

Our NanoPro software is a recommendable tool for:

- Configuration
- Testing
- Troubleshooting
- Firmware updates

Today, you'll learn how to use the NanoPro software properly.

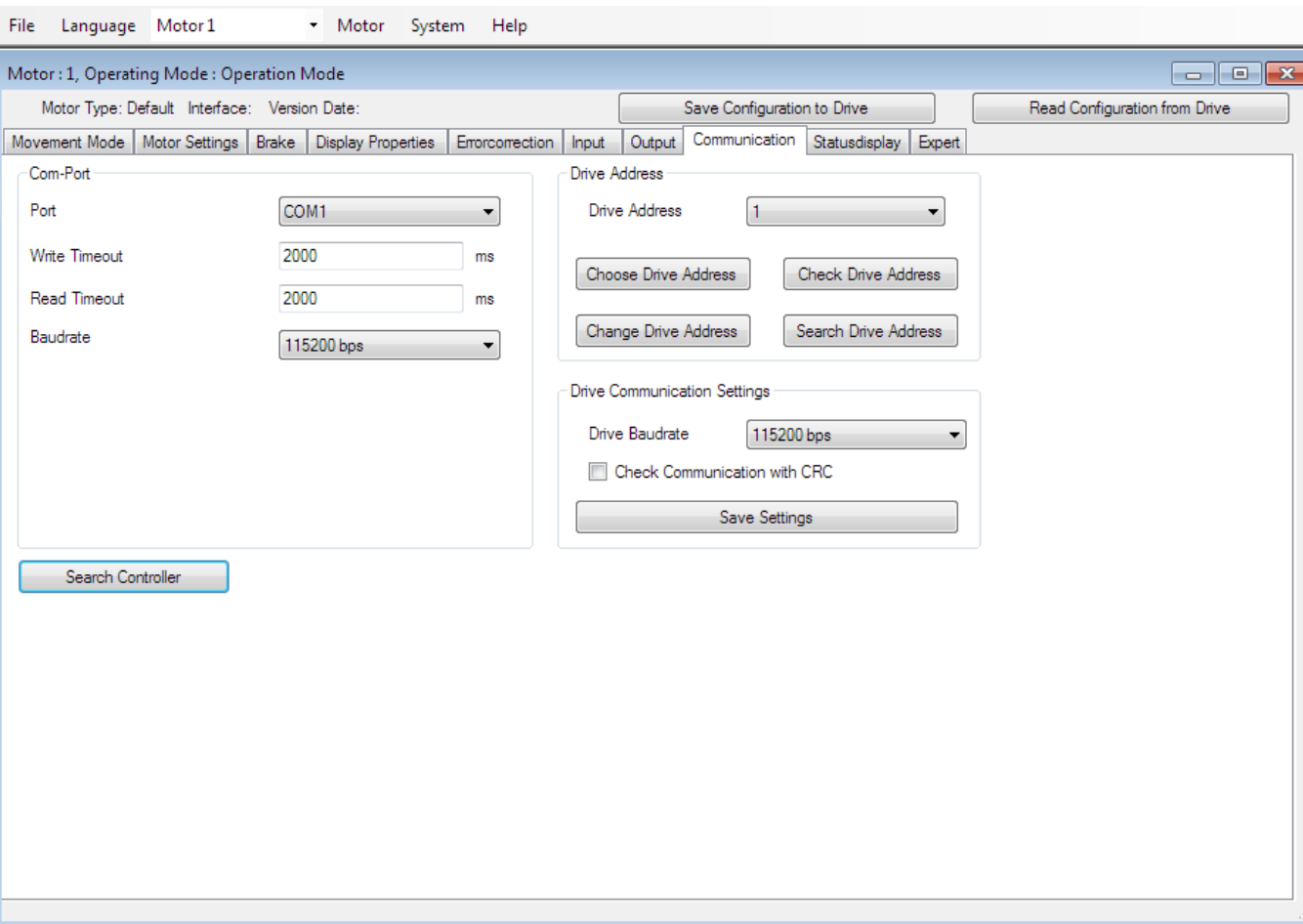
In addition, you will get a good overview of all functions of our motor controllers

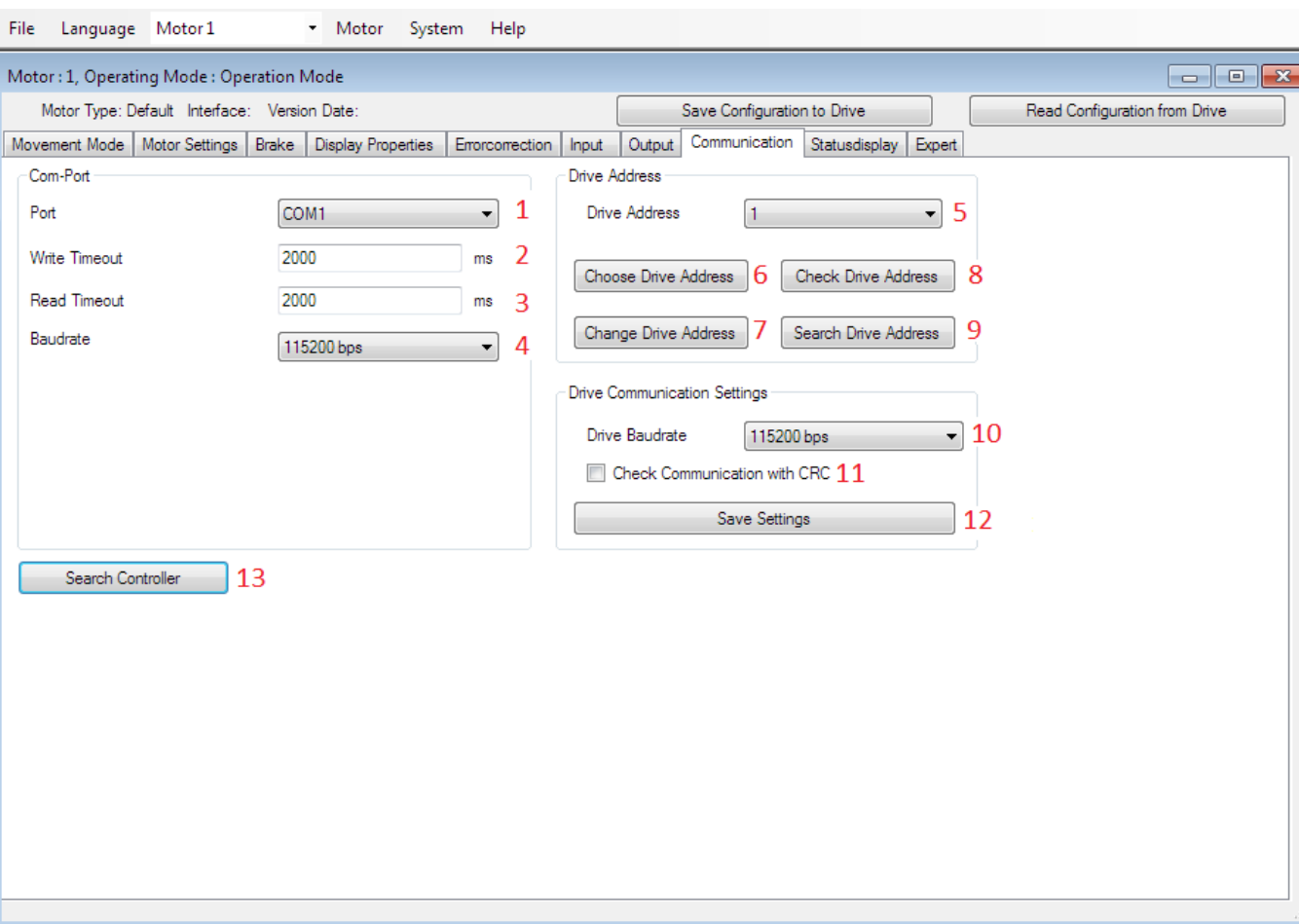
The Communication tab is the starting page of NanoPro.

You need to establish a communication here.

These communication parameters can be changed:

- Baudrate
- Drive address
- CRC check





1. Port: Comport of the PC to which the controller is connected.

2. Write Timeout: Time window before a communication error appears after writing.

3. Read Timeout: Time window before a communication error appears after reading.

4. Baudrate: The selected baud rate for the communication (default 115200).

5. Drive Address: The address you want to communicate with.

6. Choose Drive Address: Confirms a change of the drive address.

7. Change Drive Address: Changes the address of the controller connected to the software.

8. Check Drive Address: Checks if a controller with the selected address is communicating.

9. Search Drive Address: Searches for a connected controller.

10. Drive Baudrate: Changes the baud rate of the connected controller.

12. Save Settings: Saves changes in baud rate and CRC check.

11. Check Communication with CRC: Activates/deactivates the use of a CRC check.

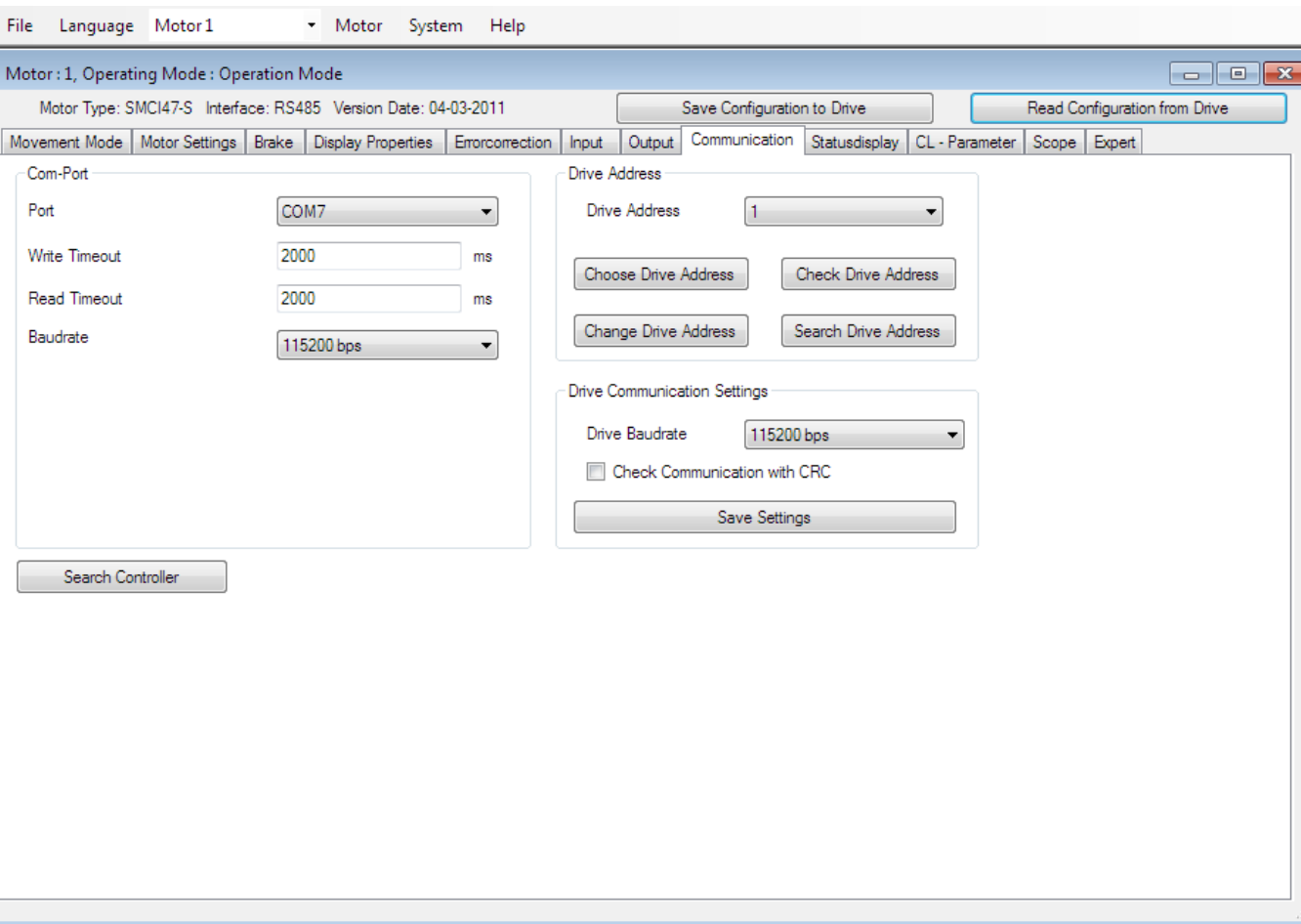
13. Search Controller: Searches all baud rates for a connected controller.

To establish a communication:

- Choose the port
- Choose the baud rate
- Choose the drive address
- Click on “read configuration from drive”

Or:

- Choose the drive address
- Click on “search controller”



Communication is established when “motor type”, “interface” and “version date” (firmware version) appear.

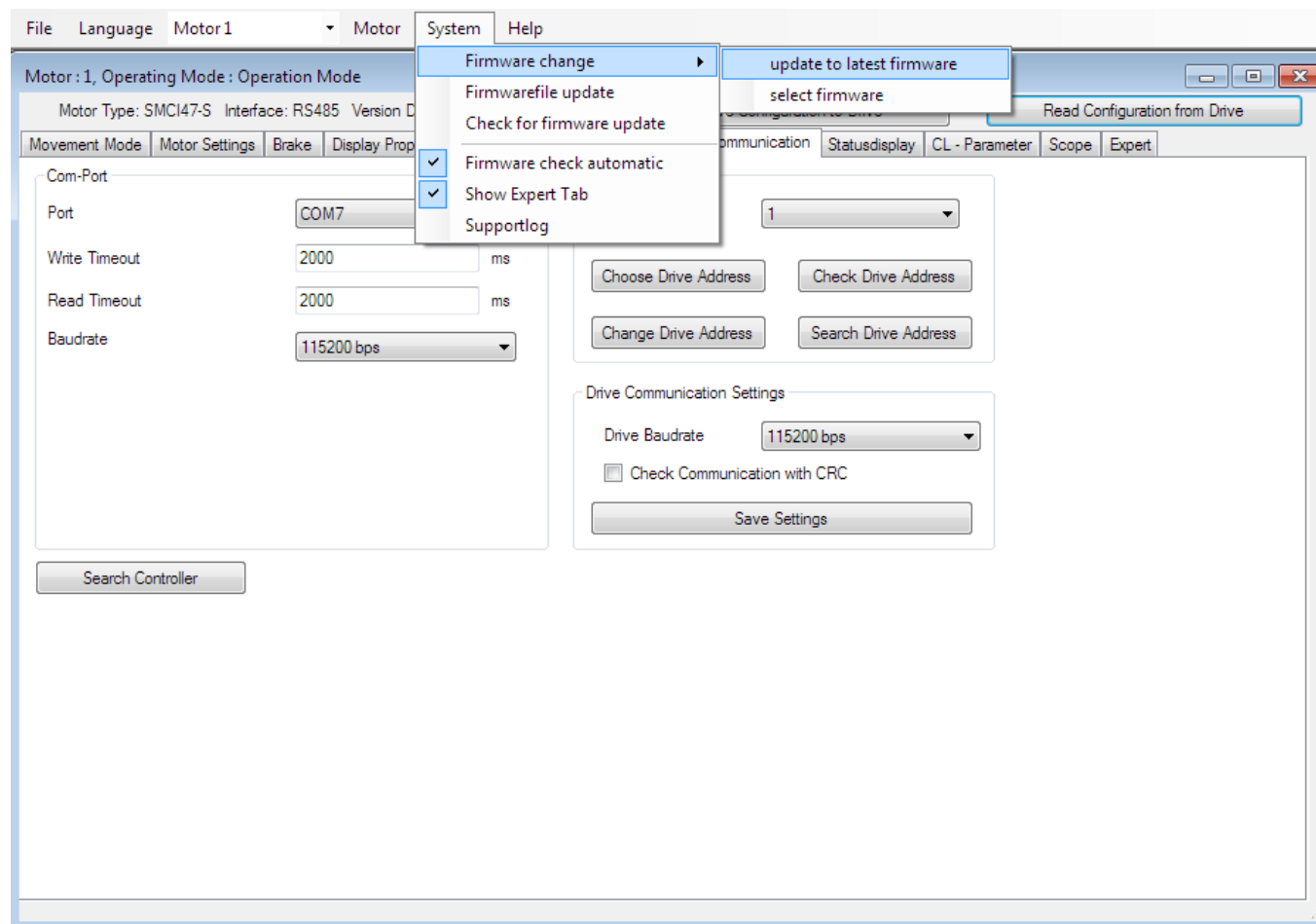
NanoPro automatically detects if a new firmware is available. In this case a message will appear.

To update the firmware, click on “System” in the toolbar.

“Firmware change” -> “update to latest firmware” for the newest version.

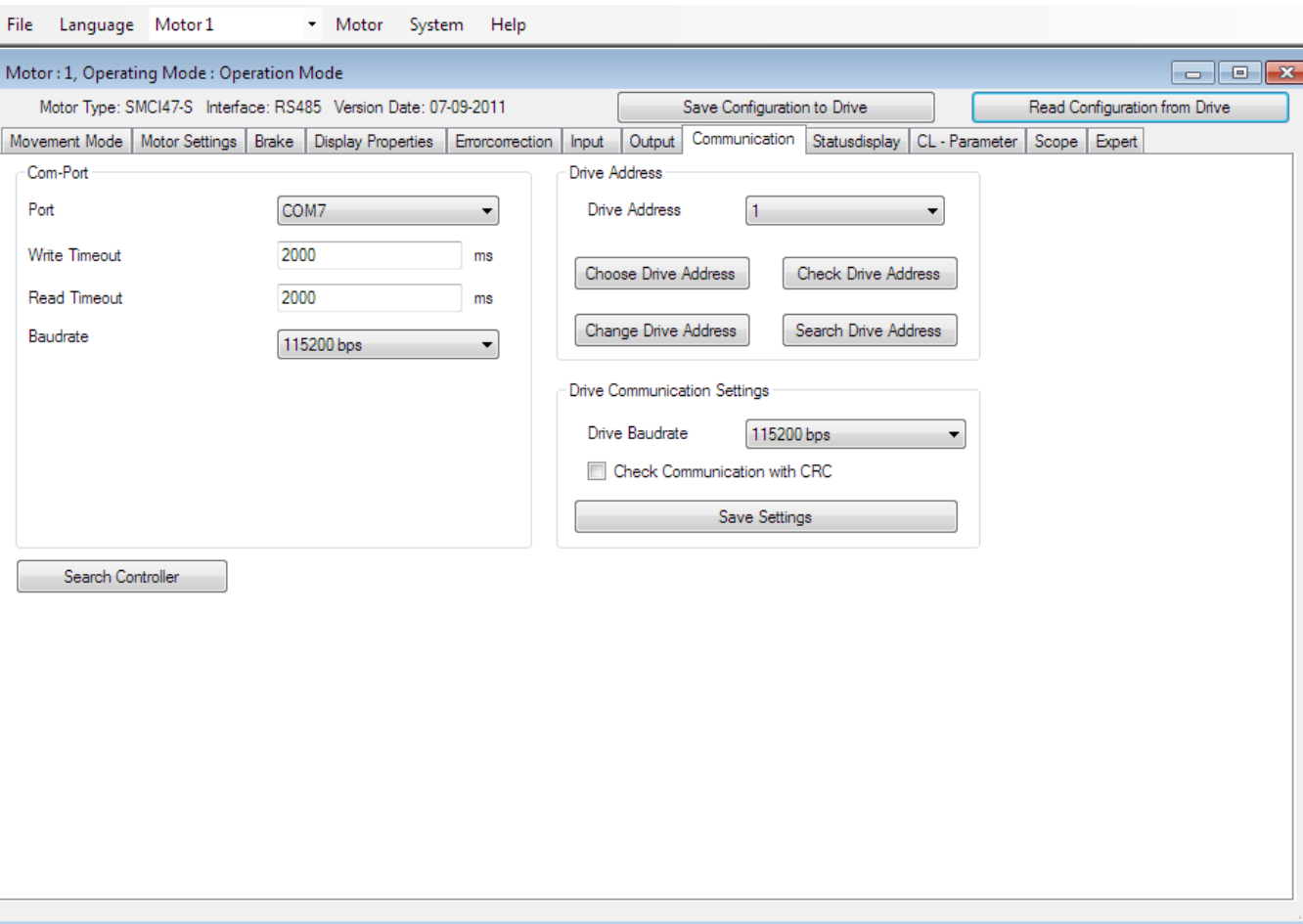
You can also select a firmware, e.g. if you need to replace a damaged controller or switch to CANopen.

The firmware update will take about 1-2 minutes. An internet connection is not necessary.



After the firmware update you will see a change in the "Version Date"

It is important that all devices of an application use the same firmware version!

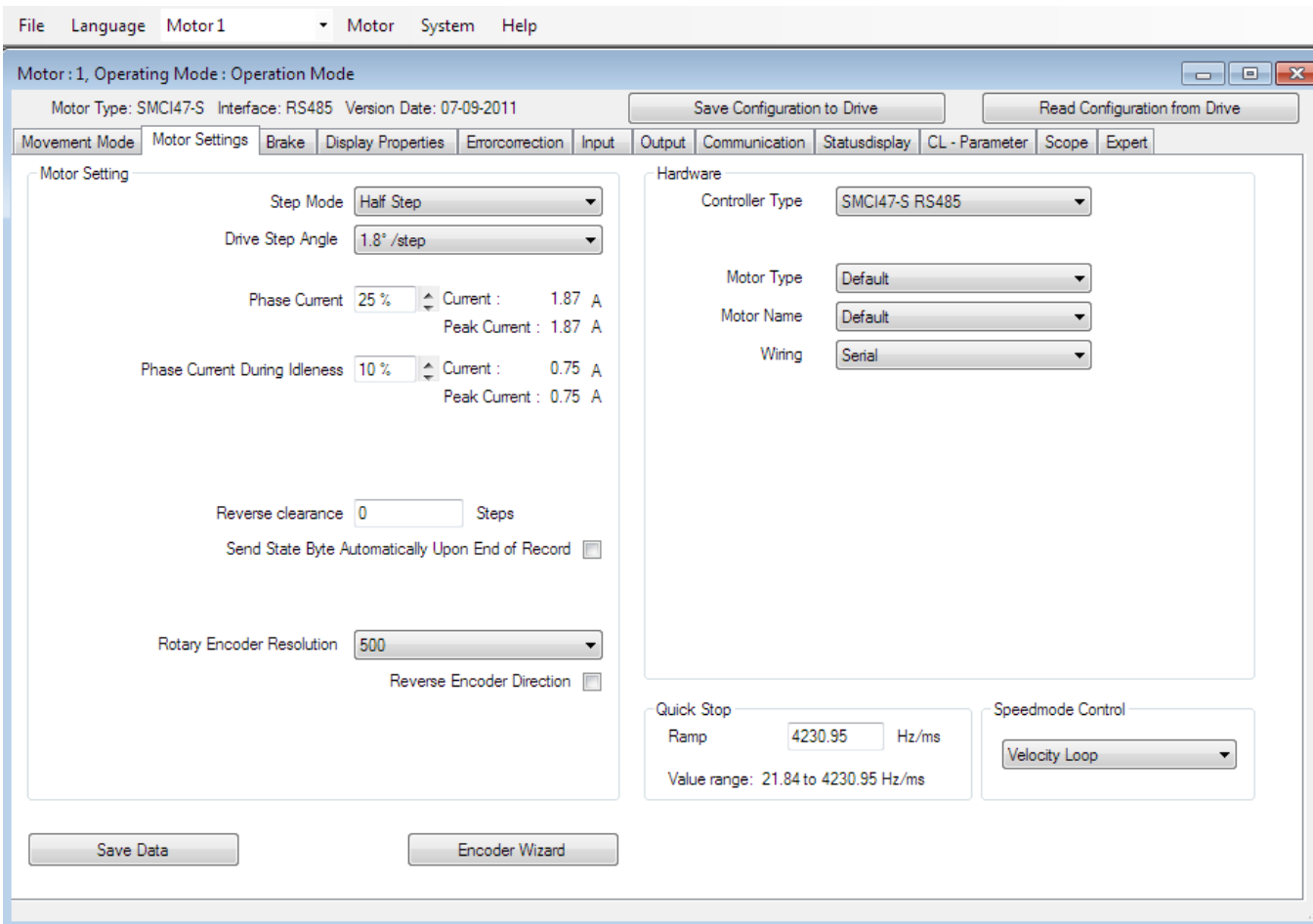


Exercise:

Update the firmware of the controller in front of you.

