
TEM INTERFACE



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REVISION INDEX						
REV.	PAR.	DESCRIPTION	DATA	R	V	A
1.0	-	Draft	13/01/2022	ag		bm
1.1	-	Updating for the new interface version	01/02/2023	ag		

R = Editing

V = Verify

A = Approval

Read carefully this manual before using the drive.

TEM reserves the right to change the information reported in this manual without prior notice because the product is in continuous evolution.

No part of this manual may be howsoever reproduced without previous consent by TEM.

Use this manual together with the manual of the drive with which the interface will be connected.

Document	Contents	Id no.
AZ3 series User Manuals	Mechanical installation, Electrical installation, Safety, Specification, Drive configuration	ST.TEC.054.EN_ManualAZ3s ST.TEC.080.EN_ManualeAZ3Plus ST.TEC.081.EN_ManualeAZ3Plus50 ST.TEC.090.EN_ManualeAZ3INT
AZ3 series CAN-bus Manual	CAN description and parameter setting	ST.TEC.071-CANopen-Manual
AZ3 series Modbus RTU Manual	Modbus description and parameter setting	ST.TEC.022.ModbusRTU-AZ3Series-Manual
TEM Interface Manual	Drive configuration and parameter setting tool	ST.TEC.109.EN_TEMInterfaceManual

1. SAFETY PRECAUTIONS




Read carefully the following items so that you can safely use the drives avoiding causing injury to the operators, damaging the mechanic components driven by the drives or other objects in the area. Make sure you that all warnings are correctly observed.



MARKING	Meaning of the marking
	Prohibition. Do not do it.
	Warning.

1.1. Operating limits



Use the drives only in industrial application; do not use them where a possible fault can cause serious injury to human life, like nuclear plants, aviation, safety device, entertainment and medical.

Use the drives only where a possible fault of the drive does not cause serious accidents or damages or use them only where safety equipment is applicable or a backup circuit device is provided outside the system.



 WARNING	
	<ul style="list-style-type: none"> Do not install or operate the drives if damaged. This can result in electrical shock or fire. Do not place any inflammable objects near the drives. If an accident occurs in which flame is emitted, this could lead to fire. Do not install in any location where the drives could come into contact with water or other fluids. This can result in electric shock or fire.
	<ul style="list-style-type: none"> Install an emergency stop device that fits with system specifications. The drive alone cannot stop operation immediately, thus resulting in an accident or injury.

 CAUTION	
	<ul style="list-style-type: none"> Always turn the power off when removing the drive from its support.

1.2. Operations

 CAUTION	
	<ul style="list-style-type: none">Use a motor that conforms to the specifications of the drive and power supply. If the motor being used does not conform to those specifications, not only will the motor not rotate correctly but also it may cause serious accidents through overheating and fire.

1.3. Changing of parameters

 WARNING	
	<ul style="list-style-type: none">Do not modify parameters before reading carefully this manual. An incorrect set of the parameters can cause injury or accidents.

2. GENERAL INFORMATION

TEM interface is a software designed for the control of AC/DC brushless motors and DC motors coupled with TEM drives. It permit to change the available parameters (factors, input/output, sensor feedback, max velocity, etc.), the communication interfaces (CAN, Modbus), control and test motor, real-time monitoring (oscilloscope).

TEM interface manual is intended to be used with TEM drives manuals.

2.1. Specifications

In order to use the TEM interface, the PC must have at least the following minimum characteristics:

- Processor: 1 GHz or superior.
- RAM: at least 512 MB.
- Operating system: Windows 7 SP1 or higher.
- Minimum disk space: (32 bit/64 bit) – 4 MB.

If the system doesn't hold the .NET 4.8 versions:

- Minimum disk space: (32 bit/64 bit) - 4,5 GB.

