I/O SET UP GUIDE

Riccardo Piccinini
Mini Motor S.P.A.

FBS-IO-EN

Firmware Revision: 5.004

Version 3, 09-2026

Table of Contents

1. Setup - Connections . . . **2**
- 1.1. Electric Connections . . . 2
- 1.2. Power Supply Connector CN1 - DBS 55 . . . 3
- 1.3. Power Supply Connector CN1 - DBS 80 . . . 3
- 1.4. I/O Connector CN2 . . . 5
- 1.5. USB service connector CN4 . . . 6
- 1.6. Protective Device Installation . . . 7
- 1.7. USB connection troubleshooting . . . 7

2. Parametrization Interface . . . **8**
- 2.1. Software Installation . . . 8
- 2.2. Software . . . 9

3. Control Methods for I/O . . . **15**
- 3.1. Available control methods . . . 15
- 3.2. Motor enable and disable . . . 15
- 3.3. Binary selection of the profiles . . . 17
- 3.4. Analog signal conditioning . . . 18
- 3.5. Speed Analog In . . . 19
- 3.6. Torque Analog In . . . 19
- 3.7. MultiSpeed . . . 20
- 3.8. MultiTorque . . . 20
- 3.9. MultiPosition . . . 22
- 3.10. MultiSpeedCycle and MultiPositionCycle . . . 23
- 3.11. Test environment . . . 25

You have chosen to buy our servomotor, and for that we thank you. Now you have to connect it to your system to use it. In this I/O setup guide you will find instructions on how to make the motor work in the various non-fieldbus operating modes. For more in-depth information, the relevant documents, downloads and guides are linked throughout this guide.

Reference manual revision	Rev 36
Reference DBS firmware	5.004

1. Setup - Connections

For detailed information on the overall dimensions of all gearmotors in the DBS family, we recommend going to the dedicated product page from which you can find both specific Datasheet and the possibility of downloading 3D models in a variety of formats through the configurator.

S1 series: https://www.minimotor.com/en/product-category/dbs-line/

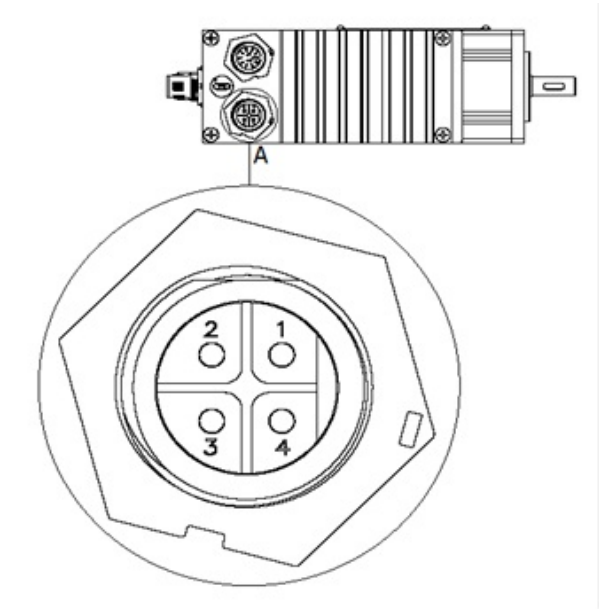
S3 series: https://www.minimotor.com/en/product-category/dbs-s3-line-intermittent-periodic-duty/

1.1. Electric Connections

Please note that the device power supply does not have a direct connection with the system earth.

WARNING: The Power must be supplied by a stabilized PSU. Protection fuse advised.

1.2. Power Supply Connector CN1 - DBS 55



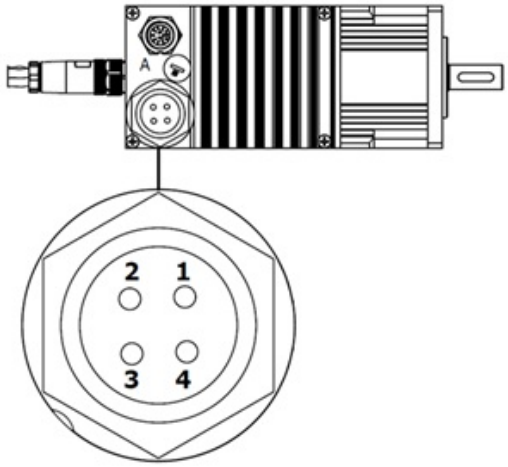
CN1			
Pin	Description	55/50	55/100
1	Logic GND	0V	0V
2	Power GND	0V	0V
3	+ Power	From 24 to 48V	48V
4	+ Logic	From 24 to 48V	

WARNING: the picture represents the top view of the connector fixed on the motor case.

WARNING: Logic and Power GND must have common ground.

Awg 18 cable is recommended for power connection.

1.3. Power Supply Connector CN1 - DBS 80



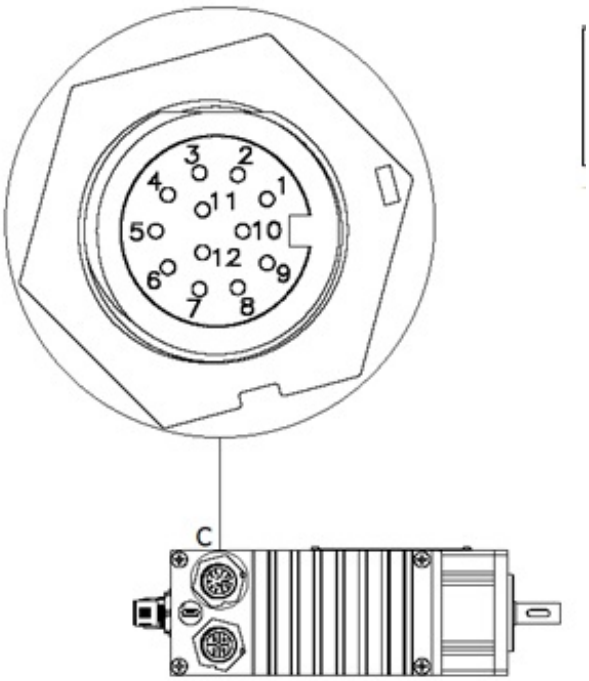
CN1			
Pin	Description	80/50	80/100
1	Logic GND	0V	0V
2	+ Power	48V	48V
3	Power GND	0V	0V
4	+ Logic	From 24 to 48V	

WARNING: the picture represents the top view of the connector fixed on the motor case.

WARNING: Logic and Power GND must have common ground.

Awg 11 cable is recommended for power connection.

1.4. I/O Connector CN2



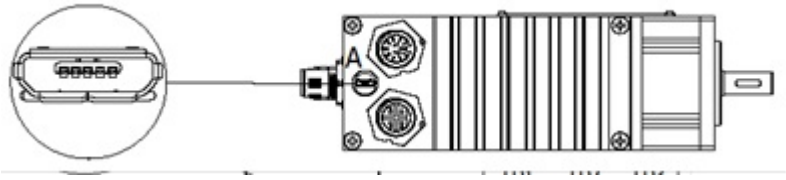
CN2			
Pin	ID	Description	
1	DIN1	Multifunction digital input 24Vdc pnp max 500kHz	
2	DIN2	Multifunction digital input 24Vdc pnp max 500kHz	
3	DIN3/STO1	Multifunction digital input 24Vdc pnp max 7kHz	STO in 1[1]
4	DIN4/STO2	Multifunction digital input 24Vdc pnp max 7kHz	STO in 2[1]
5	DIN5	Multifunction digital input 24Vdc pnp max 7kHz	
6	DIN GND	Digital Input GND	Logic GND[2]
7	AIN+	Positive Input for Analog Signal[3]	
8	AIN-	Negative Input for Analog Signal[3]	
9	AGND	Ground for analog signal	
10	+10Vdc	Service power for analog input max 5mA	
11	COM	Relay common digital output	
12	NO	NO contact relay digital output max 2A	+ Logic[2]

Awg 22 cable is recommended for I/O connection.

1.5. USB service connector CN4

Unscrew the metal cap to access the connector as shown in the picture

By using this micro USB connection, it is possible to set the device through the specific BSI software. You can download it here: https://www.minimotor.com/en/products/dbs/



⚠ The USB cable must be connected to the DBS system only with the drive powered up

1.6. Protective Device Installation

In order to prevent short circuits, the product must be connected to a power-supply line protected by devices to protect against overcurrent and short circuits, in compliance with electrical safety legislation, using standard fused, disconnect switches, etc.

