Servo Motion

# Application Note

## e530 PTI Servo drives Getting Started Guide

AN301 Rev A (EN)

**Introduction**

This application notes details are e530-PT common functions, include position control mode, speed control mode, torque control mode and jog mode. And present detailed step about each control mode how to use. Servo Composer is a powerful tool for configuration, commissioning and monitoring. A PC installed with Servo Composer can be connected to the servo drive via standard RJ45 port.

**Compatibility**

E530-PT firmware we suggest using V1.3.0.7 or later. The latest drive firmware can be downloaded from here:
https://new.abb.com/drives/zh/lv-ac-drive/servo-products

Servo composer we suggest using V1.20 or later. The latest servo composer can be downloaded from here:
https://new.abb.com/drives/zh/lv-ac-drive/servo-products/servo-composer

E530-PT Servo System User Manual can be downloaded from here:
https://search.abb.com/library/Download.aspx?DocumentID=3AXD50000942794&LanguageCode=zh&DocumentPartId=1&Action=Launch

# 1 Contents

## 2 Wiring guidance

### 2.1 E530-PT power supply instructions

E530-PT servo drive supports 1-phase and 3-phase 220 V AC power supply input based on different frame sizes, as shown in the table below:

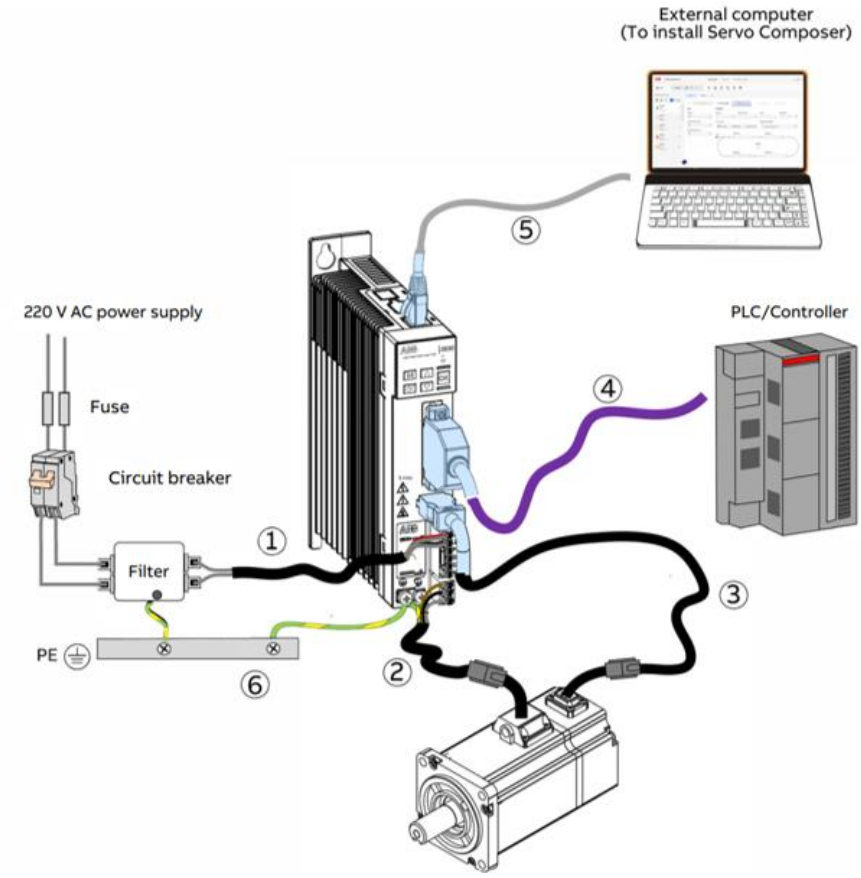
| Frame size | Input power supply | |
|---|---|---|
| | 1-phase | 3-phase |
| F2 | Supported | Not supported |
| F3 | Supported | Not supported |
| F4 | Supported | Supported |

AC input terminal Definition:

| AC power | Terminals | Description |
|---|---|---|
| 1-phase | L1 | 1-phase AC input L1, L2 |
| | L2 | |
| 3-phase | L1 | 3-phase AC input L1 |
| | L2 | 3-phase AC input L2 |
| | L3 | 3-phase AC input L3 |

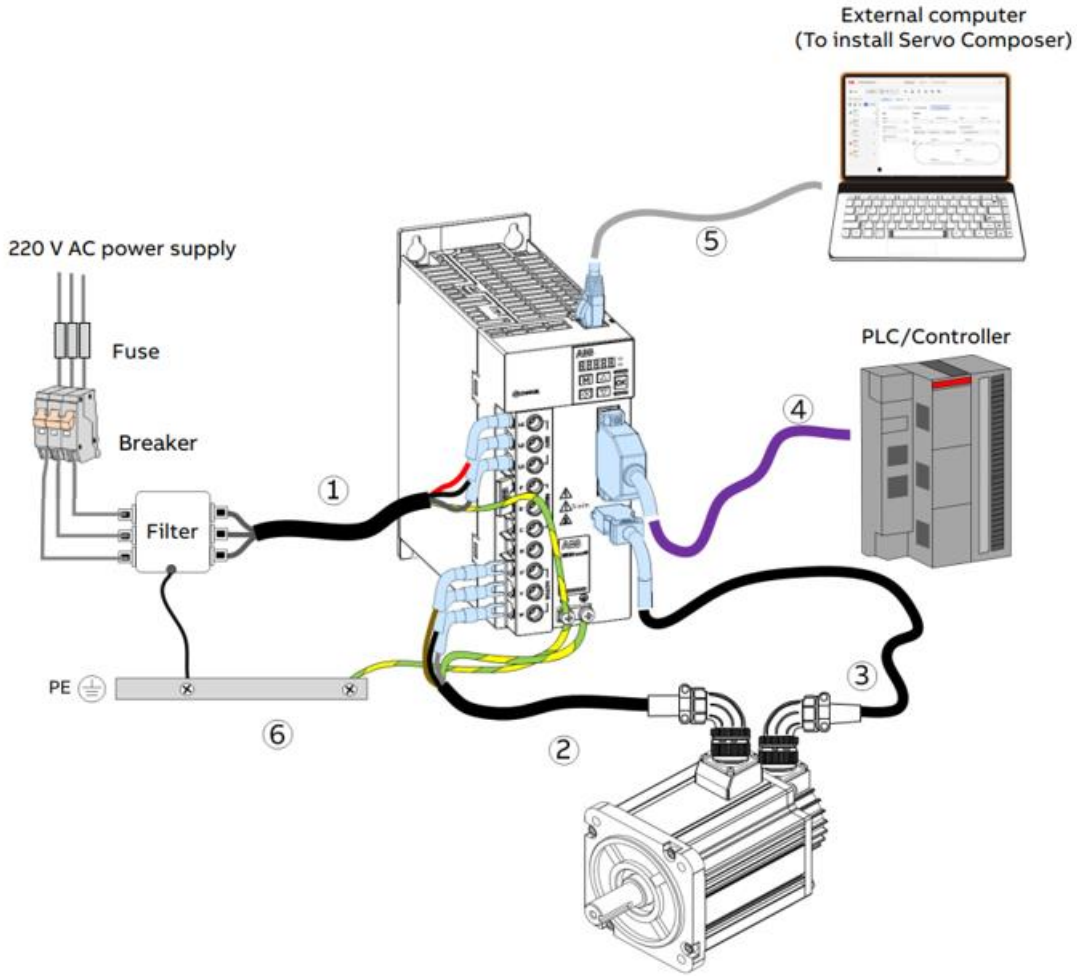
**Note: 2KW drive powered by single - phase needs to be derated to 80% for use.**

### 2.2 Frame size F2 and F3 wiring guidance




| | | | |
|---|---|---|---|
| 1 | Power cable, 1-phase | 4 | Control cable (44-pin D-type connector) |
| 2 | Motor cable | 5 | Communication cable (RJ45) |
| 3 | Encoder cable (1394 connector) | 6 | System grounding busbar |

## 2.3 Frame size F4 wiring guidance



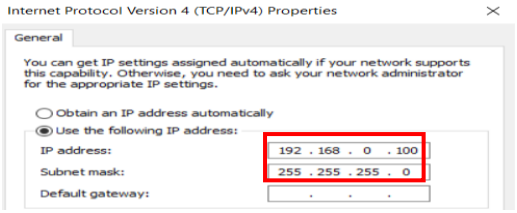

| | | | |
|---|---|---|---|
| 1 | Power cable, 3-phase | 4 | Control cable (44-pin D-type connector) |
| 2 | Motor cable | 5 | Communication cable (RJ45) |
| 3 | Encoder cable (1394 connector) | 6 | System grounding busbar |

# 3 Getting online

## 3.1 Servo composer wizard

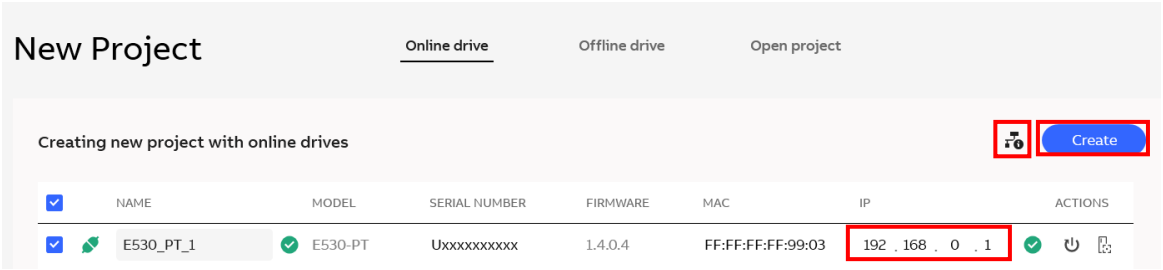
### 3.1.1 E530 PTI quick connect to servo composer

Set the IP address of the PC's Ethernet adapter to a fixed address e.g. 192.168.0.100.




Then Open Servo Composer and select '+ New Project' and wait for it to discover you connected drive.

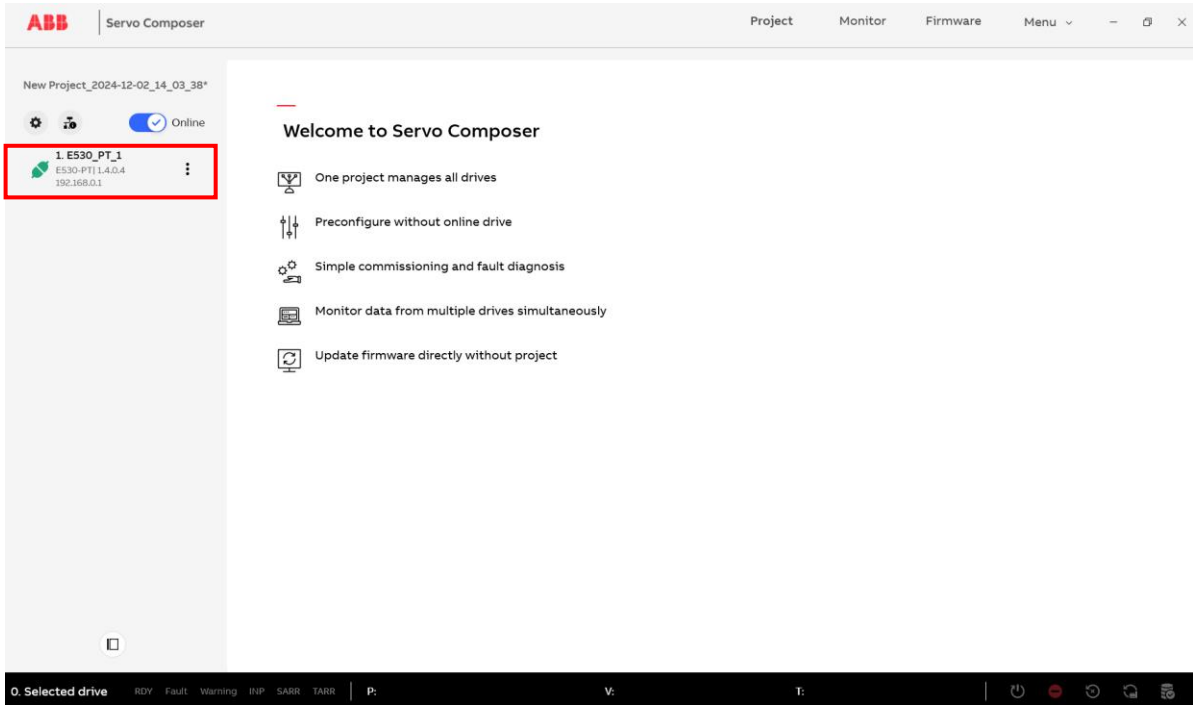
Use the interface list to check the E530 PTI IP address. The default IP address is 192.168.0.1, subnet mask is 255.255.255.0.




You can then click on the 'Create' Button to start an online session with this drive.

**Note: Settings can be checked via the 'Network' icon if there are any issues.**

At the end of this process you should be online and see any drives in your project on the left hand side



# 4 Introduction to control Modes

Before introducing the setting of parameters it's important to understand the different Control Mode options that are available in the e530 range

## 4.1 Position control mode

Position control means servo gets position command from controller or internal setting and drives motor to specified position.

Depending on the source of the position command, there are two modes of position control:

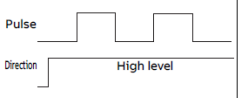
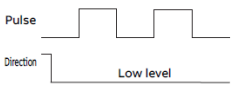
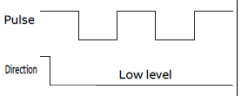
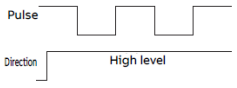
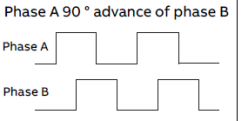
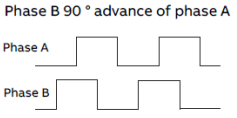
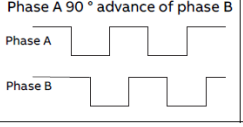
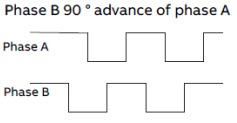
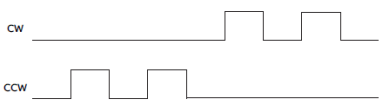
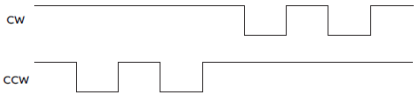
- PTI: Pulse train input
- FP: Fixed position

## 4.2 PTI: Pulse train input

PTI can be used for as the source for the external position command input. The counter value presents the position info, the frequency value presents the speed info. The possible sources are:
Low-speed input: maximum frequency is **200kHz**, pulse voltage is **24V.**
High speed input: maximum frequency is **4MHz**, pulse voltage is **5V (differential single)**.

The E530-PT servo drive supports 3 pulse input types which can be selected by **P04.01**. Both positive logic and negative logic are supported by all three pulse input types.