2.2. Connection to the drive

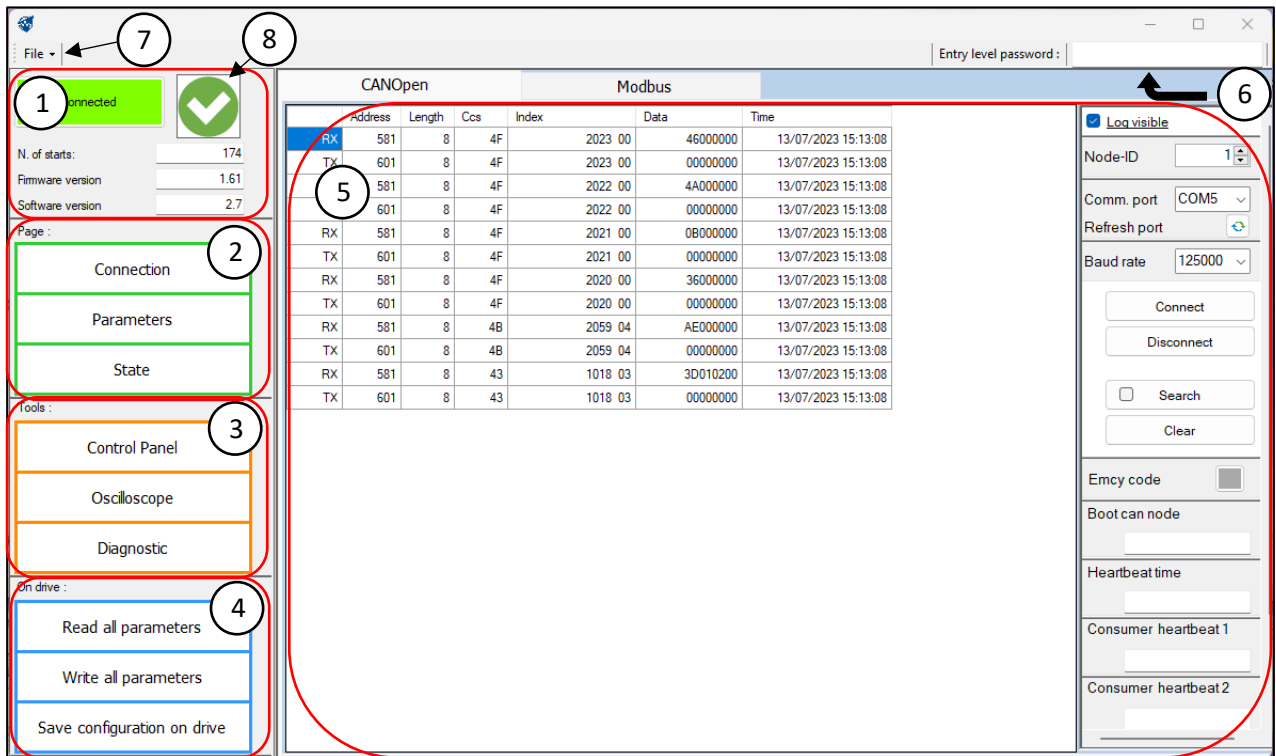
In order to connect the drive to PC is possible to use Modbus or Canopen protocol:

- For UART protocol use the USB-serial adapters **AZ3convert** (Modbus).
- For RS485 protocol any USB-serial adapters can be used (Modbus).
- For CANopen protocol use the USB-serial adapters **AZCANconvert** (CAN).

It is possible to use only one protocol at the same time.

2.3. Interface

TEM Interface is an application developed and used for communication with drives produced by **TEM Electric Motors S.r.l.**