For the installation of a switch up line of the power supply connection, we suggest to use isolating switch with slow blow fuse 20A for model DBS 55/-- and 50A for model DBS80/--

1.7. USB connection troubleshooting

The µUSB is a delicate connector and it can pick up electrical noise from the surrounding environment. If you cannot establish a connection with the motor:

- Make sure that the device drivers are installed on the PC. The drivers can be downloaded here.
- Be sure that the USB is making proper contact. If the plastic housing is too big it can prevent full contact: use a lean USB design.
- Disconnect the USB, power off the DBS, wait for 3 seconds, power up the DBS and reconnect the USB. This clears noise generated by switching power supplies.
- If disconnections are frequent, add a ferrite ring around the USB cable to protect it from a noisy environment.

[1] STO option on request

[2] DO logic Supply on CN2 optional on request, maximum 155mA of output

[3] MA Analog input configured for 0-20mA/4-20mA optional on request

2. Parametrization Interface

2.1. Software Installation

1. Download the “BSI software” and “BSI Usb Driver“ at the following link:
2. https://www.minimotor.com/prodotti/dbs/
3. Extract and run the downloaded files. Follow the installation guide procedure until it is finished.

   After the download extract the .zip file and run BSI.exe inside the folder (BSI icon).

   WARNING: this is not an installation file. It directly runs the interface software, so you do not need to install it. Because of this, every time the user wants to use the software only need to double click on this icon.

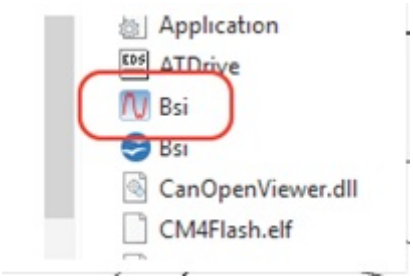


Figure 1. BSI icon

4. Connect the device through the micro USB to the pc and check that the logic is connected to the power.
5. Once the program is run, select the connection type. If choosing USB, wait for the device to be found and connect. If the DBS is connected via Fieldbus to a net that can exchange data over Ethernet (EtherNet/IP, PROFINET, POWERLINK and EtherCAT with EoE functionality) you can connect typing the DBS IP address. (BSI connection interface). UDP port used: 25113.

Figure 2. BSI connection interface

6. If the firmware stored in the device is not up to date the screen BSI update interface

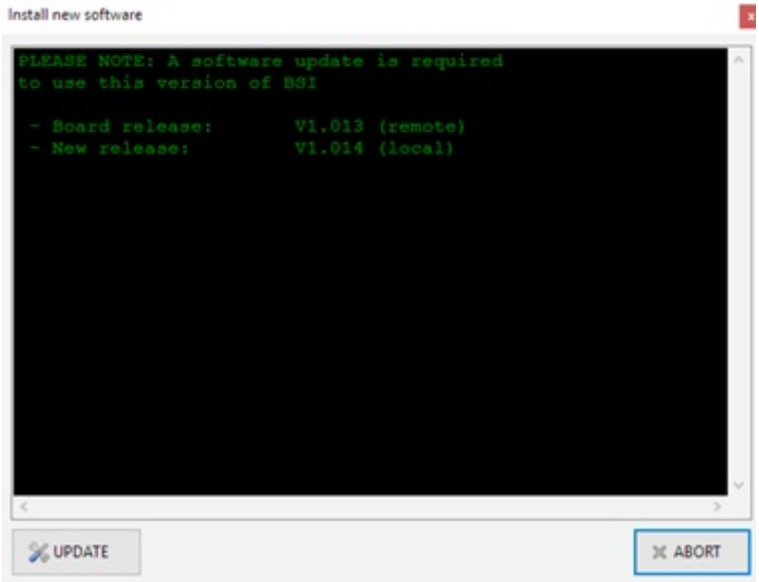


Figure 3. BSI update interface

2.2. Software

BSI update interface represents the main screen of BSI software. Following the menu it is possible to act on the motor parameter and to monitor the functional settings.

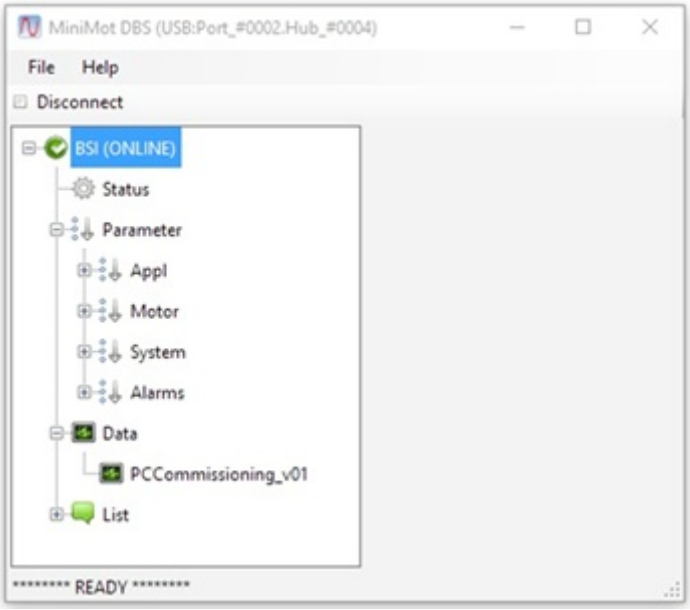


Figure 4. BSI update interface

2.2.1. Status

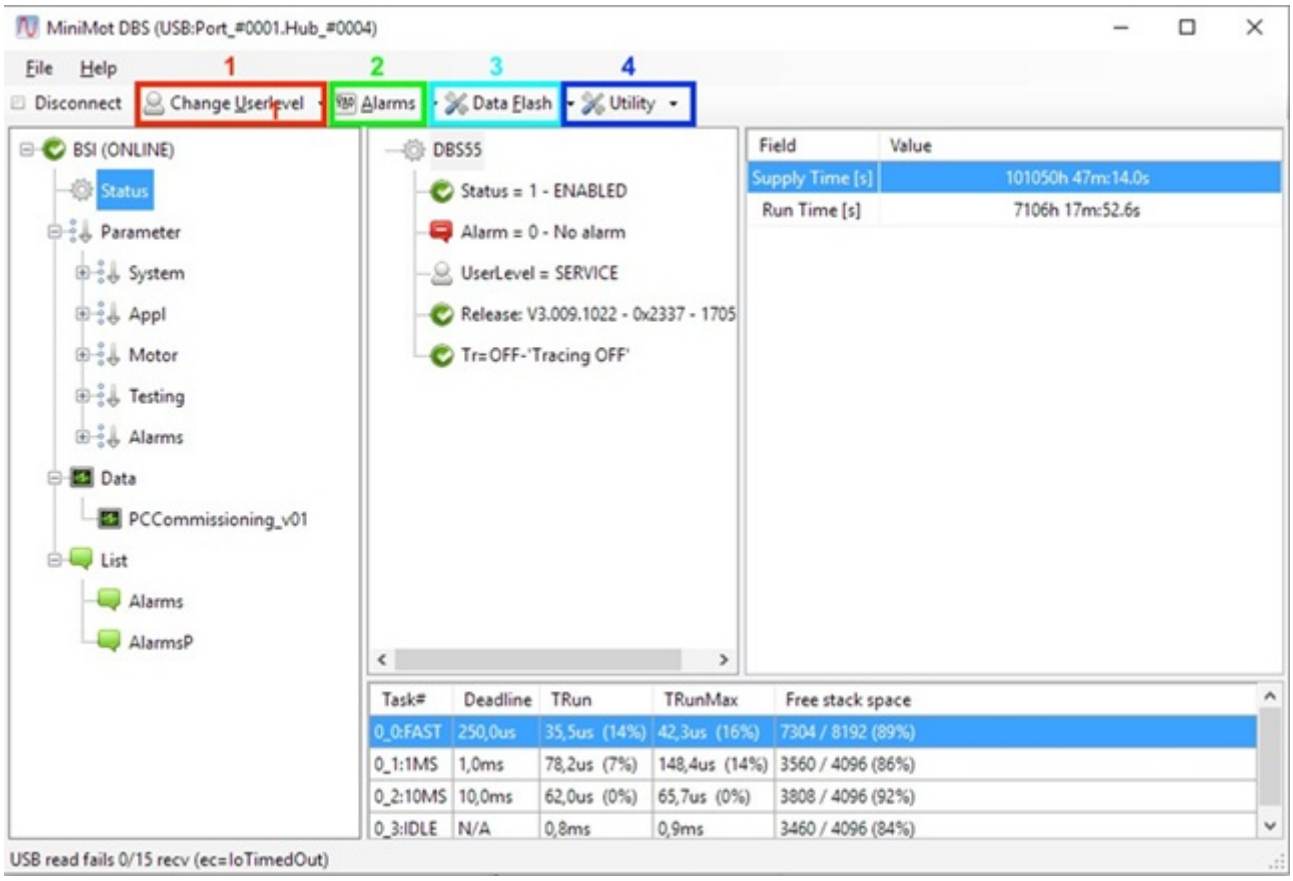


Figure 5. BSI main menu

Click on “Status” in order to know the motor status, manage the presence of fault and change the software user level.