- Pulse + direction (positive/negative logic)
- A + B (positive/negative logic)
- CW + CCW (positive/negative logic)

| P04.01 | Pulse type | Signal | Positive | Reverse |
|---|---|---|---|---|
| 0 | Pulse + direction Positive logic | PULSE SIGN |  |  |
| 1 | Pulse + direction Negative logic | PULSE SIGN |  |  |
| 2 | AB phase pulse Positive logic | PULSE (phase A) SIGN (Phase B) |  |  |
| 3 | AB phase pulse Negative logic | PULSE (phase A) SIGN (Phase B) |  |  |
| 4 | CW + CCW pulse Positive logic | PULSE (CW) SIGN (CCW) |  | |
| 5 | CW + CCW pulse Negative logic | PULSE (CW) SIGN (CCW) |  | |

### 4.2.1 FP: Fixed position

Fixed Position function is an internal position control mode of servo. Position command, max speed, acceleration, and deceleration are set by users according to different applications. This mode can provide 16 position setpoints, the position/speed/acc./dec./waiting time value of each point can be set by panel, PC-Tool, or Modbus TCP.

## 4.3 Speed control mode

The drive uses the speed command to control motor speed.
P01.00 Control mode selection set to 2, perform “Store drive parameters” then “Restart drive”, then drive will in speed control mode. Speed command sources include external sources such as AI1, internal command.

## 4.4 Torque control mode

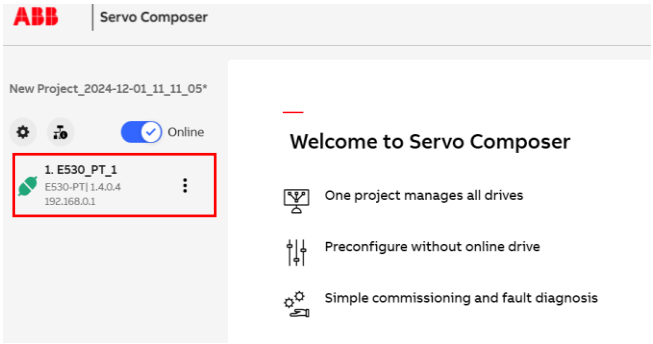
In torque control mode, the drive uses torque command to control torque output of the motor.
P01.00 Control mode selection set to 3, perform “Store drive parameters” then “Restart drive”, then drive is in torque control mode.
Torque command sources include external sources such as AI2 and internal target torque values.

## 4.5 Jog mode

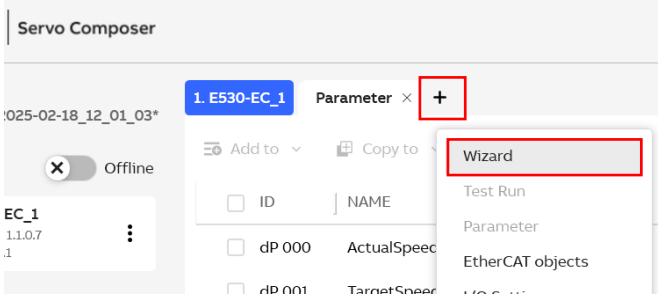
JOG function designed for commissioning, can be used through panel, servo composer and DI.
Jog mode is a very convenient way to run motor, no need to care about control mode.
In jog mode, the priority of JOGP is higher than JOGN. Before JOG, JOGEN should be enabled.
If JOGP is TRUE, motor will run in positive direction. JOG speed can be set as required.

# 5 E530 PTI parameters quick configure guides

For parameter configuration, the wizard in servo composer provides a simple, step-by-step, way to configure drive via the wizard which is a tool to quickly configure the drive.
To do so click on the axis you want to configure,




Then click on the ‘+’ to add a new page and select ‘Wizard’.




The wizard page will guide the user through a series of steps to define the drive behaviour.

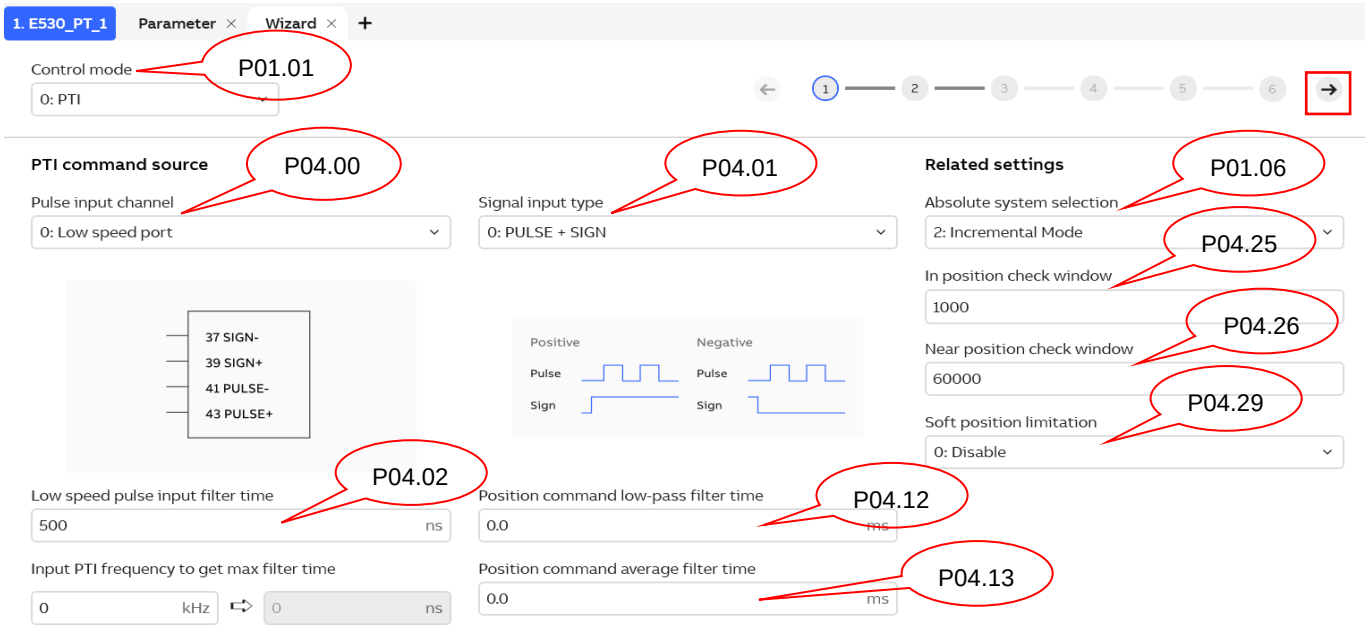
**Note: The screenshots the following pages will also guide the user as to the parameters they are setting**

### 5.1 Setting the Control Mode and related settings

The control mode (set in the top left corner of the first page) is the most fundamental setting and will allow the user to define the capabilities of their drive in each application specifying one or more control modes the drive is capable of.

#### 5.1.1 Parameters quick set in PTI mode

For modes which include PTI the configuration page for PTI will look like this.




**PTI command Source settings**

Here we can see the core settings that will define the behaviour and determination of the command source. These settings include:

- Which hardware will be used (P4.00)
- Which signal type will be used (P4.01)
- Any filtering (P4.02, P4.12 and P4.13)

**Related Settings**

Here we can see the settings that will define the use and interpretation of the position commands and related functions which relate to the position. These settings include

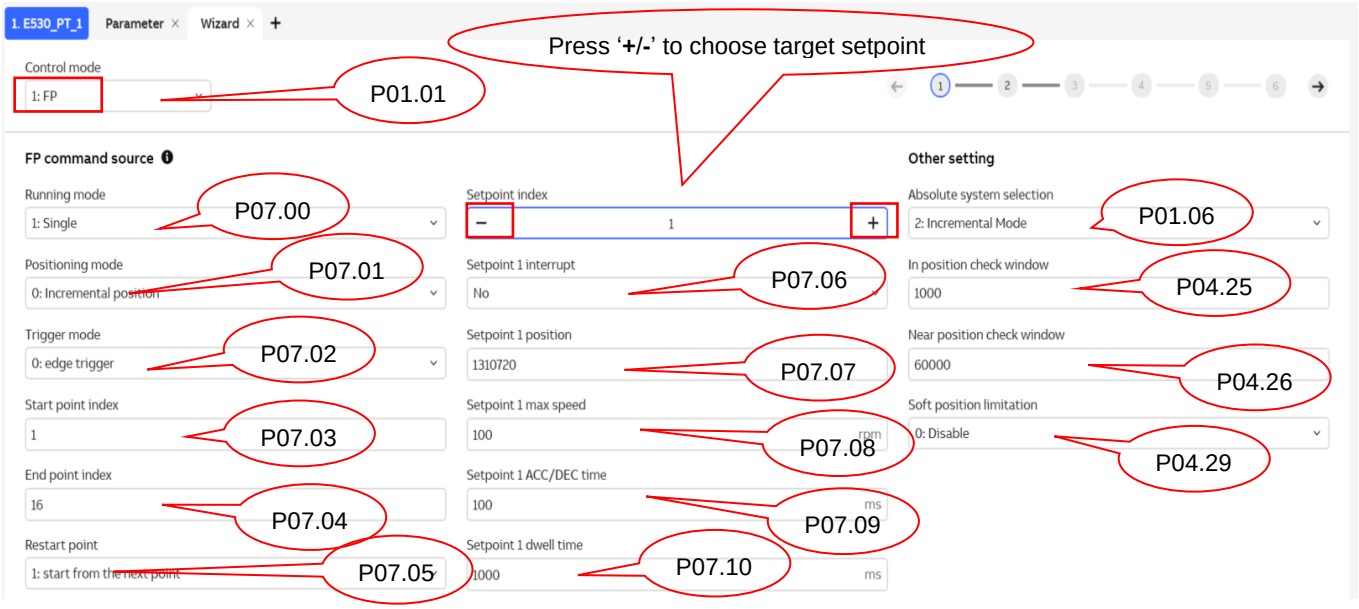
- If an absolute, linear or modulo position is used (P1.06)
- When the drive considers it's at the target position (P4.25)
- When the drive considers it's near the target position (P4.26)
- If Software limits are used (4.29) and what they are (4.30) and (4.31)

Click '→' to next page.

**Note: Next see Section 4.2**

### 5.1.2 Parameters quick set in FP mode

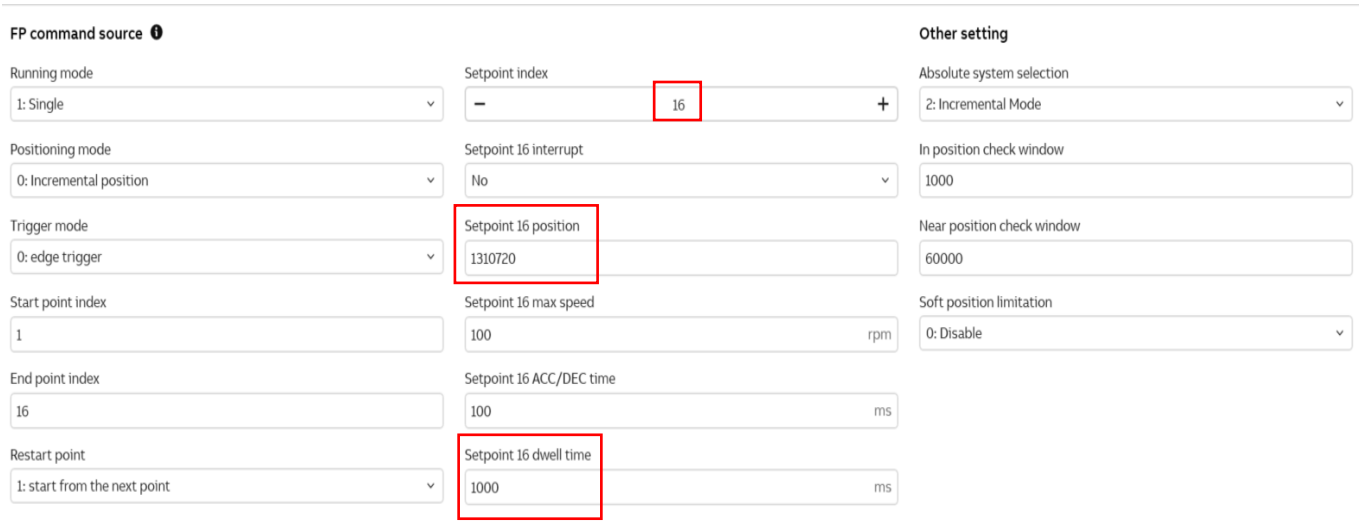
For modes which include Fixed position the configuration page for Fixed Position Settings will look like this.




Behind this there is a 'table' of move profiles which consist of.

- Index
- Position
- Speed
- Accel / Decel time
- Delay Time

The fixed position index table (and parameters) can be filled out one by one by cycling through the Setpoint indexes and changing the parameters in relation to each move

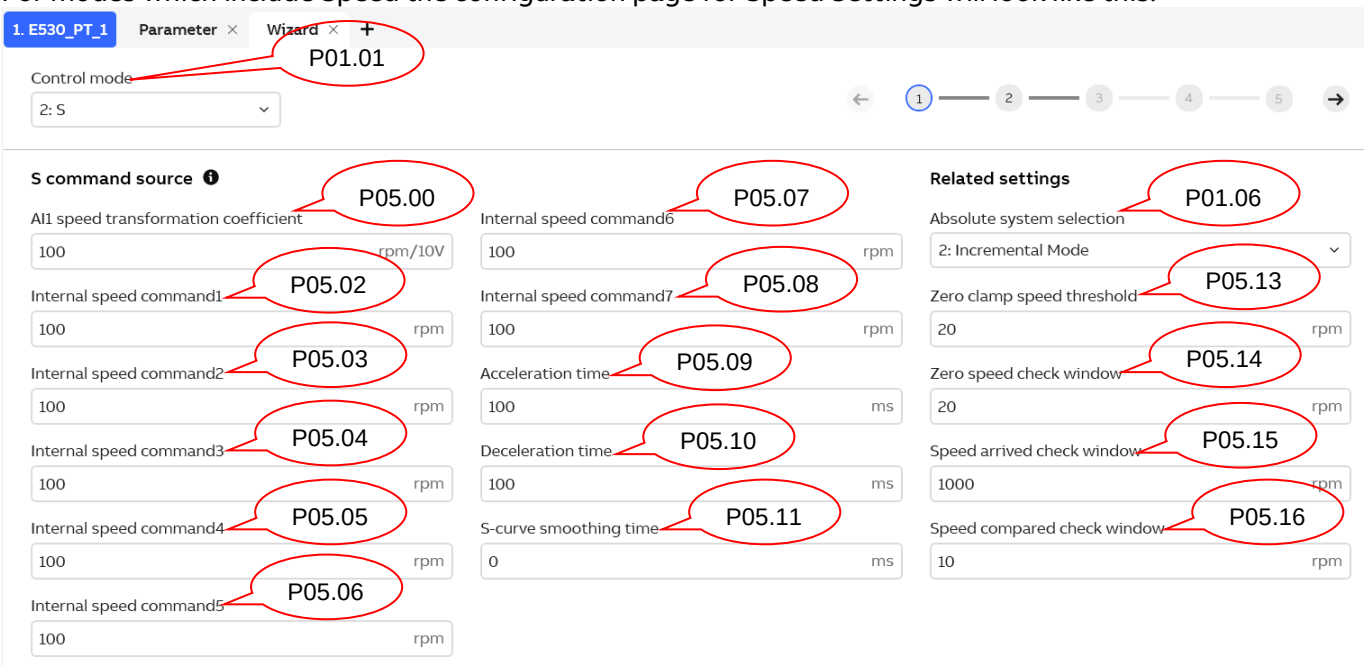



Click '→' to next page.

