Operation and maintenance instructions for driver configurator QSet

1. General recommendations

The recommendations regarding safe use in this document should be observed at all times.

- Some hazards can only be associated with the product after it has been connected to the driver. It is the task of the final user to identify these hazards and reduced the associated risks accordingly.
- Before proceeding with use of the product, carefully read all information in this document.
- Conserve this document in a safe place accessible to all personnel throughout the product life cycle.
- This document should accompany the product in the event of transfer to a new owner or user.
- The instructions in this manual must be observed together with the instructions and additional information regarding connected driver, available from the following reference links:
  - o web site http://www.camozzi.com
  - o Camozzi general catalogue
  - o Technical assistance service
- Assembly and start-up operations must be performed exclusively by qualified and authorized personnel on the basis of these instructions.
- For all situations not contemplated in this manual and in situations in which there is the risk of potential damage to objects, or injury to persons or animals, contact Camozzi for advice.
- The product may only be used in observance of the specifications provided; if these requirements are not met, the product may only be used on authorisation by Camozzi.

2. System requirements

System requirements	
CPU	2.0 GHz or greater
RAM	2 GB or greater
Operating System	Windows 7 or newer
Minimum HD free space available	600 MB
USB	2.0 standard
Minimum Screen resolution	1280x720

Comply with the above system requirements.

3. Installation and start-up

- Download the set-up file of the software "QSet" from the web site http://www.camozzi.com and proceed with installation according to the instructions on screen displayed during the process.
Start the "QSet" software by the appropriate icon on the screen or from appropriate folder on the program menu.

4. Configuration

Once QSet is started, you will be required to enter the device code
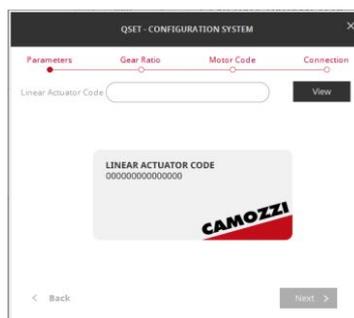
By entering the correct code and pressing the View button, the description of the selected item will be displayed.
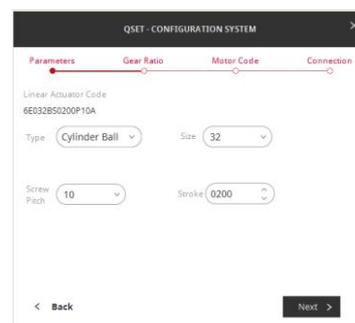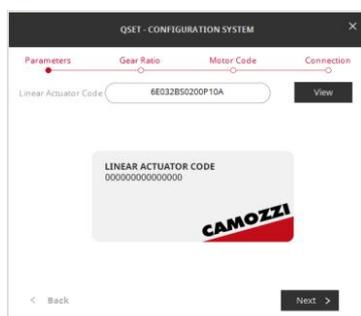
In the event you do not know the code, you can select the View button with the empty field; this will allow you to select the device by using the drop-down menu.
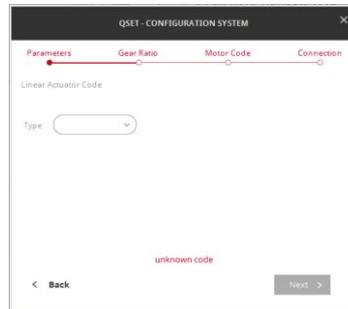
In particular, you will be required to select:

- Cylinder Ball Screw
- Cylinder Lead Screw
- Linear Belt
- Linear Belt Screw
- Only Motor

Each field will then be edited manually.
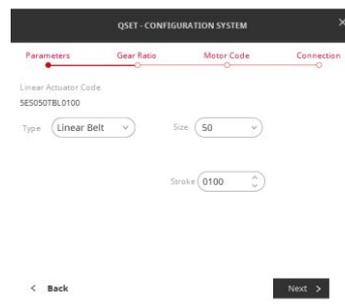
By pressing the Next button, you will access the next page.

4.1. Gear ratio
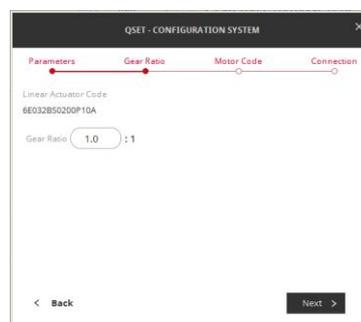
You will be required to enter the gear ratio which may be a whole number (1.0:1) or a decimal 1.5:1.

By pressing the Next button, you will access the next page, by pressing the Back button, you will return to the previous page.