1. “Change User Level”: use this option in order to change the software user level and have access to more setting parameters.

User	Free Access
Advance	Free Access
Eol	PW required
Service	PW required

2. “Alarms”: this button gives access to the alarm menu, in which you can reset the current alarm
3. “Data Flash”: diagnostic tool to save the Flash memory image.;
4. “Utility”: Diagnostic tool.

2.2.2. Alarm List

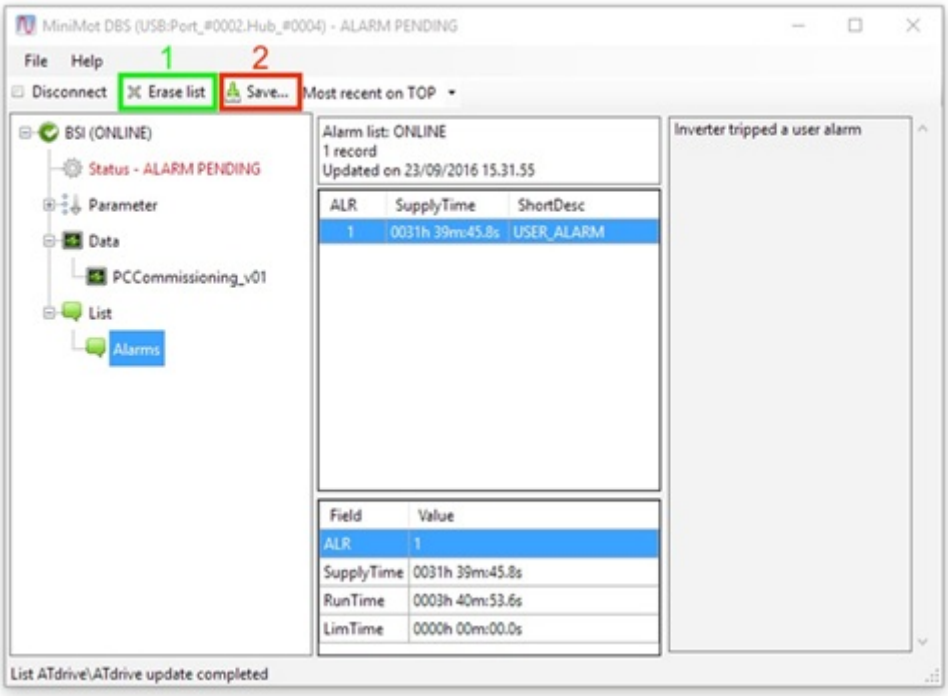


Figure 6. BSI Alarm list

By selecting “list” under the “alarm” voice, it is possible to find the alarm history list.

1. “Erase List”: use this command to erase the whole list.
2. “Save”: use this button to save the list into an external file.

2.2.3. Event List

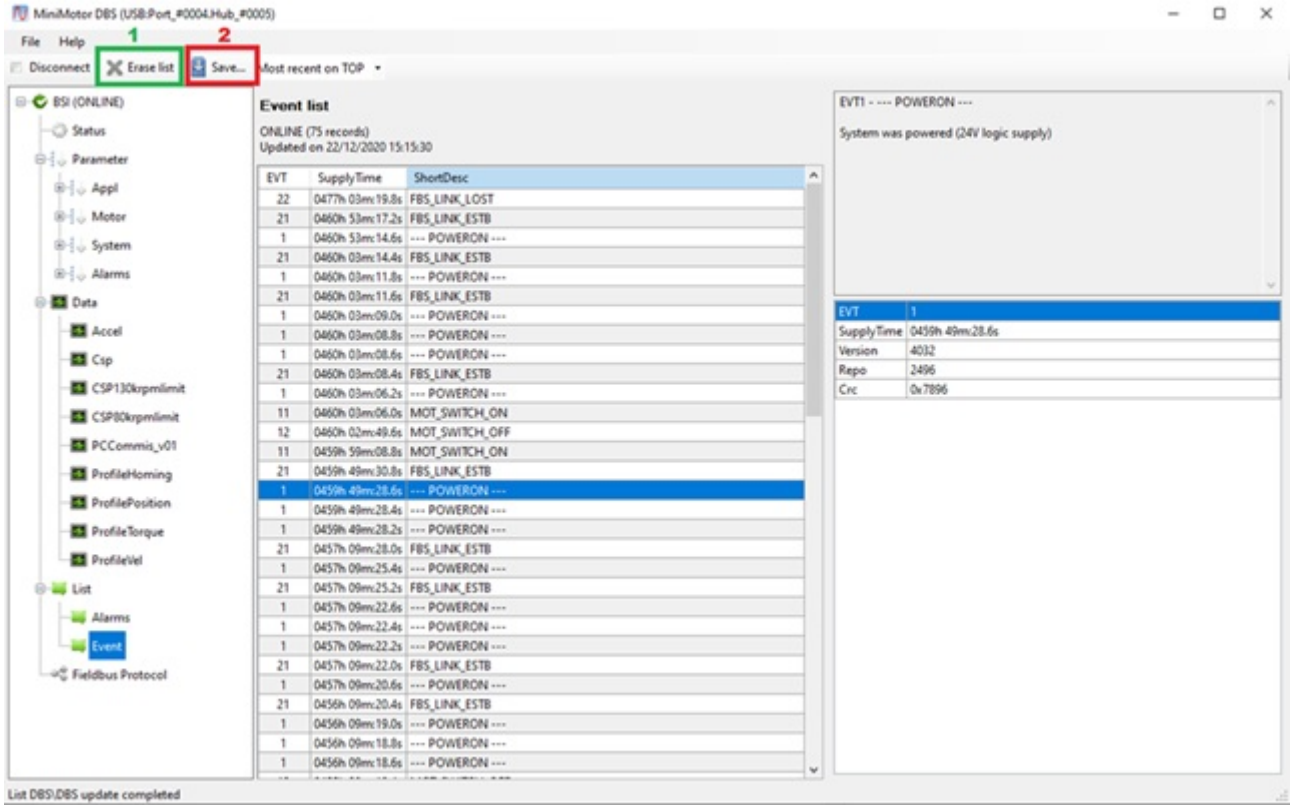


Figure 7. BSI Event List

By selecting “list” under the “event” voice, it is possible to find the event history list.

1. “Erase List”: use this command to erase the whole list.
2. “Save”: use this button to save the list into an external file.

2.2.4. Parameter

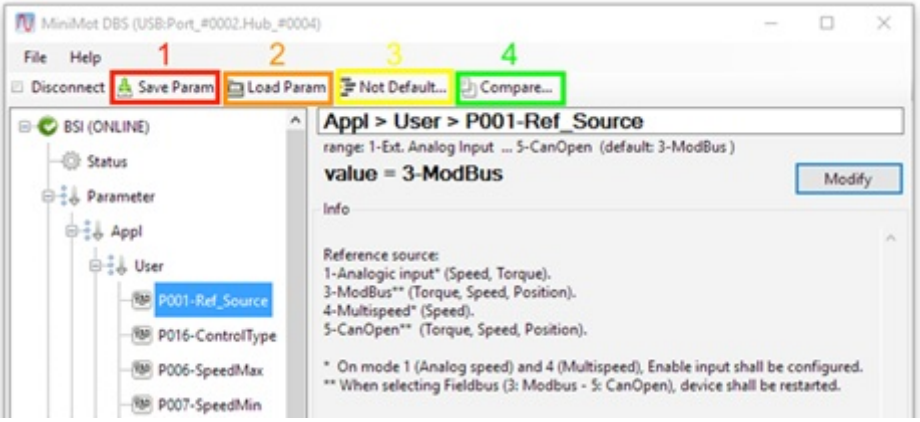


Figure 8. BSI Parameters

Under “Parameter” it is possible to find and set all the motor parameters. See the section of this guide in order to understand the meaning of all points and set the desired configuration.