**Note: Next see Section 4.2**

### 5.1.3 Parameters quick set in S/speed mode

For modes which include Speed the configuration page for Speed Settings will look like this.

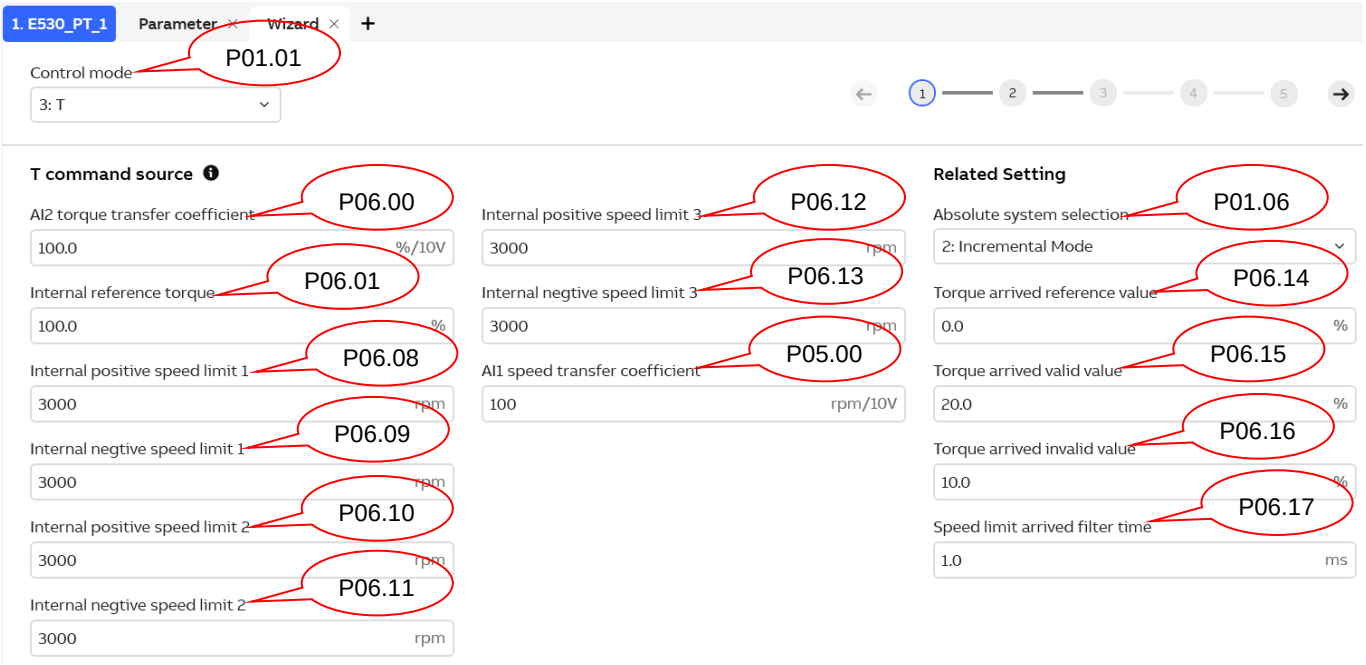



Click '→' to next page.

**Note: Next see Section 4.3**

### 5.1.4 Parameters quick set in T/Torque mode

For modes which include Torque the configuration page for Torque Settings will look like this.

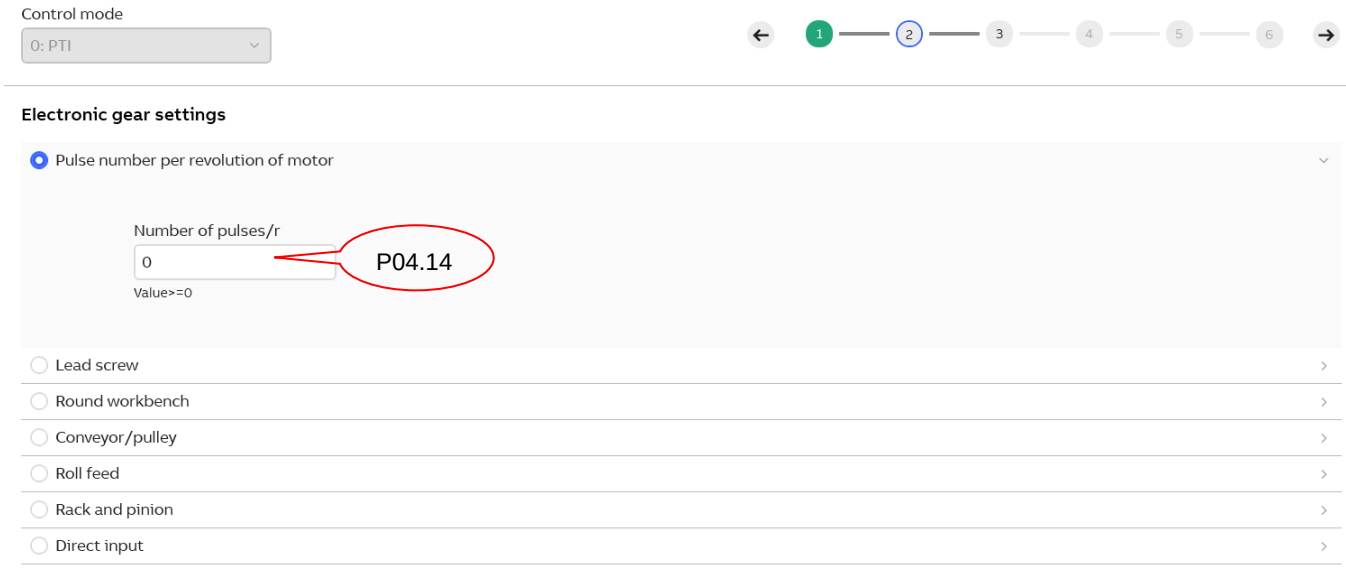



Click '→' to next page.

**Note: Next see Section 4.3**

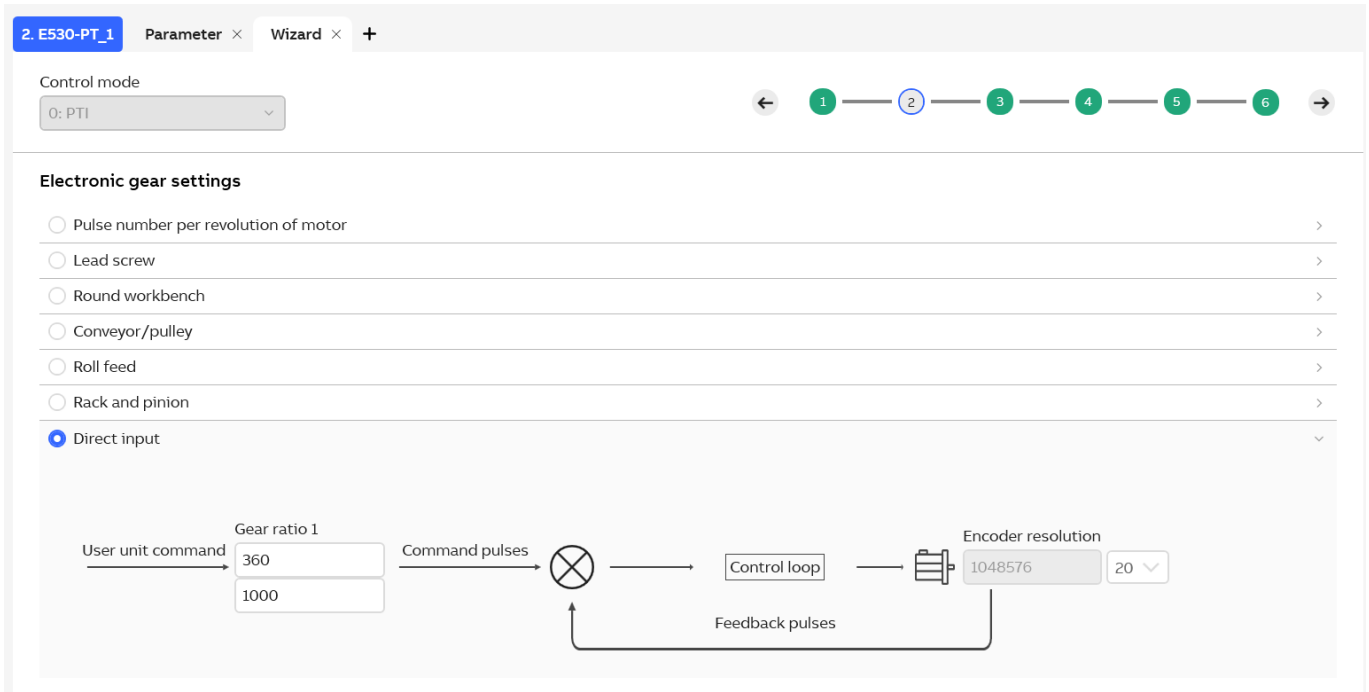
## 5.2 Parameters quick set in 'electronic gear' page

If the user wants a simple input for scaling the relationship between target and actual motion they can use of P04.14. If the value is not 0, the resultant gear ratio = P04.14 / Encoder resolution.




If the user wants to use the 'Direct input' option (or any of the mechanical modes) then they must select this and must ensure that the value of P04.14 is 0.

If this is the case the gear ratio will relate to P04.15 and P04.16. As we can see in the below example these values are embedded into the wizard page.




**Note: this page will only appear in PTI or FP related control modes**

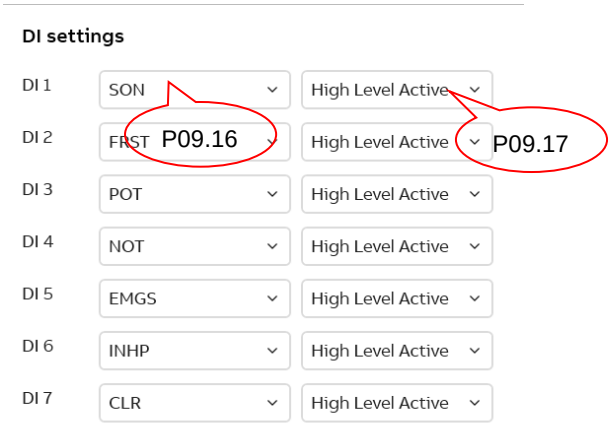
### 5.3 Parameters quick set in 'digital input' page

**'DI settings' section**
Specific example of DI1:
DI1 function selection P09.16 = 1: SON, which will enable the drive when True.
DI1 logic selection P09.17 = 0: High level active, which defines that this input will be considered 'True' when a voltage is present.

The settings for DI2 to DI7 follow the same principle and their parameter numbers are below:
DI function selection: P09.18, P09.20, P09.22, P09.24, P09.26, P09.28
DI logic selection: P09.19, P09.21, P09.23, P09.25, P09.27, P09.29

**Note: DI status can be monitored by P0.04 DI status.**

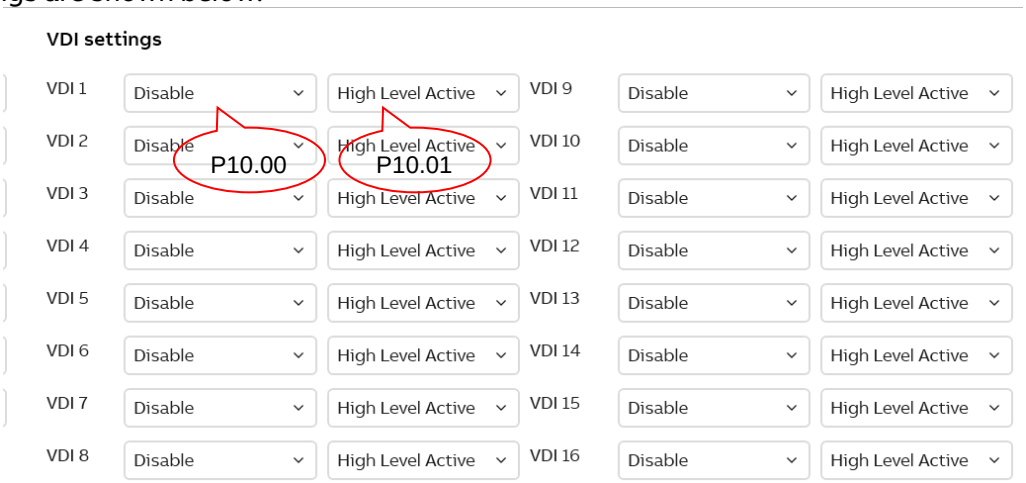
Default Settings are shown below:




**'VDI settings' section**
The settings for VDI1 to VDI16 follow the same principle as DI's. their parameter numbers are below:
VDI function selection: P10.00, P10.02, P10.04 ⋯P10.30
VDI logic selection: P10.01, P10.03, P10.05⋯P10.31

**Note: P10.32 VDI setting status can be used to control VDI status.**

Default Settings are shown below:



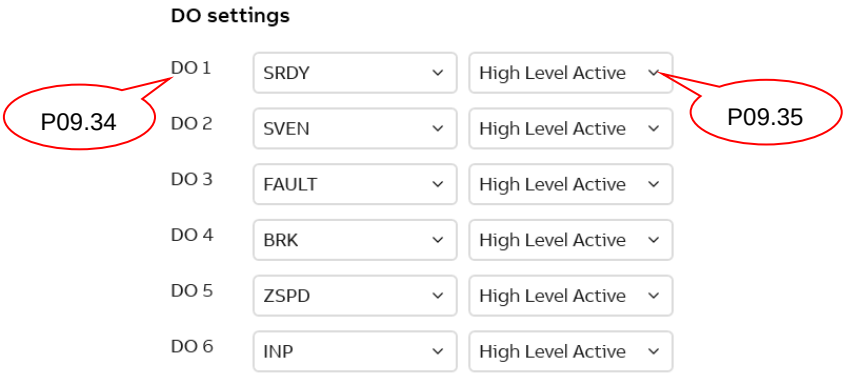

**Note: The priority of digital inputs is higher than VDI. If function select the same, DI will effective.**

### 5.4 Parameters quick set in 'digital output' page

**'DO settings' section:**
Specific example of DO1:
DO1 function selection P09.34 = 1: SRDY, which will enable the drive when True.
DO1 logic selection P09.35 = 0: High level active.

