



MOVE STRONGER.

i550 Motec

Sensorless Vector Control Mode (SLVC)

Commissioning Guide



Follow this process to commission an i550m VFD driving a 3rd party asynchronous AC motor using SLVC motor control mode. This can be accomplished using EASY Starter software either via network connection or USB connection to the drive.

The commissioning process consists of **3 steps:**



**Setting correct
motor data**



**Running energized
calibration of the motor**



**Fine-tuning
the speed controller**



Process:

** To run the energized calibration, the VFD needs to be in a certain state. It is recommended to change these settings at the beginning of the commissioning process, then restore them as the final step of the process.**

- Navigate to Settings\Overview\Flexible I/O configuration\Start / stop motor page and disable the following functions which prevent the calibration from starting.
 - a. Set "Activate network control" (0x2631:037) to selection "Not connected [0]"
 - b. Set "Run" (0x2631:002) to selection "Digital Input 1"

Diagnosis Settings **Parameter list** Trend Oscilloscope

Overview\Flexible I/O configuration\Start / stop motor

Example: Trigger for "Enable inverter" and "Run"

Preconditions for the example:

Activate network control	☐ Not connected [0]	= Not connected [0]
Stop method	☐ Standard ramp [1]	= Standard ramp [1]

Mode: ☐ Manual control off [0] = Manual control off [0]

Input

Enable inverter	☐ Constant TRUE [1]	☒
Run	☐ Digital input 1 [11]	☒
Activate quick stop	☐ Not connected [0]	☐
Start forward (CW)	☐ Not connected [0]	☐
Start reverse (CCW)	☐ Not connected [0]	☐
Run forward (CW)	☐ Not connected [0]	☐
Run reverse (CCW)	☐ Not connected [0]	☐
Jog forward (CW)	☐ Not connected [0]	☐
Jog reverse (CCW)	☐ Not connected [0]	☐
Reverse rotational direct.	☐ Constant TRUE [1]	☒

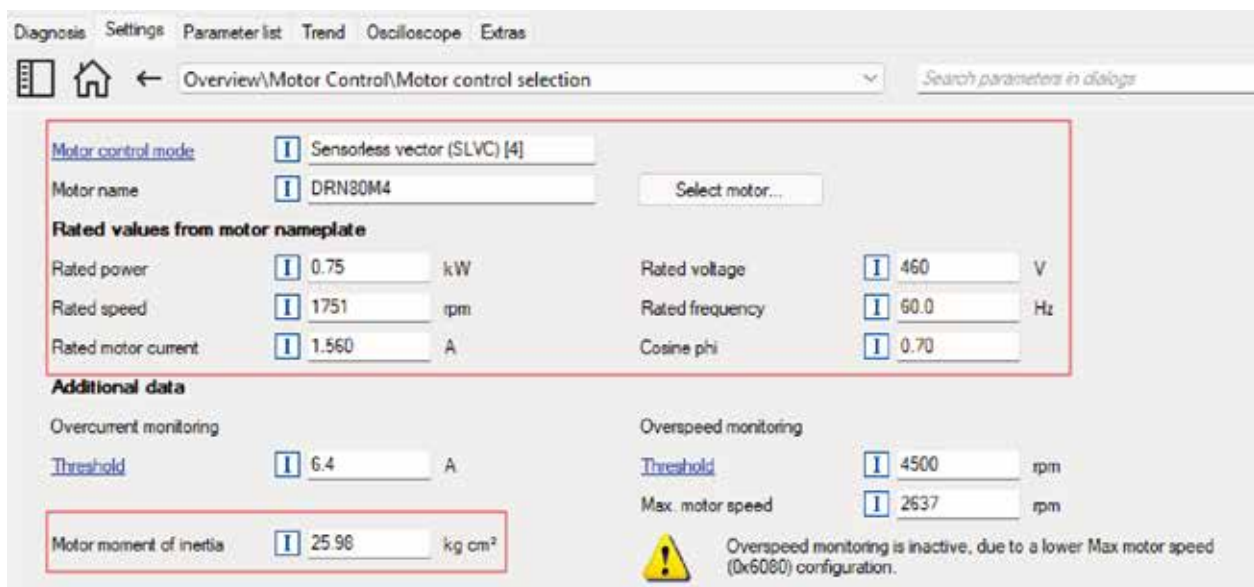
Wiring diagram: 24V supply connected to two terminals. The bottom terminal is connected to the 'Run' input.