In order to change the value or to select a different voice in one of the parameters, click on modify, change the value and then select Update to load the changes.

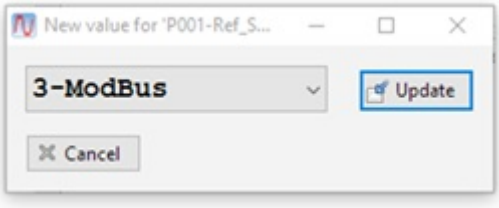


Figure 9. BSI P001

When the voice “parameter” is selected in the top of the window there are several useful options: . “Save Param”: allows to save the parameter setting into an external file.

1. “Load Param”: allows to upload the parameter stored into an external file, directly in the driver storage.
2. “Not default”: shows which parameter have been changed in respect of the default value.
3. “Compare”: allows to compare the parameter stored in the device with the parameters contained into an external file.

2.2.5. Monitoring

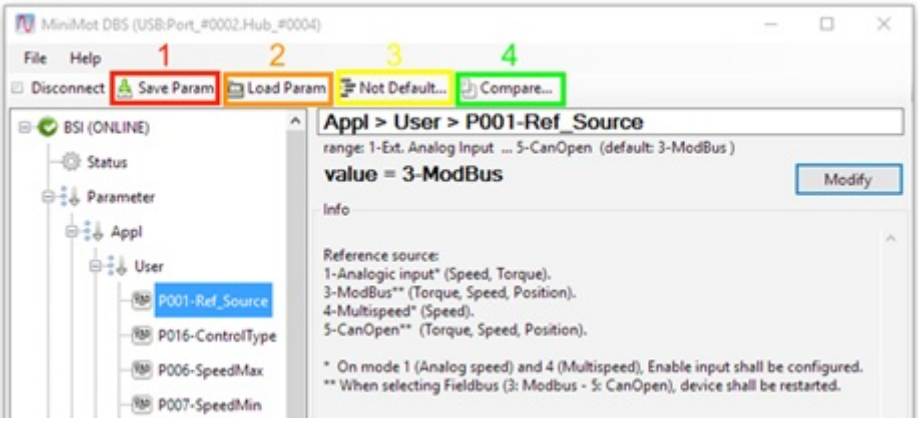


Figure 10. BSI Parameter monitoring

The program BSI is equipped with a tool useful in order to monitor the variables during the motor employment. Click on data and select PCCommissioning to see window shown in Figure 19 To activate the control of one or more variables toggle the white square under column “Upd”. The value is represented under the column “Value”. To use the oscilloscope, open the window settings and set the desired measurement, then click on single in order to obtain the measurement.

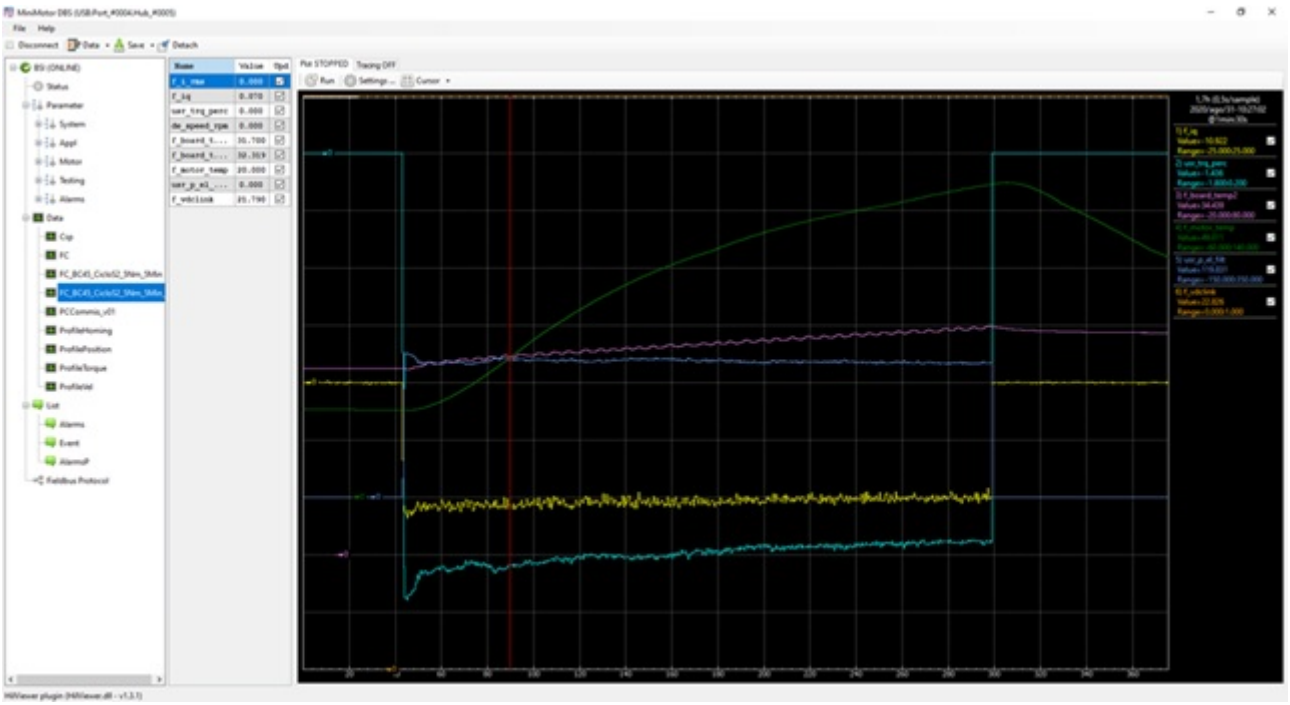


Figure 11. BSI Plot

The PLOT function, shown in BSI Plot, , enables to track values over longer period of time.

Here a table for common variables useful to monitor

NAME	DESCRIPTION
co_op_mode	DS402 6061h Mode of Operation Display
co_control_word	DS402 6040h Control Word
co_status_word	DS402 6041h Status Word
co_pp_target_pu	DS402 607Ah Target Position
co_pp_max_pu	DS402 607Dh.2 Positive position limit
co_pp_min_pu	DS402 607Dh.1 Negative position limit
co_pp_tlimit	DS402 6072h Max Torque
co_pp_wm	DS402 6082h Profile Velocity
co_pv_accel	DS402 6083h Profile Acceleration
co_pv_decel	DS402 6084h Profile Deceleration
de_speed_rpm	DS402 606Ch Velocity Actual Value
usr_trq_perc	DS402 6077h Torque Actual Value
usr_pos_pu_1ms	DS402 6064h Position Actual Value
co_pp_cmdnewset	DS402 6060h Bit 4 “new setpoint”
f_iq	Apk of current output of the drive
usr_poserror	Position error in encoder pulses from the position loop
diag_alr_code	3008h Actual Alarm
co_dc_ferror_win	DS402 6065h Following Error Window
co_dc_pos_window	DS402 6067h Position Window

3. Control Methods for I/O

You are commanding the motor with the digital and analog inputs, so you will have to make the relevant connections to the I/O connector CN2 described in I/O Connector CN2.

The BSI software **is required** to fully customize the function of the digital and analog I/O.

3.1. Available control methods

Control method	Description	P001
Speed Analog In	Use an external analog -10+10V / 0-10V signal to command the motor speed.	01-SpeedAnalogIn
Torque Analog In	Use an external analog -10+10V / 0-10V signal to command the motor torque.	11-TrqAnalogIn
MultiSpeed	Use up to 3 digital inputs to select up to 8 different speeds to execute.	04-MultiSpeed
MultiTorque	Use up to 3 digital inputs to select up to 8 different torques to execute.	12-MultiTrq
MultiPosition	Use up to 3 digital inputs to select up to 8 positions to execute, in relative or absolute mode.	13-MultiPos
MultiSpeedCycle	Cycle between 8 speeds automatically in sequence.	15
MultiPositionCycle	Cycle between 8 positions automatically in sequence.	16

The parameters referenced throughout this chapter are described in full in the Parameters chapter of the DBS manual.