The Motor Settings tab contains the most important settings for the motor and encoder, e.g.:

- Step mode
- Current
- Encoder resolution



!! If you choose the wrong settings here, it might damage your motor and the controller !!

1. Step Mode: Changes the number of steps per revolution. (For the controller/input. For the motor, we always microstep!)

2. Drive Step Angle: Choose the physical step angle of your motor.

3. Phase Current: Sets the used current for driving the motor or the max. current in closed loop mode.

4. Phase Current During Idleness: Sets the used current if the motor is not moving (holding torque).

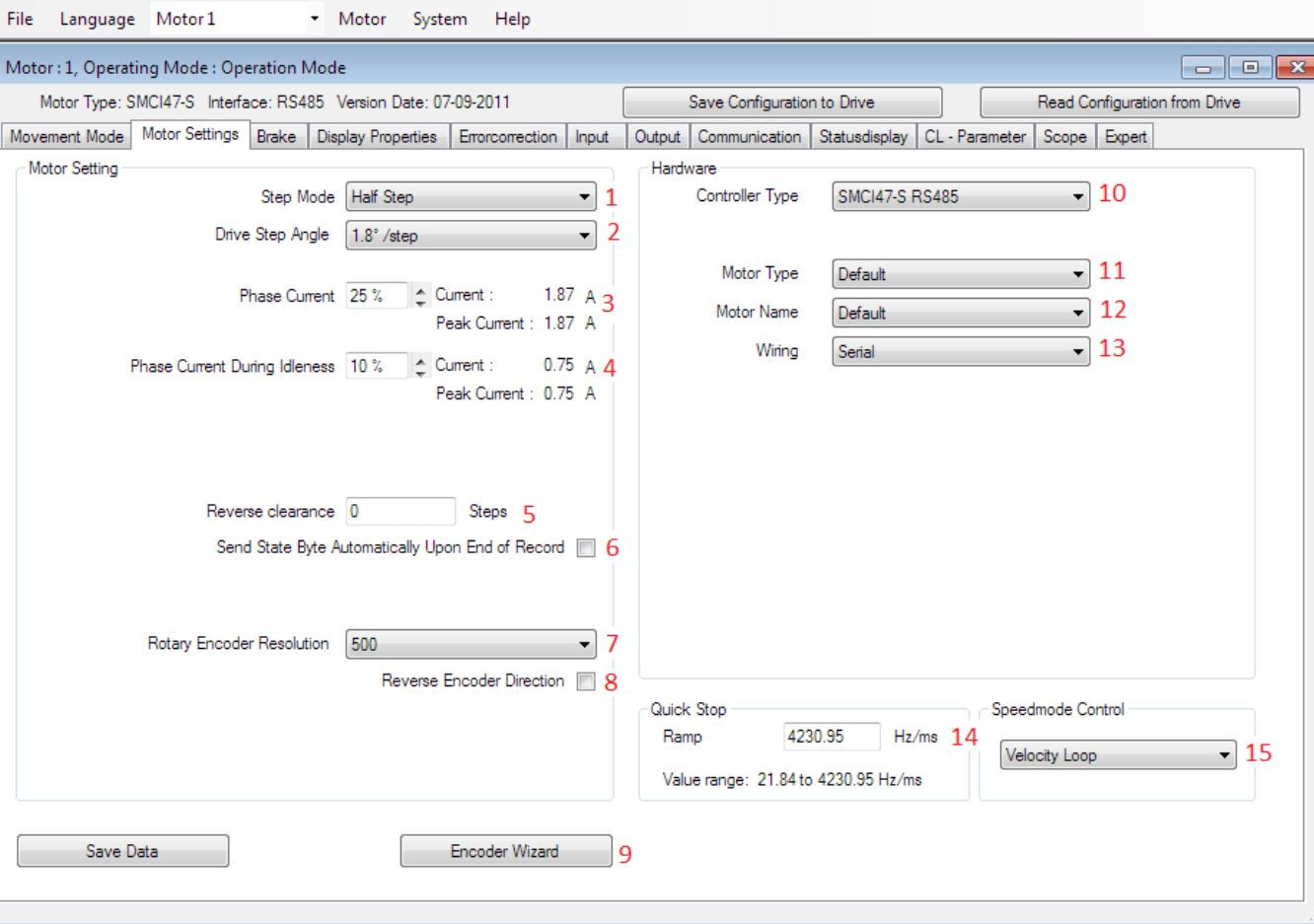
5. Reverse clearance: Can be used to compensate backlash when using a gear.

6. Send Status Byte Upon End of Record: If activated, the device sends status information at the end of a profile.

7. Rotary Encoder Resolution: Sets the resolution of the encoder in counts per revolution.

8. Reverse Encoder Direction: Changes the direction the encoder counts.

9. Encoder Wizard: Automatically detects the direction and resolution of an encoder by running one motor-turn.



10. Controller Type: Shows the name and communication type of the connected device.

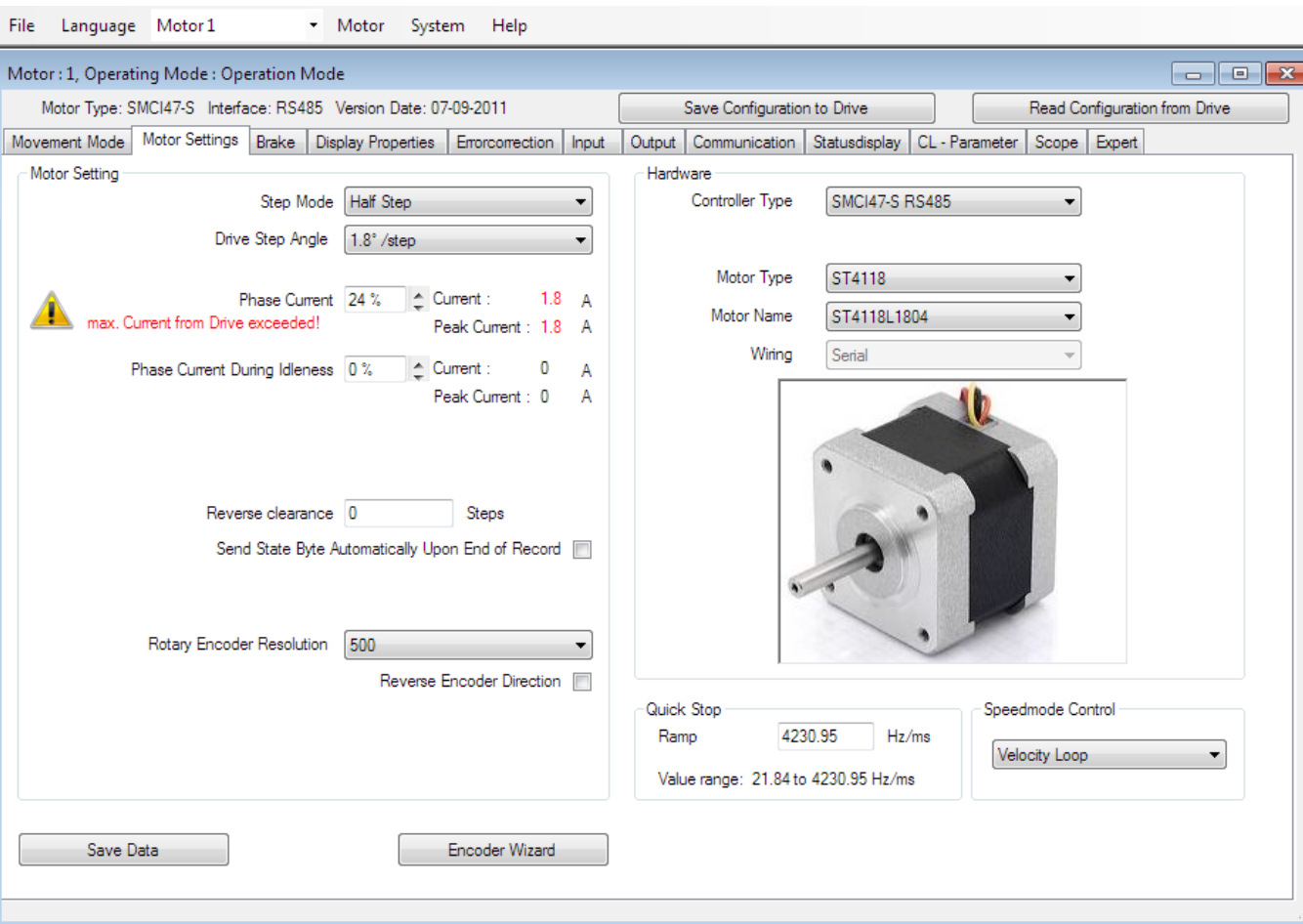
11-13. Hardware: You can select your motor type here for visual assistance.

14. Quick Stop: Sets the ramp for a quick stop.

15. Speedmode Control: Change between V- and P-Loop for Closed Loop (description at CL-Parameter)

Selecting the correct motor settings:

- Get a datasheet of the motor
- Read out the step angle and make your setting
- Read out the current and make your setting
- Set the current during idle as low as possible
- Select your motor under hardware (only necessary for BLDCs)



Motor: 1, Operating Mode: Operation Mode

Motor Type: SMCI47-S Interface: RS485 Version Date: 07-09-2011

Save Configuration to Drive Read Configuration from Drive

Movement Mode Motor Settings Brake Display Properties Errorcorrection Input Output Communication Statusdisplay CL - Parameter Scope Expert

Motor Setting

Step Mode: Half Step

Drive Step Angle: 1.8°/step

Phase Current: 24 % Current: 1.8 A Peak Current: 1.8 A

max. Current from Drive exceeded!

Phase Current During Idleness: 0 % Current: 0 A Peak Current: 0 A

Reverse clearance: 0 Steps

Send State Byte Automatically Upon End of Record

Rotary Encoder Resolution: 500

Reverse Encoder Direction

Hardware

Controller Type: SMCI47-S RS485

Motor Type: ST4118

Motor Name: ST4118L1804

Wiring: Serial

Quick Stop Ramp: 4230.95 Hz/ms

Value range: 21.84 to 4230.95 Hz/ms

Speedmode Control: Velocity Loop

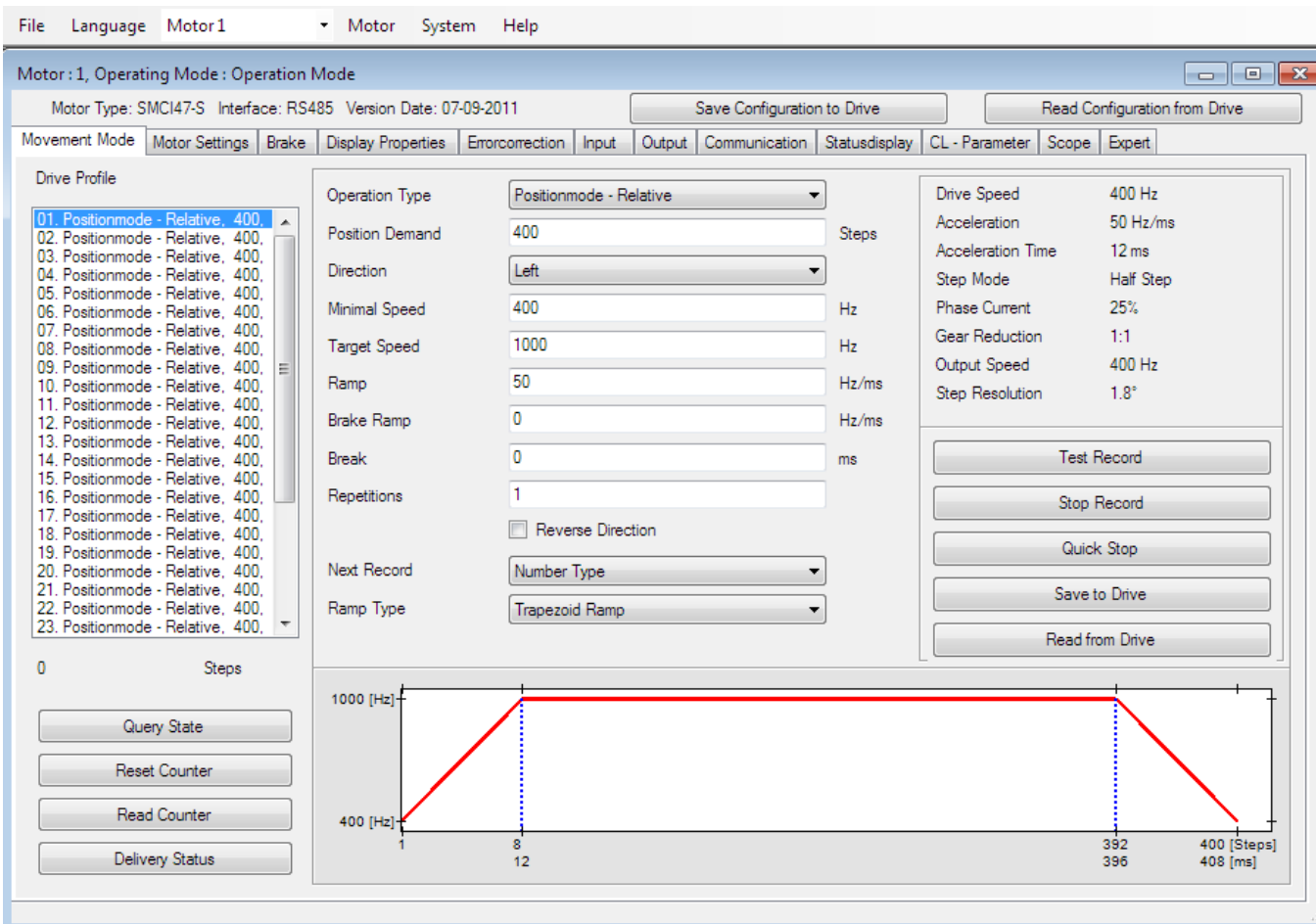
Save Data Encoder Wizard

Exercise:

Set up your motor and encoder.

The Movement Mode tab is the main tab of the NanoPro. It lets you

- Select the operation type
- Change driving conditions
- Create profiles
- Link profiles together
- Test our motor



File Language Motor1 Motor System Help

Motor: 1, Operating Mode: Operation Mode

Motor Type: SMC147-S Interface: RS485 Version Date: 07-09-2011

Save Configuration to Drive Read Configuration from Drive

Movement Mode Motor Settings Brake Display Properties Errorcorrection Input Output Communication Statusdisplay CL - Parameter Scope Expert

Drive Profile

01. Positionmode - Relative, 400
02. Positionmode - Relative, 400
03. Positionmode - Relative, 400
04. Positionmode - Relative, 400
05. Positionmode - Relative, 400
06. Positionmode - Relative, 400
07. Positionmode - Relative, 400
08. Positionmode - Relative, 400
09. Positionmode - Relative, 400
10. Positionmode - Relative, 400
11. Positionmode - Relative, 400
12. Positionmode - Relative, 400
13. Positionmode - Relative, 400
14. Positionmode - Relative, 400
15. Positionmode - Relative, 400
16. Positionmode - Relative, 400
17. Positionmode - Relative, 400
18. Positionmode - Relative, 400
19. Positionmode - Relative, 400
20. Positionmode - Relative, 400
21. Positionmode - Relative, 400
22. Positionmode - Relative, 400
23. Positionmode - Relative, 400

Operation Type: Positionmode - Relative

Position Demand: 400 Steps

Direction: Left

Minimal Speed: 400 Hz

Target Speed: 1000 Hz

Ramp: 50 Hz/ms

Brake Ramp: 0 Hz/ms

Break: 0 ms

Repetitions: 1

Reverse Direction

Next Record: Number Type

Ramp Type: Trapezoid Ramp

Drive Speed: 400 Hz

Acceleration: 50 Hz/ms

Acceleration Time: 12 ms

Step Mode: Half Step

Phase Current: 25%

Gear Reduction: 1:1

Output Speed: 400 Hz

Step Resolution: 1.8°

Test Record

Stop Record

Quick Stop

Save to Drive

Read from Drive

0 Steps

Query State

Reset Counter

Read Counter

Delivery Status

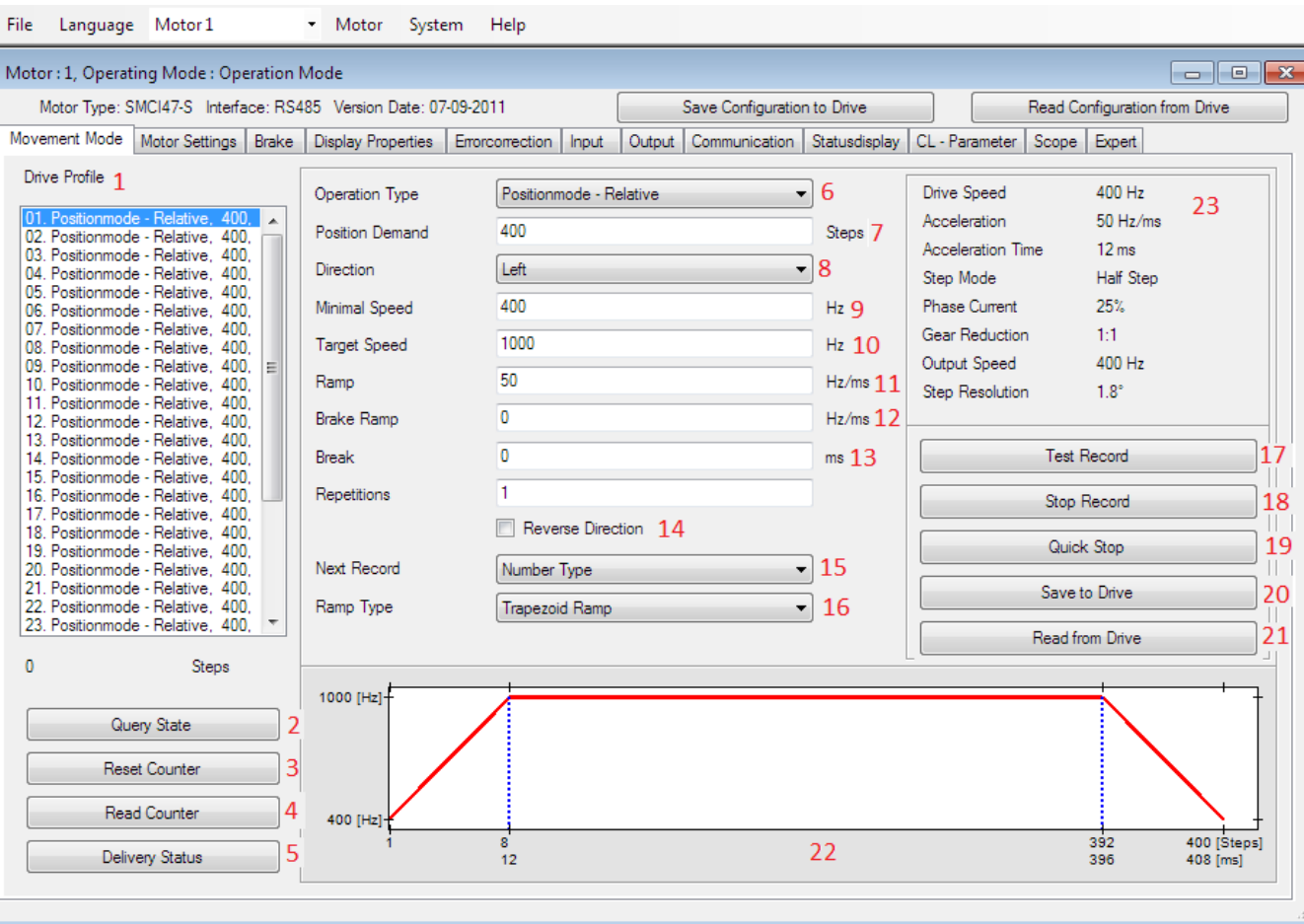
1000 [Hz]

400 [Hz]

1 8 12 392 396 400 [Steps]

408 [ms]

1. Drive Profile: Select one of 32 profiles.
2. Query State: Get the status of the controller.
3. Reset Counter: Sets all positions to "0".
4. Read Counter: Reads out the position.
5. Delivery Status: Set all parameter to its default
The analogue input cannot be used by the controller in CANopen, but it is possible to read out the value on the input through a SDO.
6. Operation Type: Select your profile type.
7. Steps: Sets the target position if available.
8. Direction: Change between cw and ccw if available.
9. Minimal Speed: Starting speed of the motor.
10. Target Speed: Driving speed.
11. Ramp: Changes the acceleration of the motor.
12. Brake Ramp: Changes the deceleration of the motor.



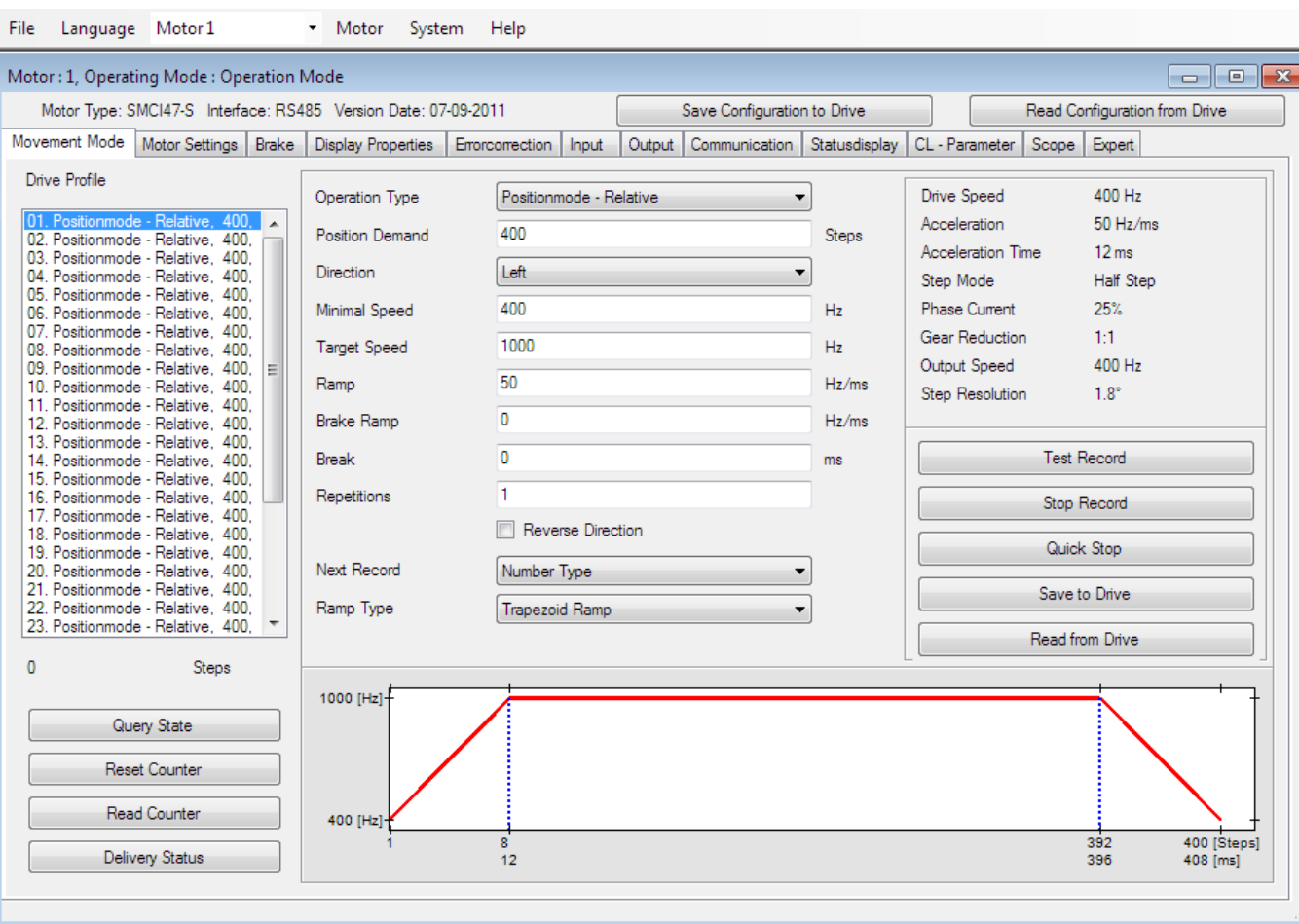
The screenshot shows the 'Motor: 1, Operating Mode: Operation Mode' window. It includes a menu bar (File, Language, Motor1, Motor, System, Help), a title bar, and a toolbar with 'Save Configuration to Drive' and 'Read Configuration from Drive'. The main area is divided into several sections:

- Drive Profile 1:** A list of 32 profiles, all labeled 'Positionmode - Relative, 400'. Profile 01 is selected.
- Operation Type:** A dropdown menu set to 'Positionmode - Relative' (6).
- Position Demand:** A text input field set to '400' (7).
- Direction:** A dropdown menu set to 'Left' (8).
- Minimal Speed:** A text input field set to '400' (9).
- Target Speed:** A text input field set to '1000' (10).
- Ramp:** A text input field set to '50' (11).
- Brake Ramp:** A text input field set to '0' (12).
- Break:** A text input field set to '0' (13).
- Repetitions:** A text input field set to '1'.
- Reverse Direction:** A checkbox (14).
- Next Record:** A dropdown menu set to 'Number Type' (15).
- Ramp Type:** A dropdown menu set to 'Trapezoid Ramp' (16).
- Drive Parameters:** A table showing: Drive Speed (400 Hz, 23), Acceleration (50 Hz/ms), Acceleration Time (12 ms), Step Mode (Half Step), Phase Current (25%), Gear Reduction (1:1), Output Speed (400 Hz), and Step Resolution (1.8°).
- Action Buttons:** 'Test Record' (17), 'Stop Record' (18), 'Quick Stop' (19), 'Save to Drive' (20), and 'Read from Drive' (21).
- Steps:** A section with buttons for 'Query State' (2), 'Reset Counter' (3), 'Read Counter' (4), and 'Delivery Status' (5).
- Diagram:** A graph showing speed [Hz] vs. position [Steps] and time [ms]. The speed starts at 400 Hz, ramps up to 1000 Hz at 8 steps (12 ms), stays constant at 1000 Hz until 392 steps (396 ms), and then ramps down to 400 Hz at 400 steps (408 ms). Red numbers 22 and 23 are overlaid on the graph.