- Navigate to Settings\Overview\Additional functions\Holding brake control page. Configure the motor holding brake control as follows to allow for calibration.
 - a. Set "Brake mode" (0x2820:001) to selection "Manually [1]"
 - b. Set "Open holding brake" (0x2631:049) to selection "Constant TRUE [1]"



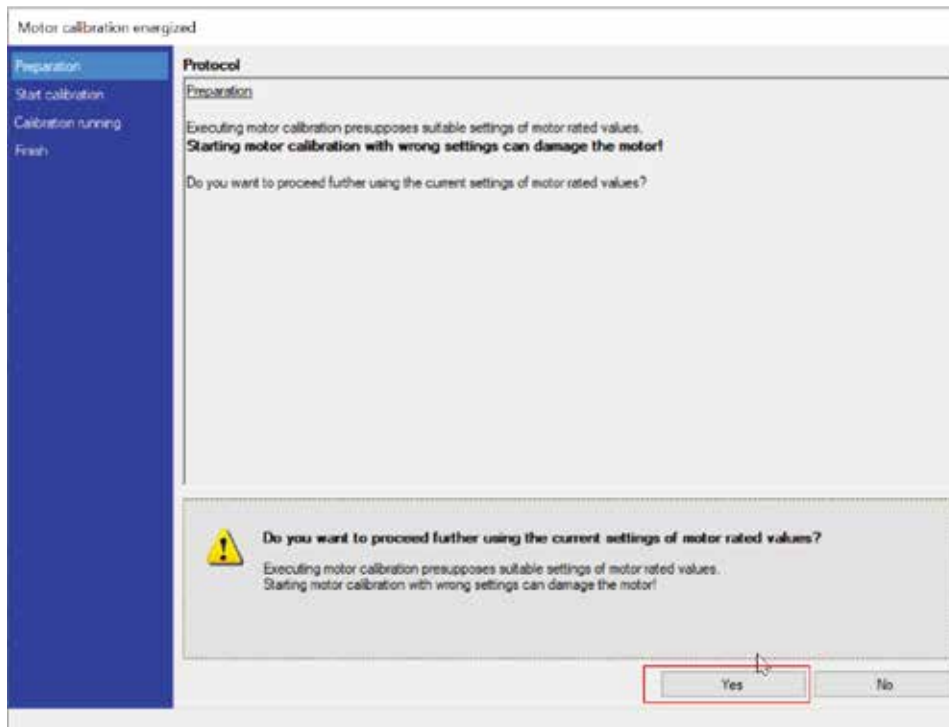
I. Setting correct motor data

1. Navigate to Settings\Overview\Motor Control\Motor control selection.
2. Select Motor control mode (SLVC) (4). Type in your motor name if desired.
3. Set "Rated values from motor nameplate" and "Motor moment of inertia" correct to your motor.