4.2. Selection of the motor type
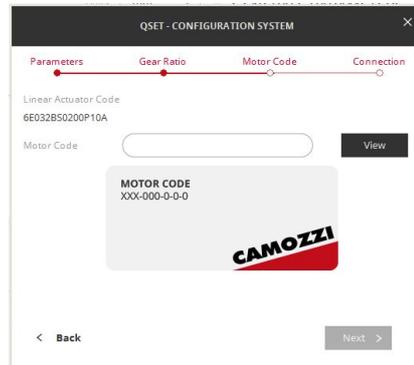
By entering the code printed on the label on the motor and pressing the View button, description of the type of motor selected will be displayed:
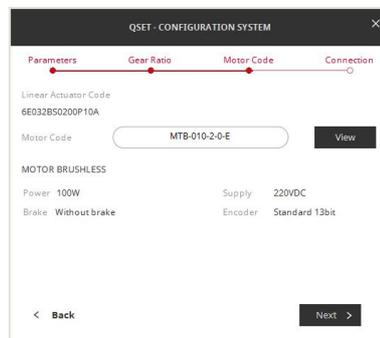
In Brushless motors, the following details will be detailed:

- Power
- Supply Voltage
- The presence of brakes
- The encoder available on the motor.
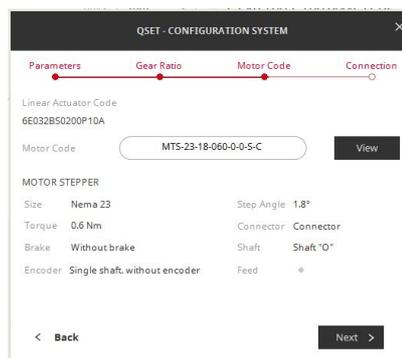
In stepper motors, the following information will be detailed:

- Size
- Step angle
- Torque
- Presence of a connector
- Presence of brakes

- Round shaft or with key
- Input or output shaft
- Presence of an encoder

4.3. Connection

By pressing the Next button, you will access the next page where you can select the type of COM connection.
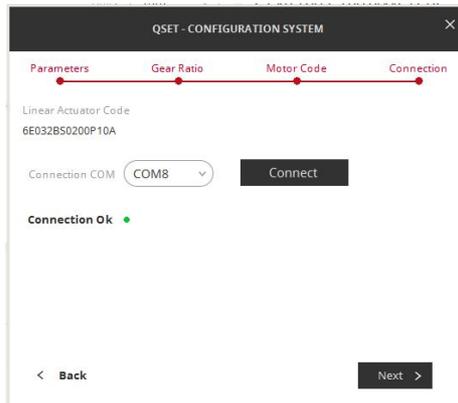
The green dot displayed next to Connection OK confirms successful connection.

Connection Ok ●

If, instead, the dot is gray. it means that connection was not successful; select another COM and press Connect once again.

Connection Ok ●

By pressing the NEXT button, you will access the SETUP page.

4.3.1. Bluetooth

If you want to establish a Bluetooth connection with the stepper driver DRCS, before to start the software QSet you need to link a COM port by the Windows menu "Bluetooth device-add device" (the authentication code is "0000"). In the above page, select the Bluetooth check, select the COM port associated and press the command Connect.

5. General

All common commands of Windows have been included in the General page.

5.1. New

Allows opening a new program file.

5.2. Open

Allows opening a program file previously created.

5.3. Save

Allows saving an open program file.

5.4. Notes

Allows opening a dialogue box where notes related to the project can be entered.
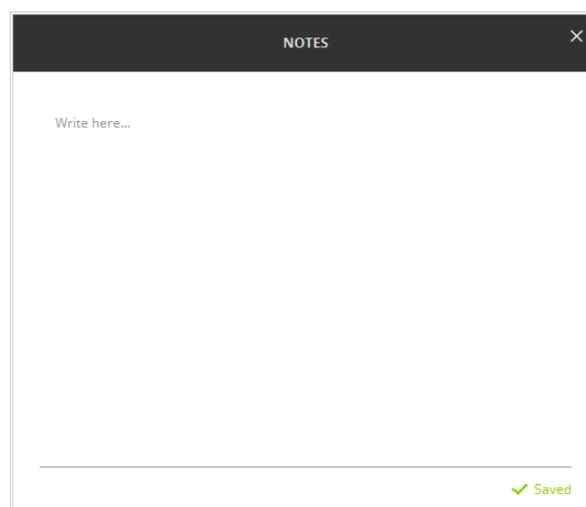
5.5. Language

The Language can be selected.

5.6. Exit

You can Exit the program.