The settings for DO2 to DO7 follow the same principle and their parameter numbers are below:
DO function selection: P09.36, P09.38, P09.40, P09.42, P09.44.
DO logic selection: P09.37, P09.39, P09.41, P09.43, P09.45.

Default Settings are shown below:

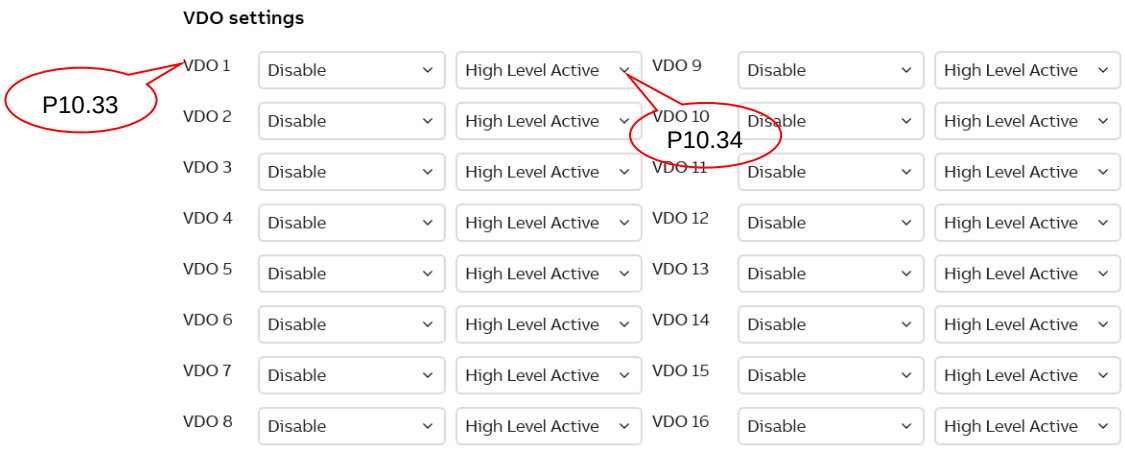



**Note: DO status can be monitored by P0.05 DO status.**

**'VDO settings' section:**
The settings for VDO1 to VDO16 follow the same principle as DI's. their parameter numbers are below:
VDO function selection: P10.33, P10.35, P10.37 ···P10.63
VDO logic selection: P10.34, P10.36, P10.38···P10.64

**Note: P10.65 VDO status can be used to monitor VDO status.**

Default Settings are shown below:

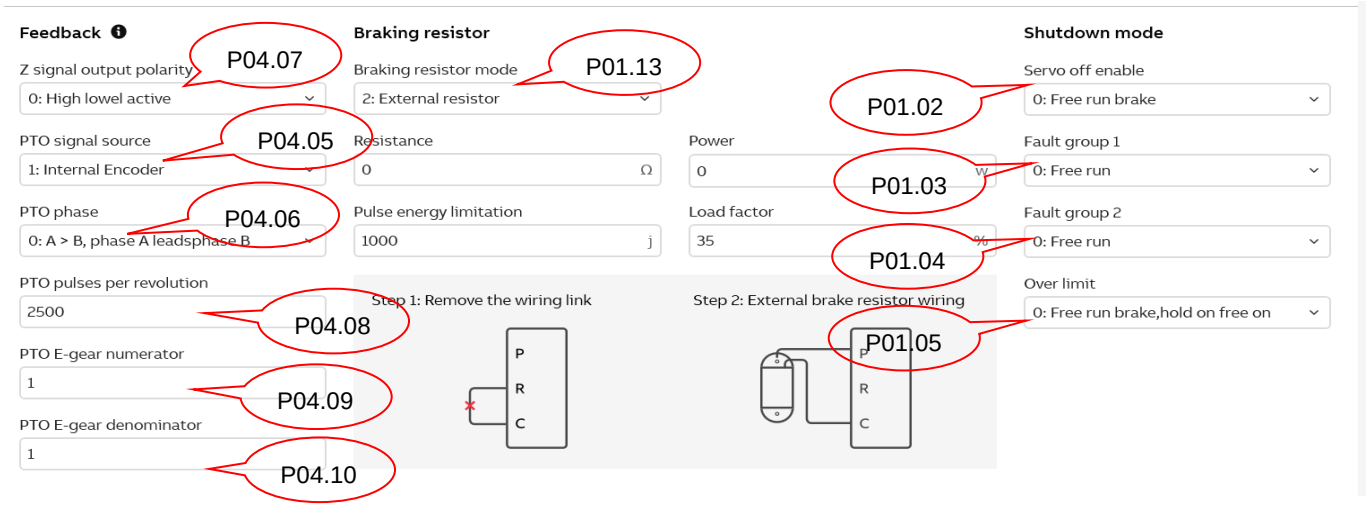



**Note: The priority of DO is high than VDO. If function selection same the same, DO will effective.**

### 5.5 Parameters quick set in 'other setting' page

Here we can see all the other settings relating to behaviours of the drive in relation to:

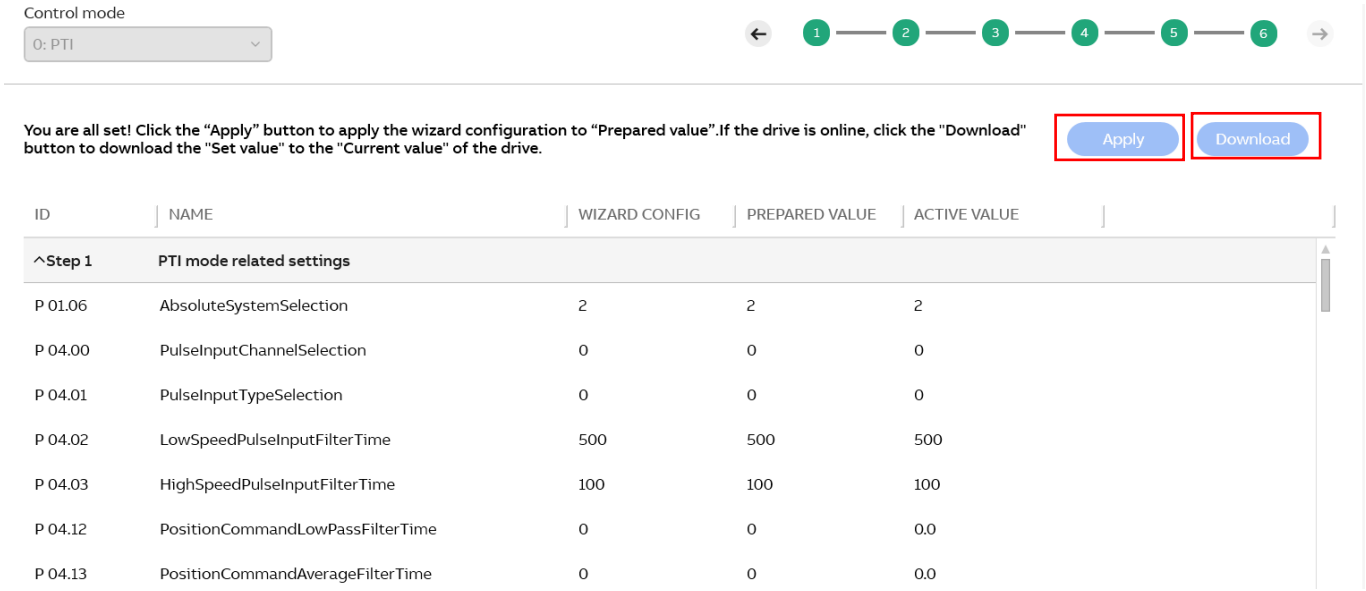
- Z pulse output behaviour
- PTO Output
  - Source
  - Phase (direction)
  - Pulses per Revolution
  - Gearing
- Braking
  - Use and Source of braking
  - Values if using an external resistor
- Shutdown beaviour




These should be set as per the application requirements.

### 5.6 Parameters quick set in 'Wizard summary' and acceptance page

You are all set! Click the "*Apply*" button to apply the wizard configuration to "Prepared value". If the drive is online, click the "Download" button to download the "Set value" to the "Current value" of the drive.




| ID | NAME | WIZARD CONFIG | PREPARED VALUE | ACTIVE VALUE |
|---|---|---|---|---|
| ^Step 1 | PTI mode related settings | | | |
| P 01.06 | AbsoluteSystemSelection | 2 | 2 | 2 |
| P 04.00 | PulseInputChannelSelection | 0 | 0 | 0 |
| P 04.01 | PulseInputTypeSelection | 0 | 0 | 0 |
| P 04.02 | LowSpeedPulseInputFilterTime | 500 | 500 | 500 |
| P 04.03 | HighSpeedPulseInputFilterTime | 100 | 100 | 100 |
| P 04.12 | PositionCommandLowPassFilterTime | 0 | 0 | 0.0 |
| P 04.13 | PositionCommandAverageFilterTime | 0 | 0 | 0.0 |

Perform “Store drive parameters” then “Restart drive” to make all parameters changed effective.

# 6 User Examples for drive settings

## 6.1 Applications using position mode

### 6.1.1 Drive configured in PTI mode

#### 6.1.1.1 Drive running with low-speed input

*In this section, **AC500eco PM5072** is used as the pulse generator.*

*Hardware Configuration as below:*

E530 terminal: 43(PULSE+) connect to PM5072 terminal: 18(DO4).

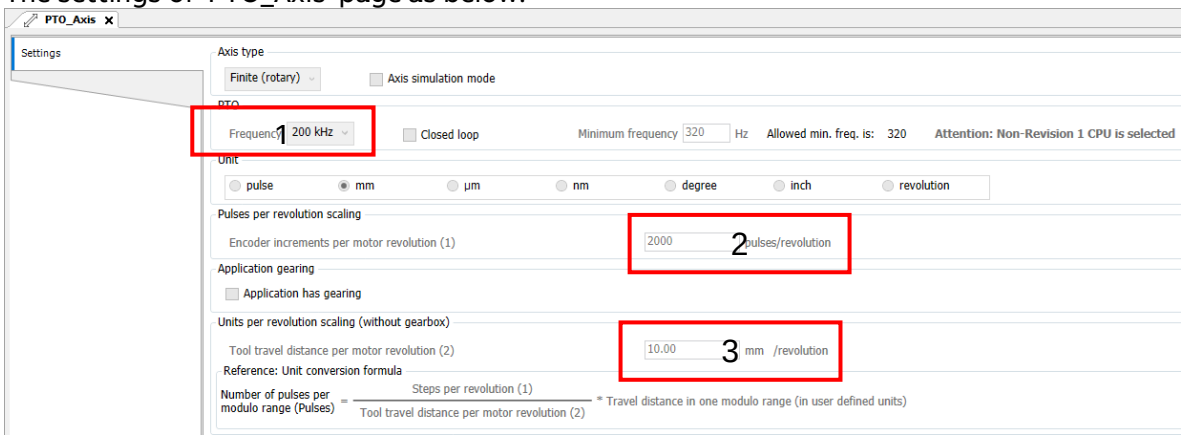
E530 terminal: 41(PULSE-) connect to PM5072 terminal: 25(ZP).

E530 terminal: 39(SIGN+) connect to PM5072 terminal: 19(DO5).

E530 terminal: 37(SIGN-) connect to PM5072 terminal: 25(ZP).

**NOTE: Shielded twisted pair cable used will get better performance. The shielded connects to the grounding of the module.**

The settings of ‘PTO_Axis’ page as below.

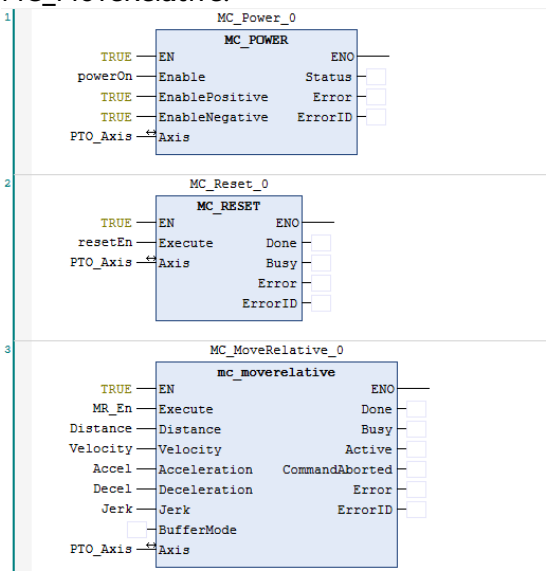



‘PTO_Axis’ page configuration

*Function block used for pulse send:*

MC_Power.

MC_MoveRelative.




*E530 parameters set:*

P01.00 Control mode selection = 0: P(PTI).

P04.00 Pulse input channel selection = 0: Low-speed input port (Max: 200kHz). (This setting corresponds to Graph 'PTO_Axis page configuration' labelled as '1')

P04.01 Pulse input type selection = 0: Pulse + Sign (Positive Polarity).

P04.14 Number of input pulse per resolution = **2000**. (Recommend: set the same value with PLC axis 'PTO_Axis page configuration' settings for increments per revolution labelled as '2').

P09.16 DI1 function selection = 1: SON.

Perform "Store drive parameters" then "Restart drive" to make all parameters changed effective.

*Test this configuration:*

Enable e530: Set DI1 = 1. E530 drive in 'RUN' status.


The PLC will issue a move with this profile:

Distance = 100000 Pulse. Totally pulses send = -1 * 100000 * 2000 / 10 = -20000000 Pulses.

Velocity = 200. Pulses send speed = -1 * 200 * 2000 / 10 = -40000 Pulses/s.

Acceleration = 500. Pulses send acceleration rate = 500 * 2000 / 10 = 100000 Pulses/s/s.

Deceleration = 500. Pulses send deceleration rate = 500 * 2000 / 10 = 100000 Pulses/s/s.

2000 → Graph 'PTO_Axis page configuration' labelled as2.

10 → Graph 'PTO_Axis page configuration' labelled as 3.

Motor will run at -1200 rpm.


Motor speed = 60 * Pulses send speed / P04.14 Number of input pulse per resolution = -1200rpm.

When motor position at about -20000000, the motor will stop running.


Disable drive: Set DI1 = 0. E530 drive in 'RDY' status.

Disable pulse send: Set 'powerOn' and 'MR_En' = 0.

Restart drive to make motor actual position = 0.

Change distance = **-100000**.

Enable e530: Set DI1 = 1. E530 drive in 'RUN' status.

Enable pulse send: Set 'powerOn' and 'MR_En' = 1. Motor running and keep at 1200rpm.


When the motor actual position at about 20000000, the motor will stop running.


Disable dirve: Set DI1 = 0. E530 drive in 'RDY' status.

Disable pulse send: Set 'powerOn' and 'MR_En' = 0.

*The test is now complete.*

#### 6.1.1.2 Drive running with high-speed input

*This test will use master-follower system.*

Two axes configured in this test, one axis as master, another as follower.

These two drives all work in PTI mode. Pulse input of master drive select low-speed input port, the follower selects high-speed input port.

Internal encoder of master drive used as the pulse output source.