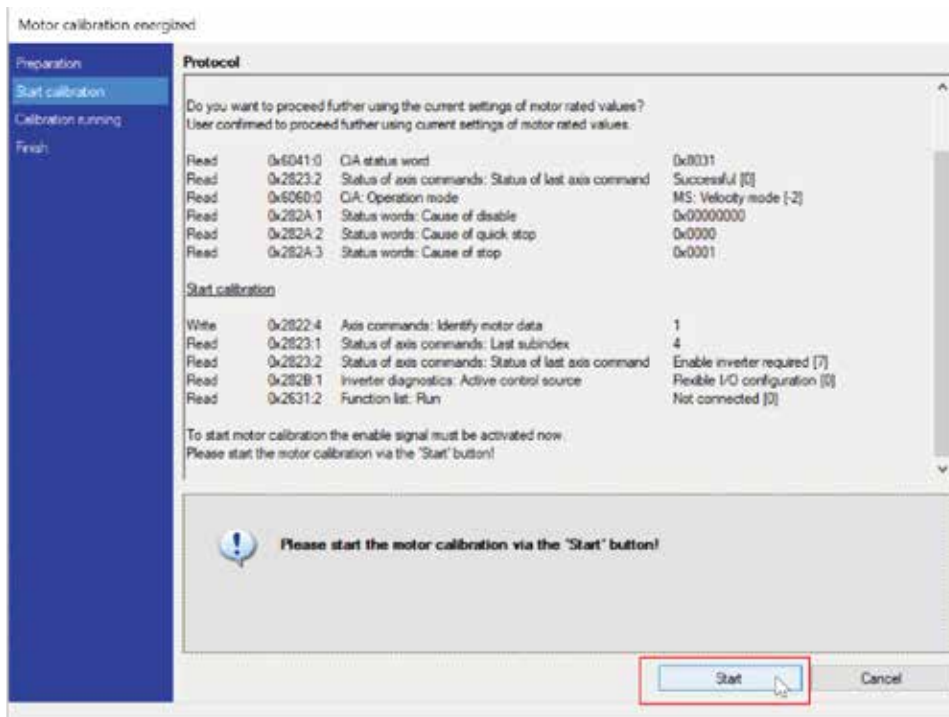


II. Running energized calibration of the motor

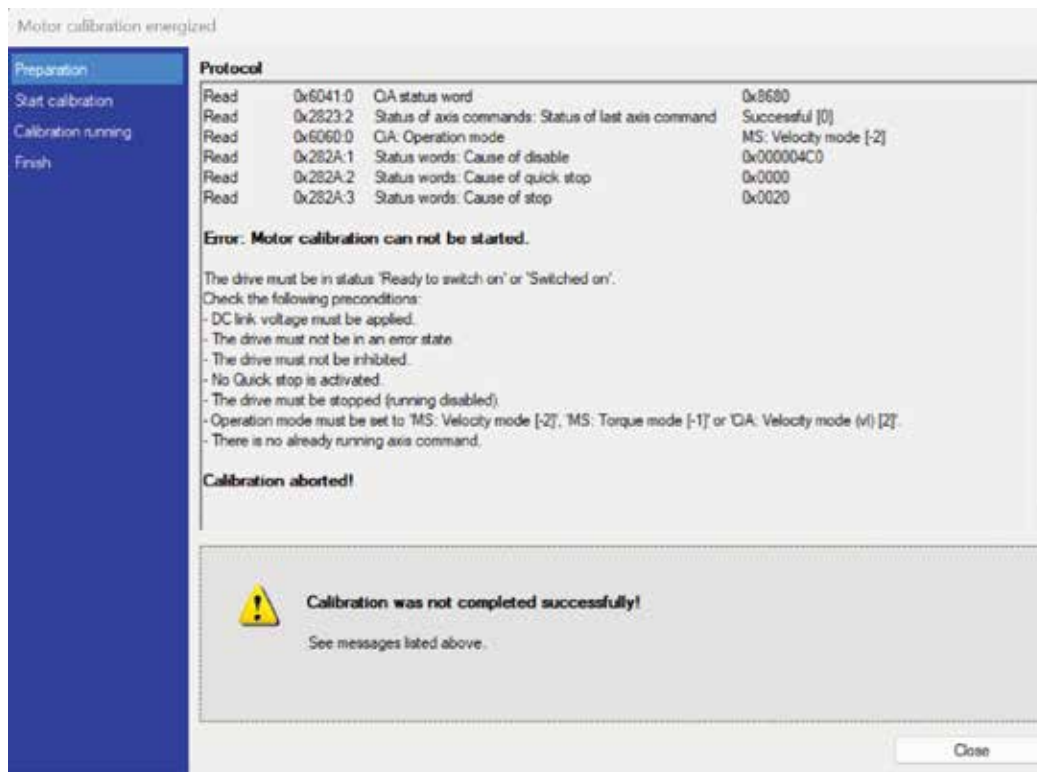
1. From this same page, click the Energized motor calibration button. A pop up wizard will appear.
2. With motor rated values set correctly from Step I, click yes to proceed.



3. If the VFD is in the proper state to run the calibration you will get the following window. Click "Start" to proceed, the calibration will start.



4. If you get an error message close the pop-up and recheck your settings based on the steps above.



5. Once calibration is finished close the pop-up.
6. The following motor circuit parameters have been determined during calibration. The inverter characteristics (0x2947:001 – 017) have also been determined.

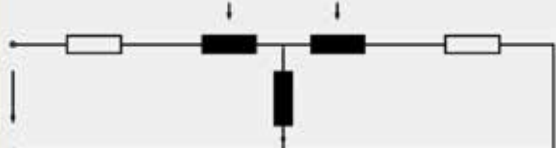
Note For larger HP applications it is beneficial to run this calibration for each VFD/motor axis as larger motors have greater variance (unit to unit) of resistance/inductance values than smaller motors. For smaller HP applications it can be sufficient to use the results of one calibration to copy parameter values onto other VFD/motor axes of the same models.