17. Test Record: Starts the selected profile
18. Stop Record: Stops the profile with the selected ramp.
19. Quick Stop: Stops the profile with the quick stop ramp.
20. Save to Drive: Saves your profiles to the EEPROM
21. Read from Drive: Reads out the profiles from the EEPROM
22. Diagram: Shows the profile
23. Values: Shows the values of the movement
13. Break: Time between two profiles.
14. Reverse Direction: Changes the direction after a profile.
15. Next Record: Defines the next record.
16. Ramp Type: Changes the ramp profile.

Your motor drives to a target position relative to the actual position with a defined speed and ramp.

Example:
Motor position is at 1000 steps.
Motor position is at 400 steps.
The motor will go to position 1400 by starting the profile.



Motor: 1, Operating Mode: Operation Mode

Motor Type: SMC147-S Interface: RS485 Version Date: 07-09-2011

Movement Mode | Motor Settings | Brake | Display Properties | Errorcorrection | Input | Output | Communication | Statusdisplay | CL - Parameter | Scope | Expert

Drive Profile

- 01. Positionmode - Relative, 400
- 02. Positionmode - Relative, 400
- 03. Positionmode - Relative, 400
- 04. Positionmode - Relative, 400
- 05. Positionmode - Relative, 400
- 06. Positionmode - Relative, 400
- 07. Positionmode - Relative, 400
- 08. Positionmode - Relative, 400
- 09. Positionmode - Relative, 400
- 10. Positionmode - Relative, 400
- 11. Positionmode - Relative, 400
- 12. Positionmode - Relative, 400
- 13. Positionmode - Relative, 400
- 14. Positionmode - Relative, 400
- 15. Positionmode - Relative, 400
- 16. Positionmode - Relative, 400
- 17. Positionmode - Relative, 400
- 18. Positionmode - Relative, 400
- 19. Positionmode - Relative, 400
- 20. Positionmode - Relative, 400
- 21. Positionmode - Relative, 400
- 22. Positionmode - Relative, 400
- 23. Positionmode - Relative, 400

Operation Type: Positionmode - Relative

Position Demand: 400 Steps

Direction: Left

Minimal Speed: 400 Hz

Target Speed: 1000 Hz

Ramp: 50 Hz/ms

Brake Ramp: 0 Hz/ms

Break: 0 ms

Repetitions: 1

Reverse Direction

Next Record: Number Type

Ramp Type: Trapezoid Ramp

Drive Speed: 400 Hz

Acceleration: 50 Hz/ms

Acceleration Time: 12 ms

Step Mode: Half Step

Phase Current: 25%

Gear Reduction: 1:1

Output Speed: 400 Hz

Step Resolution: 1.8°

Buttons: Test Record, Stop Record, Quick Stop, Save to Drive, Read from Drive

0 Steps

Buttons: Query State, Reset Counter, Read Counter, Delivery Status

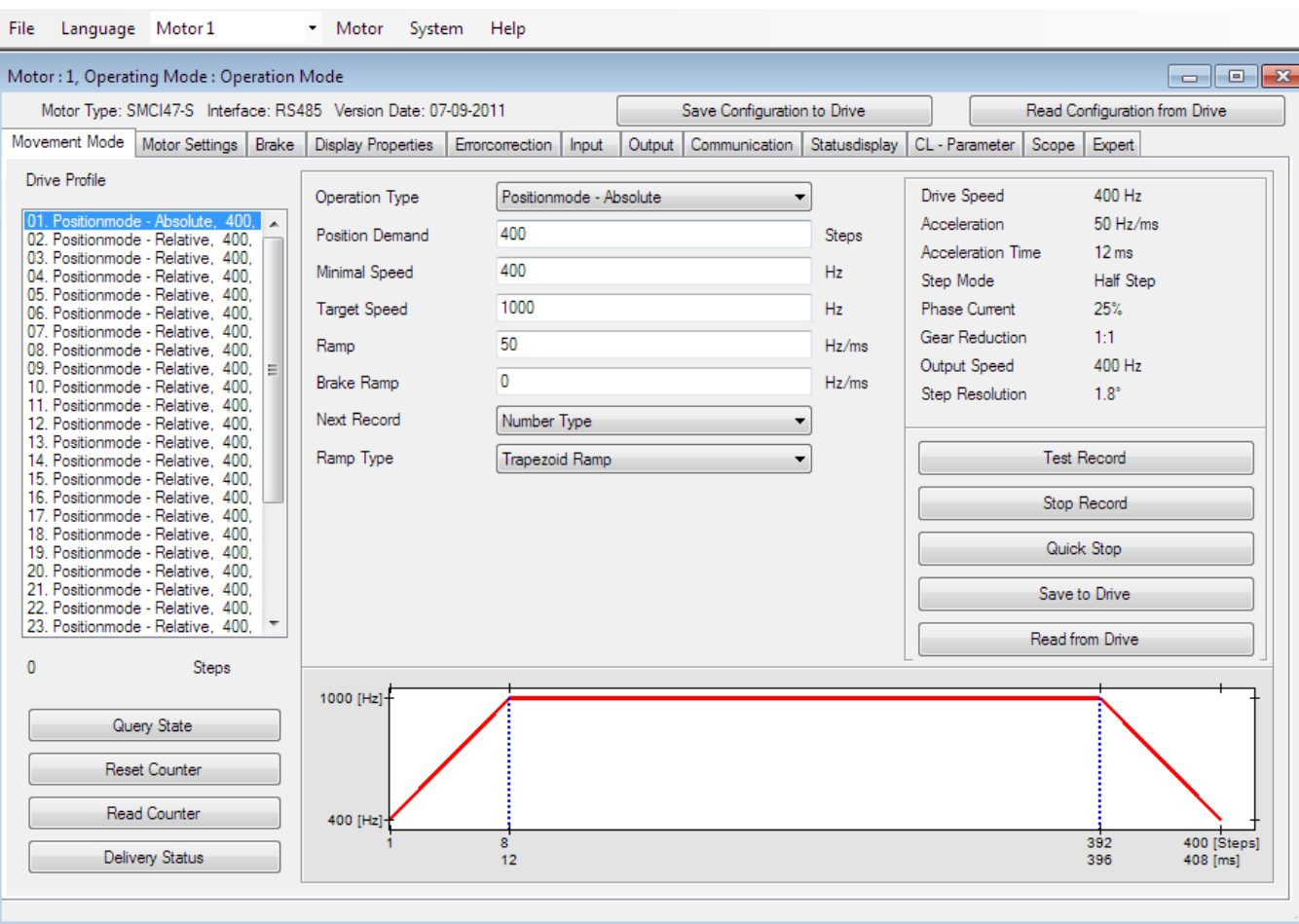
Graph: Speed [Hz] vs. Position [Steps] and Time [ms]. The graph shows a trapezoidal profile starting at 400 Hz, ramping up to 1000 Hz at 8 steps (12 ms), holding at 1000 Hz until 392 steps (396 ms), and then ramping down to 400 Hz at 400 steps (408 ms).

Exercise:

Start your motor and try some changes in the profile setting of the position mode relative. Read out the actual position by using the Read Counter button.

Your motor drives to a target position absolute to the actual position with a defined speed and ramp.

Example:
Motor position is at 1000 steps.
Target position is set to 400.
The motor will go to position 400 by starting the profile.



The screenshot shows the 'Motor : 1, Operating Mode : Operation Mode' window. The 'Drive Profile' list on the left has '01. Positionmode - Absolute, 400.' selected. The main configuration area shows:

- Operation Type: Positionmode - Absolute
- Position Demand: 400 Steps
- Minimal Speed: 400 Hz
- Target Speed: 1000 Hz
- Ramp: 50 Hz/ms
- Brake Ramp: 0 Hz/ms
- Next Record: Number Type
- Ramp Type: Trapezoid Ramp

On the right, drive parameters are listed:

- Drive Speed: 400 Hz
- Acceleration: 50 Hz/ms
- Acceleration Time: 12 ms
- Step Mode: Half Step
- Phase Current: 25%
- Gear Reduction: 1:1
- Output Speed: 400 Hz
- Step Resolution: 1.8°

At the bottom, a graph shows the speed profile. The y-axis is frequency in Hz (400 to 1000) and the x-axis is position in Steps (1 to 400). The profile starts at 400 Hz at position 1, ramps up to 1000 Hz at position 12, stays constant at 1000 Hz until position 392, and then ramps down to 400 Hz at position 400. Time markers are shown at 12, 396, and 408 ms.

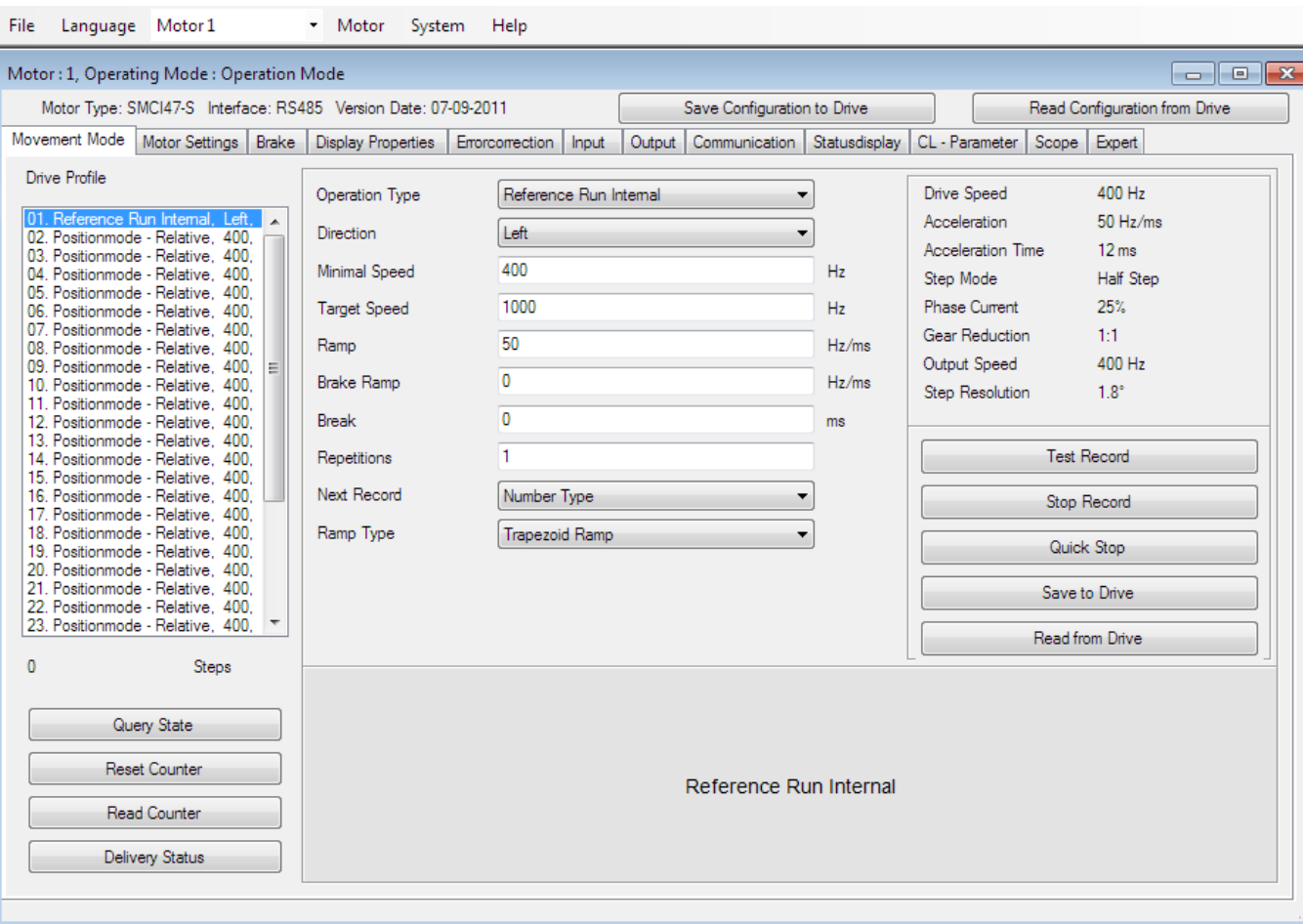
Exercise:

Play a bit with the motor to see the difference between the position mode relative and absolute. Use the Reset Counter to set the actual position to zero.

The Reference Run Internal can be used with an indexed encoder.

The motor will run cw or ccw until it reaches the signal of the encoder index, where it stops and sets the actual position to zero.

The Reference Run Internal turns once at a maximum.



The screenshot shows the Nanotec software interface for configuring a motor. The window title is "Motor: 1, Operating Mode: Operation Mode". The motor type is "SMCI47-S" and the interface is "RS485". The version date is "07-09-2011". The "Drive Profile" section is active, and the "Reference Run Internal" profile is selected. The configuration parameters are as follows:

Parameter	Value	Unit
Operation Type	Reference Run Internal	
Direction	Left	
Minimal Speed	400	Hz
Target Speed	1000	Hz
Ramp	50	Hz/ms
Brake Ramp	0	Hz/ms
Break	0	ms
Repetitions	1	
Next Record	Number Type	
Ramp Type	Trapezoid Ramp	
Drive Speed	400	Hz
Acceleration	50	Hz/ms
Acceleration Time	12	ms
Step Mode	Half Step	
Phase Current	25%	
Gear Reduction	1:1	
Output Speed	400	Hz
Step Resolution	1.8°	

Buttons for "Test Record", "Stop Record", "Quick Stop", "Save to Drive", and "Read from Drive" are visible. The "Reference Run Internal" profile is highlighted in the "Drive Profile" list. The "Steps" section shows a value of 0 and buttons for "Query State", "Reset Counter", "Read Counter", and "Delivery Status".

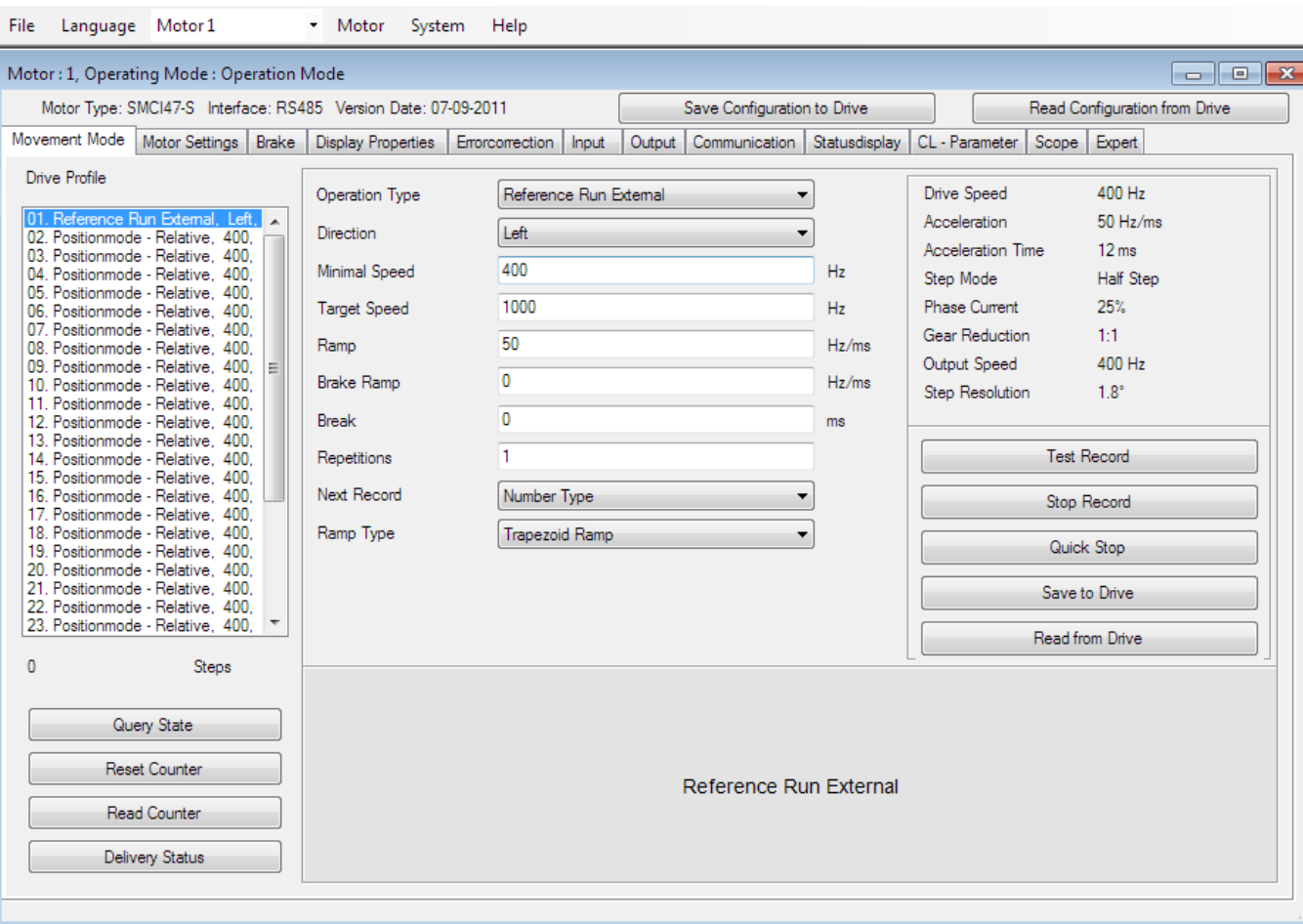
Exercise:

Try the Reference Run Internal.

If you have a sensor attached to your application, you can use it for a Reference Run External.

The motor will run cw or ccw until it reaches the signal of the sensor, where it stops and sets the actual position to zero.

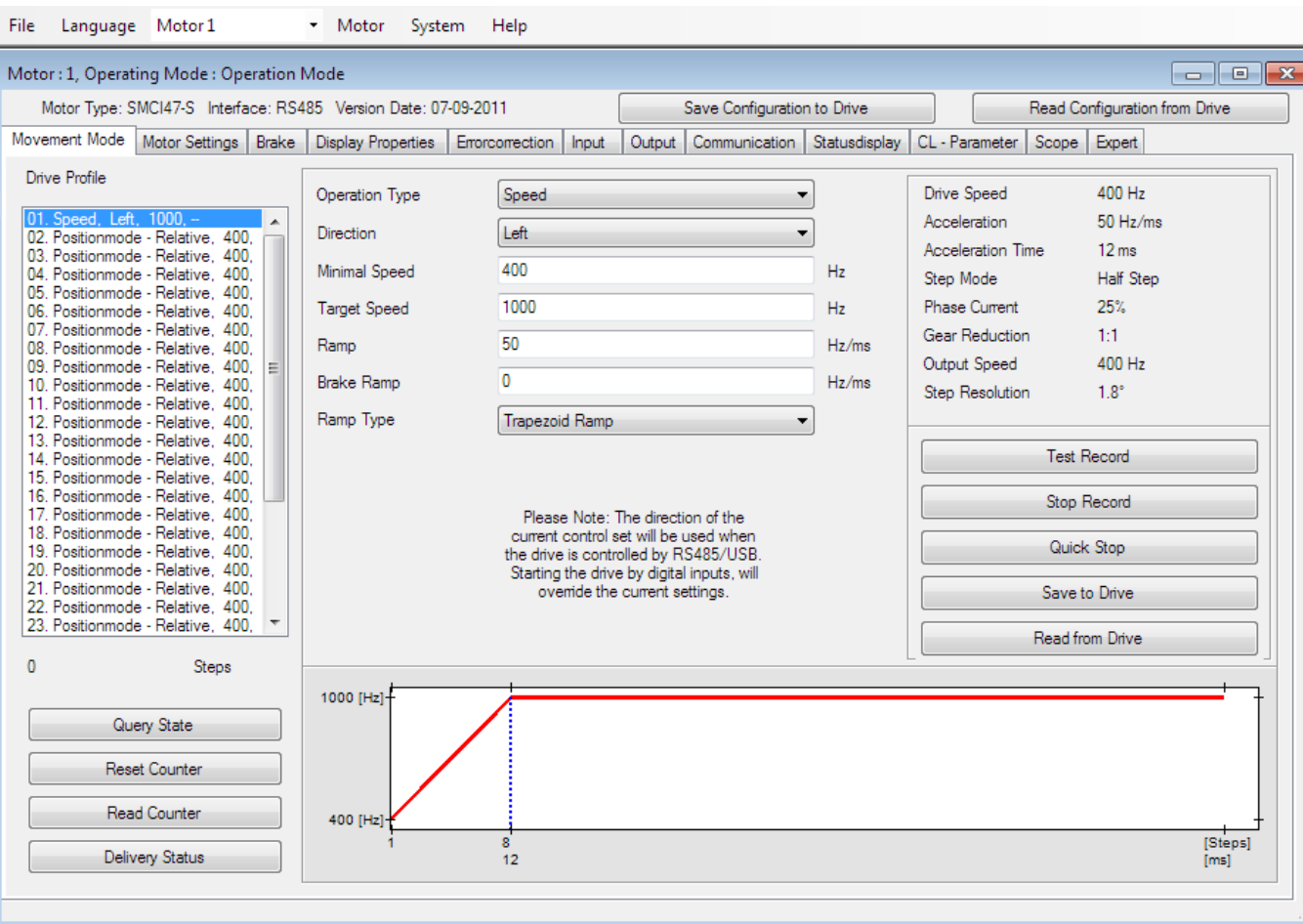
Default input 6 is set as external reference switch.