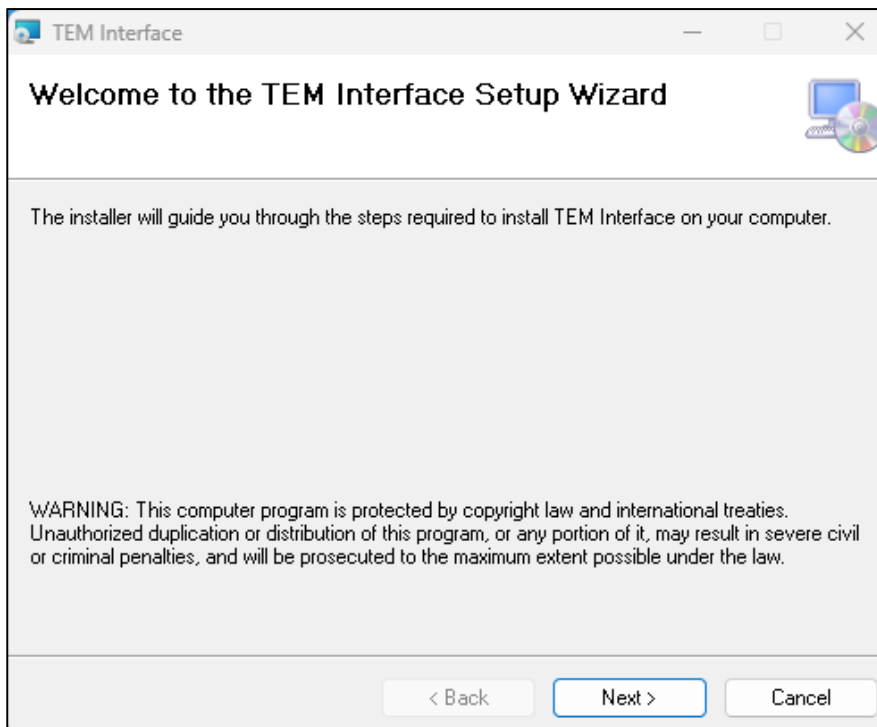
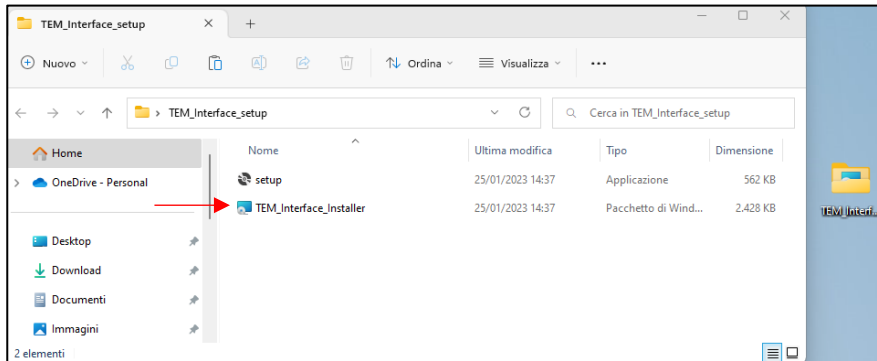


1. **State bar** – shows the connection status, the number of starts, the firmware version read by the drive, the version of the TEM interface software and the status of the drive.
2. **Displaying pages** – select the page to display in the panel where the point 5 is located.
3. **Toolbar** – select one of the tools in the software and set view on it.
4. **Operation bar** – select one of the operations to be done on drive.
5. **Page display space** – this space displays the "Display Pages".
6. **Topbar** – in the upper bar there is the space dedicated to the password entry.
7. **Operations on files** – lets you read/write parameters to/from text files.
8. **Error drive indications** – show the status of the drive.