Diagnosis Settings Parameter list Trend «Oscilloscope»

Overview/Motor Control/Motor control selection

Motor properties and equivalent circuit diagram

Rated motor torque 162.035 Nm
Number of pole pairs 2



Stator resistance 0.0515 Ω Rotor resistance 0.0677 Ω
Stator leakage inductance 1.072 mH Mutual inductance 29.3 mH
Magnetizing current 19.72 A

Controller Settings

Settings Parameter list Trend «Oscilloscope» Extras

2947 All parameters

Parameter list	Address	Display parameter	Name	Value
Group 1 - Favorites	0x2947.001		Inverter characteristic: Value y1	0.00
Group 1 - Diagnostics	0x2947.002		Inverter characteristic: Value y2	0.35
Group 2 - Basic setting	0x2947.003		Inverter characteristic: Value y3	0.66
Group 3 - Motor control	0x2947.004		Inverter characteristic: Value y4	0.89
Group 4 - I/O setting	0x2947.005		Inverter characteristic: Value y5	1.32
Group 5 - Network setting	0x2947.006		Inverter characteristic: Value y6	1.85
Group 6 - Process controller	0x2947.007		Inverter characteristic: Value y7	2.46
Group 7 - Additional functions	0x2947.008		Inverter characteristic: Value y8	3.13
Group 8 - Sequence	0x2947.009		Inverter characteristic: Value y9	3.69
	0x2947.010		Inverter characteristic: Value y10	4.05
	0x2947.011		Inverter characteristic: Value y11	4.50
	0x2947.012		Inverter characteristic: Value y12	4.68
	0x2947.013		Inverter characteristic: Value y13	4.92
	0x2947.014		Inverter characteristic: Value y14	5.21
	0x2947.015		Inverter characteristic: Value y15	5.58
	0x2947.016		Inverter characteristic: Value y16	5.83
	0x2947.017		Inverter characteristic: Value y17	6.14

Diagnosis Settings Parameter list Trend «Oscilloscope»

Overview/Motor Control/Motor control selection

Motor properties and equivalent circuit diagram

Controller Settings

Current controller

Gain 1.95 V/A
Reset time 40.89 ms

Field controller

Gain 341.29 A/Vs
Reset time 448.5 ms

Field weakening controller

Gain (ASM) 0.000 Vb/V
Reset time (ASM) 11903.5 ms
Field limitation 100.00 %

SILVC Q-controller

Gain 0.0335 Hz/A
Reset time 20.8 ms

Speed controller

Scaled load inertia 0.00 kg cm²
Coupling With backlash [2]
Actual speed filter time 2.0 ms