The screenshot shows the 'Motor: 1, Operating Mode: Operation Mode' window. The 'Motor Type' is SMC147-S, 'Interface' is RS485, and 'Version Date' is 07-09-2011. The 'Movement Mode' is set to 'Reference Run External'. The 'Operation Type' is 'Reference Run External', 'Direction' is 'Left', 'Minimal Speed' is 400 Hz, 'Target Speed' is 1000 Hz, 'Ramp' is 50 Hz/ms, 'Brake Ramp' is 0 Hz/ms, 'Break' is 0 ms, 'Repetitions' is 1, 'Next Record' is 'Number Type', and 'Ramp Type' is 'Trapezoid Ramp'. The 'Drive Profile' list on the left shows 23 items, all 'Positionmode - Relative, 400'. The 'Drive Speed' is 400 Hz, 'Acceleration' is 50 Hz/ms, 'Acceleration Time' is 12 ms, 'Step Mode' is 'Half Step', 'Phase Current' is 25%, 'Gear Reduction' is 1:1, 'Output Speed' is 400 Hz, and 'Step Resolution' is 1.8°. The 'Test Record', 'Stop Record', 'Quick Stop', 'Save to Drive', and 'Read from Drive' buttons are visible. The 'Reference Run External' status is shown at the bottom.

Exercise:

Try the Reference Run External.



The screenshot shows the 'Motor: 1, Operating Mode: Operation Mode' window. The 'Motor Type' is SMC147-S, 'Interface' is RS485, and 'Version Date' is 07-09-2011. The 'Movement Mode' is set to 'Speed'. The 'Drive Profile' list on the left has '01. Speed, Left, 1000, -' selected. The configuration parameters are:

- Operation Type: Speed
- Direction: Left
- Minimal Speed: 400 Hz
- Target Speed: 1000 Hz
- Ramp: 50 Hz/ms
- Brake Ramp: 0 Hz/ms
- Ramp Type: Trapezoid Ramp

Additional parameters on the right:

- Drive Speed: 400 Hz
- Acceleration: 50 Hz/ms
- Acceleration Time: 12 ms
- Step Mode: Half Step
- Phase Current: 25%
- Gear Reduction: 1:1
- Output Speed: 400 Hz
- Step Resolution: 1.8°

Buttons include: Save Configuration to Drive, Read Configuration from Drive, Test Record, Stop Record, Quick Stop, Save to Drive, and Read from Drive. A graph at the bottom shows a trapezoidal speed profile starting at 400 Hz at step 1, ramping up to 1000 Hz at step 12, and then remaining constant at 1000 Hz.

In speed mode, your motor will run non-stop until you stop it manually.

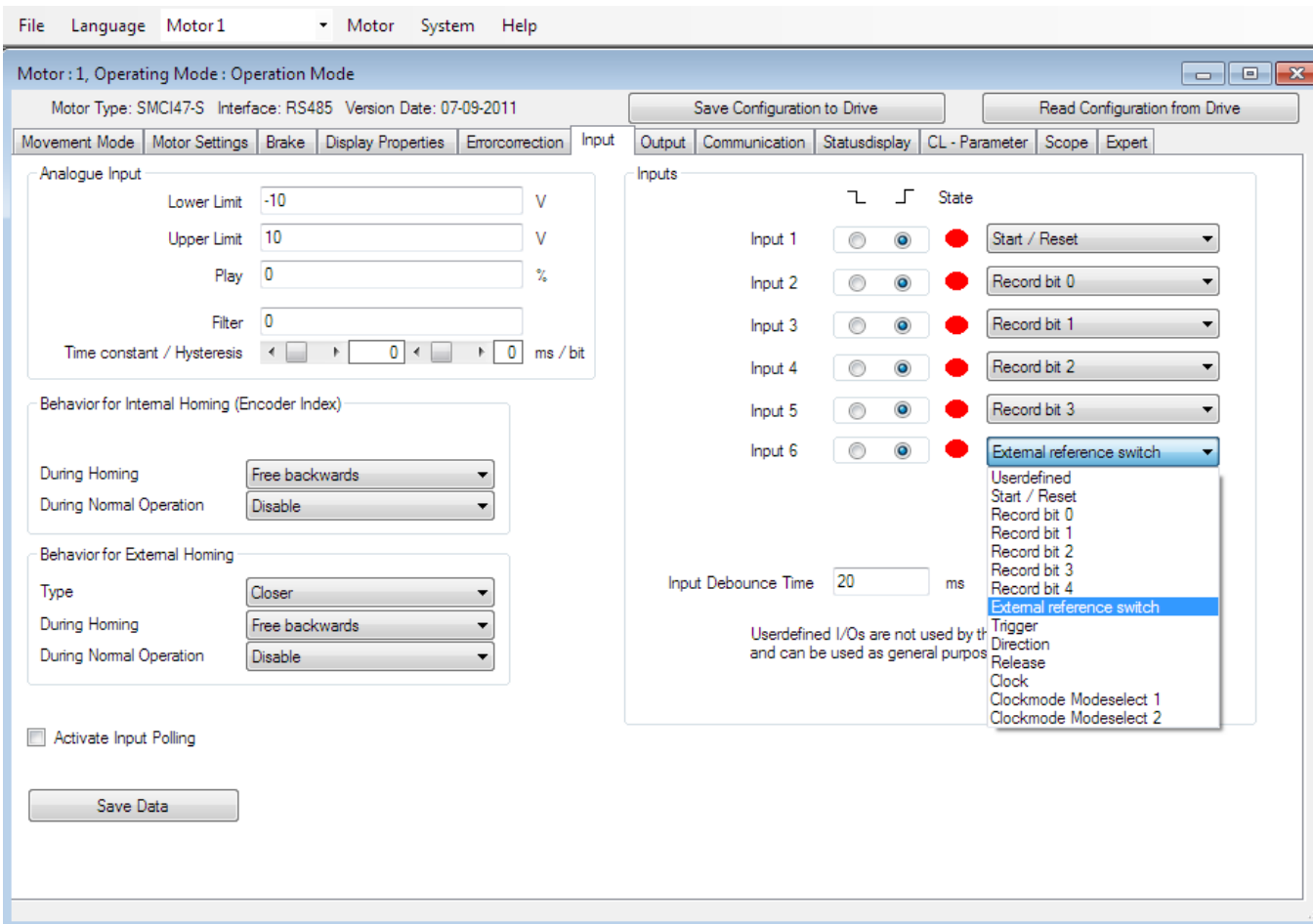
You can decrease and increase the speed by clicking on the buttons.

Exercise:

Try the speed mode.

The Input tab lets you

- change the functions of the inputs
- set the range for the analogue input
- tune the reaction of the analogue input
- set the behavior for limit switches
- see the state of the inputs in real-time.



The screenshot shows the 'Input' tab of the Nanotec software interface. The window title is 'Motor: 1, Operating Mode: Operation Mode'. The motor type is 'SMCI47-S', interface is 'RS485', and version date is '07-09-2011'. The 'Input' tab is active, showing configuration options for analogue and digital inputs.

Analogue Input:

- Lower Limit: -10 V
- Upper Limit: 10 V
- Play: 0 %
- Filter: 0
- Time constant / Hysteresis: 0 ms / bit

Behavior for Internal Homing (Encoder Index):

- During Homing: Free backwards
- During Normal Operation: Disable

Behavior for External Homing:

- Type: Closer
- During Homing: Free backwards
- During Normal Operation: Disable

Activate Input Polling

Inputs:

Input	State	Function
Input 1	Active	Start / Reset
Input 2	Active	Record bit 0
Input 3	Active	Record bit 1
Input 4	Active	Record bit 2
Input 5	Active	Record bit 3
Input 6	Active	External reference switch

Input Debounce Time: 20 ms

Userdefined I/Os are not used by the system and can be used as general purpose I/Os.

Save Configuration to Drive | Read Configuration from Drive

Movement Mode | Motor Settings | Brake | Display Properties | Errorcorrection | **Input** | Output | Communication | Statusdisplay | CL - Parameter | Scope | Expert

Save Data

Analogue Input:

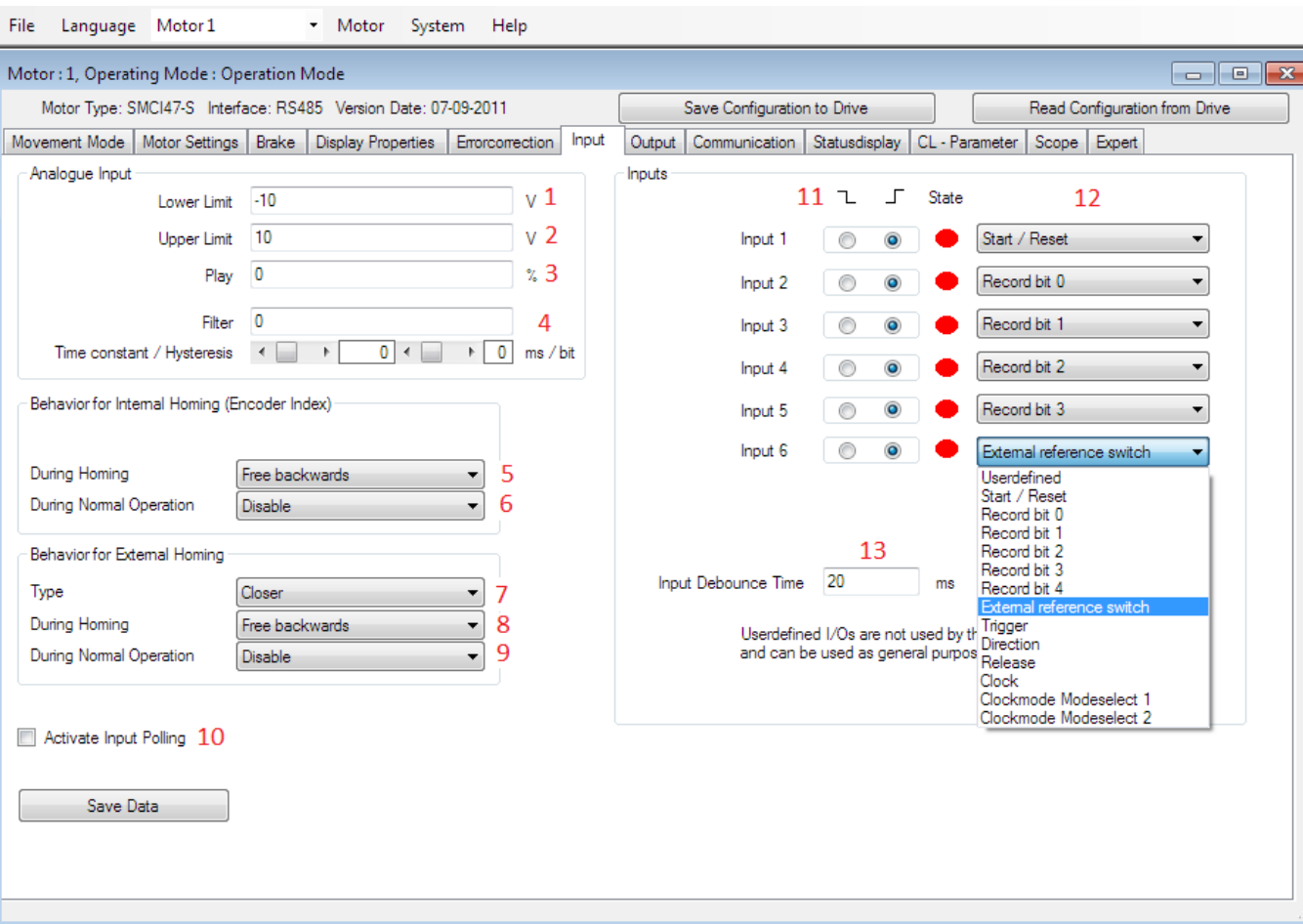
1. Lower Limit: Sets lower range for the analogue input.
2. Upper Limit: Sets upper range for the analogue input.
3. Play: Defines the backlash at both ends of the analogue input.
4. Filter: Sets the sensitivity of the analogue input. (Very important for analogue position)

Behavior for Internal Homing:

5. During Homing: Defines the reaction for reaching the index during a reference run internal.
6. During Normal Operation: Defines the reaction for reaching the index during a position run.

Behavior for External Homing:

7. Type: Sets the polarity of the used signals.
8. During Homing: Defines the reaction for reaching the signal when running a reference run external.
9. During Normal Operation: Defines the reaction for reaching the signal during a position run.



Motor: 1, Operating Mode: Operation Mode

Motor Type: SMCI47-S Interface: RS485 Version Date: 07-09-2011

Save Configuration to Drive Read Configuration from Drive

Movement Mode Motor Settings Brake Display Properties Errorcorrection **Input** Output Communication Statusdisplay CL - Parameter Scope Expert

Analogue Input

Lower Limit: -10 V 1
Upper Limit: 10 V 2
Play: 0 % 3
Filter: 0 4
Time constant / Hysteresis: 0 ms / bit

Behavior for Internal Homing (Encoder Index)

During Homing: Free backwards 5
During Normal Operation: Disable 6

Behavior for External Homing

Type: Closer 7
During Homing: Free backwards 8
During Normal Operation: Disable 9

Inputs

Input	11	State	12
Input 1	<input checked="" type="radio"/>	●	Start / Reset
Input 2	<input checked="" type="radio"/>	●	Record bit 0
Input 3	<input checked="" type="radio"/>	●	Record bit 1
Input 4	<input checked="" type="radio"/>	●	Record bit 2
Input 5	<input checked="" type="radio"/>	●	Record bit 3
Input 6	<input checked="" type="radio"/>	●	External reference switch

Input Debounce Time: 20 ms 13

Userdefined I/Os are not used by the system and can be used as general purpose I/Os

Activate Input Polling 10

Save Data

10. Activate Input Polling: Shows the status of the inputs in real-time.

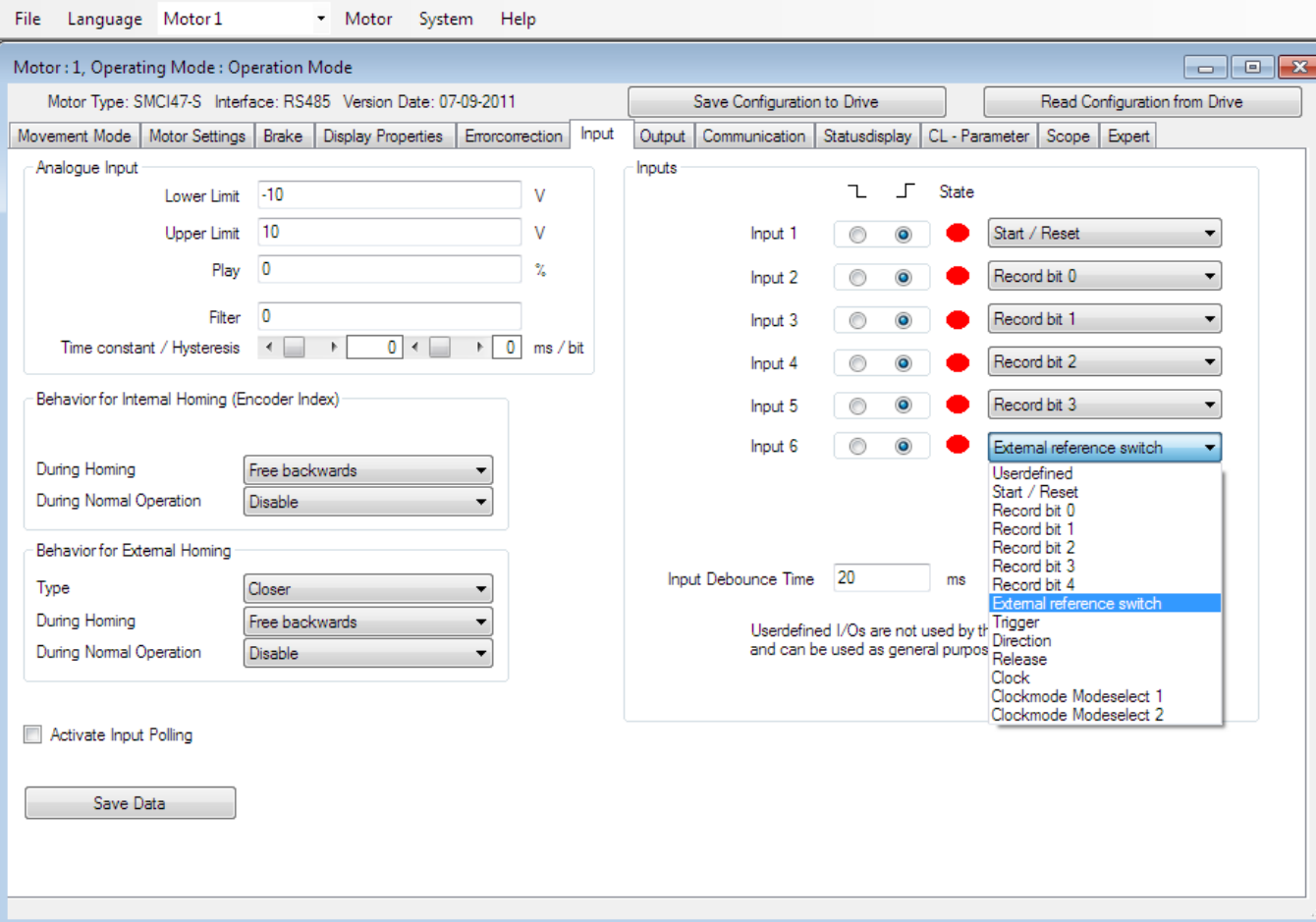
11. Polarity: Changes the polarity of the inputs between two signals.

13. Input Debounce Time: Defines the time

Input-Functions:

1. User defined: Choose this if the input is unused or should not be used by the firmware.
2. Start/Reset: Starts a profile and resets position errors (at position profiles). Starts and stops a profile with a rising/falling edge (at speed modes).
3. Record bit 0-4: Load a record from the EEPROM using a bit mask, and start it with the start/reset function.

Bit 0	Bit 1	Bit 2	Profile
0	0	0	1
1	0	0	2
0	1	0	3
1	1	0	4
0	0	1	5
1	0	1	6
...

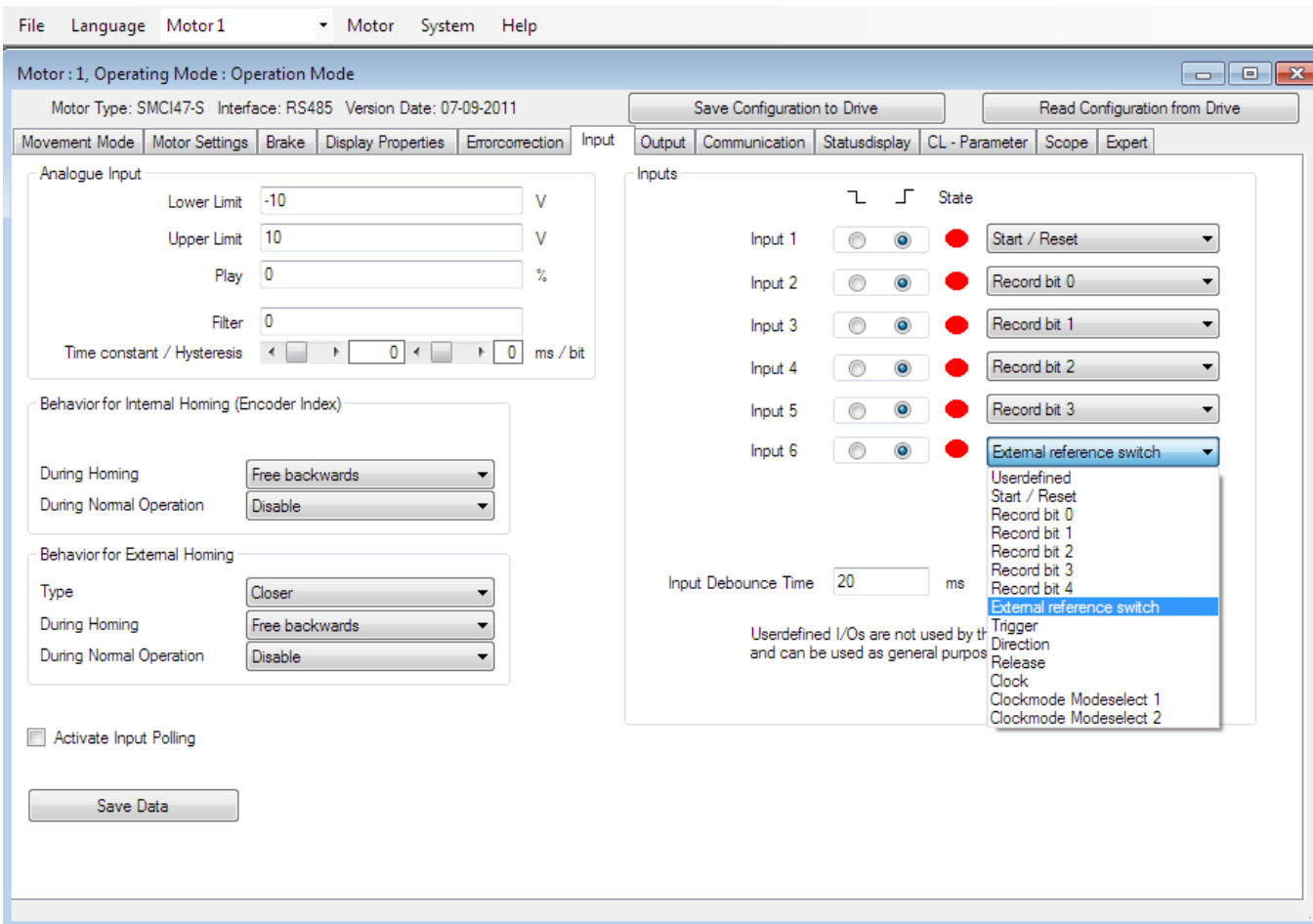


4. External reference switch: Limit switch and for reference run external.
5. Trigger: For flag position mode.
6. Direction: For speed, analogue and clock direction mode.

7. Release: Enable function for the motor.
8. Clock: Clock input for clock direction (only available at input 6).

Exercise:

- Change the function of the inputs and try out.
- Configure profiles 1-6 with different speeds and try to change between them with the record bit 0-4 function.
- Test start/reset for position and speed mode to see the difference.



The screenshot shows the 'Motor: 1, Operating Mode: Operation Mode' window. The 'Input' tab is active, displaying configuration options for six digital inputs. The 'Inputs' table is as follows:

Input	State	Function
Input 1	Active (Red LED)	Start / Reset
Input 2	Active (Red LED)	Record bit 0
Input 3	Active (Red LED)	Record bit 1
Input 4	Active (Red LED)	Record bit 2
Input 5	Active (Red LED)	Record bit 3
Input 6	Active (Red LED)	External reference switch

The dropdown menu for Input 6 is open, showing the following options: Userdefined, Start / Reset, Record bit 0, Record bit 1, Record bit 2, Record bit 3, Record bit 4, External reference switch (highlighted), Trigger, Direction, Release, Clock, Clockmode Modeselect 1, and Clockmode Modeselect 2.

