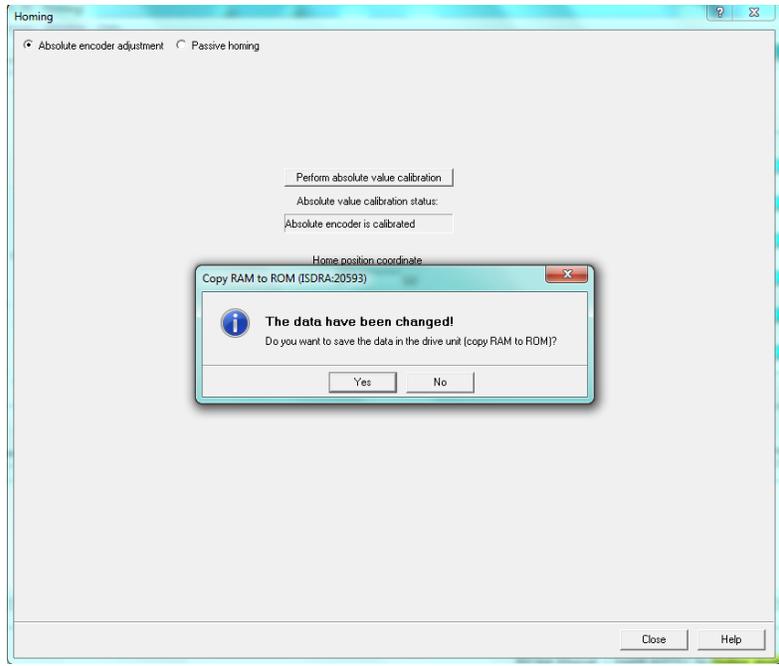
Set the encoder counts to zero and navigate to 'Homing' in the 'Basic positioner' tab under the 'Technology' tree.



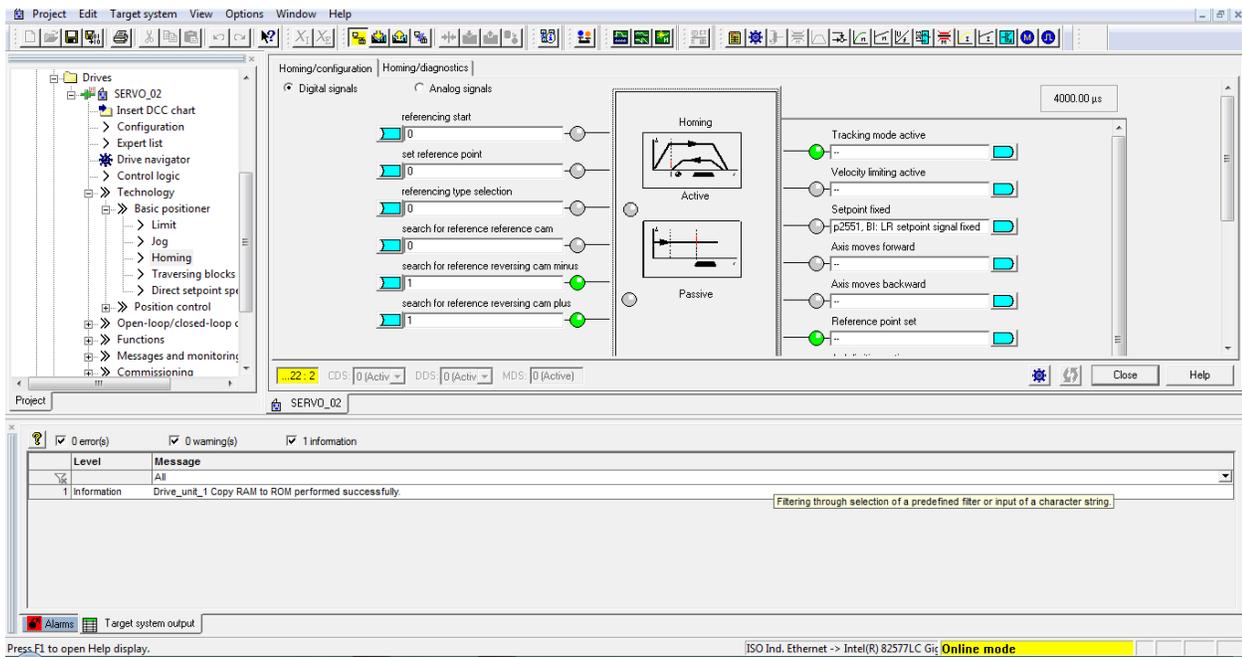
Select the 'Active Homing' graph illustration