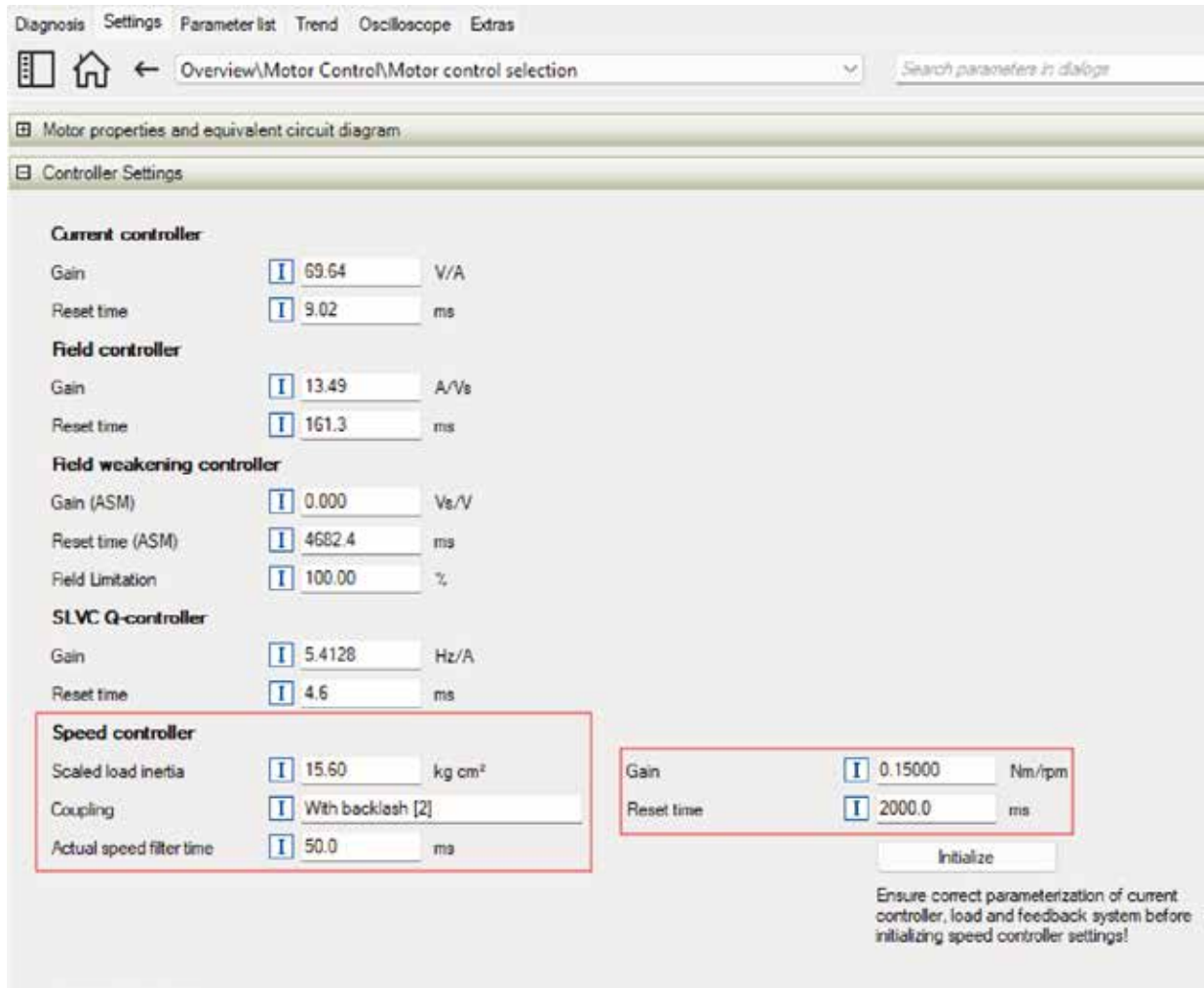
Gain 1.20427 Nm/rpm
Reset time 80.0 ms

Initialize

Ensure correct parameterization of current controller, load and feedback system before initializing speed controller settings!

III. Fine-tuning the speed controller

1. The speed controller settings need to be further adjusted. From the Settings\Overview\Motor Control\Motor control selection page, navigate to the Speed controller section.



2. Set the "Scaled load inertia" (0x2910:002) value. If the actual load inertia value is not known, we recommend using the motor moment of inertia value.
3. Set the "Actual speed filter time" (0x2904:000) to 50ms.
4. Set the "Speed Controller settings: Gain" (0x2900:001) to 0.15000Nm/rpm.
*Experimentally determined starting value.

5. Set the "Speed Controller settings: Reset Time" (0x2900:002) to 2000.0ms.
*Experimentally determined starting value.
6. Calibration is complete. Navigate back to Settings\Overview\Flexible I/O configuration\Start / stop motor page to restore settings that were disabled at the beginning of the process.
 - a. Set "Activate network control" (0x2631:037) to selection "Constant TRUE [1]"
 - b. Set "Run" (0x2631:002) to selection "Constant TRUE [1]"

Diagnosis Settings Parameter list Trend Oscilloscope

Overview\Flexible I/O configuration\Start / stop motor

Example Trigger for "Enable inverter" and "Run"

Preconditions for the example:

Activate network control ☐ Constant TRUE [1] = Not connected

Stop method ☐ Standard ramp [1] = Standard ramp

Mode ☐ Manual control off [0] = Manual control

Input

Enable inverter	☐ Constant TRUE [1]	☒
Run	☐ Constant TRUE [1]	☒
Activate quick stop	☐ Not connected [0]	☐
Start forward (CW)	☐ Not connected [0]	☐
Start reverse (CCW)	☐ Not connected [0]	☐
Run forward (CW)	☐ Not connected [0]	☐
Run reverse (CCW)	☐ Not connected [0]	☐
Jog forward (CW)	☐ Not connected [0]	☐
Jog reverse (CCW)	☐ Not connected [0]	☐
Reverse rotational direct.	☐ Not connected [0]	☐