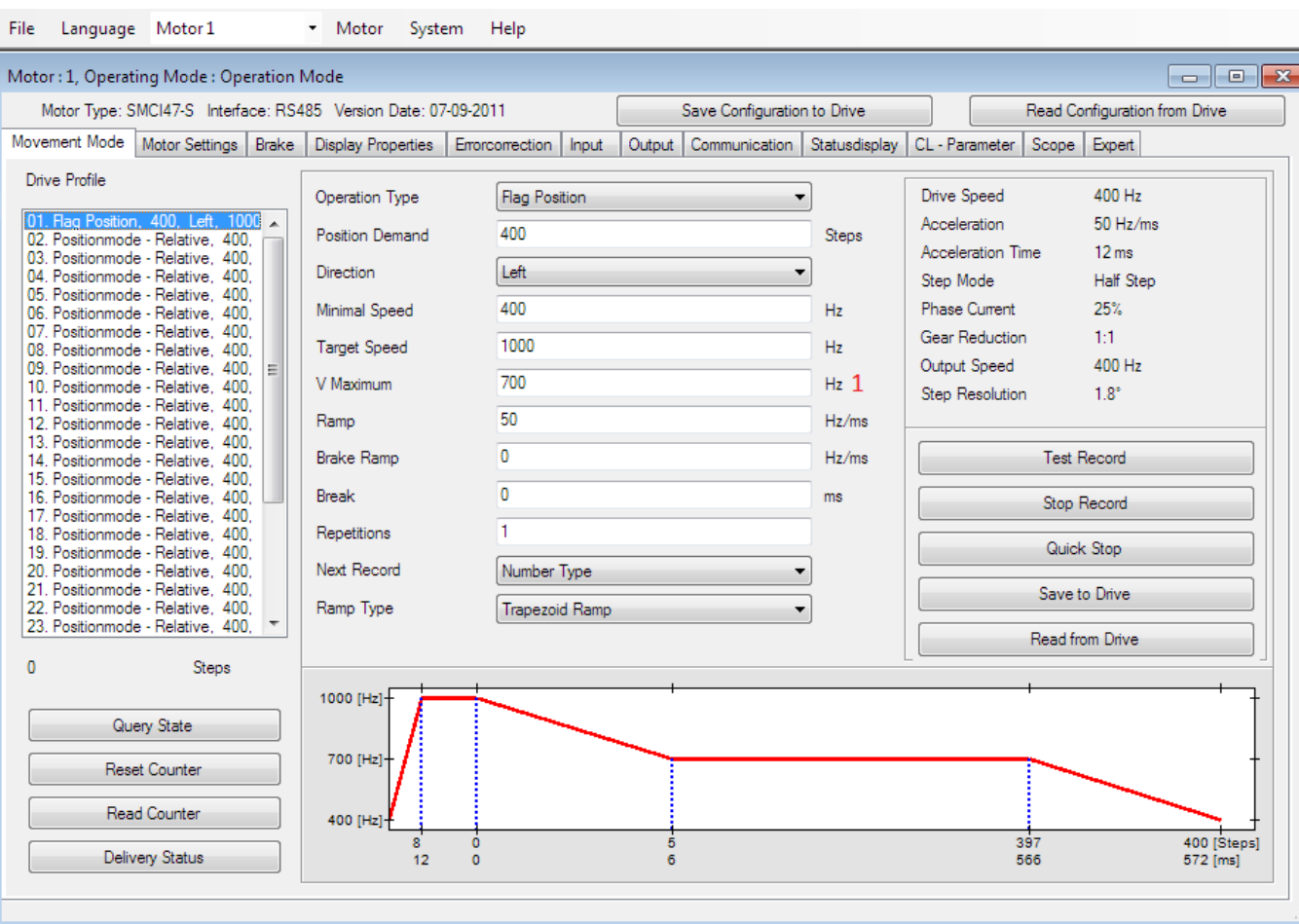
Other visible settings include: Lower Limit: -10 V, Upper Limit: 10 V, Play: 0 %, Filter: 0, Time constant / Hysteresis: 0 ms/bit, Input Debounce Time: 20 ms, and 'Activate Input Polling' checked.

The flag position is a combination of speed mode and relative positioning.

The motor will turn in speed mode until it reaches a trigger - signal. From this point on, it will move the set number of steps and stop there.

You can use different speeds before and after reaching the trigger.

This is a typical mode for label printers, for example (wind labels until you see a certain mark (trigger), then wind a defined distance to reach the right printing position)



Motor: 1, Operating Mode: Operation Mode

Motor Type: SMC147-S Interface: RS485 Version Date: 07-09-2011

Save Configuration to Drive Read Configuration from Drive

Movement Mode Motor Settings Brake Display Properties Errorcorrection Input Output Communication Statusdisplay CL - Parameter Scope Expert

Drive Profile

01. Flag Position, 400, Left, 1000

02. Positionmode - Relative, 400, 03. Positionmode - Relative, 400, 04. Positionmode - Relative, 400, 05. Positionmode - Relative, 400, 06. Positionmode - Relative, 400, 07. Positionmode - Relative, 400, 08. Positionmode - Relative, 400, 09. Positionmode - Relative, 400, 10. Positionmode - Relative, 400, 11. Positionmode - Relative, 400, 12. Positionmode - Relative, 400, 13. Positionmode - Relative, 400, 14. Positionmode - Relative, 400, 15. Positionmode - Relative, 400, 16. Positionmode - Relative, 400, 17. Positionmode - Relative, 400, 18. Positionmode - Relative, 400, 19. Positionmode - Relative, 400, 20. Positionmode - Relative, 400, 21. Positionmode - Relative, 400, 22. Positionmode - Relative, 400, 23. Positionmode - Relative, 400,

Operation Type: Flag Position

Position Demand: 400 Steps

Direction: Left

Minimal Speed: 400 Hz

Target Speed: 1000 Hz

V Maximum: 700 Hz 1

Ramp: 50 Hz/ms

Brake Ramp: 0 Hz/ms

Break: 0 ms

Repetitions: 1

Next Record: Number Type

Ramp Type: Trapezoid Ramp

Drive Speed: 400 Hz

Acceleration: 50 Hz/ms

Acceleration Time: 12 ms

Step Mode: Half Step

Phase Current: 25%

Gear Reduction: 1:1

Output Speed: 400 Hz

Step Resolution: 1.8°

Test Record

Stop Record

Quick Stop

Save to Drive

Read from Drive

0 Steps

Query State

Reset Counter

Read Counter

Delivery Status

1000 [Hz]

700 [Hz]

400 [Hz]

8 0 5 397 400 [Steps]

12 0 6 566 572 [ms]

1. V Maximum: This is the speed you will use for the positioning.

Exercise:

Try the flag position mode.

If you are using a PLC, which should control the movement of your motor with TTL signals, you can use the clock direction mode.

For each signal on the clock input, the motor moves one step.

You can choose between left and right.

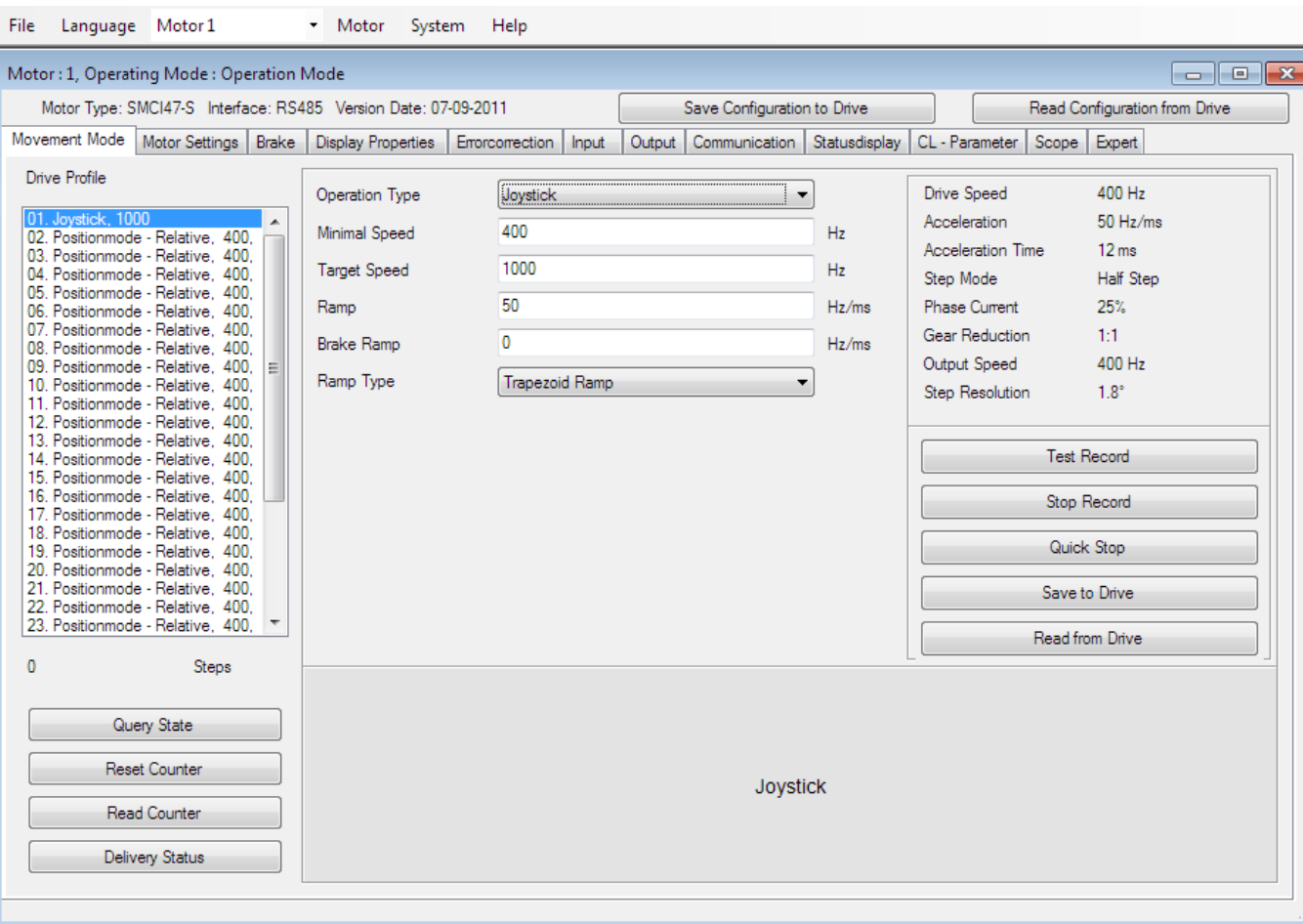
You can also use an input signal to change the direction.

The screenshot shows the 'Motor: 1, Operating Mode: Operation Mode' window. The 'Motor Type' is SMC147-S, 'Interface' is RS485, and 'Version Date' is 07-09-2011. The 'Movement Mode' is 'Clock Direction Left'. The 'Operation Type' is set to 'Clock Direction Left'. The 'Minimal Speed' is 400 Hz, 'Target Speed' is 1000 Hz, and 'Ramp' is 50 Hz/ms. The 'Brake Ramp' is 0 Hz/ms and 'Ramp Type' is 'Trapezoid Ramp'. The 'Drive Speed' is 1000 Hz, 'Acceleration' is 50 Hz/ms, and 'Acceleration Time' is 12 ms. The 'Step Mode' is 'Half Step', 'Phase Current' is 56%, 'Gear Reduction' is 1:1, 'Output Speed' is 1000 Hz, and 'Step Resolution' is 1.8°. The 'Test Record', 'Stop Record', 'Quick Stop', 'Save to Drive', and 'Read from Drive' buttons are visible. The 'Steps' counter is 0, and the 'Clock Direction Left' status is displayed.

Please try this at home with a function generator.

The joystick mode allows you to control the speed and direction with an analogue input signal.
(potentiometer or joystick)

The analogue input uses -10 to +10V, where -10V means target speed left, +10V means target speed right and 0V means stop.

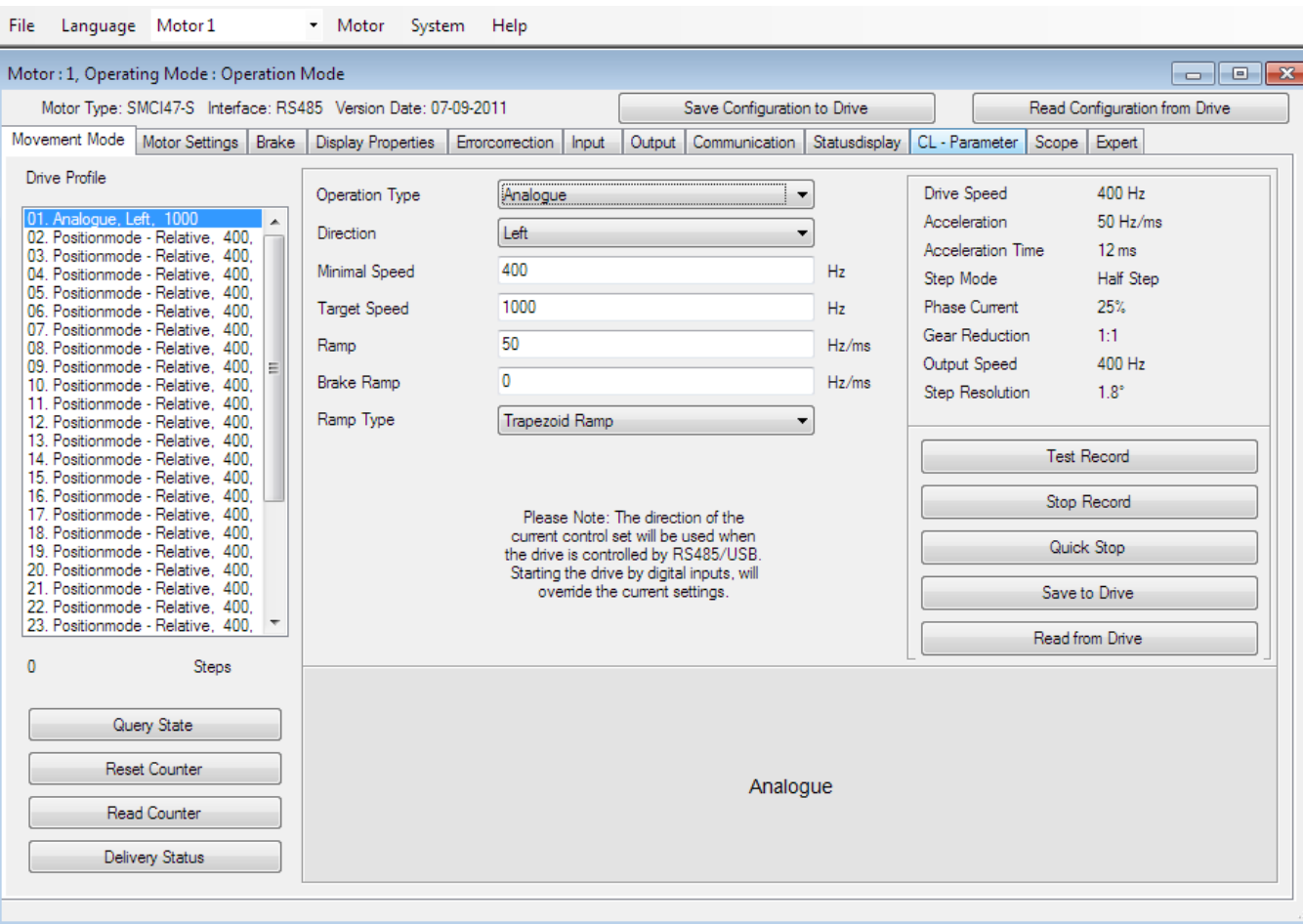


Exercise:

Try the joystick mode using the potentiometer on your board to control speed and direction.

The analogue mode works the same as the joystick mode, but only in one direction. This gives you the possibility to use a higher range at the analogue input.

-10V to +10V are used only for one direction, -10V means stop, 0V means half target speed and +10V is target speed.



The screenshot shows the 'Motor: 1, Operating Mode: Operation Mode' window. The 'Motor Type' is SMC147-S, 'Interface' is RS485, and 'Version Date' is 07-09-2011. The 'Movement Mode' is set to 'Analogue'. The 'Operation Type' is 'Analogue', 'Direction' is 'Left', 'Minimal Speed' is 400 Hz, 'Target Speed' is 1000 Hz, 'Ramp' is 50 Hz/ms, 'Brake Ramp' is 0 Hz/ms, and 'Ramp Type' is 'Trapezoid Ramp'. The 'Drive Profile' list on the left shows 23 profiles, with '01. Analogue, Left, 1000' selected. The 'Please Note' section states: 'Please Note: The direction of the current control set will be used when the drive is controlled by RS485/USB. Starting the drive by digital inputs, will override the current settings.' The 'Output' section shows: Drive Speed 400 Hz, Acceleration 50 Hz/ms, Acceleration Time 12 ms, Step Mode Half Step, Phase Current 25%, Gear Reduction 1:1, Output Speed 400 Hz, and Step Resolution 1.8°. The 'Test Record', 'Stop Record', 'Quick Stop', 'Save to Drive', and 'Read from Drive' buttons are visible. The 'Steps' section shows 0 steps and buttons for 'Query State', 'Reset Counter', 'Read Counter', and 'Delivery Status'. The word 'Analogue' is displayed in the bottom right of the main area.

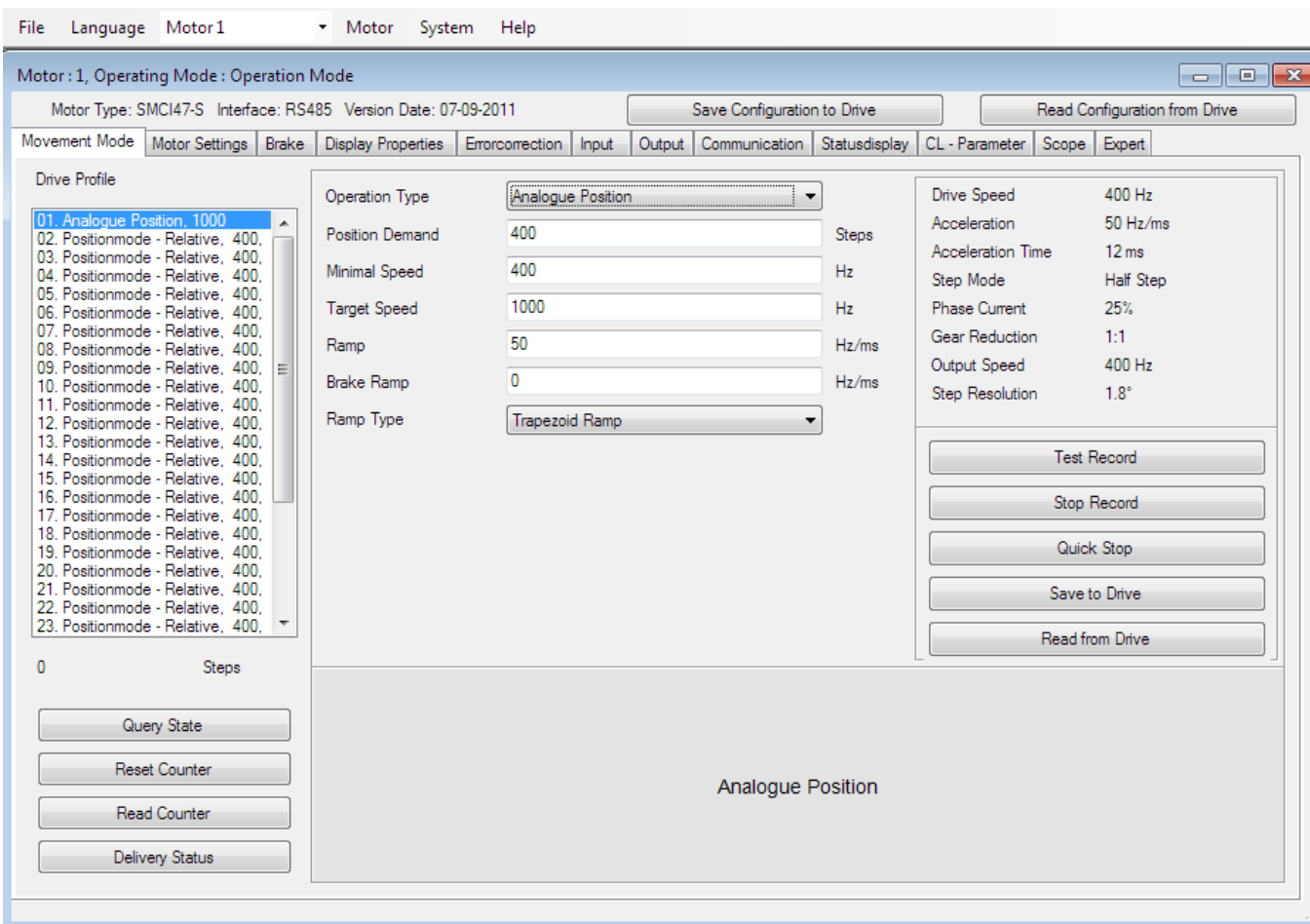
Exercise:

Try out the analogue mode to see how it differs from the joystick mode.

The analogue position mode works like the position mode absolute. However, instead of setting a fixed target position, the analogue input is used.

Example:

If you use 400 as the position demand, the motor goes to position 400 at +10V, to 200 at 0V and to 0 at -10V.



The screenshot shows the 'Motor: 1, Operating Mode: Operation Mode' window. The 'Motor Type' is SMC147-S, 'Interface' is RS485, and 'Version Date' is 07-09-2011. The 'Movement Mode' is set to 'Analogue Position, 1000'. The 'Operation Type' is 'Analogue Position'. The 'Position Demand' is set to 400. The 'Minimal Speed' is 400 Hz, 'Target Speed' is 1000 Hz, and 'Ramp' is 50 Hz/ms. The 'Ramp Type' is 'Trapezoid Ramp'. The 'Drive Speed' is 400 Hz, 'Acceleration' is 50 Hz/ms, and 'Acceleration Time' is 12 ms. The 'Step Mode' is 'Half Step', 'Phase Current' is 25%, 'Gear Reduction' is 1:1, 'Output Speed' is 400 Hz, and 'Step Resolution' is 1.8°. The 'Analogue Position' display shows 0 Steps. Buttons for 'Query State', 'Reset Counter', 'Read Counter', 'Delivery Status', 'Test Record', 'Stop Record', 'Quick Stop', 'Save to Drive', and 'Read from Drive' are visible.

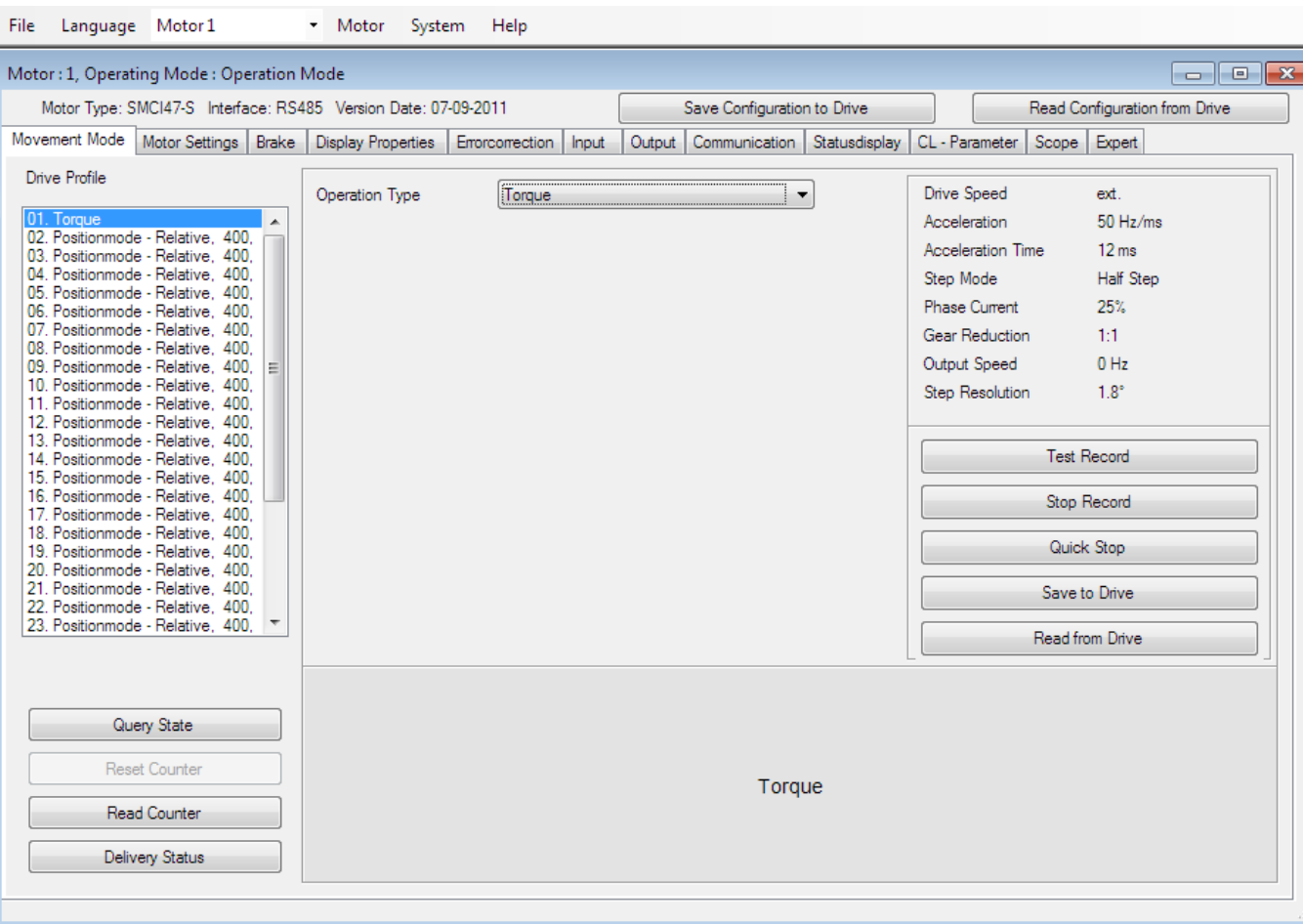
Exercise:

Try the analogue position mode using one value below and one value far above 1000 steps.