Click 'Perform absolute value calibration' to calibrate the encoder. Select 'Yes' in the prompt in order to save the data to the drive.

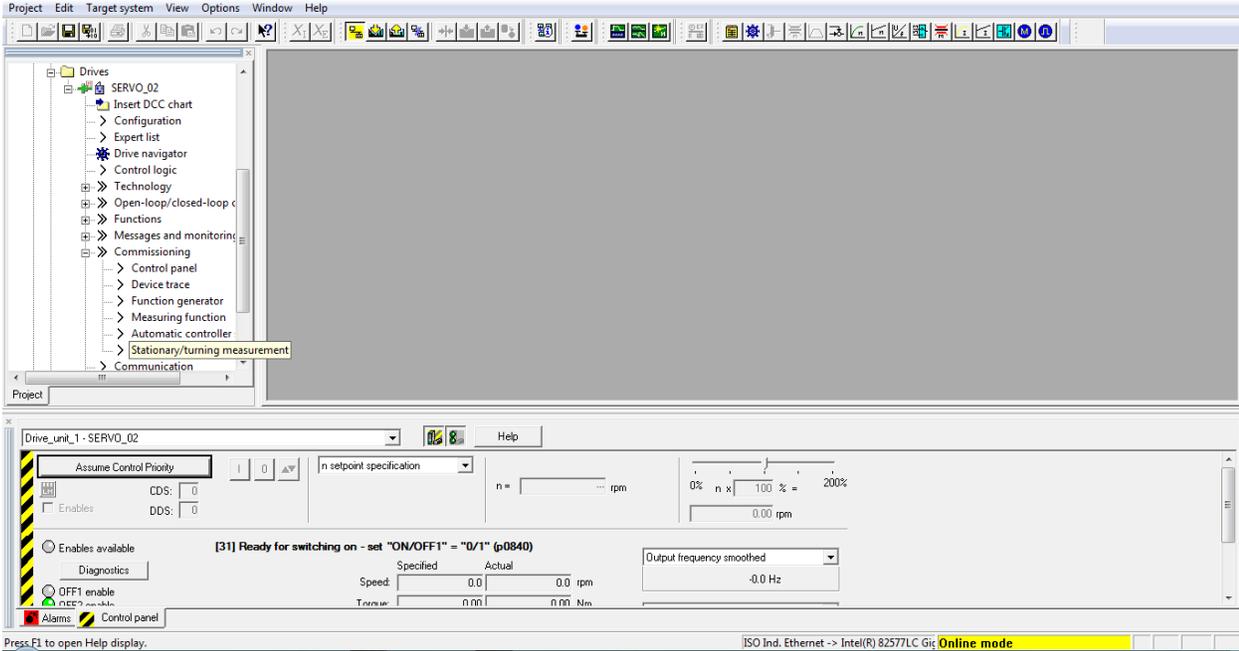


After it has been saved, close the 'Homing' screen.