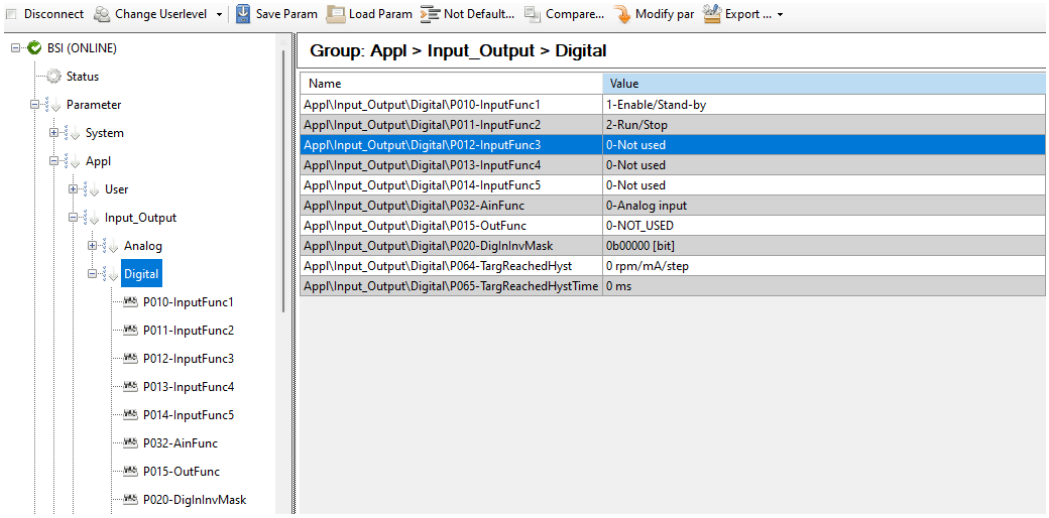
3.2. Motor enable and disable

The motor needs at least one digital input configured as the enable signal to work. The system can be configured in two ways: with dual input or with single input.

3.2.1. Dual input

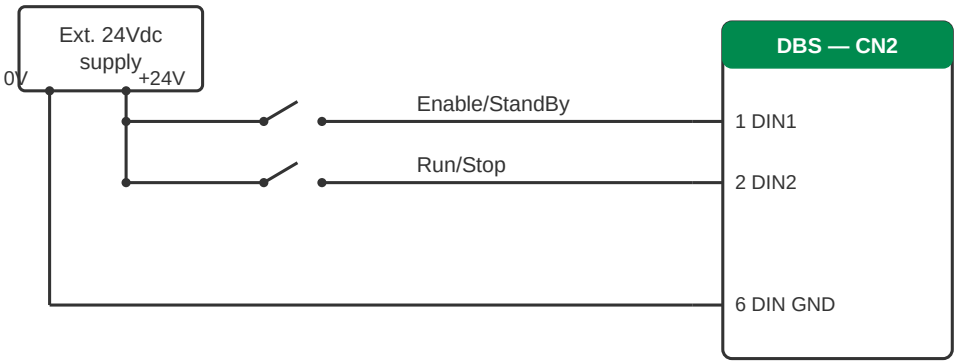
Configure two digital inputs as follows:

- Enable/StandBy
- Run/Stop



With this configuration, when Enable/StandBy is active the motor is torque enabled and will hold position. When Run/Stop is active together with Enable/StandBy, the motor will execute the command specific to the operating mode.

The digital inputs are PNP: they are activated by applying +24Vdc, taken from an external 24Vdc supply, to the relevant CN2 pin. The 0V of that external supply must always be connected to pin 6 (DIN GND) to provide the common reference.



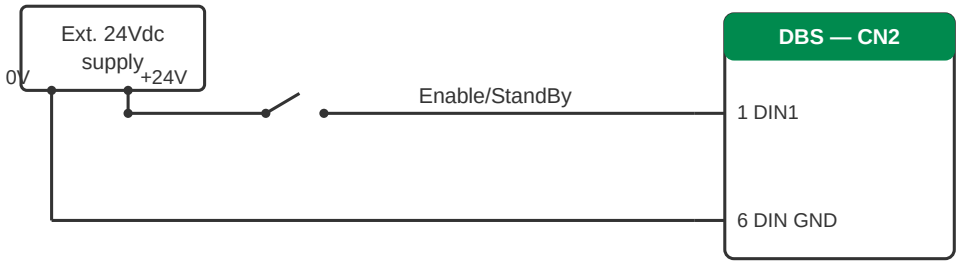
Dual input — Enable/StandBy + Run/Stop

3.2.2. Single input

Program a single digital input as:

- Enable/StandBy

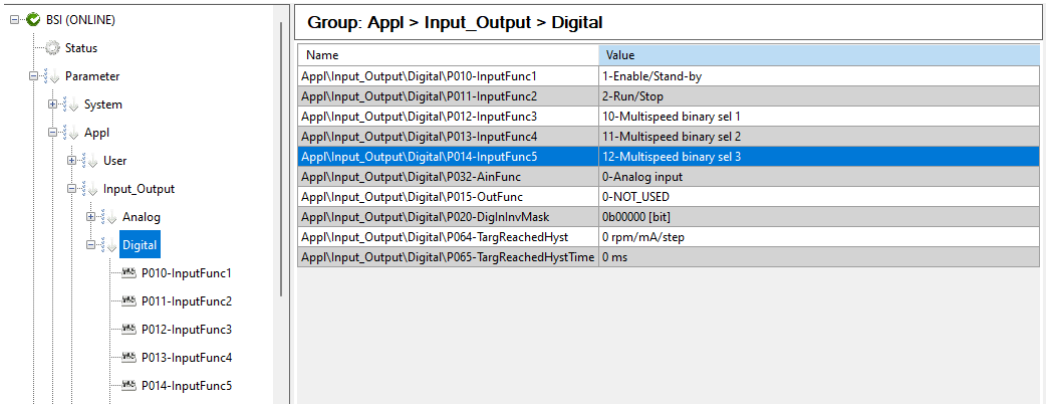
When this digital input is active, the motor will automatically execute the relevant command.



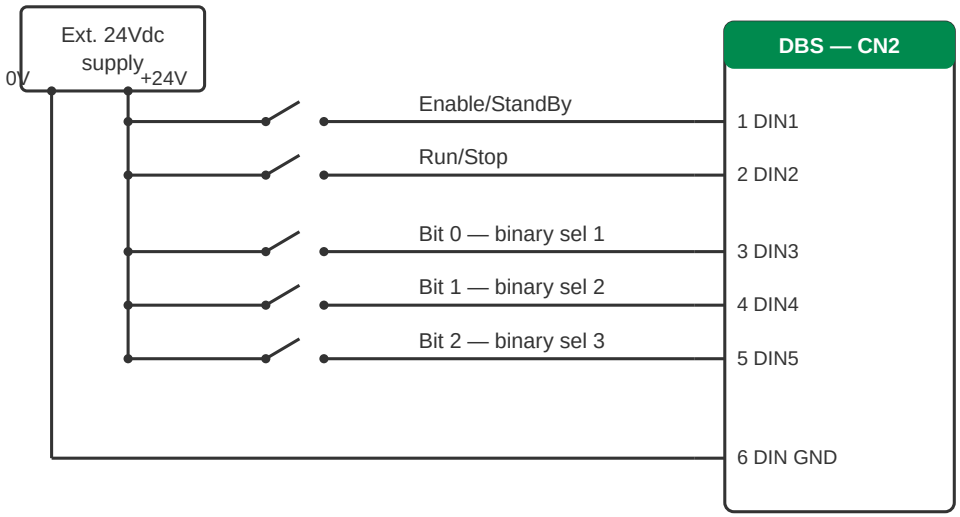
Single input — Enable/StandBy

3.3. Binary selection of the profiles

The MultiSpeed, MultiTorque and MultiPosition modes all select the active profile the same way: set up to 3 digital inputs to **Multispeed binary sel**, depending on how many profiles you need to choose from.



The binary combination of those inputs selects the profile index, from 1 to 8. The same encoding is used to simulate the inputs in Test environment. A typical wiring is shown below: DIN1 and DIN2 keep the Enable/StandBy and Run/Stop commands, while DIN3, DIN4 and DIN5 carry the three bits of the binary selection, as in the screenshot above.