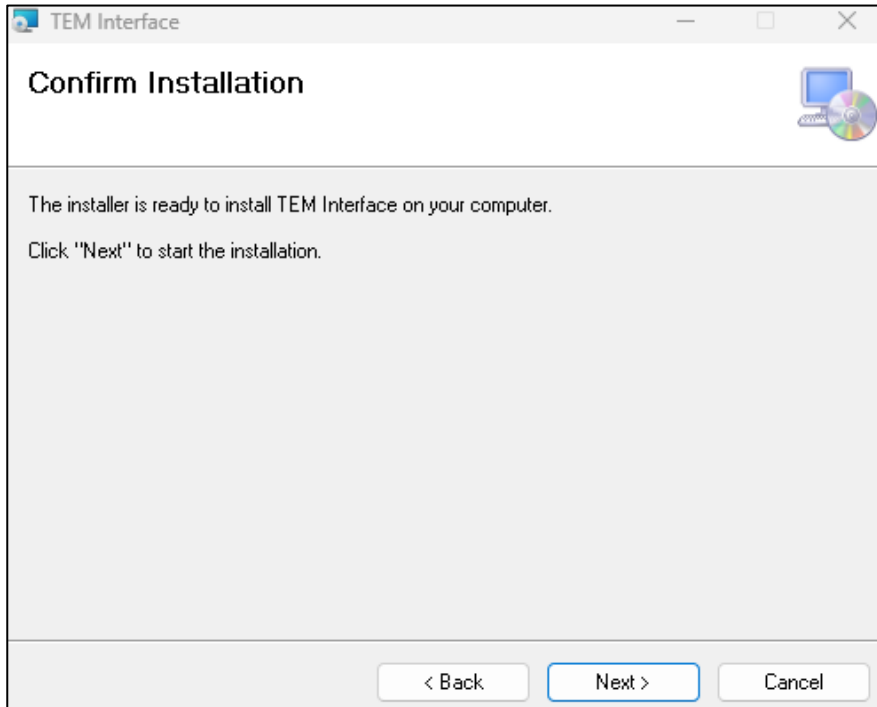
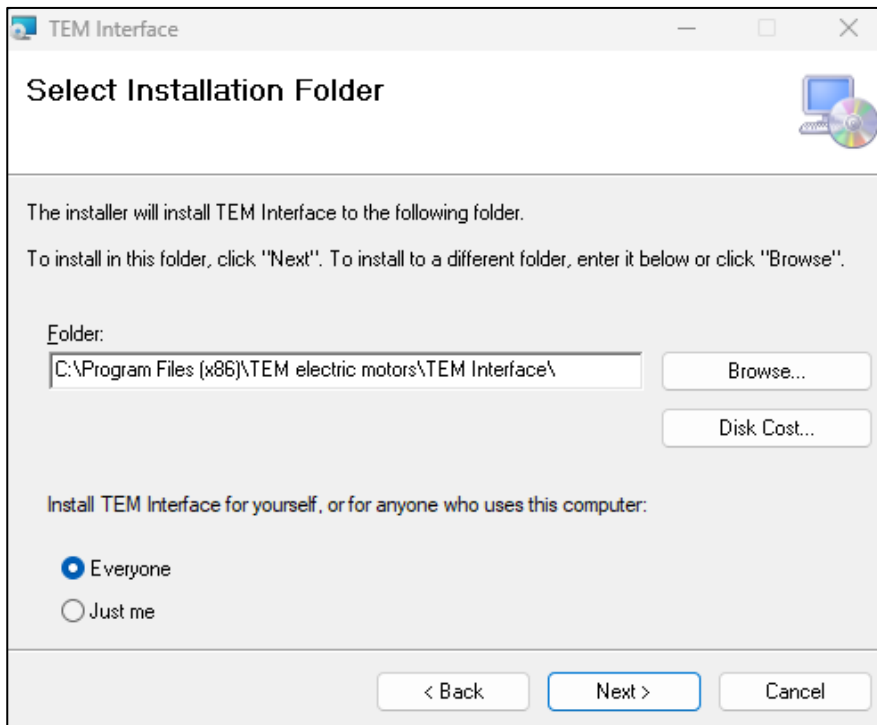
Error found	
No error found	