The torque mode supplies the motor with constant power.

Motor "cracks" during the run. By increasing the torque, the motor will lower its speed.

The maximum torque is controlled by the analogue input.



You need to be in closed loop mode to run the torque mode, so we will try this later.

File Language Motor1 Motor System Help

Motor: 1, Operating Mode: Operation Mode

Motor Type: SMC147-S Interface: RS485 Version Date: 07-09-2011

Save Configuration to Drive Read Configuration from Drive

Movement Mode Motor Settings Brake Display Properties Errorcorrection Input Output Communication Statusdisplay CL - Parameter Scope Expert

External Brake

Time t_a ms

Time t_b ms

Time t_c ms

The external brake can be configured by three parameters:
 t_a , t_b , t_c

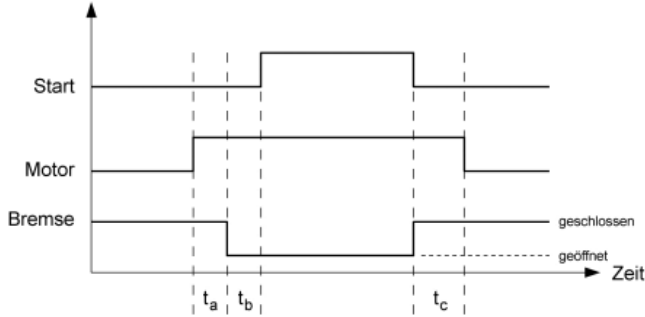
The parameters define times (ms). Possible values are 0-65535.

Power up sequence:

When the Controller is turned on, the brake is active and the drive is not under current.
Then the drive is set under current and the controller will wait for t_a ms.
Then the brake is disabled and the controller waits for t_b ms.
After t_b the controller is accepting drive commands.

t_c is the time between activating the brake and disabling the drive current.

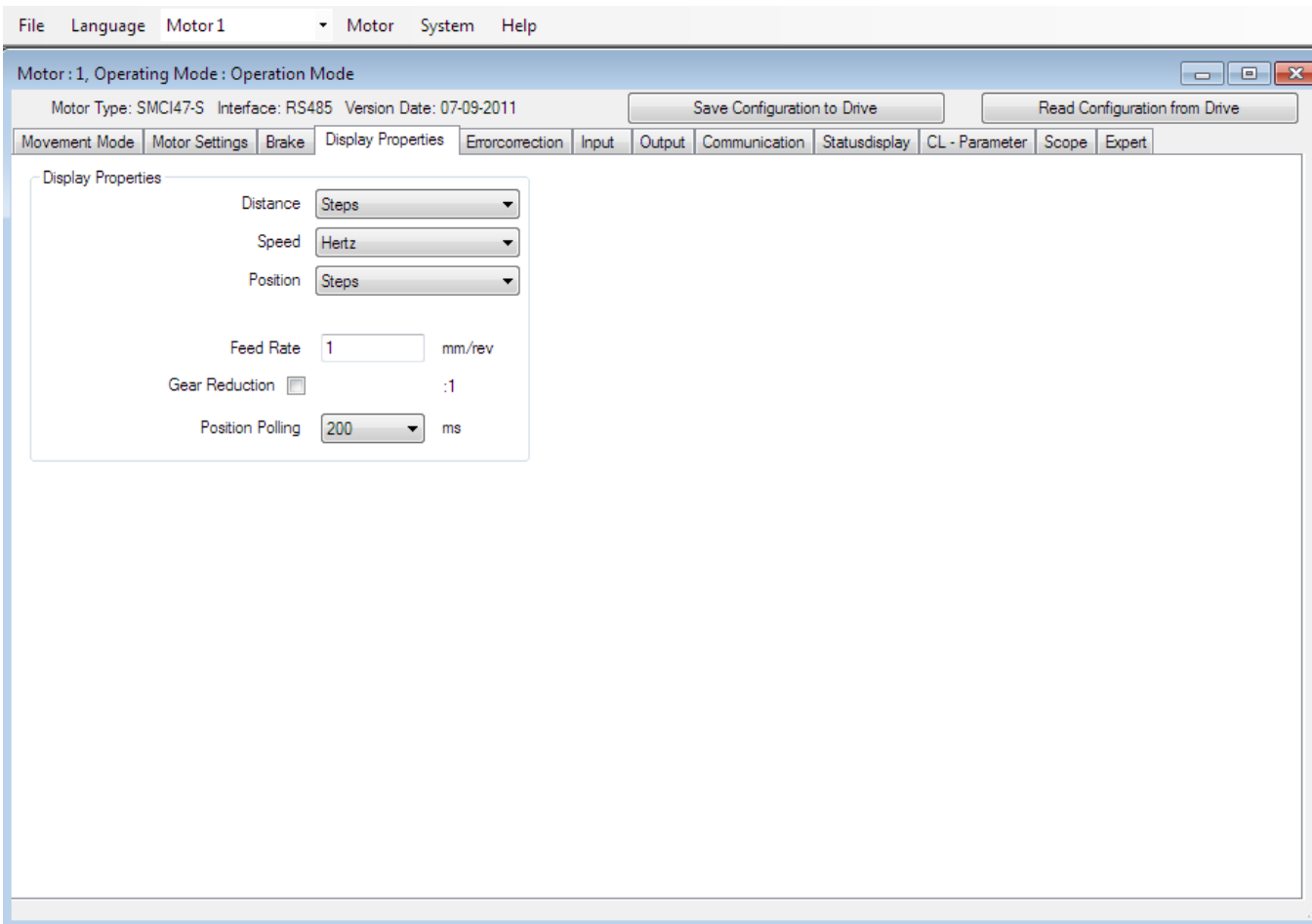
Save Data



The Brake tab is solely for the SMC147-S to change the behavior of the brake output.

The release input function opens and closes the brake in this case.

You can change the time between powering on/off the motor and opening/closing the brake.



Display properties are for

- changing units of some values in NanoPro
- working with a gear ratio
- setting a feed rate

only in NanoPro, not on the controller

Exercise:

Test different unit settings, the feed rate and the gear reduction

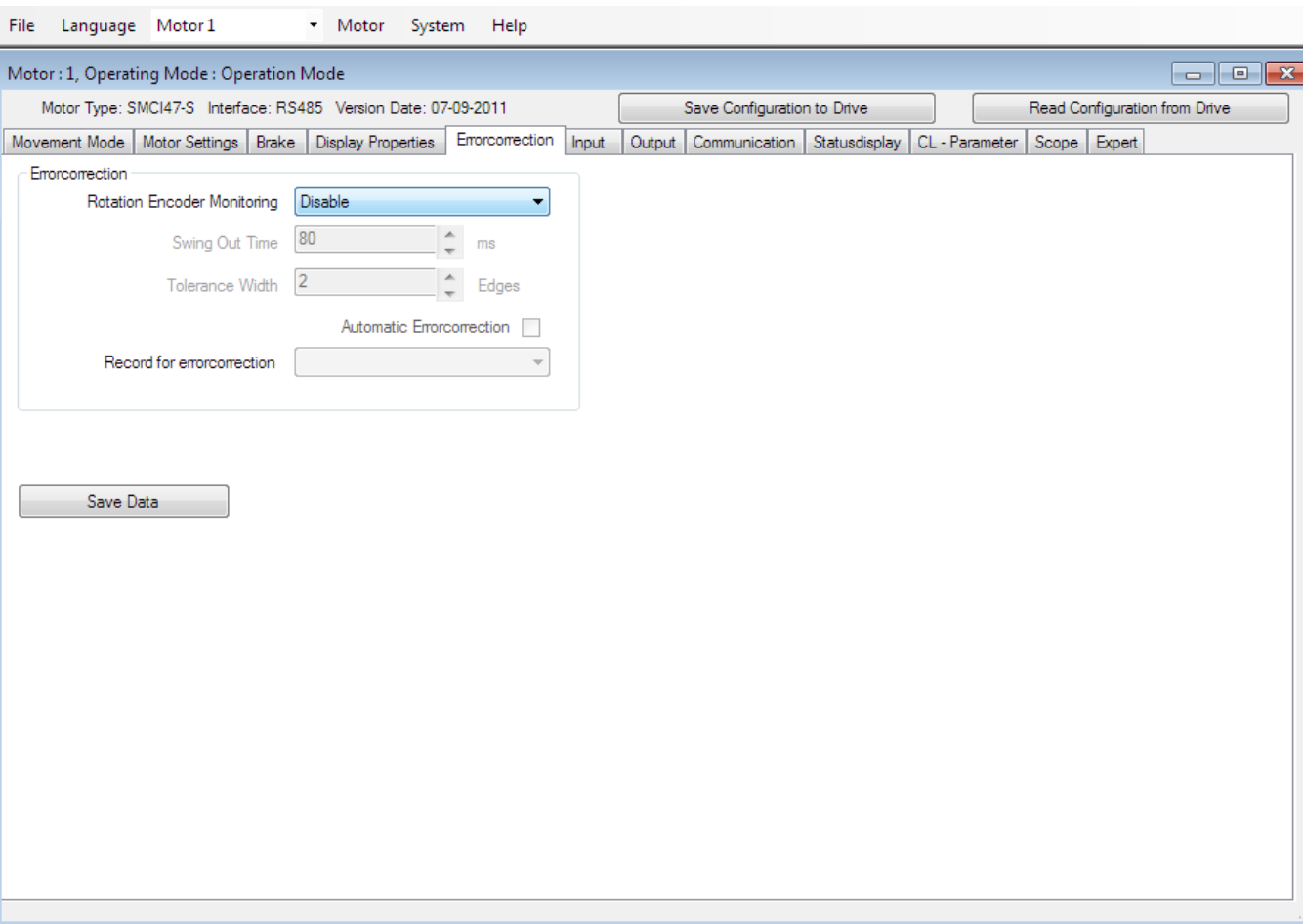
Error correction has to be activated for position surveillance or even to automatically correct a position error.

In this case an allowed tolerance, a swing out time and a profile (only speed and acceleration are used from this profile) have to be chosen.

If some steps are lost at a position profile, the controller checks if the demand and target position are equal at the end of travel. If not, it starts a second travel to retrieve the lost steps.

(only possible with an encoder)

This is the “simple” closed loop, no FOC, only position correction. Never activate this together with Closed Loop.

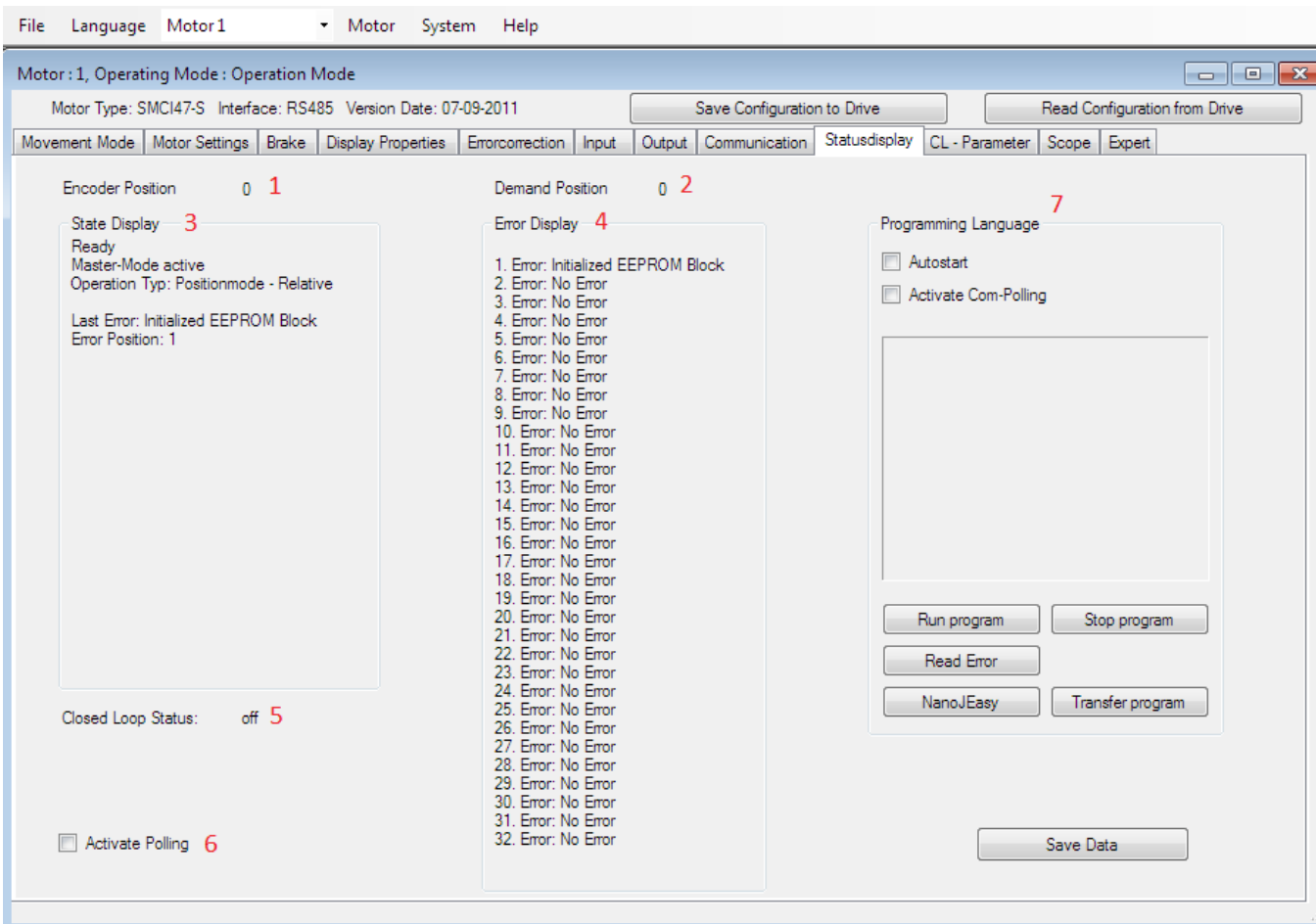


The Status display is used especially for troubleshooting.

On the left side, it shows the controller status and allows you to read out the encoder and demand positions, in case there is an active error and the error history.

By uploading a Java program to the controller, special functions that go beyond the firmware functionality are displayed on the right side of the tab.

The screenshot shows the 'Statusdisplay' tab of the Nanotec software. The window title is 'Motor: 1, Operating Mode: Operation Mode'. The motor type is 'SMCI47-S', interface is 'RS485', and version date is '07-09-2011'. The interface includes buttons for 'Save Configuration to Drive' and 'Read Configuration from Drive'. The main display area is divided into three sections: 'State Display', 'Error Display', and 'Programming Language'. The 'State Display' shows 'Ready', 'Master-Mode active', 'Operation Typ: Positionmode - Relative', and 'Last Error: Initialized EEPROM Block'. The 'Error Display' shows a list of 32 error messages, all of which are 'Error: No Error'. The 'Programming Language' section has checkboxes for 'Autostart' and 'Activate Com-Polling', and buttons for 'Run program', 'Stop program', 'Read Error', 'NanoJEasy', and 'Transfer program'. A 'Save Data' button is located at the bottom right. The 'Closed Loop Status' is shown as 'off' and there is an 'Activate Polling' checkbox at the bottom left.



1. Encoder Position: Displays the actual position.

2. Demand Position: Displays the position the motor is supposed to be in.

3. State Display: Shows
- the driving state of the motor (ready, busy, at reference)
- the selected operating mode
- the last reported error.

4. Error Display: Shows the error history of the controller.

5. Closed Loop Status: Active or non-active

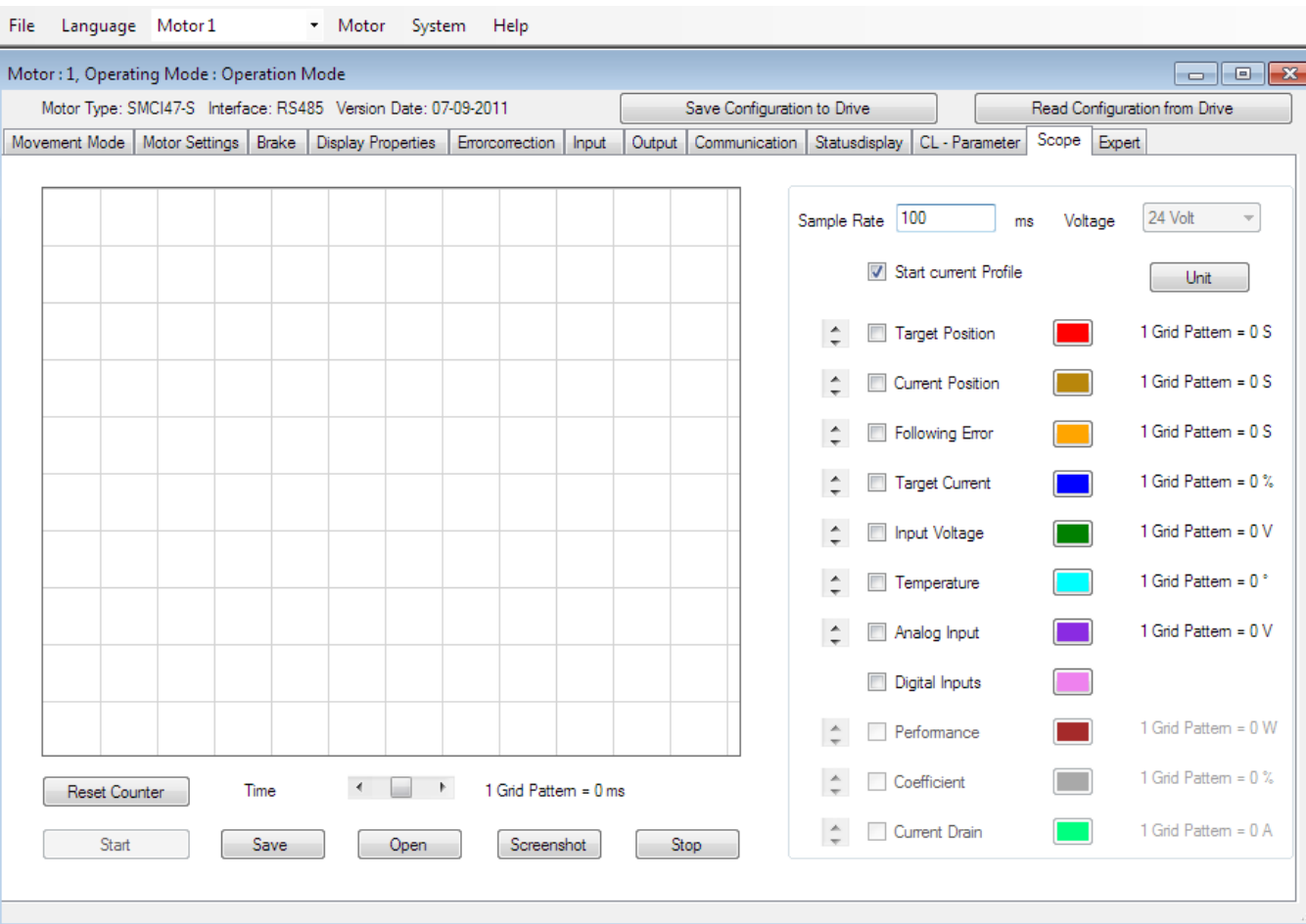
7. Programming Language: If you are working with NanoJEasy, you can upload and start programs from here.

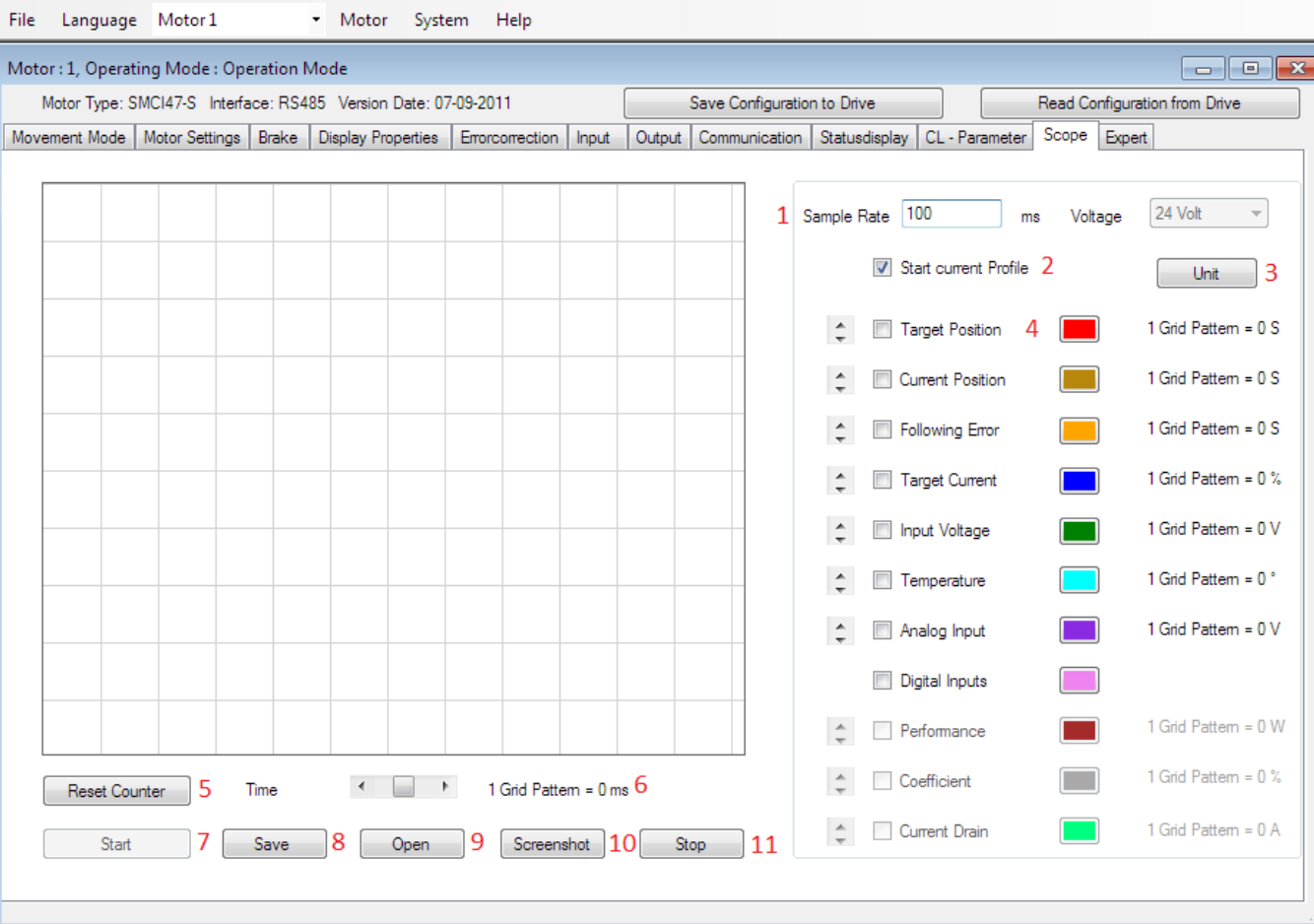
6. Activate Polling: If activated, you can see the status in real-time.