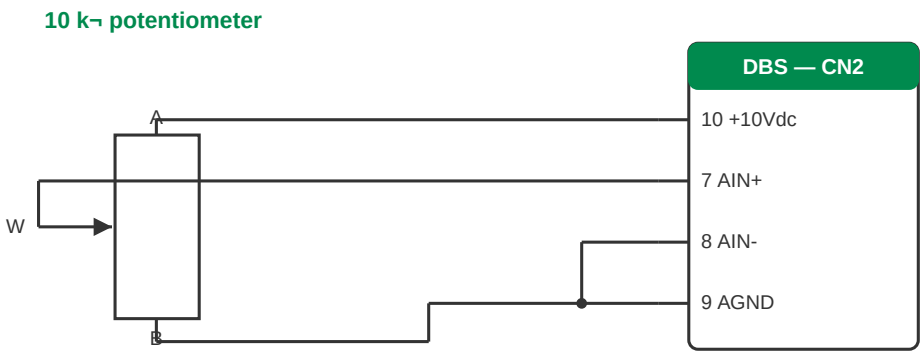
DIN1–DIN2 = Enable/StandBy + Run/Stop — DIN3–DIN5 = Multispeed binary sel

DIN3/DIN4 double as STO: if STO is wired, only DIN5 is left for the binary selection (2 profiles)

Binary selection — Enable/StandBy, Run/Stop and up to 3 inputs (Bit 0–2)

3.4. Analog signal conditioning

Both the Speed Analog In and Torque Analog In modes read the command from the differential analog input AIN+ / AIN- of CN2. A simple 0…10 V reference can be built with a potentiometer supplied by the 10Vdc service output (pin 10), as in the example below. For a bipolar −10…+10 V command (typically a PLC output) the signal goes to AIN / AIN- and the type is selected with P043.



0…10 V reference on AIN+ (P043 = 0)

The Speed Analog In and Torque Analog In modes share the same set of parameters to condition the analog signal:

Parameter	Function
P004 / P005	Regulate the minimum and maximum reference of the analog signal.
P043	Select between -10V+10V and 0..10V on normal motors, and 0..20mA and 4..20mA for MA option code motors.
P045	Select an offset for the analog signal.
P046	Select a multiplicative gain for the analog signal.
P047	Select a threshold below which the signal does not affect the behaviour of the motor.

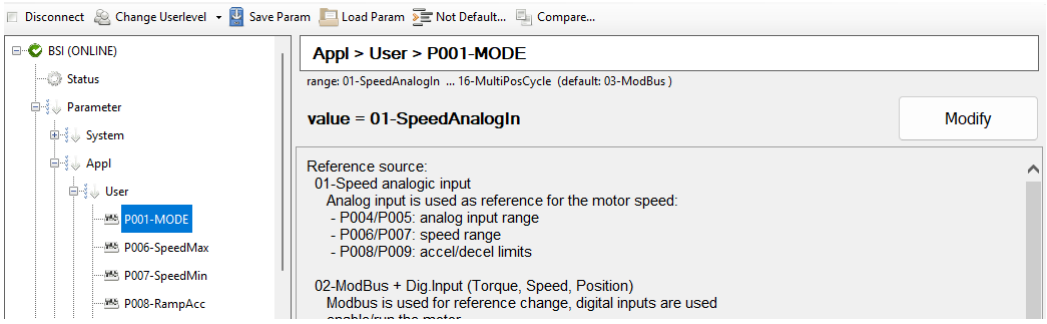
The following parameters adjust the motor behaviour in both modes:

Parameter	Function
P008	Acceleration ramp when changing speed, in rpm/s.
P009	Deceleration ramp when changing speed, in rpm/s.
P021	Permanently change the motor direction. Useful for mirrored motor placements driven by the same inputs: one motor has P021 at 0 and the other at 1.
P017	The maximum current the motor can use. Can be used to enable boost torque or to limit torque.

3.5. Speed Analog In

The **Speed Analog In** mode makes the motor run at a speed commanded through the analog input.

To activate this mode, set **P001** to **01-SpeedAnalogIn**.

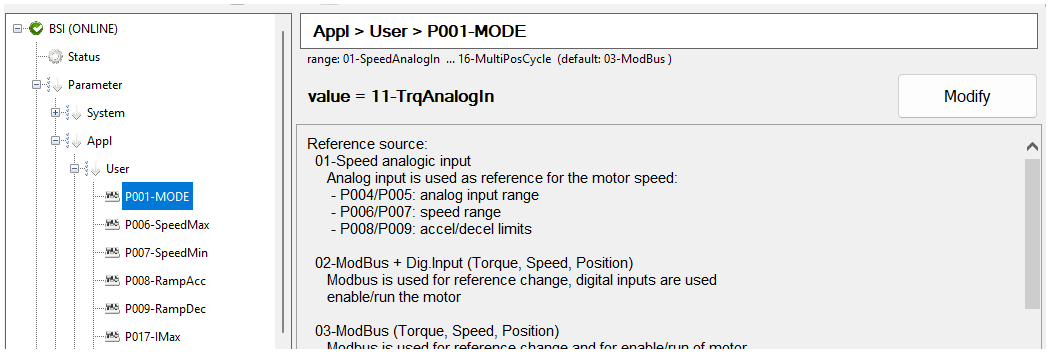


Adjust the behaviour with the parameters listed in Analog signal conditioning.

3.6. Torque Analog In

The **Torque Analog In** mode makes the motor apply a torque commanded through the analog input.

To activate this mode, set **P001** to **11-TrqAnalogIn**.

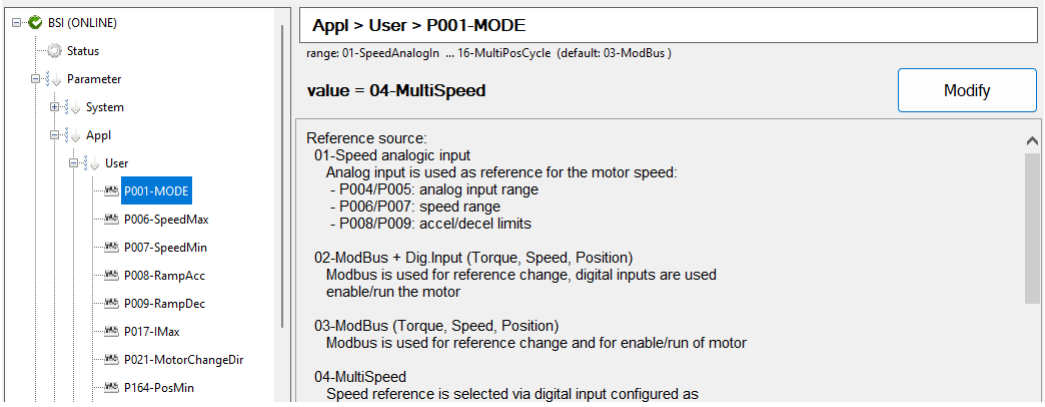


Adjust the behaviour with the parameters listed in Analog signal conditioning.

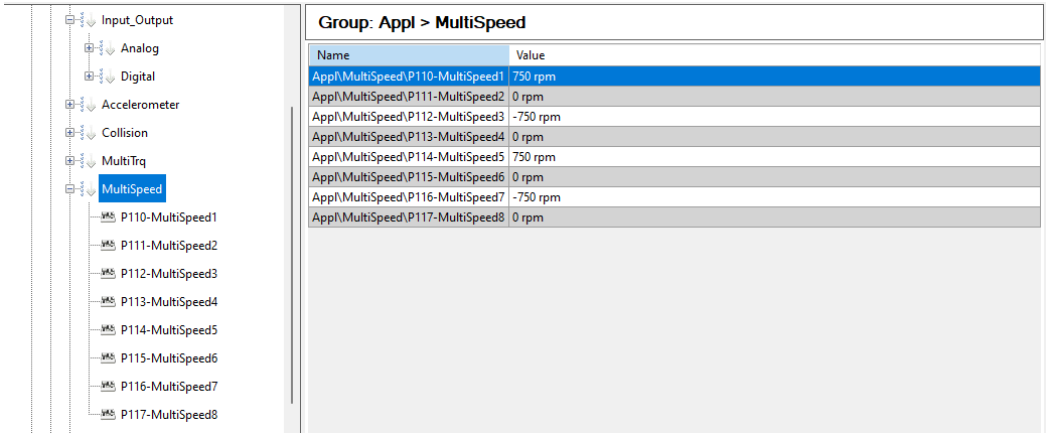
3.7. MultiSpeed

MultiSpeed mode uses a combination of digital inputs to select from up to 8 preselected speeds.

1. Set **P001** to **04-MultiSpeed**.



2. Configure the digital inputs as described in Binary selection of the profiles.
3. Set the speed of each selection in parameters **P110 – P117**.