Output

1 Output frequency	☐ 0.0 Hz	f [Hz]
Frequency setpoint	☐ 0.0 Hz	1

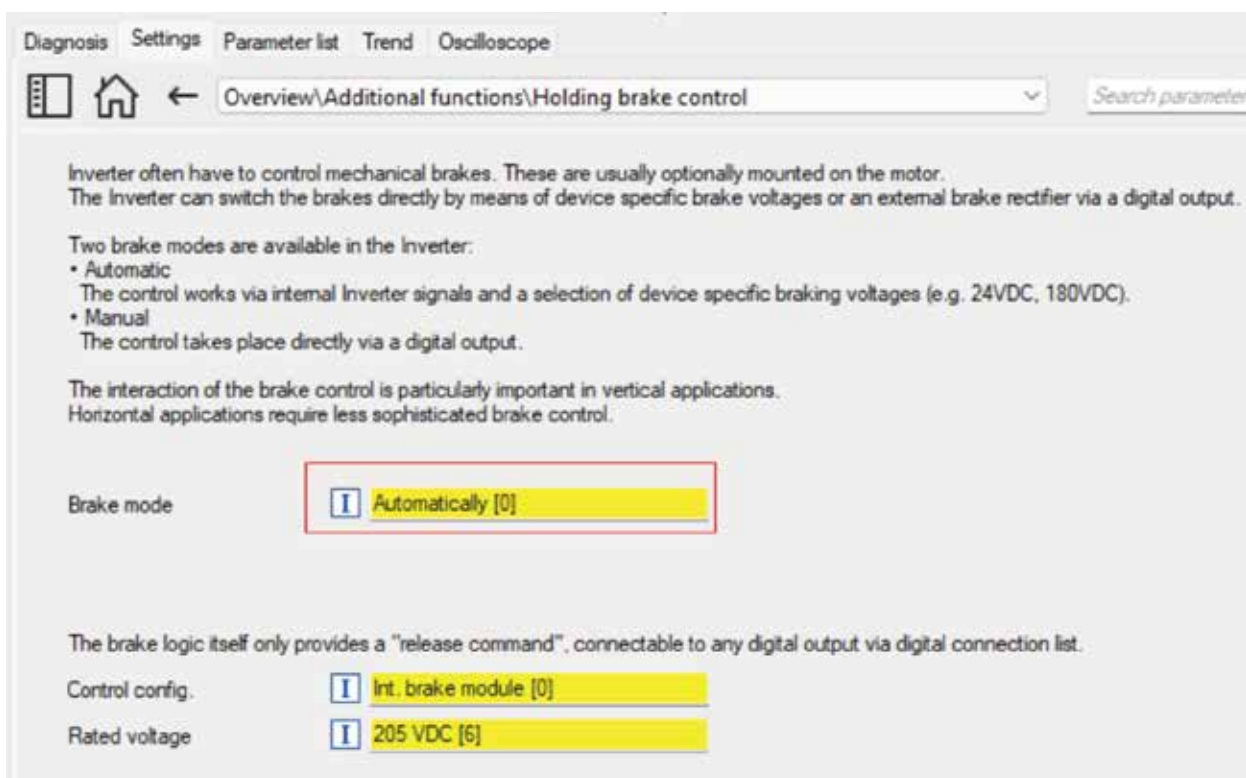
24

f [Hz]

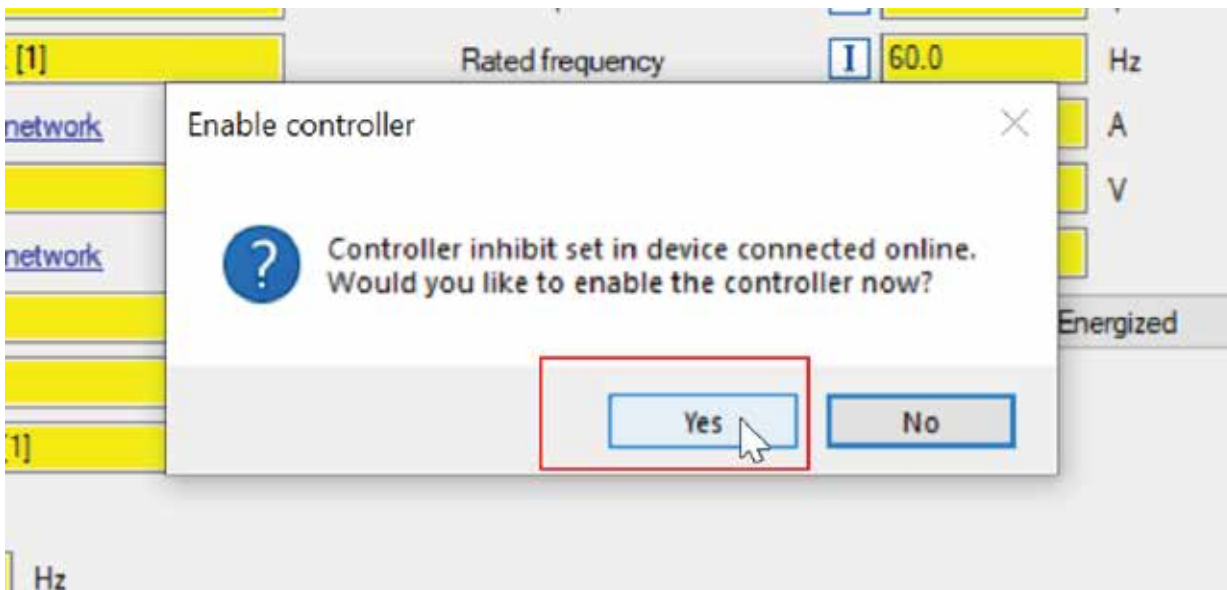
7. Navigate back to Settings\Overview\Additional functions\Holding brake control page to restore settings that were disabled at the beginning of the process.