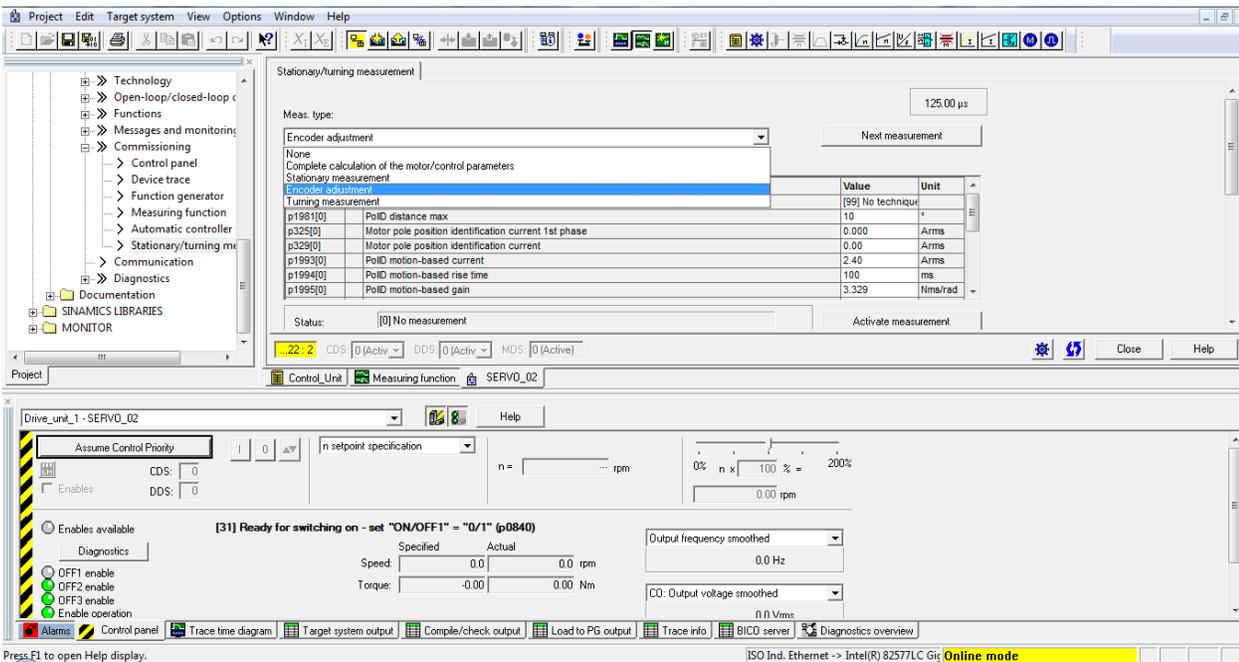


Performing the measurement

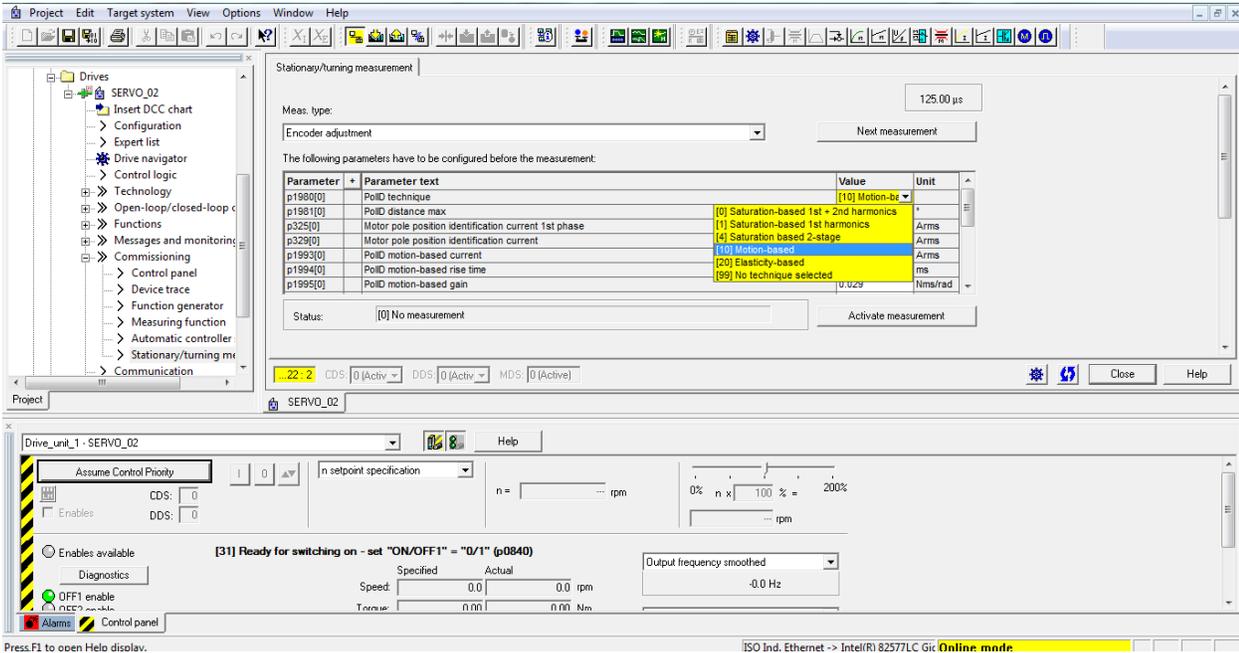
Under Commissioning, open the control panel and navigate to the 'Stationary/tuning measurement' tab.