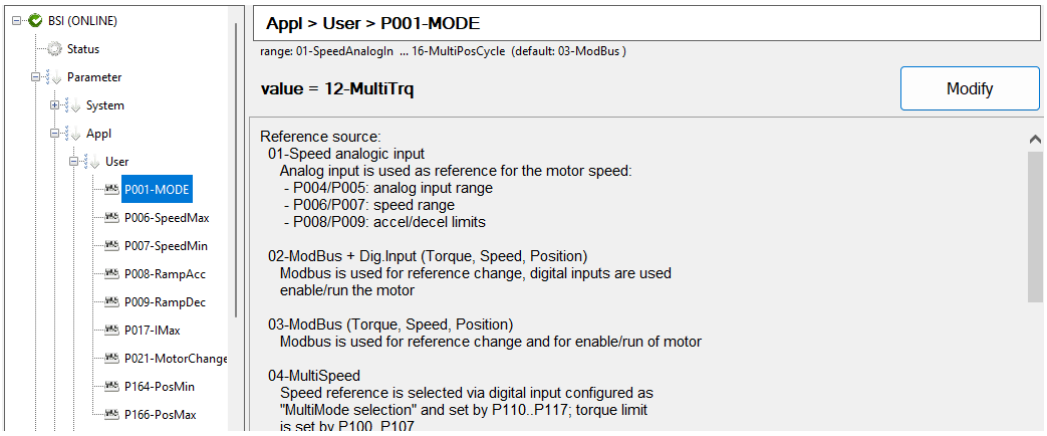


When the motor is enabled, the profile selected by the digital inputs is executed. All profiles use the same acceleration and deceleration, defined in P008 and P009 respectively.

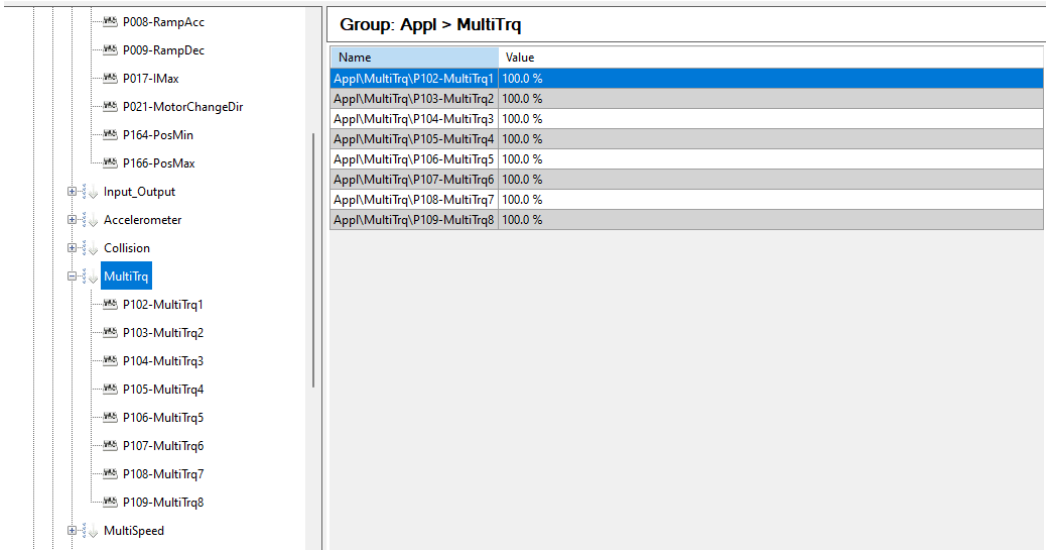
3.8. MultiTorque

MultiTorque mode uses a combination of digital inputs to select from up to 8 preselected torque profiles.

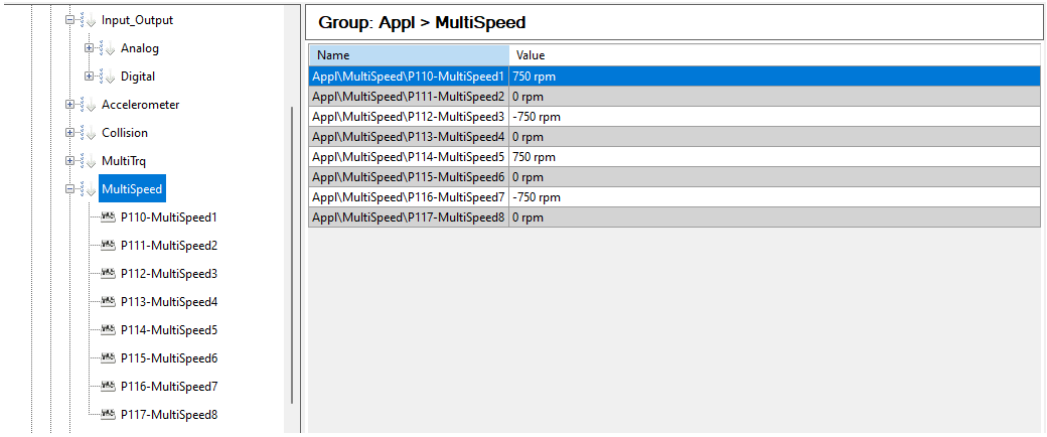
1. Set **P001** to **12-MultiTrq**.



2. Configure the digital inputs as described in Binary selection of the profiles.
3. Set the torque applied by each profile in parameters **P102 – P109**.



4. Set the maximum speed of each torque profile in parameters **P110 – P117**.

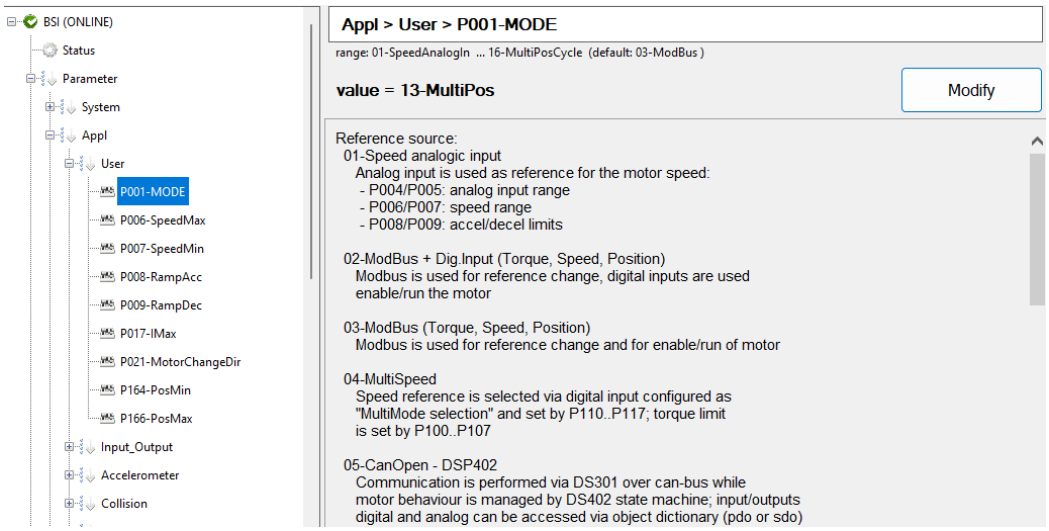


All profiles use the same acceleration and deceleration, defined in P008 and P009 respectively.

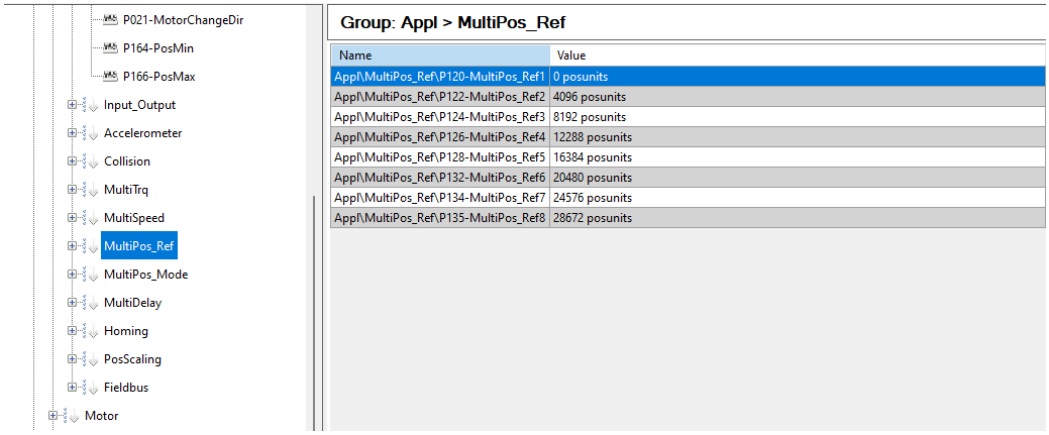
3.9. MultiPosition

MultiPosition mode uses a combination of digital inputs to select from up to 8 preselected positions.