Pulse input type of follower select 'A+ B', the frequency of pulse will quadruple frequency multiplication.

*Hardware configuration is below:*

Master terminal: 21(EA+) connect to Follower terminal: 38(HPULSE+).

Master terminal: 22(EA-) connect to Follower terminal: 36(HPULSE-).

Master terminal: 23(EB-) connect to Follower terminal: 40(HSIGN-).

Master terminal: 25(EB+) connect to Follower terminal: 42(HSIGN+).

*Master parameters set:*

P01.00 Control mode selection = 0: P(PTI).

P04.00 Pulse input channel selection = 0: Low-speed input port (Max: 200kHz). (This setting corresponds to Graph 'PTO_Axis' page configures_1)

P04.01 Pulse input type selection = 0: Pulse + Sign (Positive Polarity).

P04.05 Pulse output source selection = 1: Internal Encoder.

P04.08 Number of output pulses per revolution = **10000**.

P04.14 Number of input pulse per resolution = **10000**.

P09.16 DI1 function selection = 1: SON.

Perform "Store drive parameters" then "Restart drive" to make all parameters changed effective.

*Follower parameters set:*

P01.00 Control mode selection = 0: P(PTI).

P04.00 Pulse input channel selection = 1: **High-speed Input Port** (Max. 4MHz).

P04.01 Pulse input type selection = 2: A + B (Positive Polarity).

P04.14 Number of input pulse per resolution = **10000**.

P09.16 DI1 function selection = 1: SON.

*Test this configuration:*

Enable follower: Set DI1 = 1. Follower drive in 'RUN' status.

Enable master: Set DI1 = 1. master drive in 'RUN' status.

The PLC will issue a move with this profile:

Distance = 100000 Pulse.

Velocity = 1000.

Acceleration = 500.

Deceleration = 500.

Master motor run at -1200rpm, follower motor run in -4800rpm.

When the master motor actual position at 20000000, the master motor will stop running. The follower motor also stops, follower actual position is about 80000000.


Disable master and follower dirve: Set DI1 = 0. Drive in 'RDY' status.

Restart drive to make motor actual position = 0.

Disable pulse send: Set 'powerOn' and 'MR_En' = 0.

Change distance to **-100000**.

Enable master and follower drive: Set DI1 = 1. Drive in 'RUN' status.

Enable pulse send: Set 'powerOn' and 'MR_En' = 1.

Master motor running and keep at 1200rpm. Follower motor running and keep in 4800rpm.

Masterdrive:


Follower drive:


When the motor actual position at about 20000000, the master and follower motor will stop running.


The following actual position is about 80000000.


Disable master and follower dirve: Set DI1 = 0. Drive in 'RDY' status.

Disable pulse send: Set 'powerOn' and 'MR_En' = 0.

*The test is now complete.*

### 6.1.2 Drive configured in FP mode

This section will present:

1) FP running with step mode
2) FP running with single mode
3) 'CTRG' signal operation

#### 6.1.2.1 FP runs in step mode

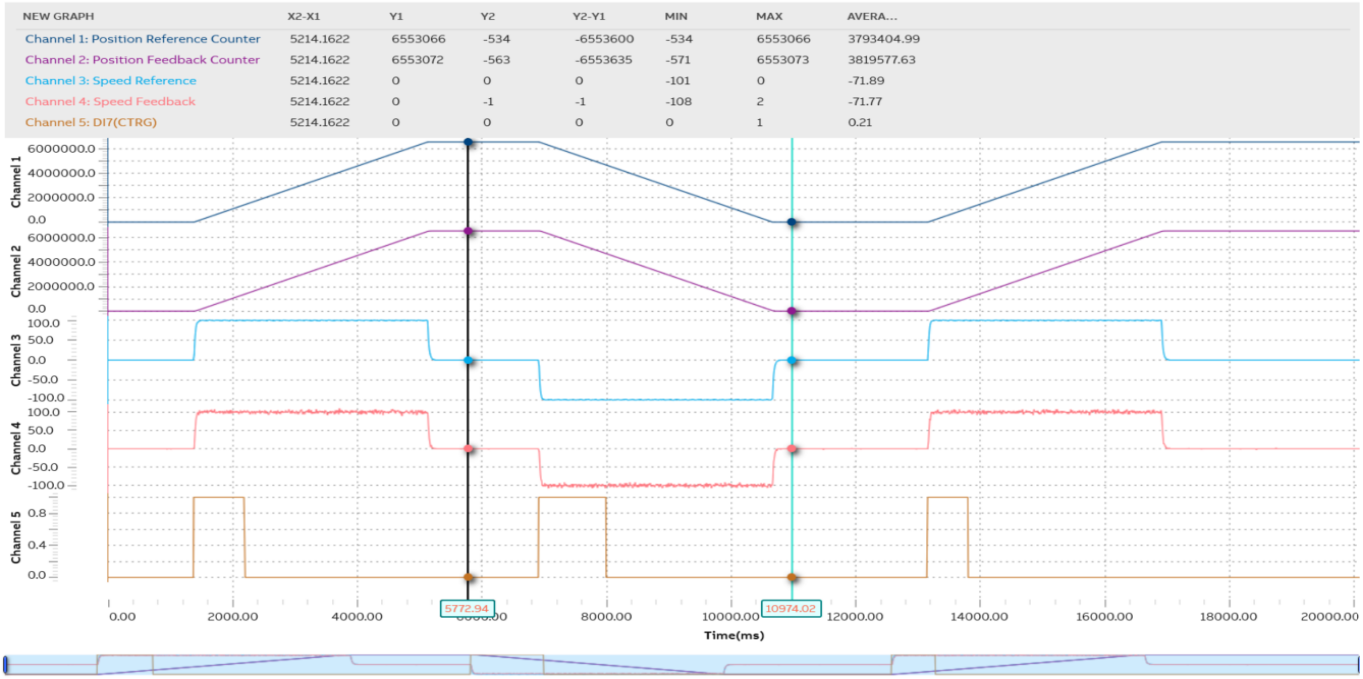
*Here we will use digital inputs to issue position commands in a step-by-step process*

*E530 parameters set:*

P01.00 Control mode selection = 1: P (FP mode)
P07.00 FP running mode selection = 0: Step.
P7.07 FP set point1 position = 13107200.
P7.10 FP set point1 delay time = 1000.
P7.11 FP set point2 position = -13107200.
P7.14 FP set point2 delay time = 1000.
P7.15 FP set point3 position = -13107200.
P7.18 FP set point3 delay time = 1000.
P04.15 Electronic gear ratio denominator = 2.
P04.16 Electronic gear ratio numerator = 1.
P09.16 DI1 function selection = 1: SON.
P09.28 DI7 function selection = 33: CTRG.
Perform "Store drive parameters" then "Restart drive" to make all parameters changed effective.

*Test this configuration:*

Enable drive: Set DI1 = 1. Drive status changed to 'RUN.'
Enable FP setpoint 1: Set DI7 = 1. Motor position increment to position setpoint 1, motor speed is 100rpm.
Disable DI7: Set DI7 = 0.
Enable FP setpoint 2: Set DI7 = 1. Motor position increment to position setpoint 2, motor speed is 100rpm.
Disable DI7: Set DI7 = 0.
Enable FP setpoint 1: Set DI7 = 1. Motor position increment to position setpoint 3, motor speed is 100rpm.
Disable DI7: Set DI7 = 0.




In every setpoint movement, the position counter is equal to half setpoint (due to the gearing).
Every setpoint run needs 'CTRG'(DI7) signal (as P07.00 FP running mode selection = Step)
One setpoint is finished, it should wait for 1S (FP set point delay time) then next setpoint can be effective.

#### 6.1.2.2 FP runs in single mode

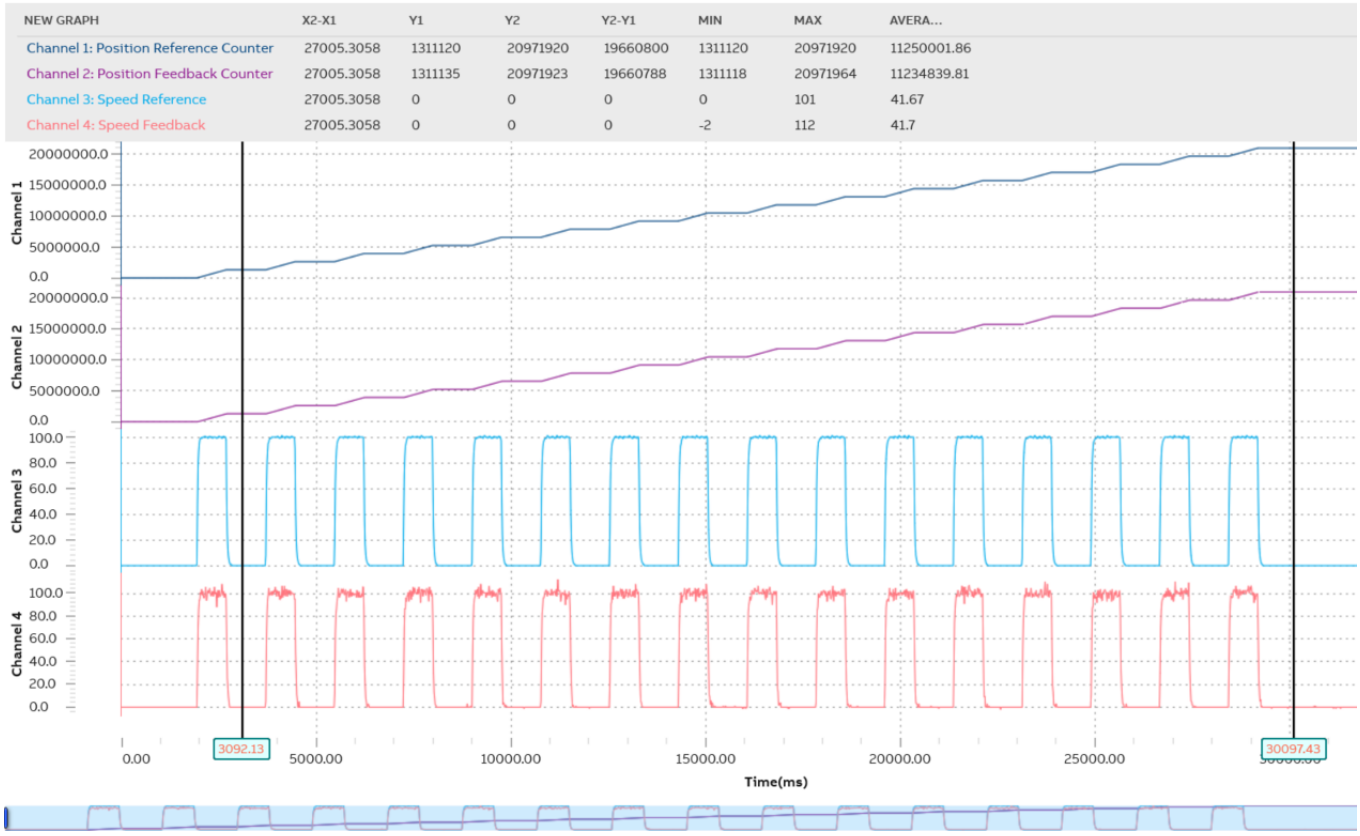
*Here we will use digital inputs to issue position commands in a single cycle process*

*E530 parameters set:*

P01.00 Control mode selection = 1: P (FP mode)
P07.00 FP running mode selection = 1: Single.
P07.03 FP start point index = 1.
P07.04 FP end point index = 16.
P7.07 FP set point1 position = 1310720.
P7.11 FP set point2 position = 1310720.
…
P7.67 FP set point16 position = 1310720.
P04.15 Electronic gear ratio denominator = 1.
P04.16 Electronic gear ratio numerator = 1.
P09.16 DI1 function selection = 1: SON.
P09.28 DI7 function selection = 33: CTRG.
P09.28 DI7 Logic selection = 0: High level.

Perform “Store drive parameters” then “Restart drive” to make all parameters changed effective.

*Test this configuration:*
Enable drive: Set DI1 = 1.
Enable FP: Set DI7 =1.




We can see from the graph that as the configuration of
Disable FP and drive: Set DI1 & DI7 = 0.

*The test is now complete.*

## 6.2 Applications using speed mode

This section will present:

1) Run drive with different speed command sources AI and internal.
2) Run motor in reverse direction via DI.
3) How SARR works.

### 6.2.1 Speed command source from internal speed command

*Here we will use digital inputs to Run the motor in the default direction*

*E530 parameters set:*

P01.00 Control mode selection = 2: S (Speed mode)

P05.02 Internal speed command1 = 1000.

P05.09 Acceleration time of speed command = 150.

P05.15 Speed reached signal limit = 1000rpm.

P09.16 DI1 function selection = 1: SON.

P09.21 DI3 function selection = 14: SPD1.

P09.23 DI4 function selection = 15: SPD2.

P09.25 DI5 function selection = 16: SPD3.

P09.40 DO4 function selection = 10: SARR.

Perform “Store drive parameters” then “Restart drive” to make all parameters changed effective.

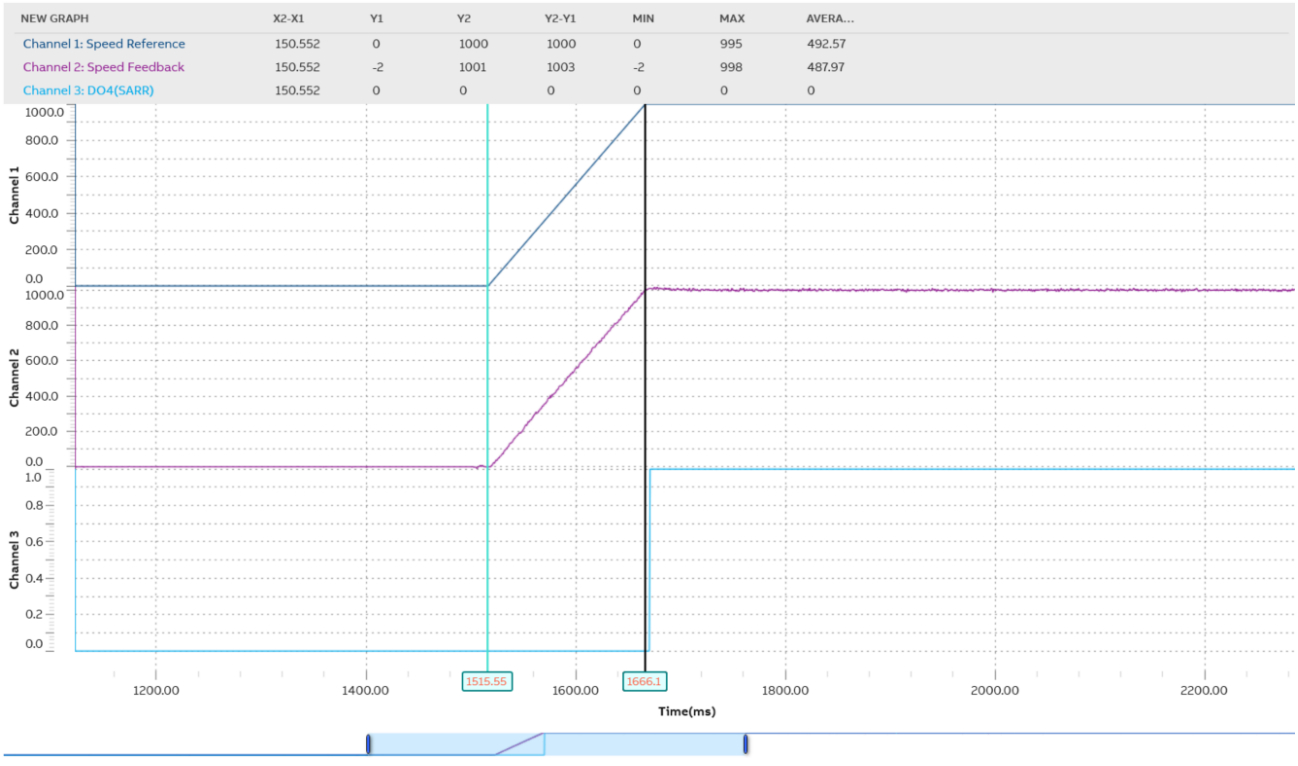
*Test this configuration:*

Enable the internal speed command 1 by setting DI3 = True.