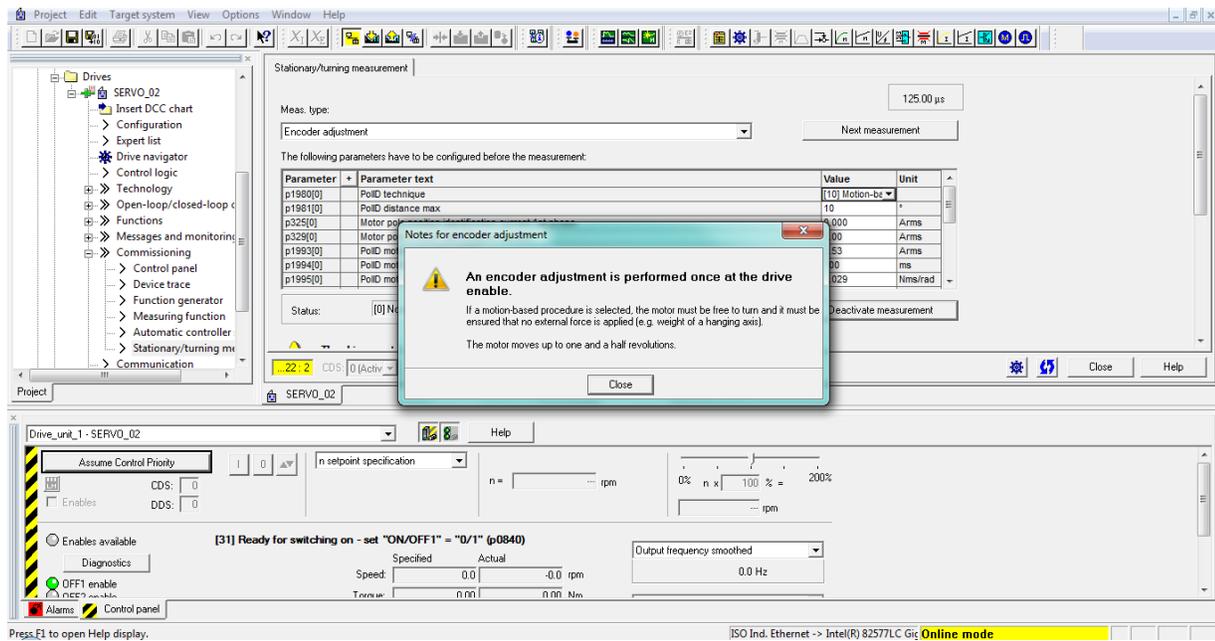
In the 'Meas. type' menu, select 'Encoder adjustment'.