6. Setup

The Setup page is divided into 4 sections and each section has a functional role:

- Generals Parameters
- Homing Parameters
- Jog Parameters
- Set Digital Output

6.1. General Parameters

The "General Parameters" window summarizes the basic settings of the device selected and, in particular, note that there some differences between Brushless motors and Stepper motors.
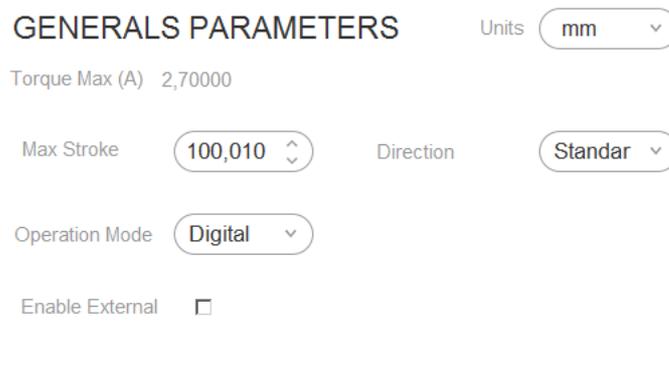
GENERALS PARAMETERS   Units (mm ∨)

Torque Max (A) 2,70000

Max Stroke (100,010 ⌄)   Direction (Standar ∨)

Operation Mode (Digital ∨)

Enable External ☐

Torque Max: this parameter cannot be changed and it indicates the maximum torque that the system can develop; the current indicated depends on the motor type selected during the configuration phase.

Max Stroke: this parameter indicates the maximum system course value selected during configuration phase. This value can be reduced but not increased.

Direction: this parameter allows setting the sense of rotation of the motor which can be clockwise (standard) or counter clockwise (reverse).

 Units: you can select the units of measure that can be expressed in "mm" or "inc" (inches).

6.1.1. Operation Mode Digital (for brushless and stepper motor)

The drives in use the entry of 6 digital inputs whose binary combination produces 64 different combinations; a command line will be associated to every single combination (see Menage page). The combinations are expressed as follows:

In6	In5	In4	In3	In2	In1	Programma	Linea Strobe
OFF	OFF	OFF	OFF	OFF	OFF	1	↑
OFF	OFF	OFF	OFF	OFF	ON	2	↑
OFF	OFF	OFF	OFF	ON	OFF	3	↑
OFF	OFF	OFF	OFF	ON	ON	4	↑

OFF	OFF	OFF	ON	OFF	OFF	5	↑
OFF	OFF	OFF	ON	OFF	ON	6	↑
OFF	OFF	OFF	ON	ON	OFF	7	↑
OFF	OFF	OFF	ON	ON	ON	8	↑
OFF	OFF	ON	OFF	OFF	OFF	9	↑
OFF	OFF	ON	OFF	OFF	ON	10	↑
OFF	OFF	ON	OFF	ON	OFF	11	↑
OFF	OFF	ON	OFF	ON	ON	12	↑
OFF	OFF	ON	ON	OFF	OFF	13	↑
OFF	OFF	ON	ON	OFF	ON	14	↑
OFF	OFF	ON	ON	ON	OFF	15	↑
OFF	OFF	ON	ON	ON	ON	16	↑
OFF	ON	OFF	OFF	OFF	OFF	17	↑
OFF	ON	OFF	OFF	OFF	ON	18	↑
OFF	ON	OFF	OFF	ON	OFF	19	↑
OFF	ON	OFF	OFF	ON	ON	20	↑
OFF	ON	OFF	ON	OFF	OFF	21	↑
OFF	ON	OFF	ON	OFF	ON	22	↑
OFF	ON	OFF	ON	ON	OFF	23	↑
OFF	ON	OFF	ON	ON	ON	24	↑
OFF	ON	ON	OFF	OFF	OFF	25	↑
OFF	ON	ON	OFF	OFF	ON	26	↑
OFF	ON	ON	OFF	ON	OFF	27	↑
OFF	ON	ON	OFF	ON	ON	28	↑
OFF	ON	ON	ON	OFF	OFF	29	↑
OFF	ON	ON	ON	OFF	ON	30	↑
OFF	ON	ON	ON	ON	OFF	31	↑
OFF	ON	ON	ON	ON	ON	32	↑
ON	OFF	OFF	OFF	OFF	OFF	33	↑
ON	OFF	OFF	OFF	OFF	ON	34	↑
ON	OFF	OFF	OFF	ON	OFF	35	↑
ON	OFF	OFF	OFF	ON	ON	36	↑
ON	OFF	OFF	ON	OFF	OFF	37	↑
ON	OFF	OFF	ON	OFF	ON	38	↑
ON	OFF	OFF	ON	ON	OFF	39	↑
ON	OFF	OFF	ON	ON	ON	40	↑
ON	OFF	ON	OFF	OFF	OFF	41	↑
ON	OFF	ON	OFF	OFF	ON	42	↑
ON	OFF	ON	OFF	ON	OFF	43	↑
ON	OFF	ON	OFF	ON	ON	44	↑
ON	OFF	ON	ON	OFF	OFF	45	↑
ON	OFF	ON	ON	OFF	ON	46	↑

ON	OFF	ON	ON	ON	OFF	47	↑
ON	OFF	ON	ON	ON	ON	48	↑
ON	ON	OFF	OFF	OFF	OFF	49	↑
ON	ON	OFF	OFF	OFF	ON	50	↑
ON	ON	OFF	OFF	ON	OFF	51	↑
ON	ON	OFF	OFF	ON	ON	52	↑
ON	ON	OFF	ON	OFF	OFF	53	↑
ON	ON	OFF	ON	OFF	ON	54	↑
ON	ON	OFF	ON	ON	OFF	55	↑
ON	ON	OFF	ON	ON	ON	56	↑
ON	ON	ON	OFF	OFF	OFF	57	↑
ON	ON	ON	OFF	OFF	ON	58	↑
ON	ON	ON	OFF	ON	OFF	59	↑
ON	ON	ON	OFF	ON	ON	60	↑
ON	ON	ON	ON	OFF	OFF	61	↑
ON	ON	ON	ON	OFF	ON	62	↑
ON	ON	ON	ON	ON	OFF	63	↑
ON	ON	ON	ON	ON	ON	64	↑

ATTENTION: command line 1 (with all inputs OFF) corresponds to the zero command (Homing).