Enable drive: Set DI1 = 1.

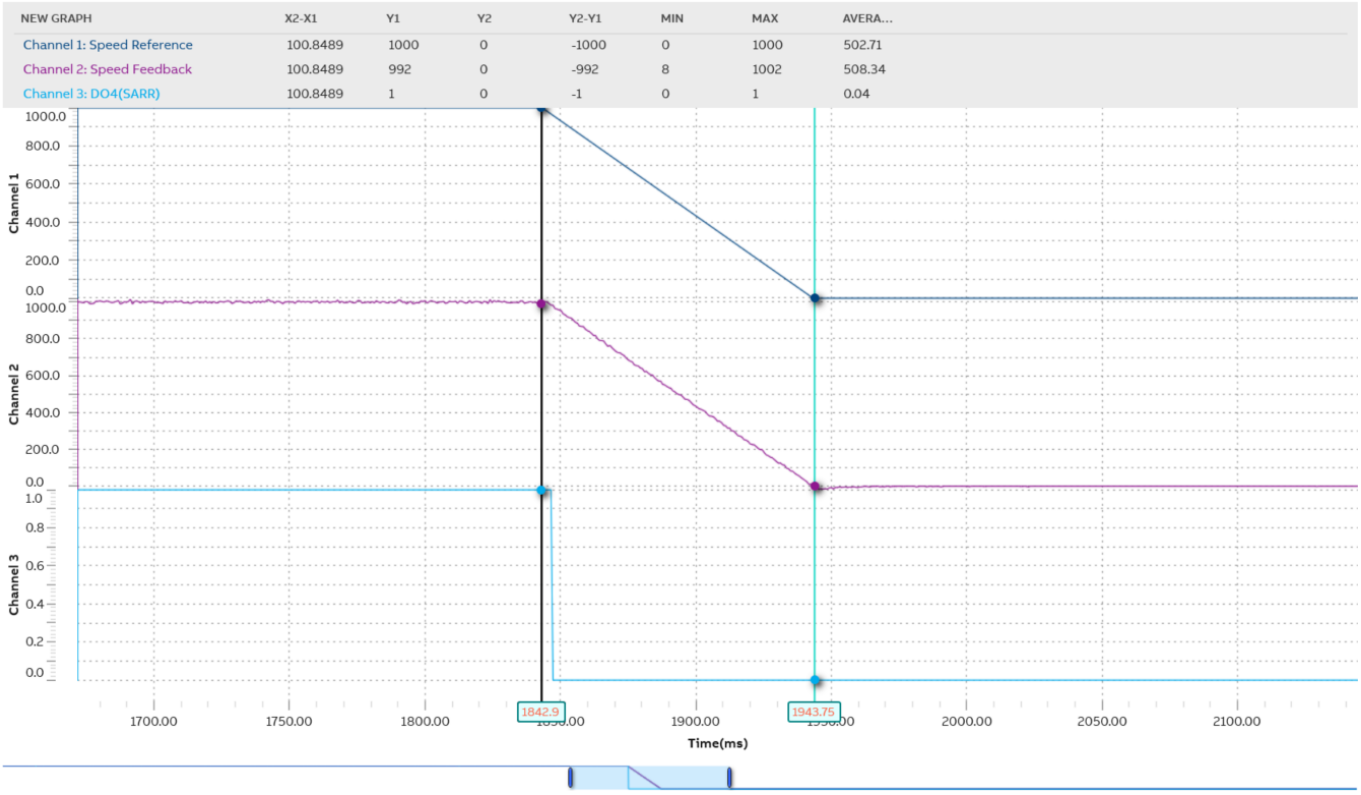
The drive status should change to ‘RUN’ and motor will speed up to 1000rpm, ramp up time is about150ms.

DO4 SARR = 1 after the motor speed arrives at 1000rpm.



Disable the internal speed command 1 by setting DI3 = False. The Drive will now revert to AI1 control which should be ‘0’ or thereabouts.

The Motor will speed down from 1000rpm to 0rpm, with a ramp down time is about 100ms.
DO4(SARR) = 0 after the motor speed is less than 1000rpm.




Other tests:
Set DI3 = 0, DI4 = 1, DI5 = 0, internal speed command2 will work.
Set DI3 = 1, DI4 = 1, DI5 = 0, internal speed command3 will work.
Set DI3 = 0, DI4 = 0, DI5 = 1, internal speed command4 will work.
Set DI3 = 1, DI4 = 0, DI5 = 1, internal speed command5 will work.
Set DI3 = 0, DI4 = 1, DI5 = 1, internal speed command6 will work.
Set DI3 = 1, DI4 = 1, DI5 = 1, internal speed command7 will work.

Disable the drive: Set DI1 = 0. Drive status changed to ‘SRDY’.

*The test is now complete.*

### 6.2.2 Speed command source from AI1

*Here we will use digital inputs to Run motor with AI1 in default direction*

*E530 parameters set:*

P05.00 AI1 speed transformation coefficient = 3000 (rpm/10v).

P05.15 Speed reached signal limit = 1000rpm.

P09.16 DI1 function selection = 1: SON.

P09.21 DI3 function selection = 14: SPD1*

P09.23 DI4 function selection = 15: SPD2*

P09.25 DI5 function selection = 16: SPD3*

P09.40 DO4 function selection = 10: SARR

**Note: *Setting these inputs to SPDx is not needed if only analog control is needed**

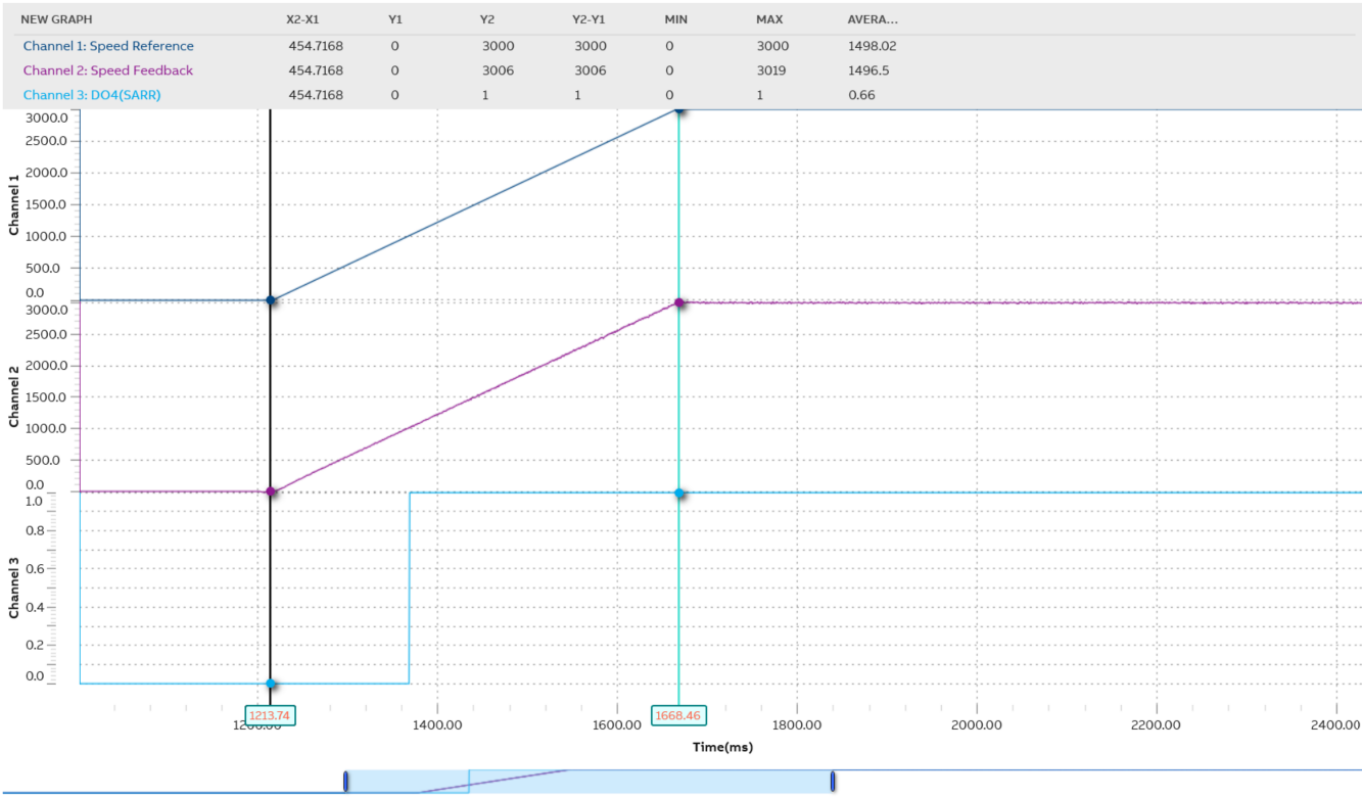
*Test this configuration:*

Enable AI1 as speed command source by setting DI3 & DI4 & DI5 = 0

Turn Analog input all the way up to +10v input.

Enable drive: Set DI1 = 1. Drive status changed to 'RUN' and motor speed up to 3000rpm, ramp up time is about 150ms.

DO4(SARR) = 1 after the motor speed arrives at 1000rpm.

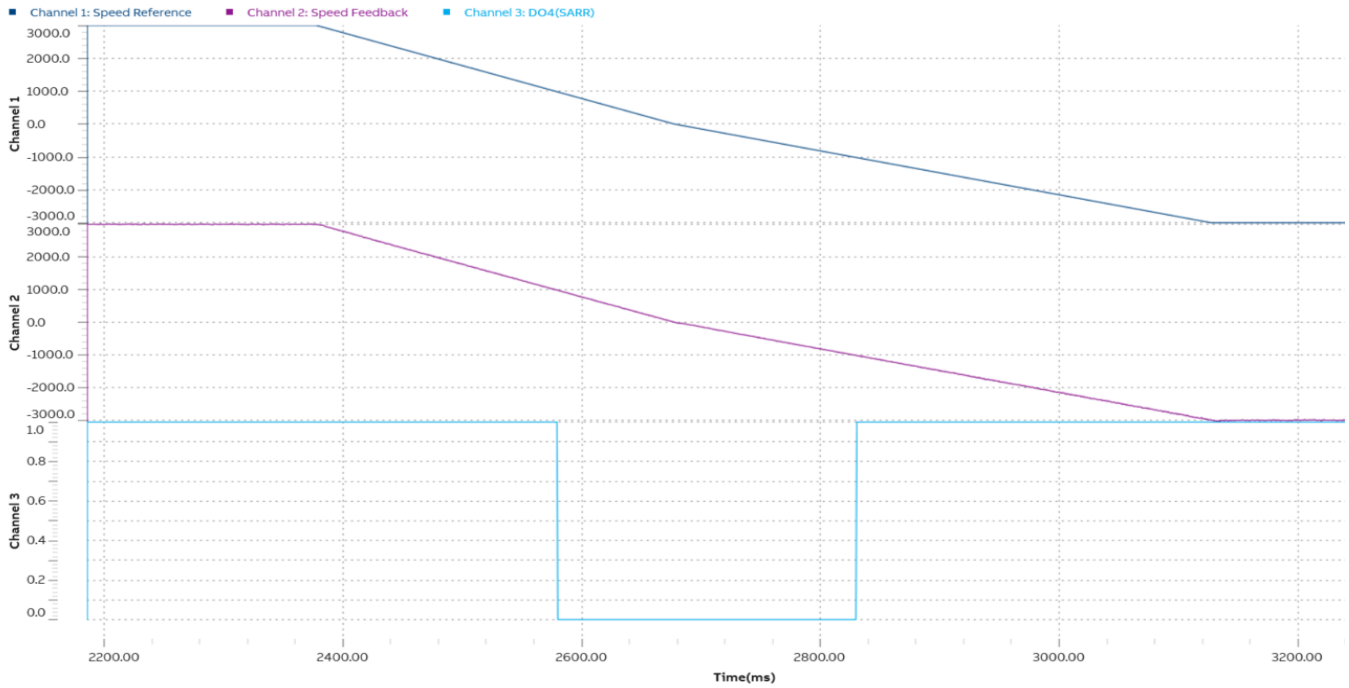



Next we can test it in reverse direction.

Set AI1 = -10V.

Motor will run to -3000rpm following the set ramp time setting.

DO4(SARR) = 1 if motor speed absolute value >= 1000rpm, otherwise DO4(SARR) = 0.




Disable drive: Set DI1 = 0. Drive status changed to 'RDY'.

*The test is now complete.*

### 6.2.3 Speed command inversion / running in reverse direction

*Here we will use digital inputs to Run motor with AI1 in default direction*

*E530 parameters set:*

P05.00 AI1 Speed Transformation Coefficient = 3000 (rpm/10v).

P05.15 Speed Reached signal limit = 1000rpm.

P09.16 DI1 function selection = 1: SON.

P09.26 DI6 function selection = 17: SDIR (speed control mode rotating direction).