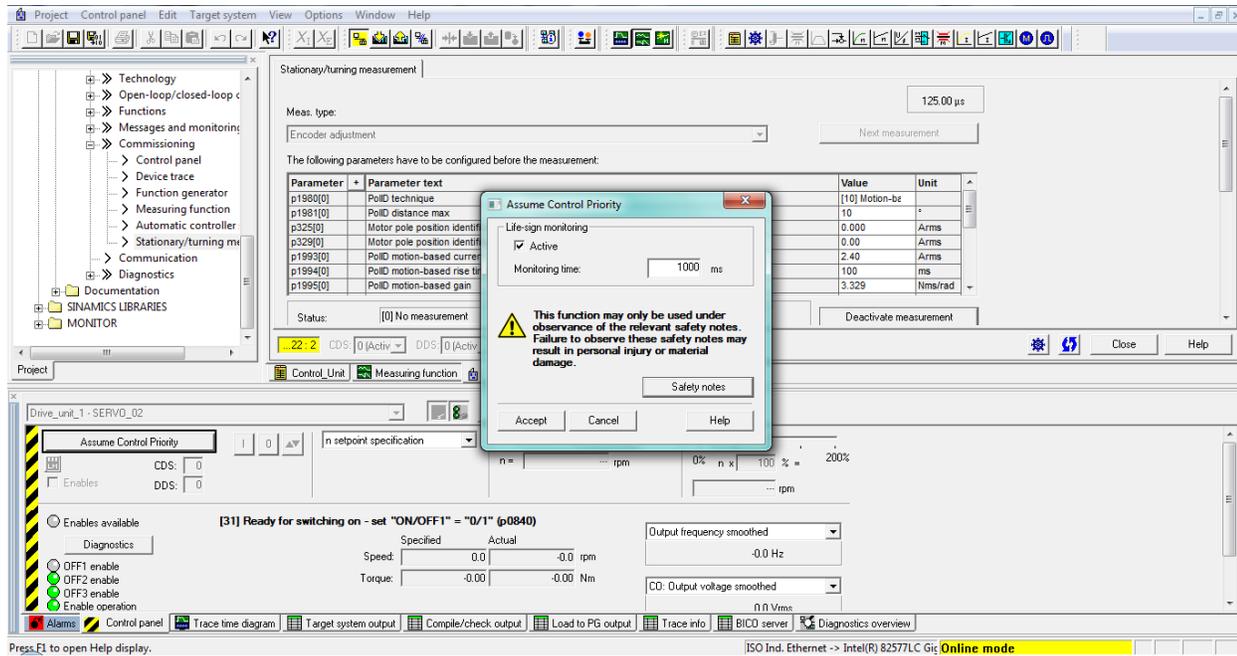
Select '[10] Motion-based' technique under the value parameter selection menu.



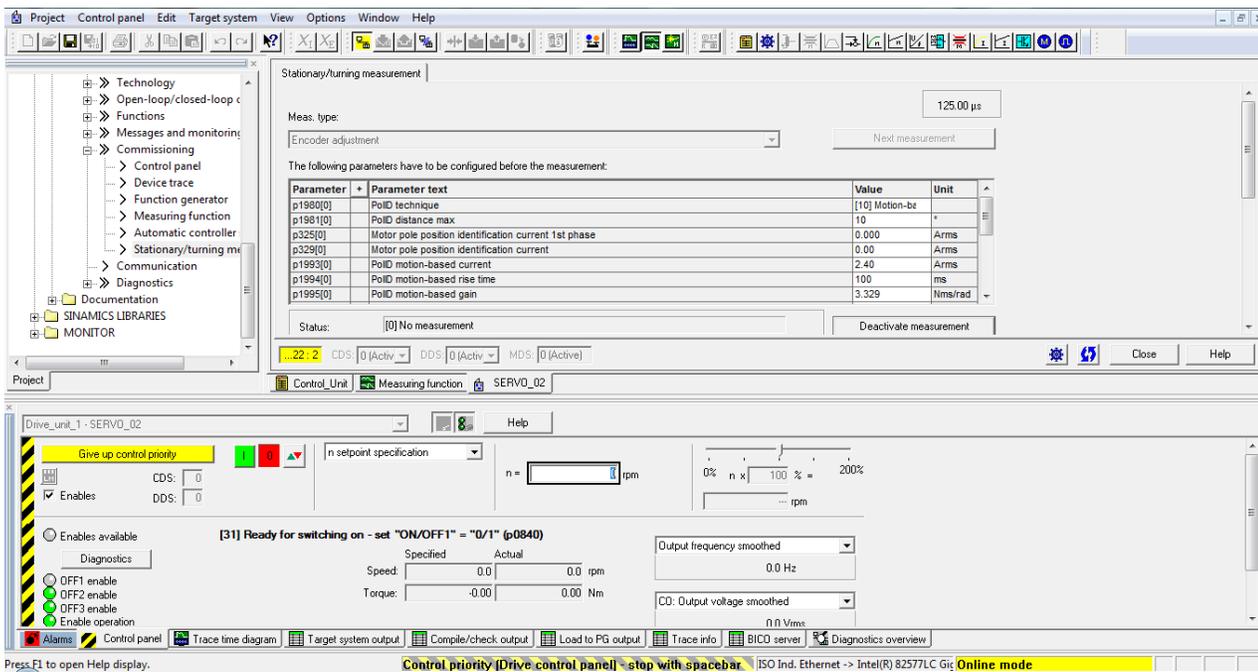
Activate the measurement, review and close the prompt.