6.1.1.1. Enable external

You can set also external Jog command by selecting the check box as showed in the below image:
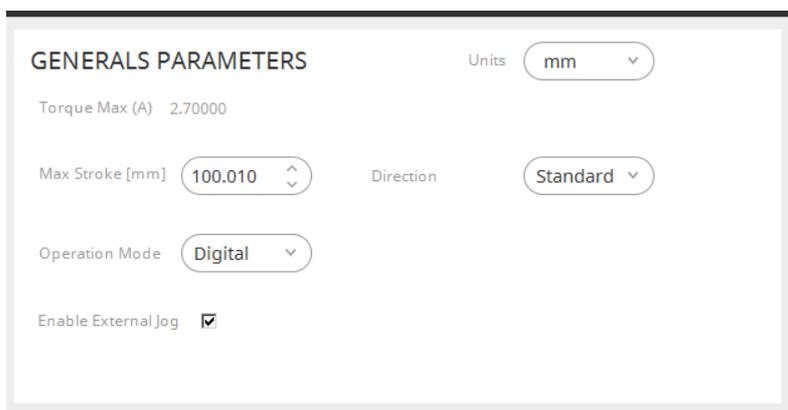
If you select the external Jog command the IN7 and IN6 in Brushless driver and Camozzi DRCS Stepper driver are used.

A message advises you that the number of command line will be reduced.
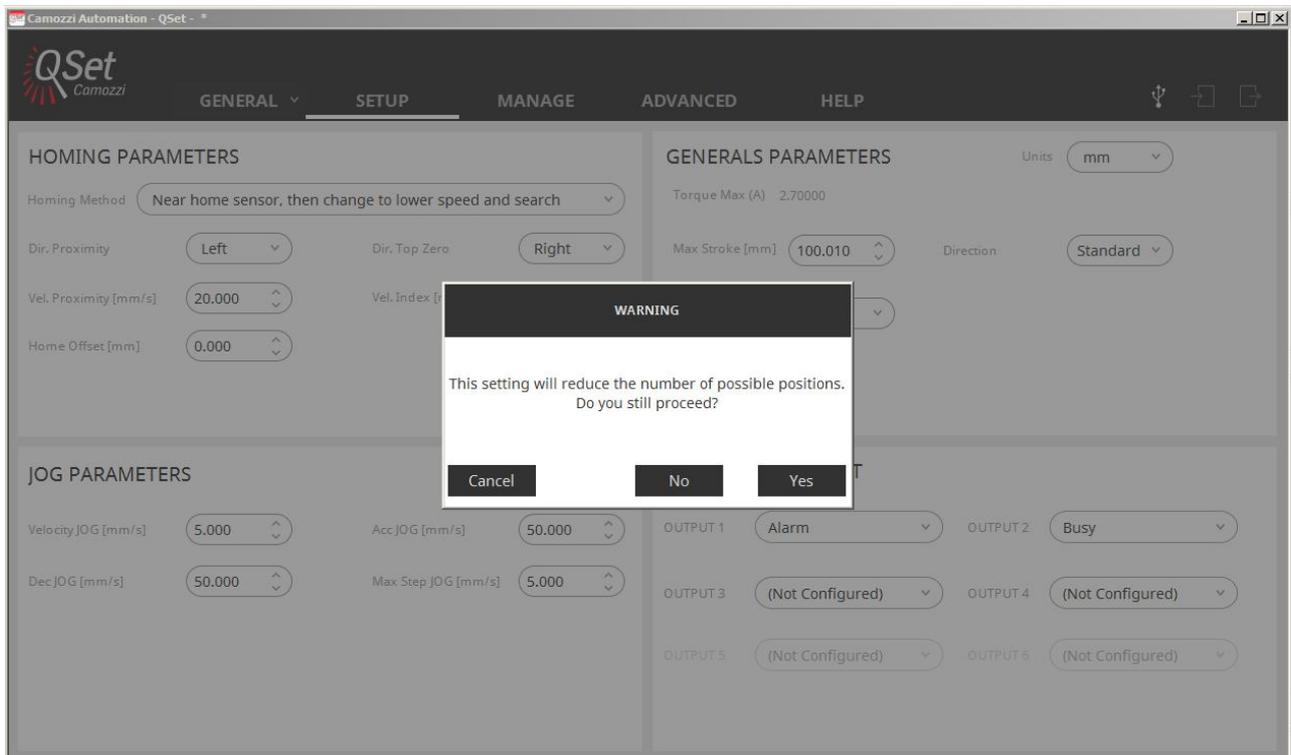
6.1.2. Operation Mode Analog (only for brushless motors)
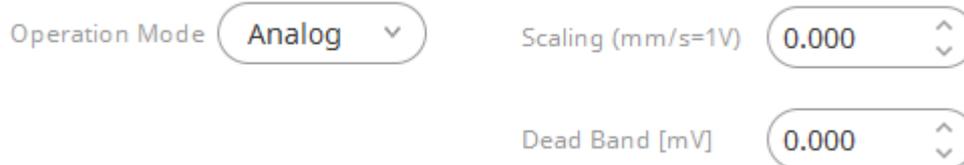
Setting the analogue signal allows controlling the motor's motion following a voltage profile that can be positive or negative depending on the sense of rotation of the motor.