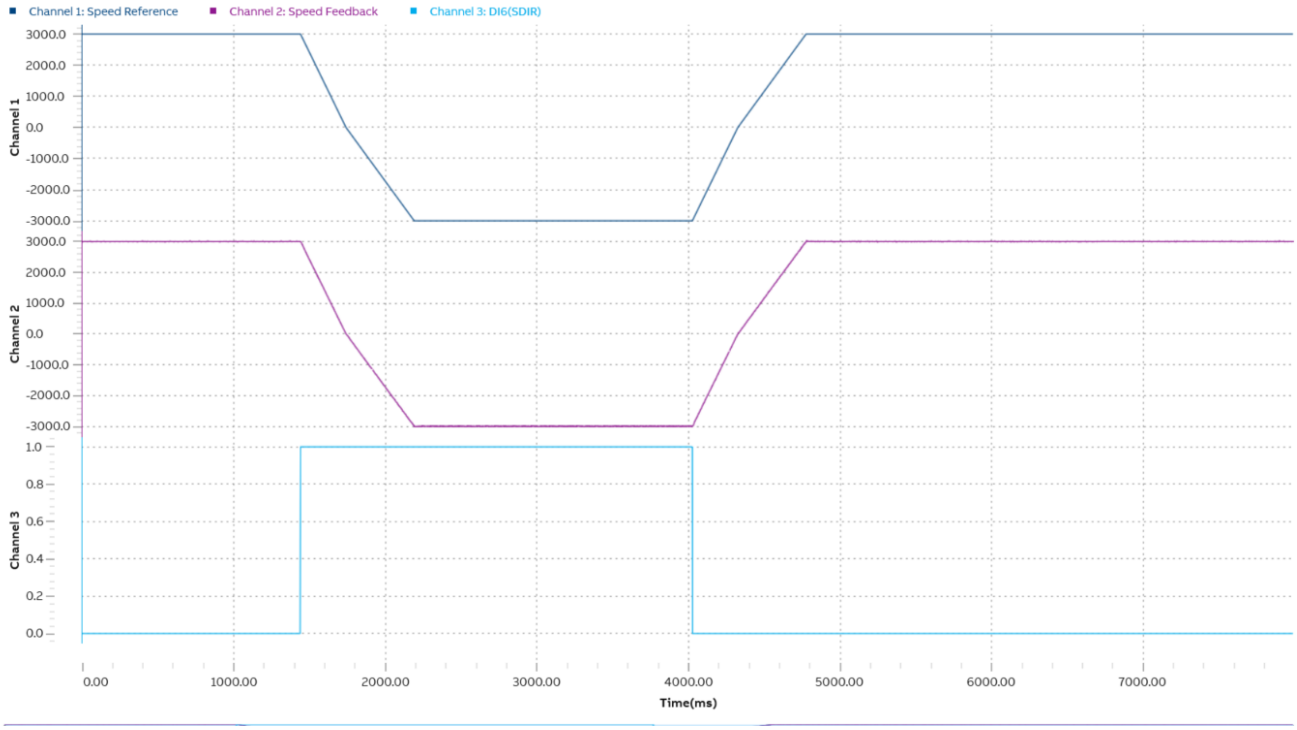
*Test this configuration:*

Set AI1 = 10V then enable drive.

Drive status changed to 'RUN' and motor speed up to 3000rpm.

Set DI6 = 1. The motor will change direction and run to -3000rpm.

Set DI6 = 0. The motor will change direction and run to 3000rpm.




Disable drive: Set DI1 = 0. Drive status changed to ‘RDY’.

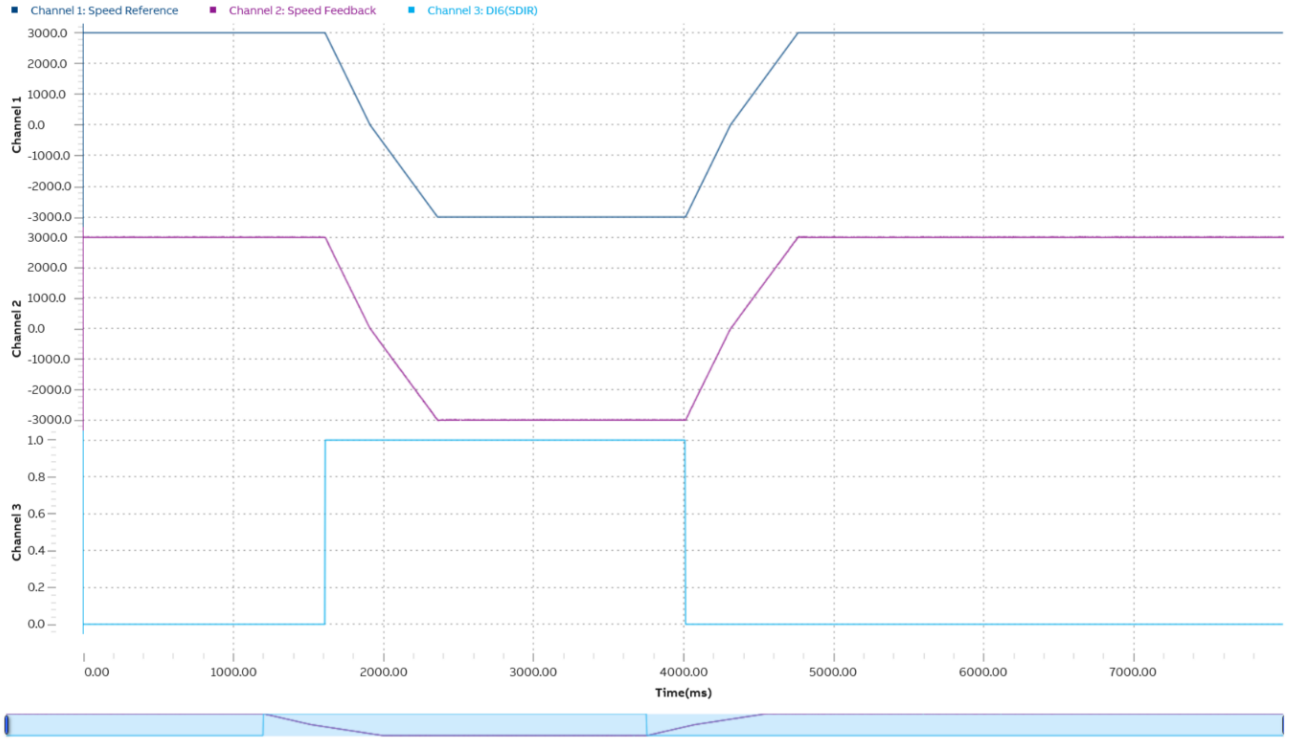
*Here we will use digital inputs to Run motor in reverse direction*

Enable internal speed command 1: Set DI3 &DI4 = 1.

Enable drive: Set DI1 = 1. The drive status changed to ‘RUN’ and motor speed up to 3000rpm, ramp up time is about 450ms. SARR = 1 after the motor speed arrives at 1000rpm.

Set DI6 = 1. The motor will change direction and run to -3000rpm.

Set DI6 = 0. The motor will change direction and run to 3000rpm.




Disable drive: Set DI1 = 0. Drive status changed to ‘RDY’.

Set DI3&DI4 = 0.

### 6.3 Application using torque mode

This section will present:

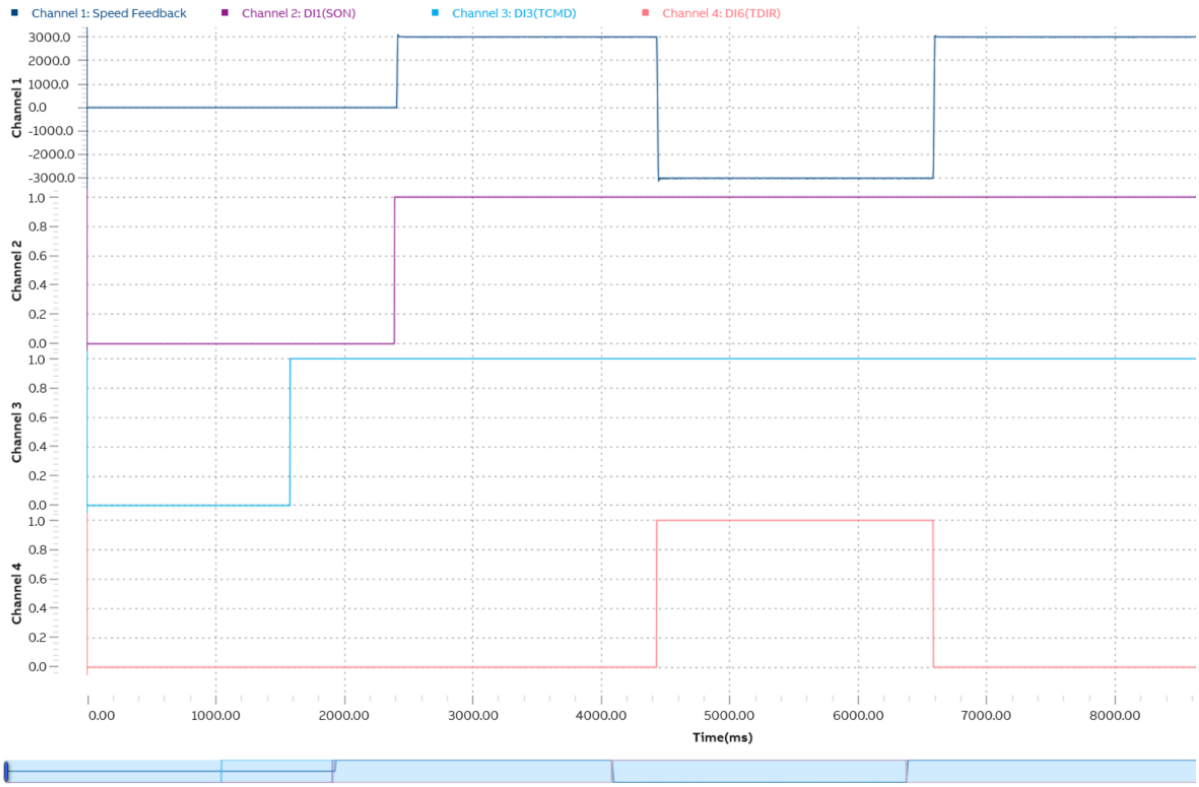
1) Run drive with different torque command sources AI and internal.
2) Run motor in reverse direction via DI.

#### 6.3.1 Torque command source from internal target torque value

*Here we will use digital inputs to Run the motor*

*E530 parameters set:*
P01.00 Control mode selection = 3: T (Torque mode)
P06.01 Internal target torque value = 30 (%).
P06.08 Internal positive speed limit1 = 3000 (rpm).
P06.09 Internal negative speed limit1 = 3000 (rpm).
P09.16 DI1 function selection = 1: SON.
P09.21 DI3 function selection = 19: TCMD (Torque command source selection).
P09.26 DI6 function selection = 20: TDIR (Torque command direction selection in torque mode).
Perform “Store drive parameters” then “Restart drive” to make all parameters changed effective.

*Test this configuration:*
Enable the internal target torque value by setting DI3 = True.
Enable drive: Set DI1 = 1.
The driver’s status should change to ‘RUN’ and the motor will speed up then keep in 3000rpm.
After motor running stable, set DI6 = True.
Motor reverse to -3000rpm immediately after DI6 = True.
After motor running stable, set DI6 = False.
Motor reversed to 3000rpm immediately after DI6 = False.




Disable drive by set DI1 = False.
The driver’s status should change to ‘RDY’
Set DI3 = False.

### 6.3.2 Torque command source from AI2

*Here we will use digital inputs to Run motor with AI2*

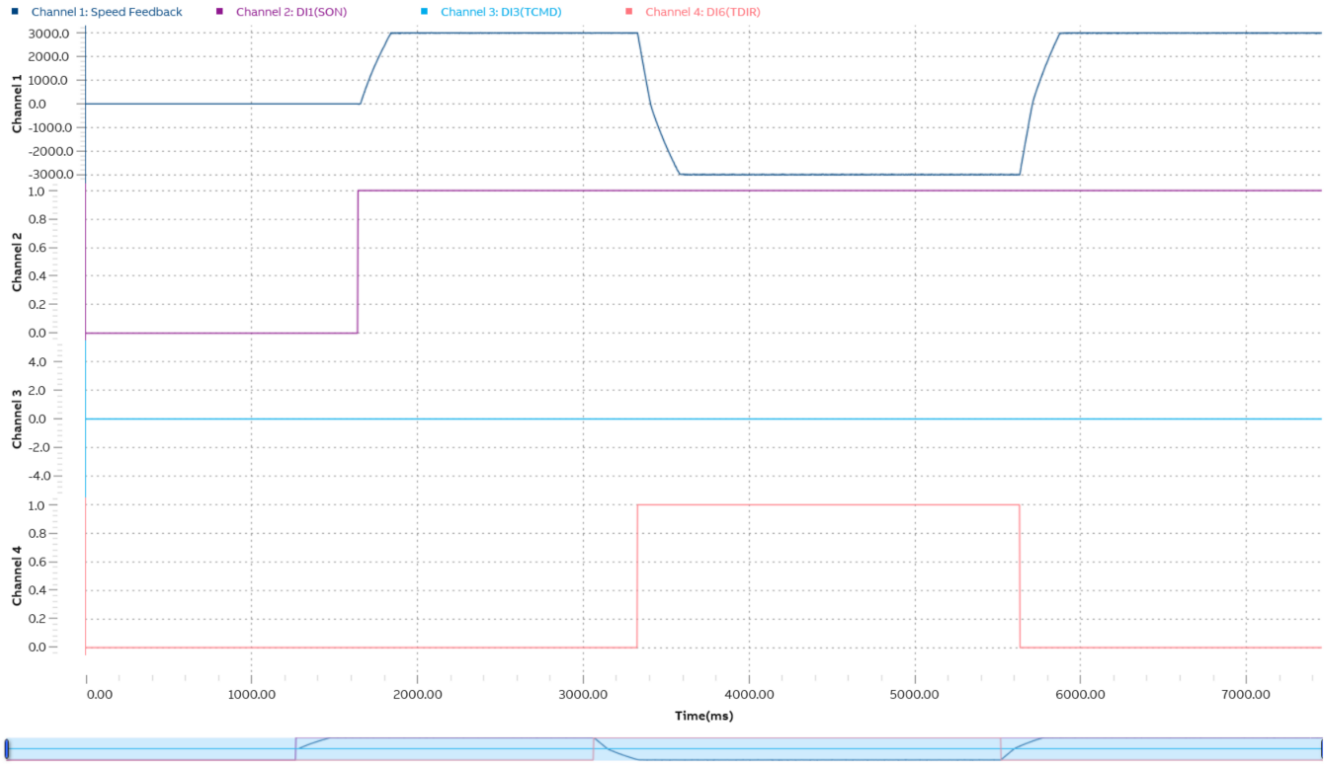
*E530 parameters set:*
P01.00 Control mode selection = 3: T (Torque mode)
P06.00 AI2 torque transformation coefficient = 100.
P06.01 Internal target torque value = 0 (%).
P06.08 Internal positive speed limit1 = 3000 (rpm).
P06.09 Internal negative speed limit1 = 3000 (rpm).
P09.16 DI1 function selection = 1: SON.
P09.21 DI3 function selection = 19: TCMD (Torque command source selection).
P09.26 DI6 function selection = 20: TDIR (Torque command direction selection in torque mode).

Perform “Store drive parameters” then “Restart drive” to make all parameters changed effective.