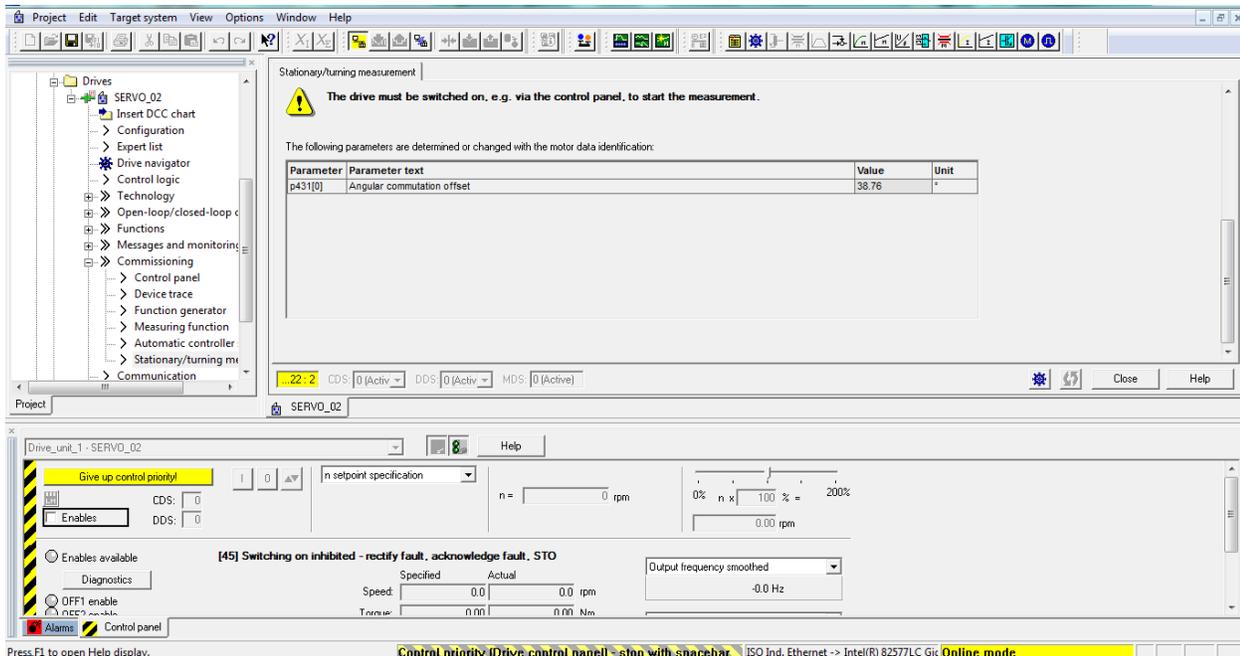
Assume Priority control



Check 'Enables' and turn the drive on by pressing the green 'I' box to perform measurement. The drive will momentarily turn on to initiate the measurement.



Scroll to the bottom of the 'Stationary/tuning measurement' screen and confirm that an 'Angular commutation offset' has been identified.



Tuning is now complete.