1. Set **P001** to **13-MultiPos**.



2. Configure the digital inputs as described in Binary selection of the profiles.
3. Write the desired positions in parameters **P120 – P135**.



The positioning behaviour is defined by the following parameters:

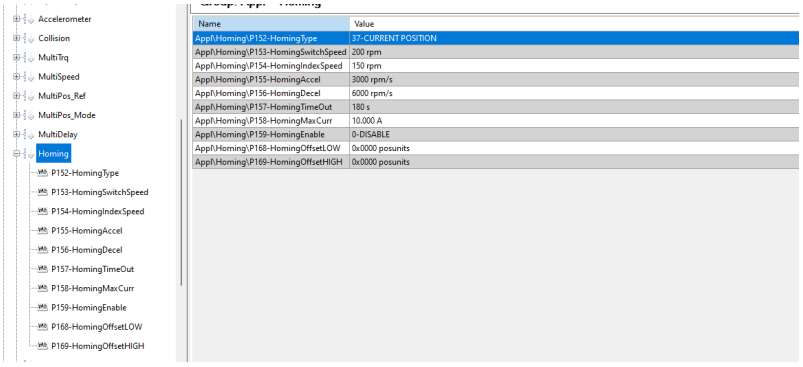
Parameter	Function
P008 / P009	Acceleration and deceleration, common to all profiles.
P110 – P117	Speed of each position.
P102 – P109	Torque limit of each position.

Parameter	Function
P221 – P228	Type of positioning for each position: **Absolute** Position setpoint is interpreted as an absolute value to be reached on index selection. **Relative** Position setpoint is interpreted as relative to the motor OFF position on index selection. **Additive** Position setpoint is interpreted as relative to the previous setpoint; the offset is added on the run rising edge.

3.9.1. Homing

If the motor needs to be homed for the use of Profile Position, proceed as follows:

1. Define the homing procedure parameters in the specific homing section of the software.



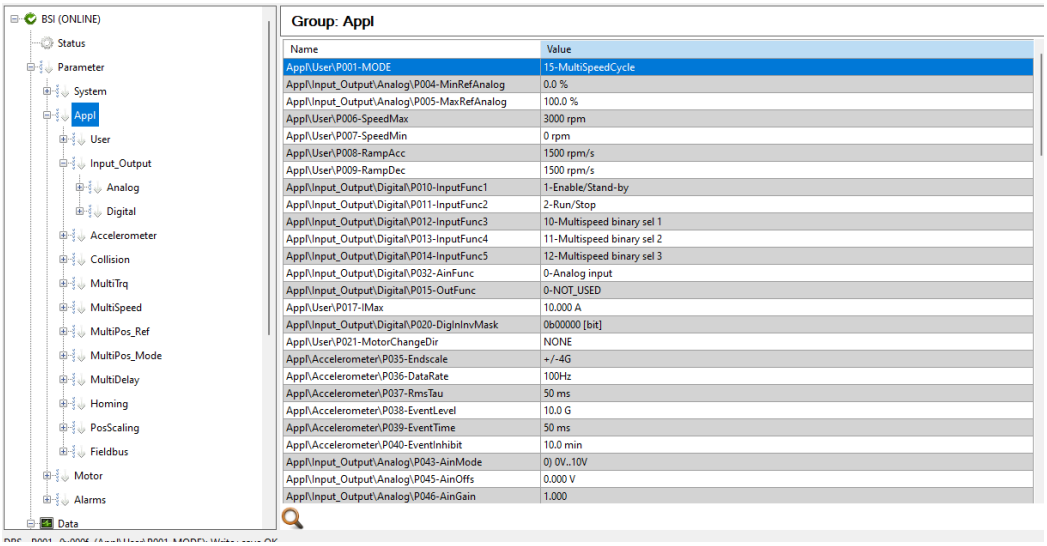
2. If a homing method other than homing in place is chosen, a limit sensor or home sensor must be connected to the I/O connector, and the corresponding digital input set to that role in parameters **P010 – P014**.
3. If no digital input is available, P032 can turn the analog input into a digital input function.

> **Do not drive the analog input with 24V: it will damage the drive.** It remains a 0-10V or 0..20mA input, and only works as a digital input internally, to enable the programmed function.

3.10. MultiSpeedCycle and MultiPositionCycle

MultiSpeedCycle and MultiPositionCycle allow the automatic switching of the MultiSpeed and MultiPosition modes described above.

1. Set **P001** to **15** (MultiSpeedCycle) or **16** (MultiPositionCycle).



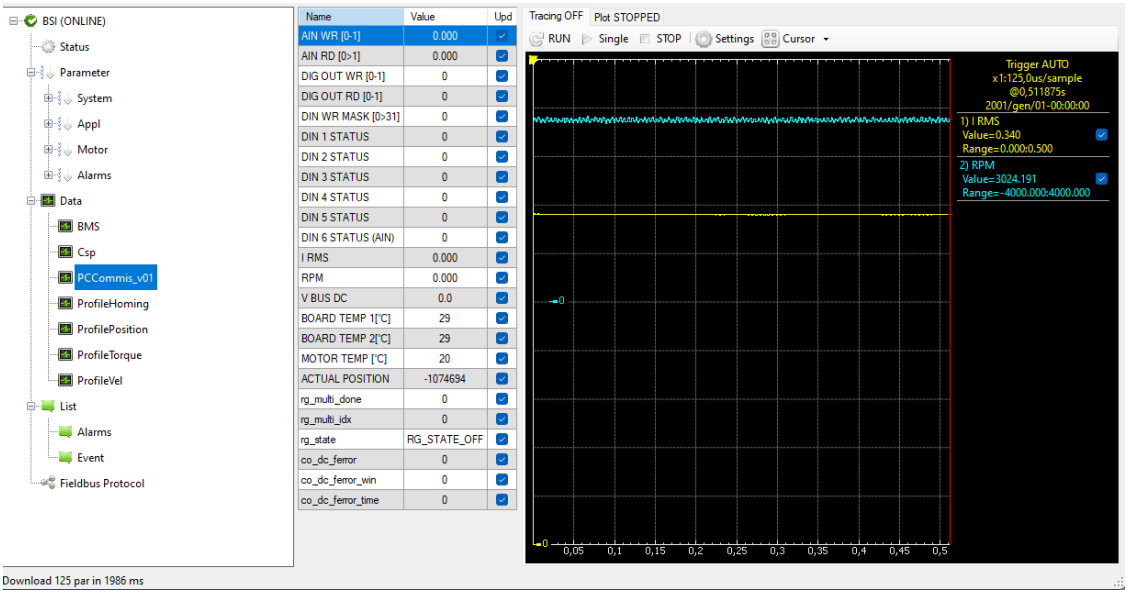
2. Define the 8 speed or position profiles as described in the corresponding section.
3. Use parameters **P142 – P149** to define the delay between each profile change, once the target is reached.

Enabling the motor automatically activates the cycle, from speed or position 1 to 8, cyclically. If the cycle has fewer than 8 different steps, repeat them in a correct pattern while filling all 8 parameters. Stopping and restarting the motor always restarts from the first profile.

3.11. Test environment

The behaviour of all digital and analog inputs can be checked and simulated before wiring any physical connection, so the logic behind it can be tested.

1. Program the drive the way you want it to behave.
2. Go to the Data section in BSI and select the PCCommis_v01 interface. Click on the Upd label in the data to check all variables, so they update in real time.



3. In `AIN RW[0-1]` write the value you want for the analog input (1.0 = 100%, 0.0 = 0%). It is reflected in `AIN RD[0-1]` below.
4. In `DIN WR MASK [0-31]` write the combination of active digital inputs. The result is reflected in `DIN 1-5 STATUS` below. It uses a binary combination; the table below shows the first 10 combinations to illustrate the logic.

Integer number	Din 1	Din 2	Din 3	Din 4	Din 5
0	0	0	0	0	0
1	1	0	0	0	0
2	0	1	0	0	0
3	1	1	0	0	0
4	0	0	1	0	0
5	1	0	1	0	0
6	0	1	1	0	0
7	1	1	1	0	0
8	0	0	0	1	0
9	1	0	0	1	0
10	0	1	0	1	0

5. Entering the right values according to the programming will activate the motor.

Mini Motor S.p.a.

Via E.Fermi, 5

42011 Bagnolo in Piano (RE), Italy

Tel. +39 0522 951889

Fax. +39 0522 952610

info@minimotor.com

www.minimotor.com