With the Scaling parameter, you can set the ratio between linear velocity and voltage.

Example: by entering 10 as value, you will have a velocity of 10 mm/s for every volt; therefore, by entering the maximum reference (10V), you will have a velocity of 100 mm/s.

With the "Dead Band" parameter, you can filter noise (not transforming it into a velocity parameter); values between the 10mV and 500mV are usually used.

6.1.3. Operation Mode step-direction (only for stepper motors)

By using this operation mode, is necessary to use the signals FASE B- and FASE B + (pin 2 and pin 4 on "Encoder connector) in order to set the motor rotation direction and the signals FASE A- and FASE A+ (pin 6 and pin 8 on "Encoder connector) in order to increment the step motor position.

Is possible to invert the motor rotation direction by changing the value "Direction": "Standard" or "Inverse".

6.1.4. Operation Mode CanOpen (only for stepper motors)

By using this operation mode, is possible to enable the communication via CanOpen network (only with driver DRCS-XXX-X-C-X-X).

Is possible to invert the motor rotation direction by changing the value "Direction" ("Standard" or "Inverse"), the Node ID (from 1 to 127) and the Baud rate (10k, 20k, 50k, 100k, 125k, 125k, 250k, 500k, 800k, 1M).

6.2.   Jog Parameters (only for Operation Mode digital)

JOG PARAMETERS

Velocity JOG [mm/s]	10.000	Acc JOG [mm/s]	100.000
Dec JOG [mm/s]	100.000	Max Step JOG [mm/s]	5.000

In Jog Parameters you can select the maximum desired Jog velocity; acceleration and deceleration values.

You can also set a step movement of the Jog; in the window

Max Step JOG [mm/s]   5.000

You can set the quantity, mm or inches, for each movement.

6.3.   Homing Parameters

Based on the motor type, there are several rules for finding the zero position (homing).

6.3.1. Brushless Motors

HOMING PARAMETERS

Homing Method	Near home sensor, then change to lower speed and

Dir. Proximity	Left	Dir. Top Zero	Right
Vel. Proximity [mm/	20,000	Vel. Index [mm/s]	5,000
Home Offset [mm]	0,000		

In Brushless motors, there are three methods for finding the zero position:

6.3.1.1. Index Signal Only:

The motor rotates until the zero-encoder signal is reached; the sense of rotation of the search is based on what is set in the window:

Dir. Top Zero   Left

Where Left corresponds to clockwise rotation and Right to counter clockwise.

Search velocity is set in the window:

Vel. Index [mm/s]   0.500

6.3.1.2. Near Home Sensor Only

The motor rotates until the zero-limit sensor is reached; the sense of rotation of the search is based on what is set in the window:

Dir. Proximity   Left

Where Left corresponds to clockwise rotation and Right to counter clockwise.

Search velocity is set in the window:

Vel. Proximity [mm/s]   1.000

6.3.1.3. Near Home sensor, then change to lower speed and search index

The motor rotates until the zero-limit sensor is reached; once this is identified, the zero-encoder search will start. The sense of rotation of the search is based on what is set in the window:

Dir. Proximity   Left   Dir. Top Zero   Left

Where Left corresponds to clockwise rotation and Right to counter clockwise.

Search velocities are set, respectively, in the following windows:

Vel. Proximity [mm/s]   1.000   Vel. Index [mm/s]   0.500

6.3.2. Stepper Motors

HOMING PARAMETERS

Dir. Proximity   Left

Vel. Proximity [mm/   20,000   Vel. Final [mm/s]   5,000

Home Offset [mm]   0,000

There is only one zero method in Stepper motors and it is based on the zero-limit sensor; the method is described as follows: the motor rotates searching the zero -limit sensor and the sense of rotation of the search is based on what is set in the window.

Dir. Proximity   Left ⌄

Search velocity is set in the window:

Vel. Proximity [mm/s]   100.000 ⌄

Once detected the limit sensor, the motor stops and changes rotation sense until the limit sensor is no longer engaged.