NanoPro can also be used as a scope for some values of the controller.

It is possible to log some parameters like

- the target position
- the temperature of the controller
- the analogue input
- the digital inputs
- ...





1. Sample Rate: Change the number of samples.

2. Start current Profile: Start a profile by starting the measurement if activated

3. Unit/Value: Change between the unit per pattern and an absolute value.

4. Curves: Activate the curves you want to measure and change the color of the curves.

5. Reset Counter: Clears the window.

6. ms per Grid Pattern: Stretch the curves by changing the time per pattern

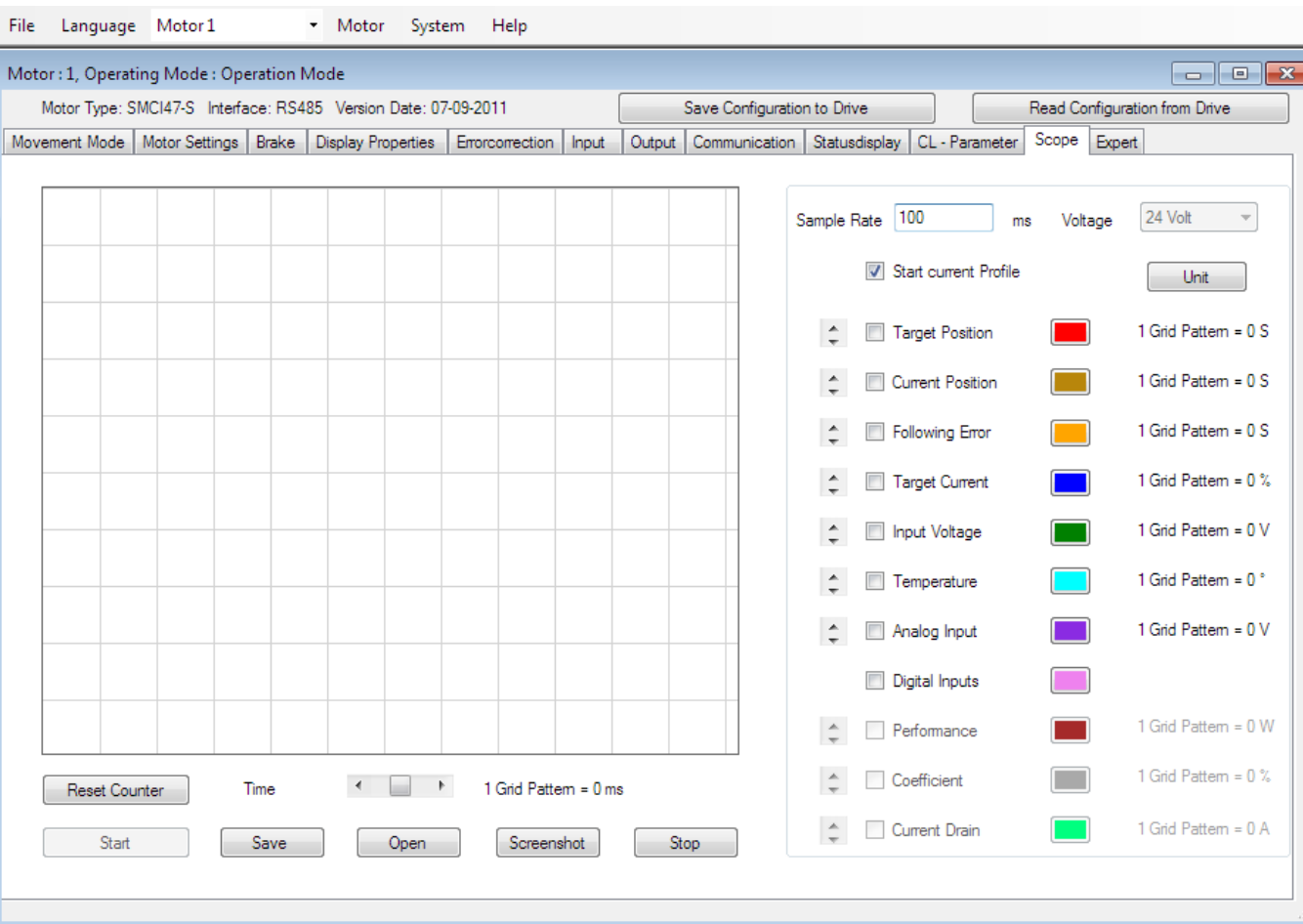
7. Start: Start your measurement (and a profile if selected).

8. Save: Save the measured points to a file.

9. Open: Open a file with measured points.

10. Screenshot: Save the curves to a picture file.

11. Stop: Stop the measurement (and the profile if selected).



Motor: 1, Operating Mode: Operation Mode

Motor Type: SMCI47-S Interface: RS485 Version Date: 07-09-2011

Save Configuration to Drive Read Configuration from Drive

Movement Mode Motor Settings Brake Display Properties Errorcorrection Input Output Communication Statusdisplay CL - Parameter Scope Expert

Sample Rate 100 ms Voltage 24 Volt

Start current Profile Unit

- Target Position 1 Grid Pattern = 0 S
- Current Position 1 Grid Pattern = 0 S
- Following Error 1 Grid Pattern = 0 S
- Target Current 1 Grid Pattern = 0 %
- Input Voltage 1 Grid Pattern = 0 V
- Temperature 1 Grid Pattern = 0 °
- Analog Input 1 Grid Pattern = 0 V
- Digital Inputs
- Performance 1 Grid Pattern = 0 W
- Coefficient 1 Grid Pattern = 0 %
- Current Drain 1 Grid Pattern = 0 A

Reset Counter Time 1 Grid Pattern = 0 ms

Start Save Open Screenshot Stop

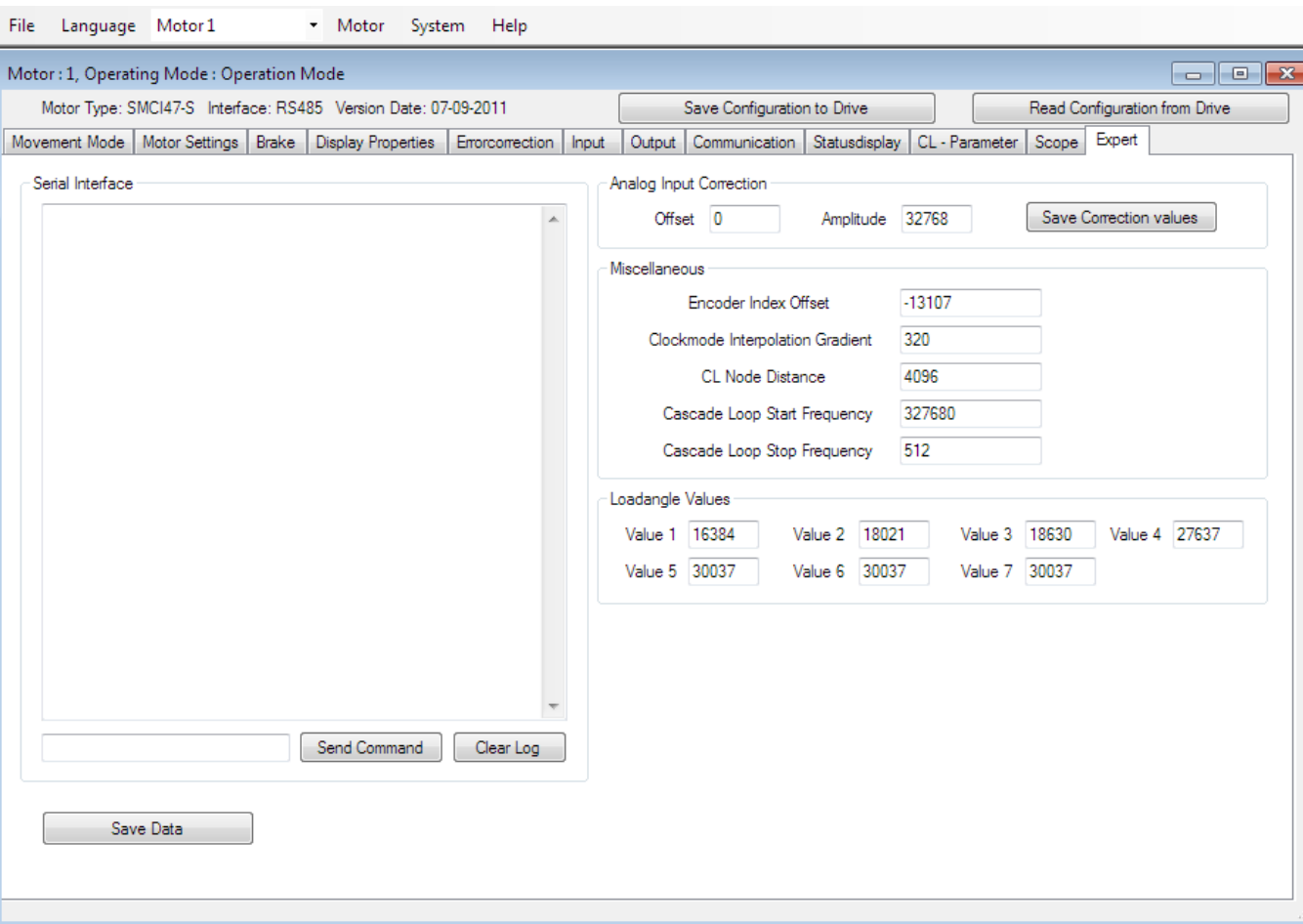
Exercise:

Measure the digital and analogue input (without starting a profile).
 Measure the target and current position (start a profile).

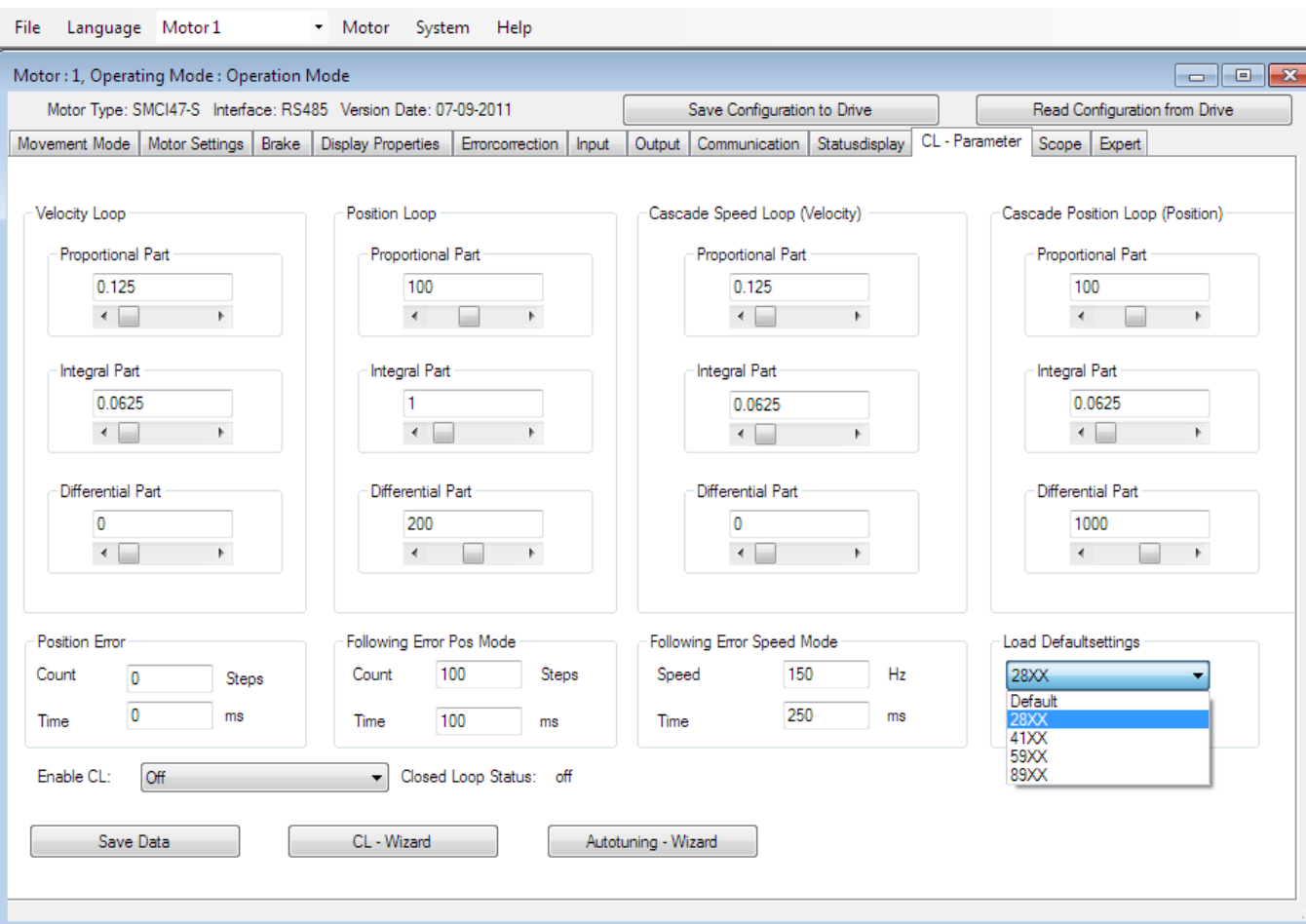
The Expert tab allows some very special configurations, which normally should not be changed by the customer.

You can find the load angle values and the encoder index offset here, which are determined by the CL-Wizard.

On the left side is a serial interface for using our ASCII commands.



- Set the motor to the closed loop mode
- Change the tolerances for the following errors
- Tune the PID parameters of the loop



The screenshot shows the 'CL - Parameter' window for a motor. The window title is 'Motor: 1, Operating Mode: Operation Mode'. The motor type is 'SMCI47-S', interface is 'RS485', and version date is '07-09-2011'. The window contains several tabs: 'Movement Mode', 'Motor Settings', 'Brake', 'Display Properties', 'Errorcorrection', 'Input', 'Output', 'Communication', 'Statusdisplay', 'CL - Parameter', 'Scope', and 'Expert'. The 'CL - Parameter' tab is active, showing four main control loop sections: 'Velocity Loop', 'Position Loop', 'Cascade Speed Loop (Velocity)', and 'Cascade Position Loop (Position)'. Each section has three sub-sections: 'Proportional Part', 'Integral Part', and 'Differential Part', each with a numerical input field and a slider. Below these are sections for 'Position Error' (Count and Time), 'Following Error Pos Mode' (Count and Time), 'Following Error Speed Mode' (Speed and Time), and 'Load Defaultsettings' (a dropdown menu). At the bottom, there are buttons for 'Save Data', 'CL - Wizard', and 'Autotuning - Wizard'. The 'Enable CL:' dropdown is set to 'Off' and 'Closed Loop Status:' is 'off'.

Testing and changing the values here should best be done if the motor is not attached to the application, and can run freely. If you tune the application, take care that “motors running wild” cannot hurt the application or the operator. Changing the PID beyond the default values needs some experience!

1. Velocity Loop: PID parameters for the velocity loop. (Speed as controlled value)

2. Position Loop: PID parameters for the position loop. (Position as controlled value)

3. Cascade Speed Loop: Only for special applications.

4. Cascade Position Loop: Only for special applications.

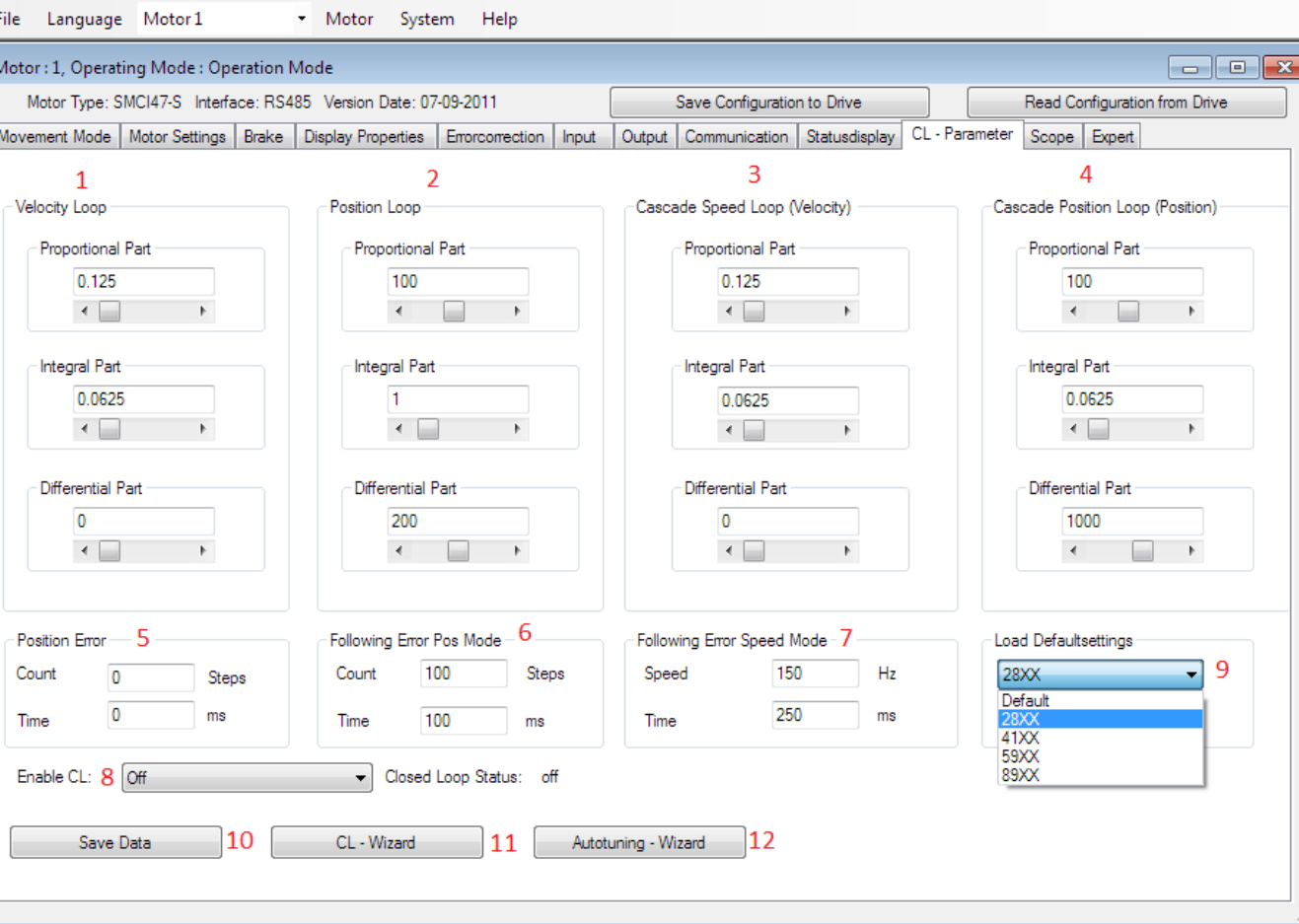
5. Position Error: Sets the allowed end position error in steps and the time the controller has to get this position at the end of the profile.

6. Following Error Position Mode: Allowed number of steps beside the demand position and the time to get back into range.

7. Following Error Speed Mode: Allowed frequency beside the target speed and time to get back into range.

8. Enable CL: Choose between Closed Loop off, activation directly by appearance of the index signal or at the end of the profile, where the index signal appeared.

9. Load Default setting: You can load PID parameters which approximately fit to the motor.



10. Save Date: Save your settings.

11. CL-Wizard: Determine the load angle and encoder index offset (has to be done before you can switch to CL)

12. Autotuning-Wizard: Helps you to find the best PID parameters under load. (Motor moves very far and with high speed)

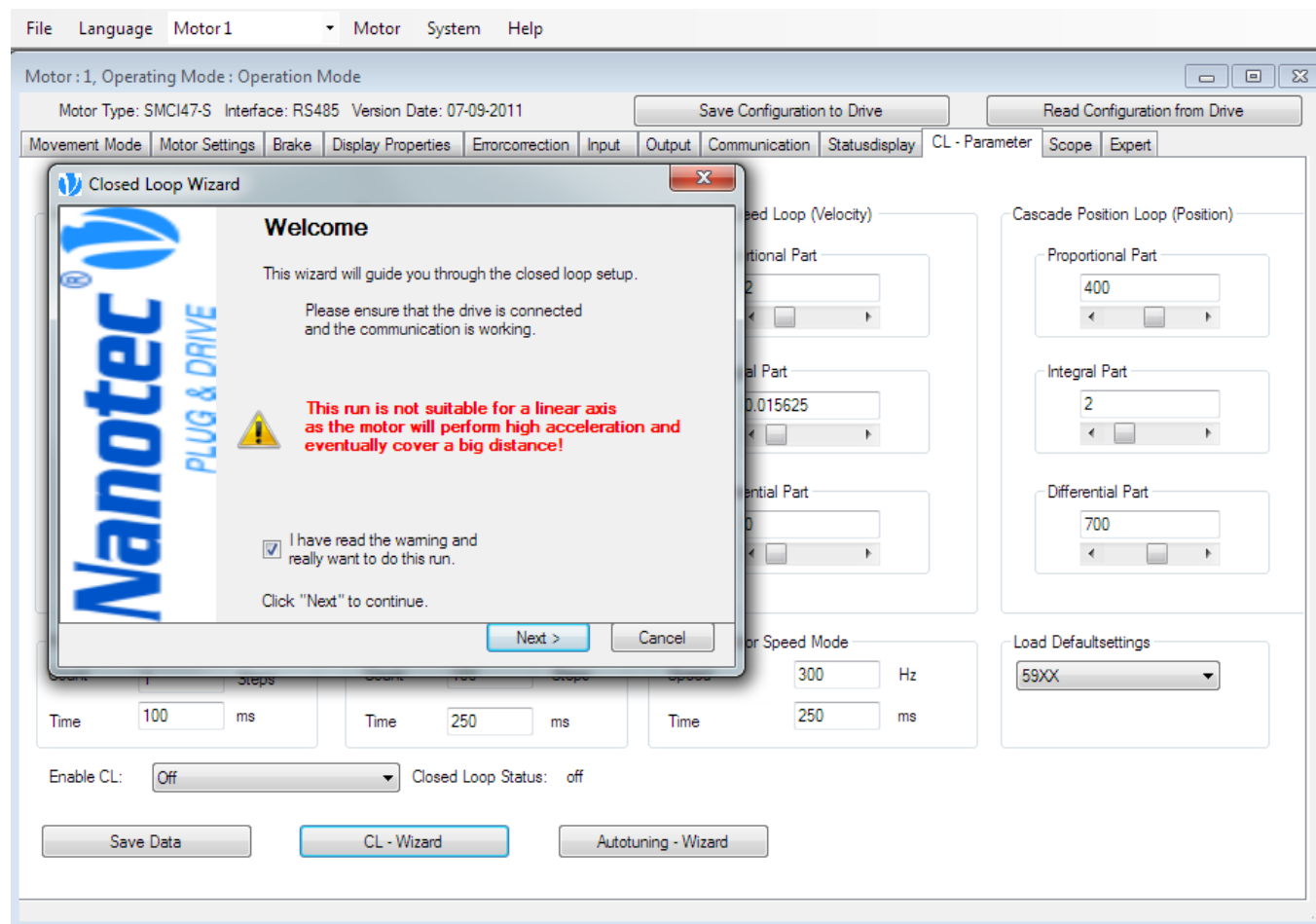
Setting up Closed Loop

First, set the right configuration on the Motor Settings tab.