*Test this configuration:*
Enable AI2 as the source in torque control mode by setting DI3 = False.
Turn Analog input all the way up to +2v input.
Enable drive: Set DI1 = 1.
The driver’s status should change to ‘RUN’ and the motor will speed up then keep in 3000rpm.
P0.03 Target torque = 20%.

| ID | NAME | PREPARED VALUE | ACTIVE VALUE | UNIT |
|---|---|---|---|---|
| dP 003 | TargetTorque | - | 20.0 | % |

After motor running stable, set DI6 = True.
Motor reverse to -3000rpm immediately after DI6 = True.
After motor running stable, set DI6 = False.
Motor reversed to 3000rpm immediately after DI6 = False.




Disable drive by set DI1 = False.
The driver’s status should change to ‘RDY’

### 6.4 Applications using jog mode

This section will present:

1) Using Jog command to control the drive via DIs

#### 6.4.1 DI control jog

DI functions selection should be configured in this method.

DI function selection effective mode is **power cycle**, so perform “Store drive parameters” then “Restart drive” is necessary after DI function selection changed.

**Note: Please be aware that Jog has its own enable input function and will not work if the drive is enabled from standard enable**

*E530 parameters set:*

P05.01 Jog speed = 3000.

P05.09 Acceleration time of speed command = 1000.

P05.10 Deceleration time of speed command = 500.

P09.16 DI1 function selection = 8: JOGEN (Jog Enable)

P09.18 DI2 function selection = 6: JOGP (Jog in Positive Direction)

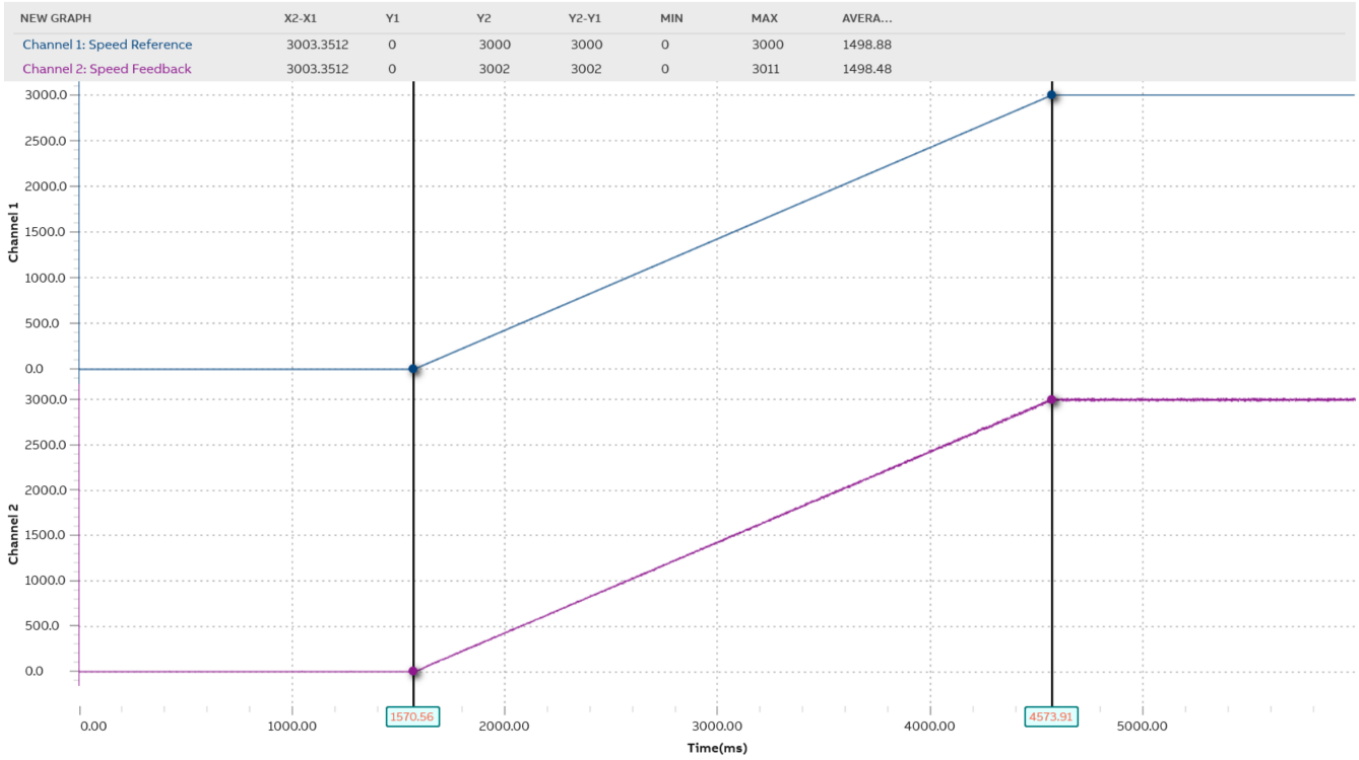
P09.20 DI3 function selection = 7: JOGN (Jog in Negative Direction)

Perform “Store drive parameters” then “Restart drive”

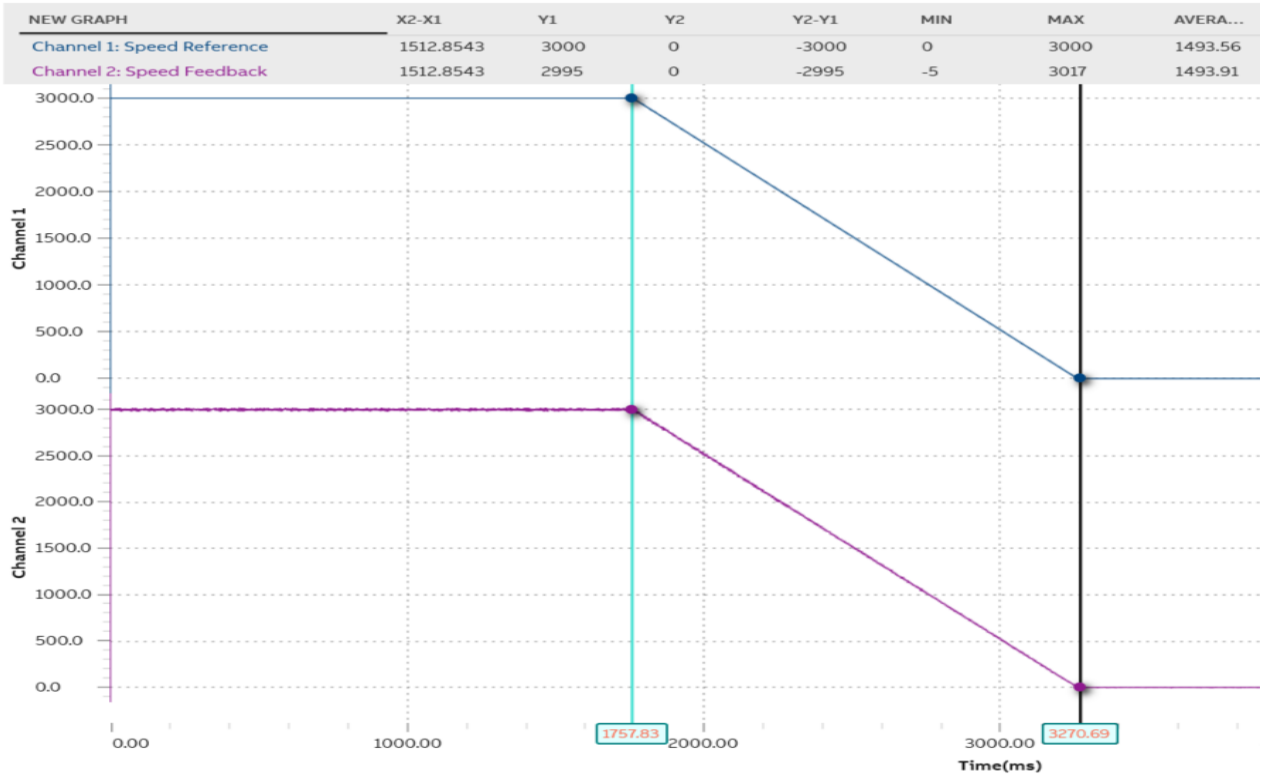
*Test this configuration running jog mode in positive direction:*

Set DI1 = 1, drive status change to Enabled.

Set DI2 = 1, motor run from 0 to 3000rpm about 3s.



Set DI2 = 0, motor run from 3000rpm to 0rpm about 1.5s.

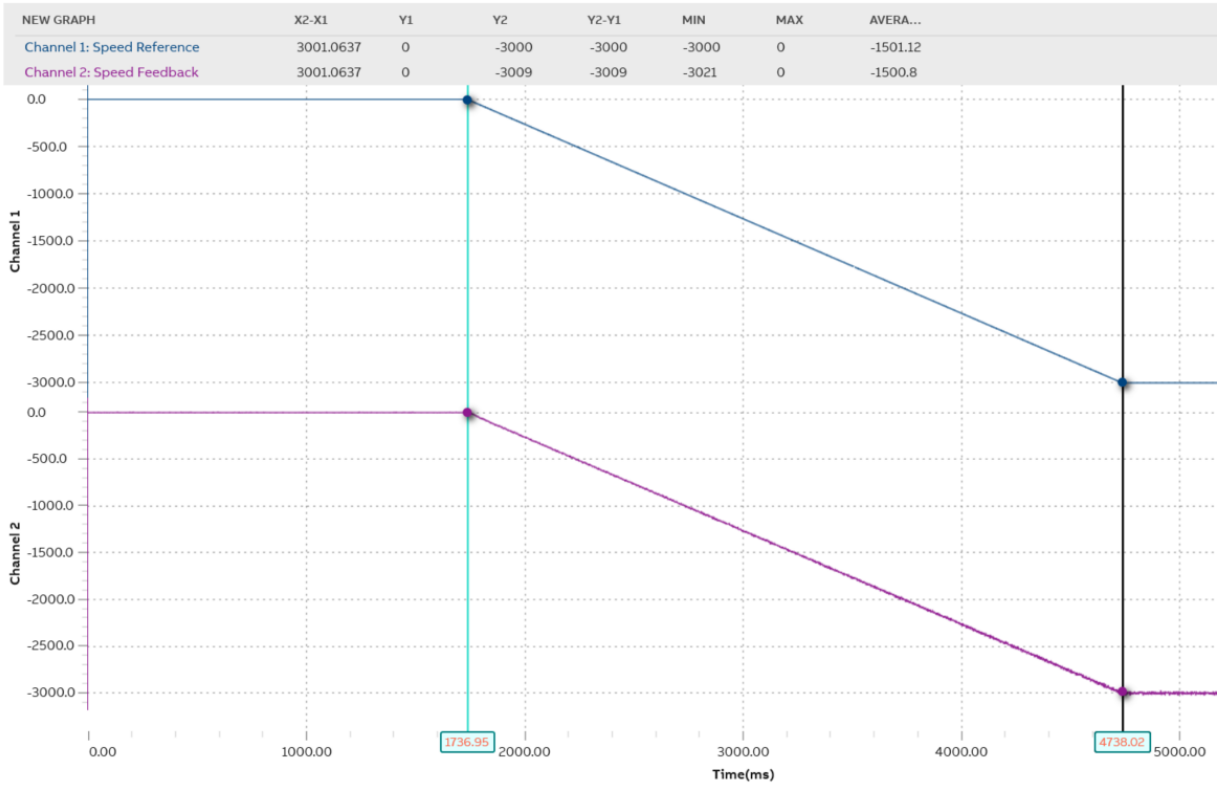



Set DI1 = 0, drive status change from enabled to ready.

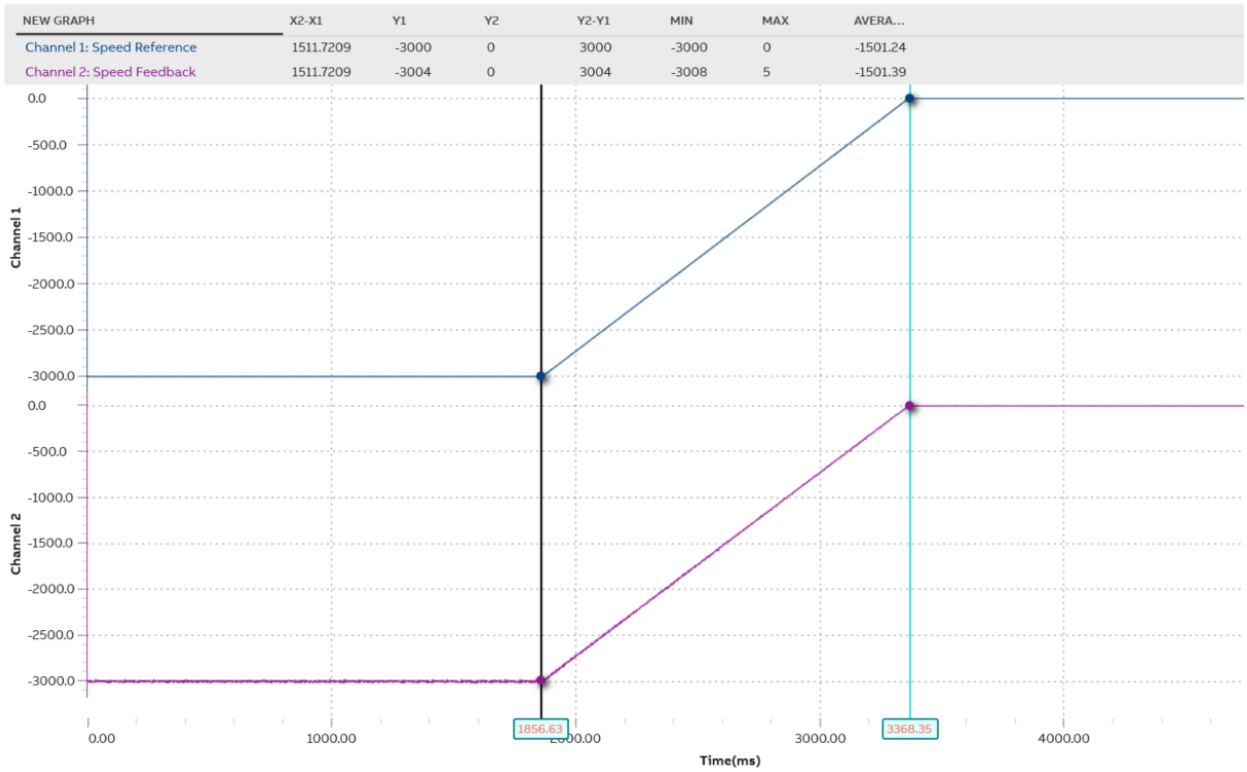
*Test this configuration running jog mode in negative direction:*

Set DI1 = 1, drive status change to enable.

Set DI3 = 1, motor run from 0 to -3000rpm about 3s.



Set DI2 = 0, motor run from -3000 to 0 about 1.5s.




Set DI1 = 0, drive status change from enable to ready.

*The test is now complete.*

**Contact us**

For more information, please contact your local ABB representative or one of the following:

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**new.abb.com/drives**
**new.abb.com/drivespartners**
**new.abb.com/PLC**