- a. Set "Open holding brake" (0x2631:049) to selection "Not Connected [0]"
- b. Set "Brake mode" (0x2820:001) to selection "Automatically [0]"

*Note that "Open holding brake" disappears once "Brake mode" is set to "Automatically [0]", therefore set "Open holding brake" = Not Connected [0] first. The parameter has no effect when brake mode is automatically controlled, but should still be reset to "Not Connected [0]" as a precaution.



8. If the VFD does not return to Enabled state, click the Enable button on the tool ribbon and click "Yes" on the pop-up.

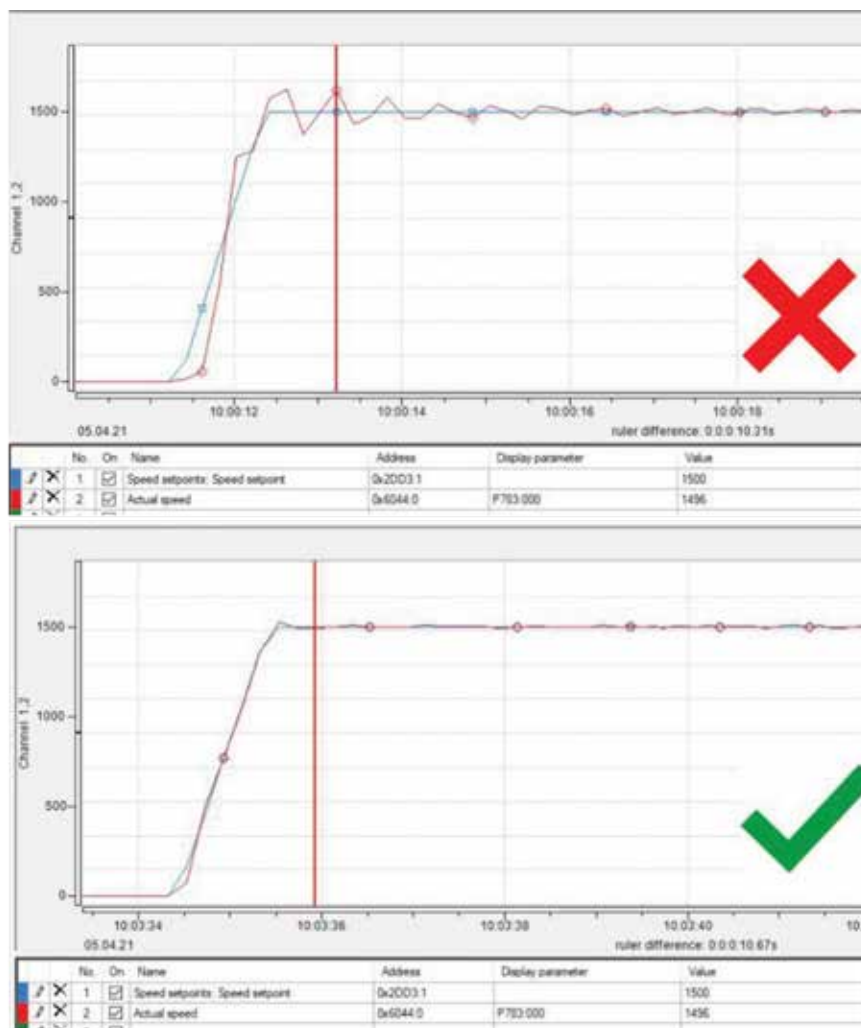


9. Adjustments are complete. Click "Save" to save parameters to VFD memory.

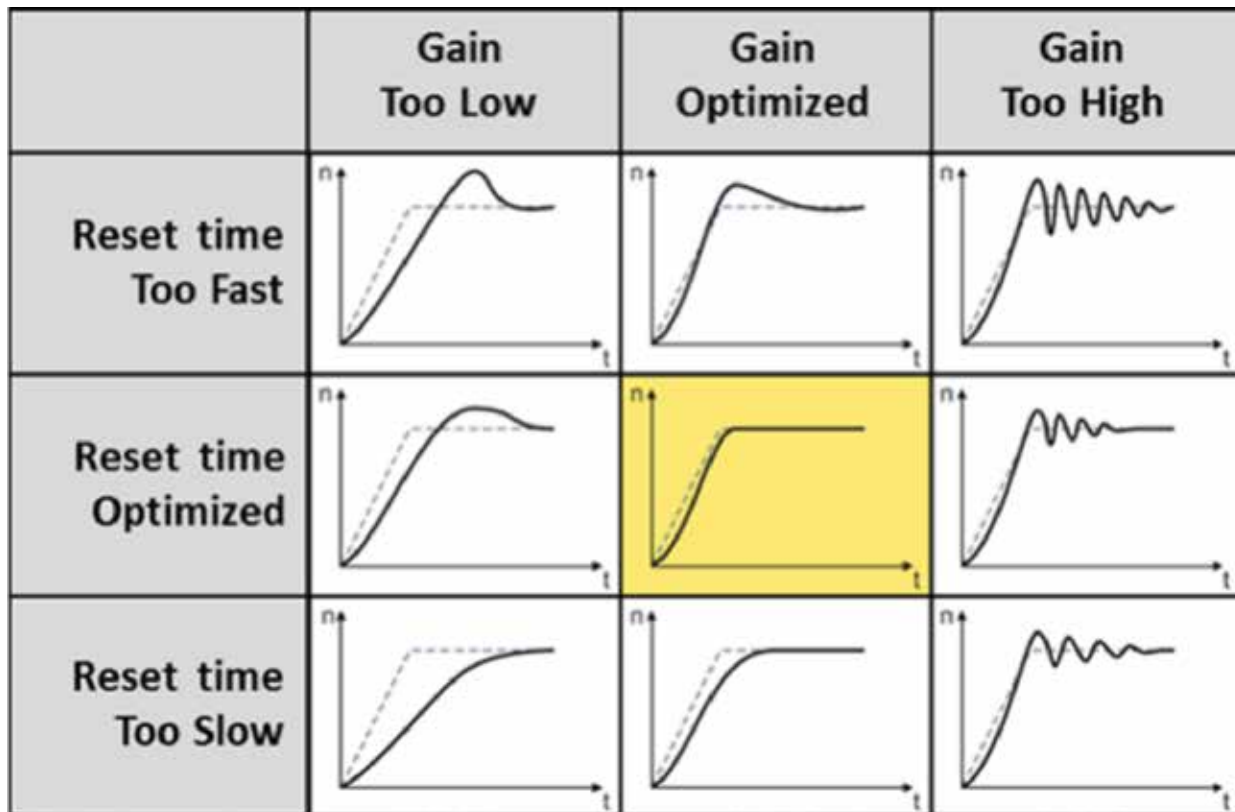
Process:

If motor control is not stable, follow these steps to re-tune the speed controller.

- A. Configure a trend or trace comparing Speed setpoint [0x2DD3:001] versus Velocity actual value [0x6044:000]. Attempt to run the motor up to rated / application speed.



- B. Return to Settings\Overview\Motor Control\Motor control selection. Change "Actual speed filter time" (0x2904:000) to its maximum 50ms. With the trace running, start the motor. If the actual velocity is not tracking the setpoint, adjust the Speed Controller Gain and Reset Time accordingly.
- C. General advice is to adjust the values in +/- 10-30% increments. Do not click "Initialize" button after making adjustments to the Gain/Reset Time as doing so will overwrite your changes back to the originally calculated values.



D. Repeat adjustment until tuning is satisfactory.