Dir. Proximity   Left ⌄

In this case, velocity for the new zero search will be set in the window:

Vel. Final [mm/s]   1.000 ⌄

It is important that the final search velocity is very low in order to ensure high accuracy of zero.

6.4.   Set Digital Output

SET DIGITAL OUTPUT

OUTPUT 1	Busy ⌄	OUTPUT 2	Ready ⌄
OUTPUT 3	Position Completed ⌄	OUTPUT 4	Homing Completed ⌄

You can configure 4 NPN type output signals. For each output, you can set:

- Busy: the motor is moving therefore it can't receive more movement commands.
- Ready: the motor is stationary and is ready to receive new commands.
- Alarm: every alarm that occurs in the drive will activate this output.
- Position Completed: indicates when the set position is reached.
- Homing Completed: indicates when the Homing operation is completed.

Once Setup operations are completed, save the drive data by using the special icons:

In particular:

Save data in the PC in the drive memory.

 Retrieve data previously saved in the drive memory making it available to the PC.

 Restore the USB connection to the Driver.

7. Menage

In the Menage page, you will find the motion operational commands, in particular:

7.1. Servo ON and Servo OFF
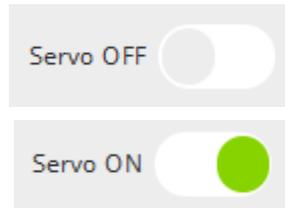
By clicking on the switch with the mouse, you can change the status from Servo OFF to Servo ON.

ATTENTION! The Servo ON status is possible only if the enable hardware selection is enabled (input IN9 Pin 9 for Brushless drives and input X3 Pin 10 for Stepper drives).

7.2. Homing
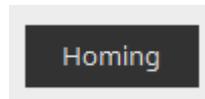
By clicking on the Homing icon with the mouse, the Homing procedure previously set in the Setup will begin. ATTENTION!! The Servo must be found in the ON status.

7.3. STOP
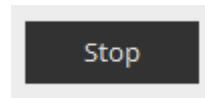
If the motor is in motion, this will stop by clicking on the STOP icon.

7.4.   Programs

Programs are the table that contains all command lines; the table is directly editable and, in order to easily enter data, you can use the Add New command. By clicking on the symbol, $+$ you can expand the notes line in order to read its content.

By clicking on the symbol, $\triangleright$ you can run the command and therefore move the actuator.

BEFORE RUNNING THE COMMAND; MAKE SURE THAT NO ORGANS, THINGS OR PEOPLE CAN BE DAMAGED OR HARMED BY THE MOTION.

7.5.   ADD NEW

With the Add new command, you can enter motion data and their position in the command lines of the table. In particular, by clicking on the Add new icon with the mouse, the following image will be displayed:
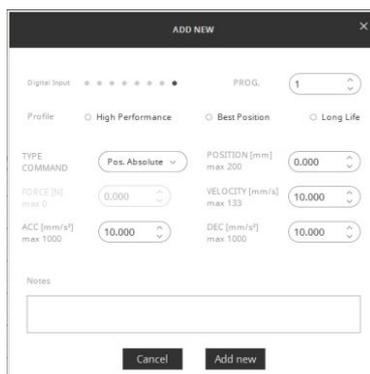
Where

defines the line in the table and can be modified by using the Up and Down arrows or by simply typing the desired line number

The "Digital input" icon expresses the combination of the inputs that must be activated depending on the value of the selected program line (see table in the SETUP chapter, paragraph Operation Mode: Digital). The least significant input will be seen on the right and the most significant on the left.

EXAMPLE:

Program Line 1

Program Line 25
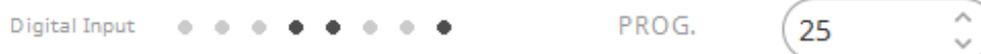
7.6.   Type Command

The command type can be:

- Absolute
- Relative
- Force Command.
- Abs pos. + stop

7.6.1. Absolute

| TYPE COMMAND | Pos. Absolute ⌄ | POSITION [mm] max 200 | 200.000 ⌃⌄ |

This means that the value expressed is absolute compared to the zero position, therefore if the absolute value is set at 200 mm, the actuator will move 200 mm with respect to the zero position.

| TYPE COMMAND | Pos. Absolute ⌄ | POSITION [mm] max 200 | 30.000 ⌃⌄ |

If the absolute value is set at 30 mm, the actuator will move -170 mm compared to the previous value, which means it will move 30 mm from the zero position.

7.6.2. Relative

| TYPE COMMAND | Pos. Relative ⌄ | POSITION [mm] max 200 | 30.000 ⌃⌄ |

It means that the movement is relative to the position where the actuator is found, therefore, if you run an absolute movement of 200 mm, and then you set up a relative motion of 30 mm, the actuator will be moved to a value of 230 mm. Every time the relative value is selected, it will be added with respect to its current position at that moment.