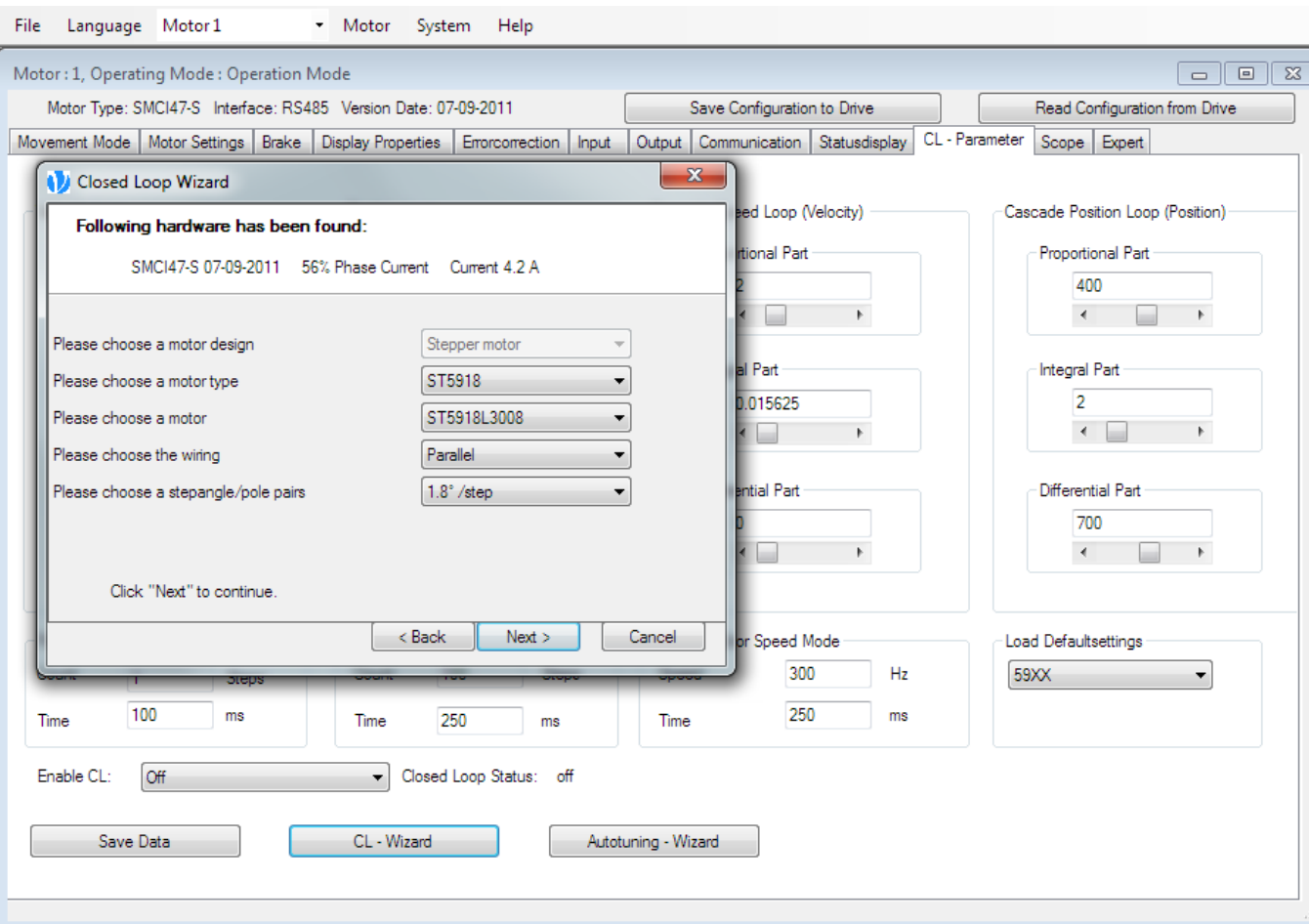
The Phase Current should be the rated current of the motor, (here 4.2A). The encoder resolution has to be at the right value. (here 500)

Then load the default settings for the 59XX.

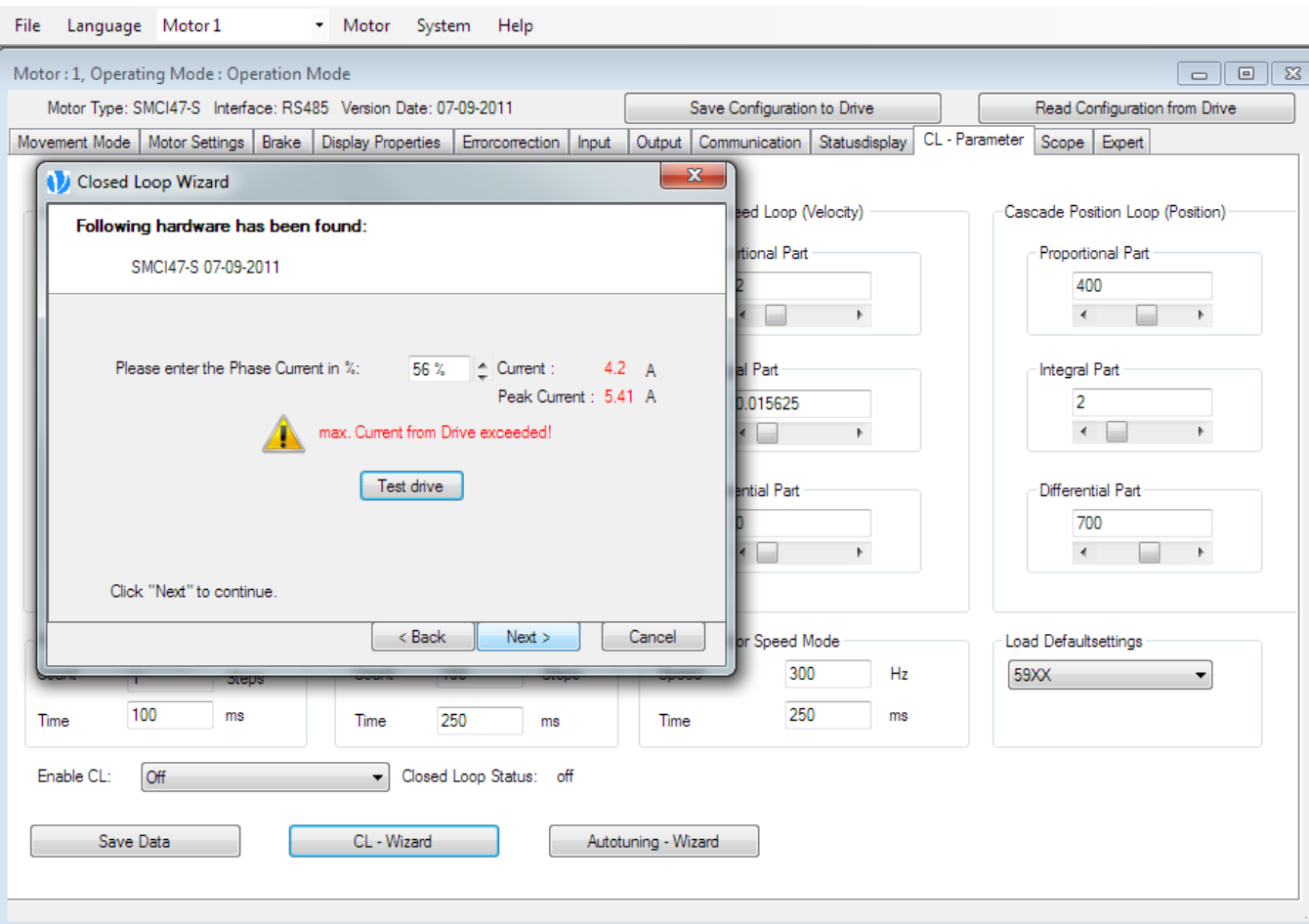
Start the CL-Wizard now.



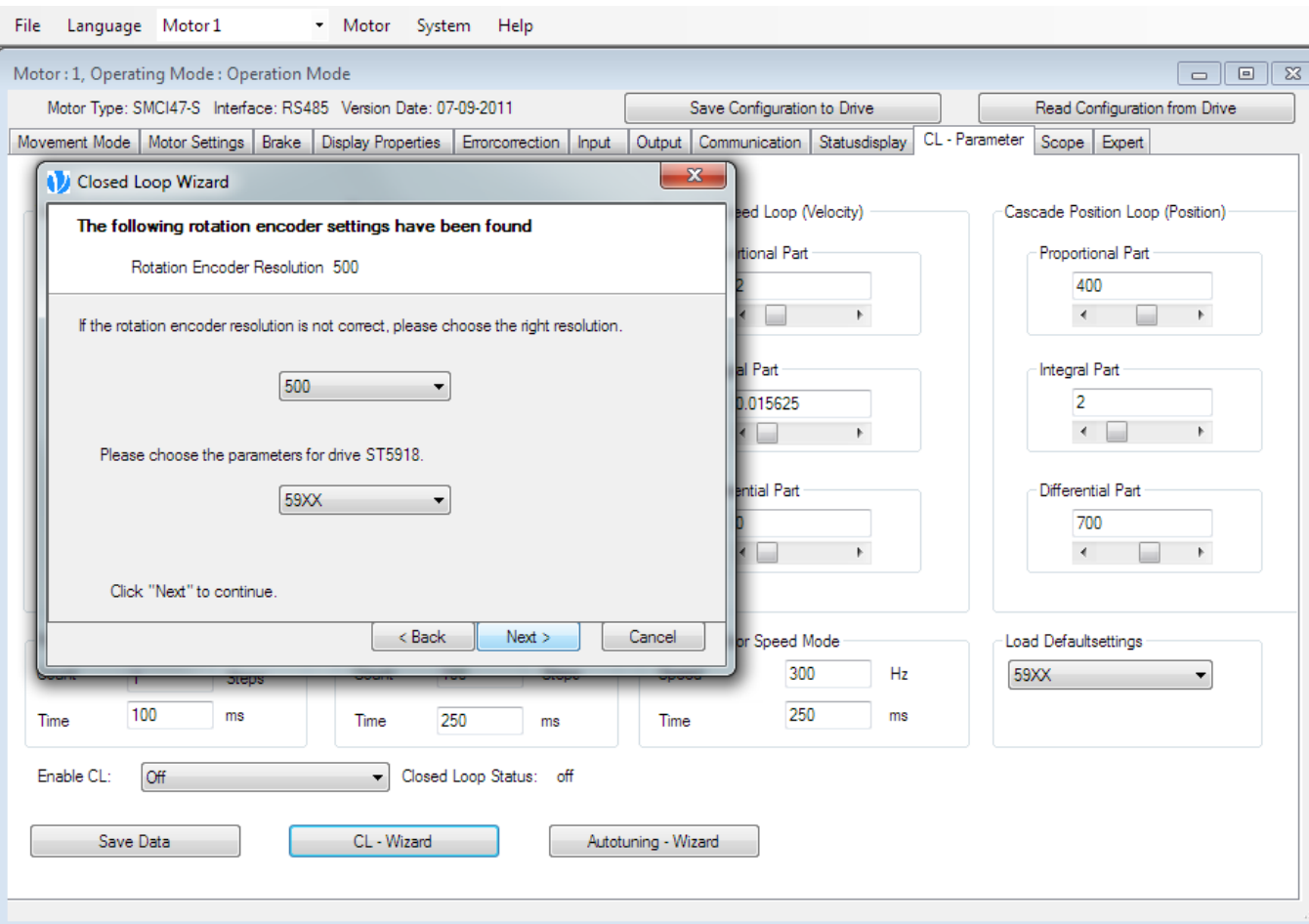
The Closed Loop Wizard shows the configuration with the important data.



The Closed Loop Wizard shows the configuration with the important data.



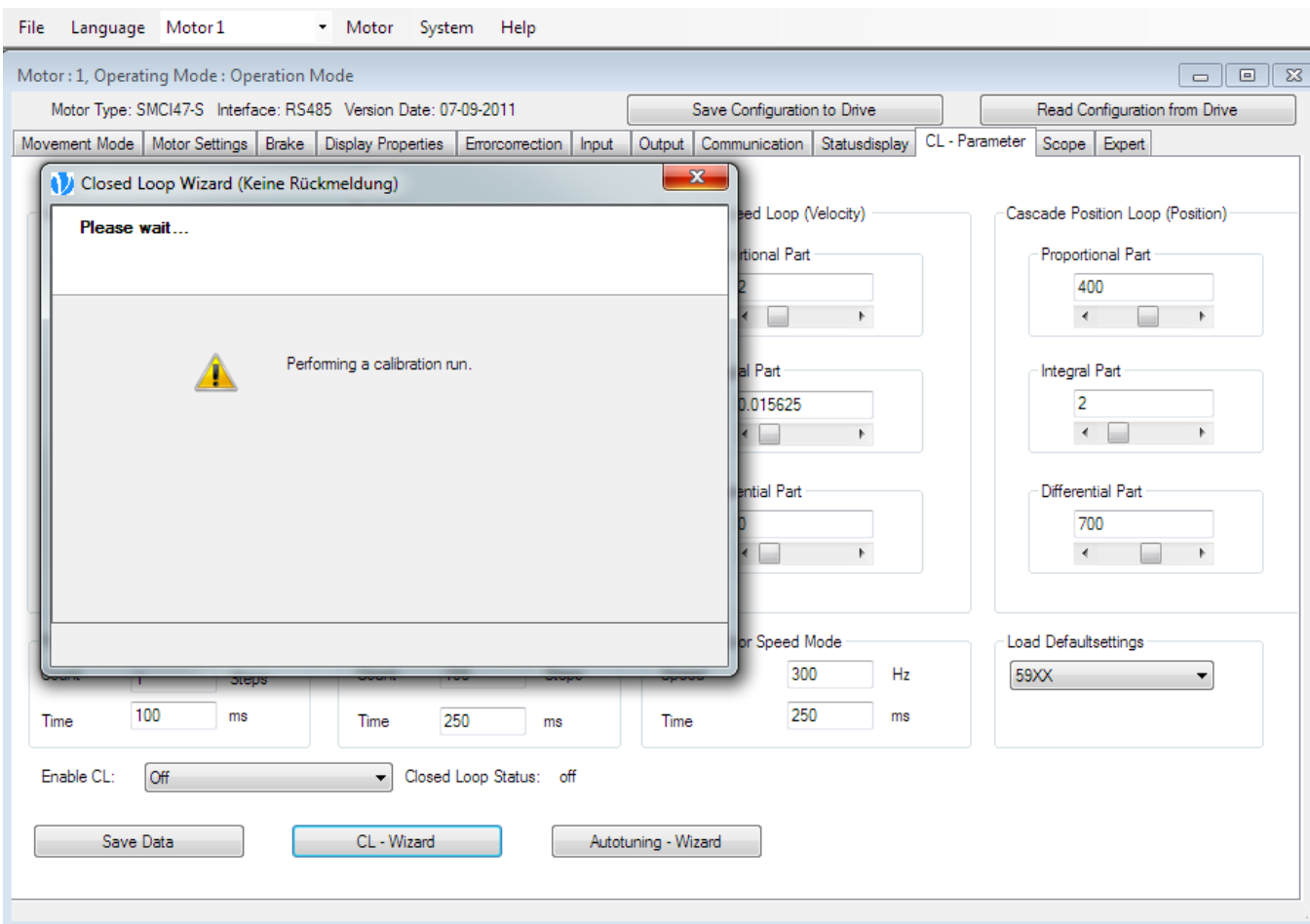
The Closed Loop Wizard shows the configuration with the important data.



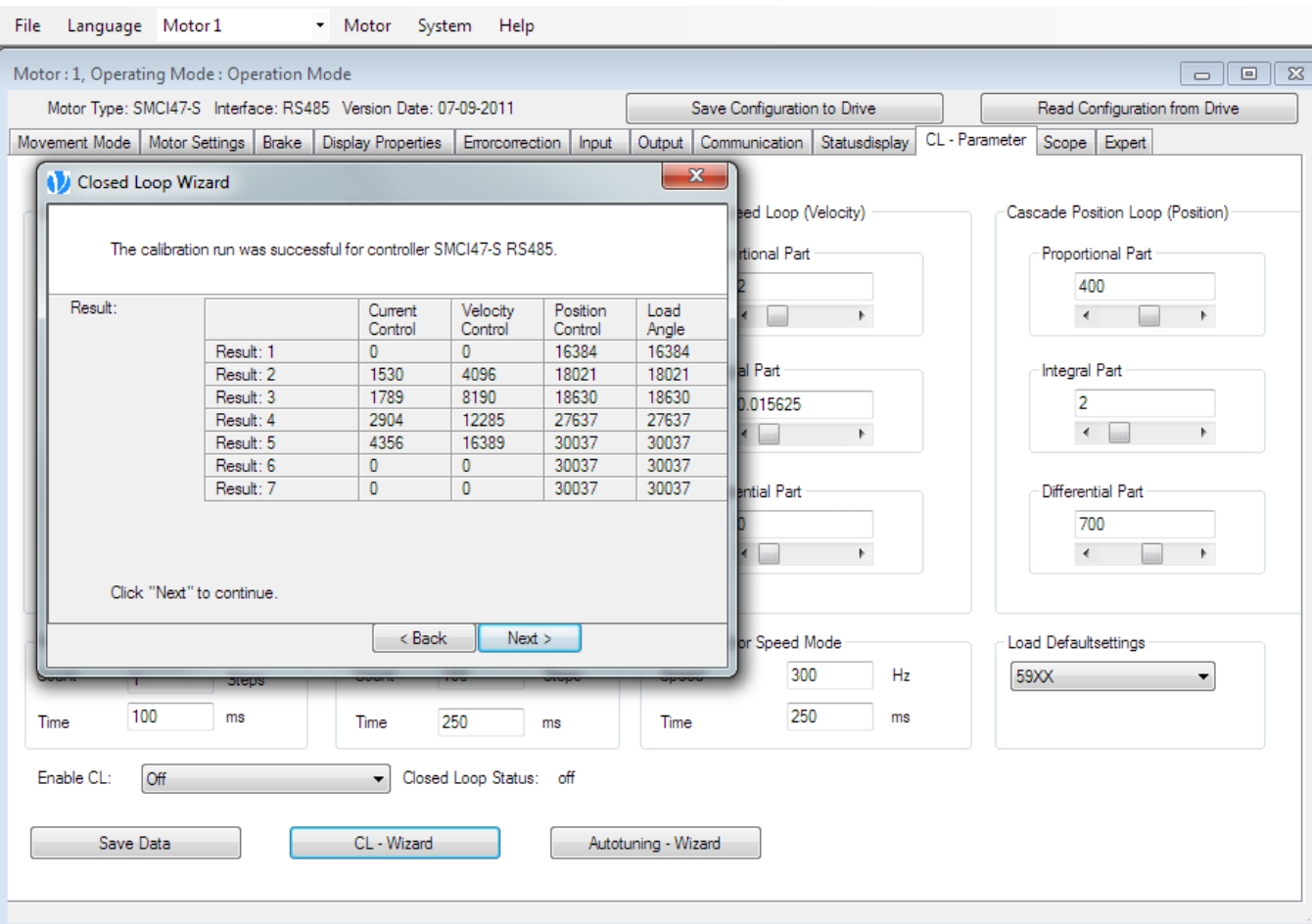
Now the motor will run in both directions at a different speed.

The calibration run will take about 1-2 minutes.

Do not disturb the motor during this period as this would cause a bad calibration.



If the calibration is successful, a table with the measured values appears.



Motor: 1, Operating Mode: Operation Mode

Motor Type: SMCI47-S Interface: RS485 Version Date: 07-09-2011

Save Configuration to Drive Read Configuration from Drive

Movement Mode Motor Settings Brake Display Properties Errorcorrection Input Output Communication Statusdisplay CL - Parameter Scope Expert

Closed Loop Wizard

The calibration run was successful for controller SMCI47-S RS485.

Result:

	Current Control	Velocity Control	Position Control	Load Angle
Result: 1	0	0	16384	16384
Result: 2	1530	4096	18021	18021
Result: 3	1789	8190	18630	18630
Result: 4	2904	12285	27637	27637
Result: 5	4356	16389	30037	30037
Result: 6	0	0	30037	30037
Result: 7	0	0	30037	30037

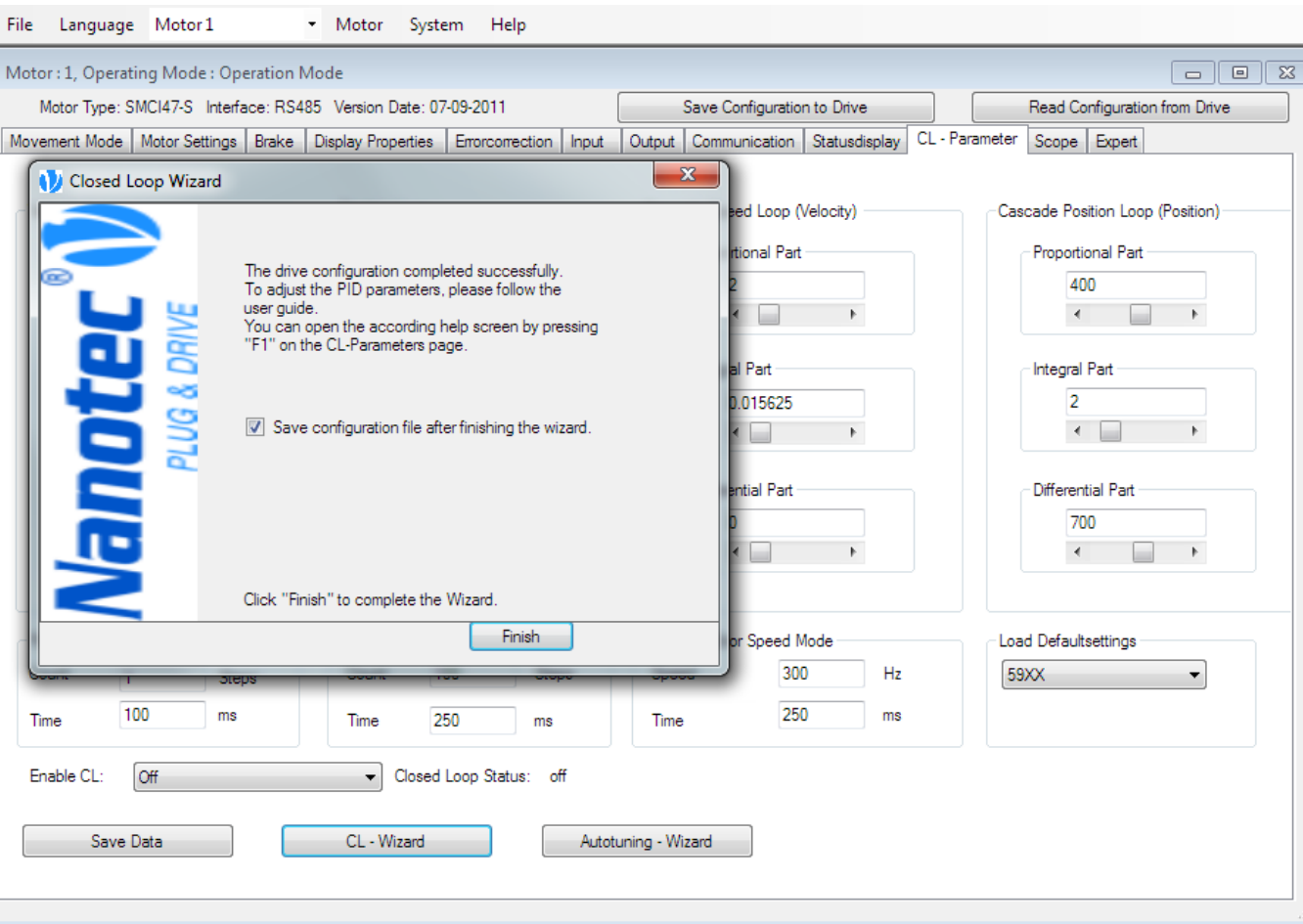
Click "Next" to continue.

< Back Next >

Enable CL: Off Closed Loop Status: off

Save Data CL - Wizard Autotuning - Wizard

Your system is in closed loop mode now!



Exercise:

Test a few different operating modes to see the benefit of the closed loop mode. Try out the functionality of the torque mode, which is enabled now.

Here are some typical problems you may face at the customer site:

- ? There is no reaction on the inputs.
- ! The Signal GND (COM) might not be connected.

- ? If I want to start a profile I always get into an error loop.
- ! The “Release” function might be chosen for an input but it is low.
(typical at SMCI35)

- ? I do not get any communication.
- ! The correct driver might not be installed.

- ? My outputs are not working; there is no signal.
- ! The outputs are open collector outputs; they switch to GND potential.



Thanks for
your attention!

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