7.6.3. Force Command

| TYPE COMMAND | Force ⌄ |

| FORCE [N] max 272 | 0.000 ⌃⌄ |

Force command is measured in Newton and the maximum settable value (which depends on the type of motor and actuator selected) is shown on the side of the settings window. Force command is a temporary command, i.e. it is limited in time; this in order not to enable the motor/drive thermal protection systems. In particular, the time value depends on the value set and, more precisely, the maximum settable value is applied to a value no greater than 1.5 sec. This time value will increase by reducing the force value. The force value requires velocity and acceleration/deceleration settings as well.

FORCE COMMAND OF IS NOT PROVIDED IN STEPPER MOTORS.

7.6.4. Abs pos. + stop (Comando con Stop) (only for brushless motors)

You can run a line command where the motion stop could be different from the target position, but an external signal can to block the movement.

For example, could be possible to set a comment line as showed below:

PROG.	TYPE COMMAND	FORCE [N] max 1087	POSITION [mm] max 100	VELOCITY [mm/s] max 375	ACC [mm/s²] max 7000	DEC [mm/s²] max 7000		
1	Abs Pos.+Stop ⌄	0.000	100.000	375.000	1000.000	1000.000	+	▷

If the stop input doesn't become ON, the actuator reach the final position (100 mm), but if the input stop became ON before the actuator reach the final position, the actuator stop the movement using the setted deceleration value.

About the Brushless motor the input stop is the IN7 input.

NOTE: with the stepper driver DRCS is possible to stop the movements by using the stop input (pin 6 on "Proximity" connector or pin2 on "I/O 25 poles" connector).

7.6.5. Velocity, Acceleration, Deceleration

	VELOCITY [mm/s] max 750	0.000 ⌃⌄
ACC [mm/s²] max 7000	0.000 ⌃⌄	DEC [mm/s²] max 7000	0.000 ⌃⌄

For each command line, you can set the velocity, acceleration and deceleration in addition to its position; the maximum settable values are shown next to the respective setting window, and are related to the type of motor and actuator set; these values also refer to the reduction ratio set, therefore indicating the actual movement of the actuator.

To facilitate data entry, three easily settable configurations were created.

7.6.6. Profile

Profile   ● High Performance   ○ Best Position   ○ Long Life

7.6.6.1. High Performance

Profile   ● High Performance

	VELOCITY [mm/s] max 750	750.000 ⌃⌄
ACC [mm/s²] max 7000	7000.000 ⌃⌄	DEC [mm/s²] max 7000	7000.000 ⌃⌄

With High Performance, you can set the maximum velocity, acceleration and deceleration settable for the device.

7.6.6.2. Best Position

Profile   ● Best Position

VELOCITY [mm/s]   750.000
max 750

ACC [mm/s²]   7000.000   DEC [mm/s²]   2030.000
max 7000   max 7000

With Best Position, you can set maximum velocity and maximum acceleration that can be applied to the device, while deceleration is reduced by 50% so as to be brought in position with greater accuracy therefore reducing the possible over shots.

7.6.6.3. Long life

Profile   ● Long Life

VELOCITY [mm/s]   375.000
max 750

ACC [mm/s²]   2030.000   DEC [mm/s²]   2030.000
max 7000   max 7000

With Long Life, velocity, acceleration and deceleration are reduced by 50% over the maximum acceptable value, so as to ensure a long product life.

7.6.6.4. Notes

Notes

Comments or reminders can be entered in the notes field in support of reading the program that will be executed.
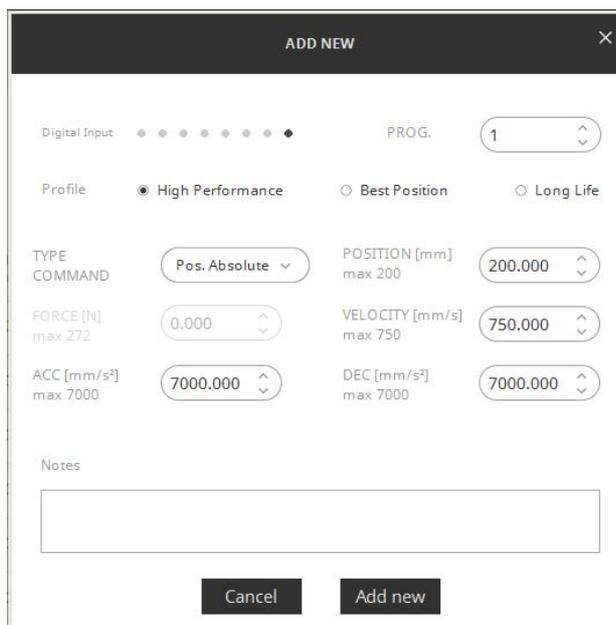
The Add new button allows entering the commands in the table and also closes the dialog box, while by pressing Cancel you will close the dialog box without implementing the data entered.

7.6.7. Cycle

Through the Cycle command, you can enter a series of commands in sequential order from one line to another. To compile a cycle table, you must click on the icon.
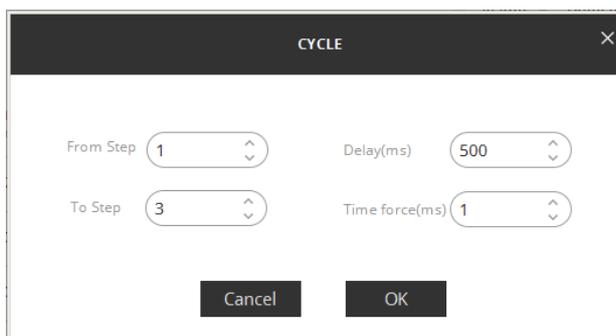
From Step and To Step set the limits of the command lines between which the program will run its cycle; in the example above, you will run the cycles included in program lines 1, 2 and 3 and, with this sequence, these programs will continue to cycle. You cannot change the order of execution of the command lines.

The execution time between a line and the other is defined in the Delay settings.

It is expressed in mS (1s= 1000 ms)

If a command line consists of a force command, you must also set the time in which the force will remain applied before moving on to the next line.

Time force(ms) [1]

7.6.8. Status

STATUS

In Run ● Homed ● Ready ●

0.016mm
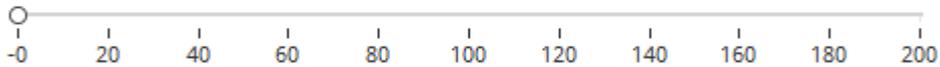
OUT ● ● ● ●   IN ● ● ● ● ● ● ● ●   PROG. 0

The status window displays a series of information that are not editable.

- In particular:
- In run will become lit green while the motor is moving.
- Homed will become lit green when the actuator has reached the homing position.
- Ready will become lit green when the drive is ready to receive commands.
- IN, the input LEDs become dark black when the inputs are in the ENABLED status.
- OUT, the output LEDs become dark black when the outputs are in the ENABLED status.

7.6.9. MANUAL CONTROL

MANUAL CONTROL

Velocity JOG [mm/s] [10.000]   Step [mm] [5.000]

◁   ◁◁   ZERO   ▷▷   ▷

With the manuals controls you can move the actuators clockwise or counter clockwise by acting on their respective icons.

◁   ▷

Motion will remain continuous as long as the buttons are pressed.

Use the Step buttons to move the actuators and each time you press the button, you will move the actuator according to the set Step value.

Step [mm] (5.000)

◁◁   ▷▷

7.6.10.   ERRORS

The occurrence of problems is expressed indicating errors that vary if these occur in Brushless motors or Stepper Motors and, in particular:

Brushless Motor	
Alarm Code	**Description**
1	Temp Over driver input
2	Serial Encoder Comunication Error
3	Driver Fault Event (PWM Disabled)
4	Virtual temp Over (i2T protection)
5	Pos_err > Max Err
6	Analog encoder error
7	5V for encoder card out of range
8	Motor Disconnect
9	Vbus < Vbus_yh_low(SW)
10	Driver over voltage
11	Driver over current (short)
12	Hall sensor error
13	Phase init fail
15	HW inconsistent
16	Current Control Error
18	Try execute of unsupport PDL command
19	Both HW limits are active
20	Left HW limit
21	Right HW limit
22	Vel_err > Vel_err_worn_win

23	Pos_err > Pos_err_worn_win
24	Right SW limit
25	Left SW limit
26	Pulse command and homing conflict
27	I2T Warning
28	Home Fail
Stepper motor	
1	motor not configured
2	homing
3	overflow limit
4	undervoltage
5	thermal
6	overcurrent
7	step lost (if encoder is present)

8. Adviced

8.1. Auto Tune

AUTO TUNE

WARNING

The actuator will produce low and high frequency vibrations.
Before performing the "Auto tune" function make sure that the actuator is in the middle of the stroke.
Be careful object in motion.

GAIN Primary_CG   0.30000

Execute Autotune

The Auto Tune command allows automatic calibration of the correct parameters to the Driver, depending on the load applied to the actuator.

Before executing Auto Tune, make sure that:

- The driver is on the ON status (see chapter Menage Servo On Servo Off)
- The actuator is approximately at half its run.
- There are no mechanical parts that can collide or break as a result of the oscillations.
- That NO PEOPLE are standing near the actuator.
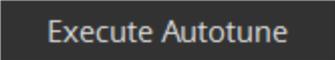
By pressing the **Execute Autotune** button, the actuator will begin oscillating, initially in low frequency then gradually increasing the oscillation rate.
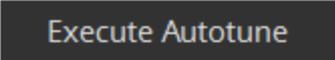
A dialog box will appear once the test is completed indicating the correct execution of the Auto Tune; resulting parameters will be automatically saved in the driver.

8.2. Log in to modify

🔒 **Log in to modify**

The command and the password to access "Log in to modify" is of exclusive information of Camozzi personnel.

9. Contacts

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