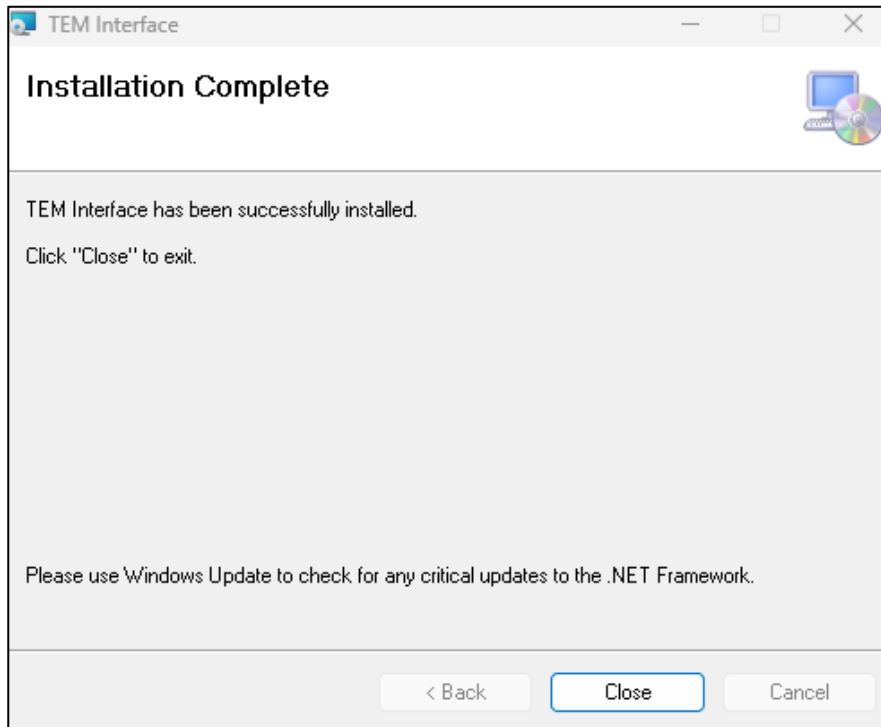
2.4. Installation procedure

To install the TEM Interface, start the executable file and follow the steps showed below.



Select the location to install the software on your PC and click on “Next”.

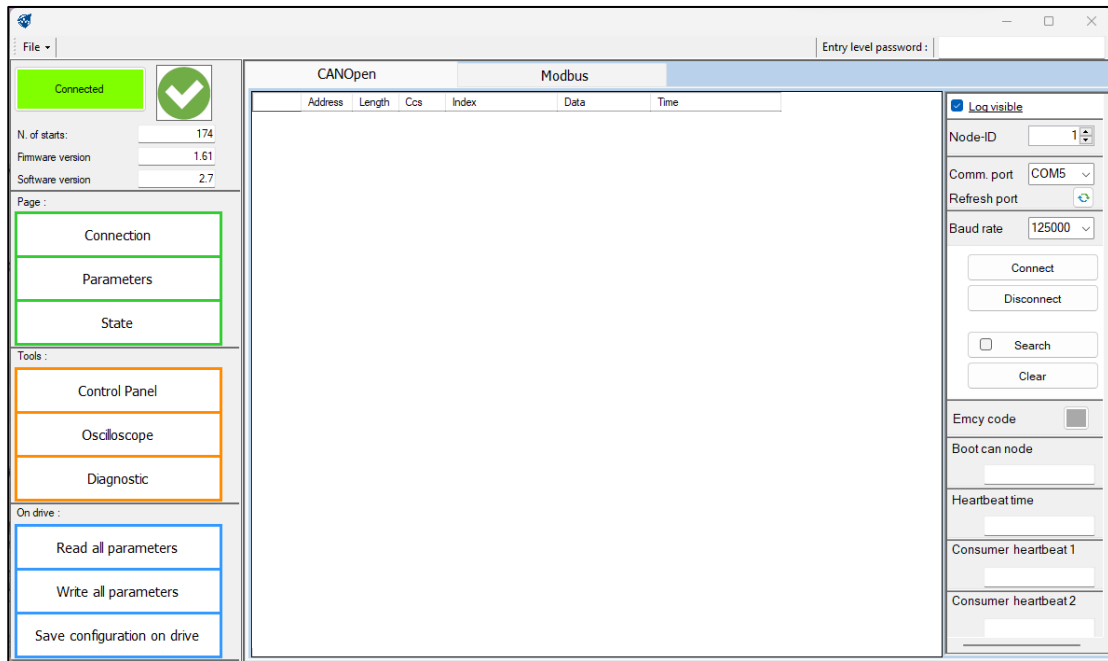




The software will be on desktop and will be installed and ready to use.

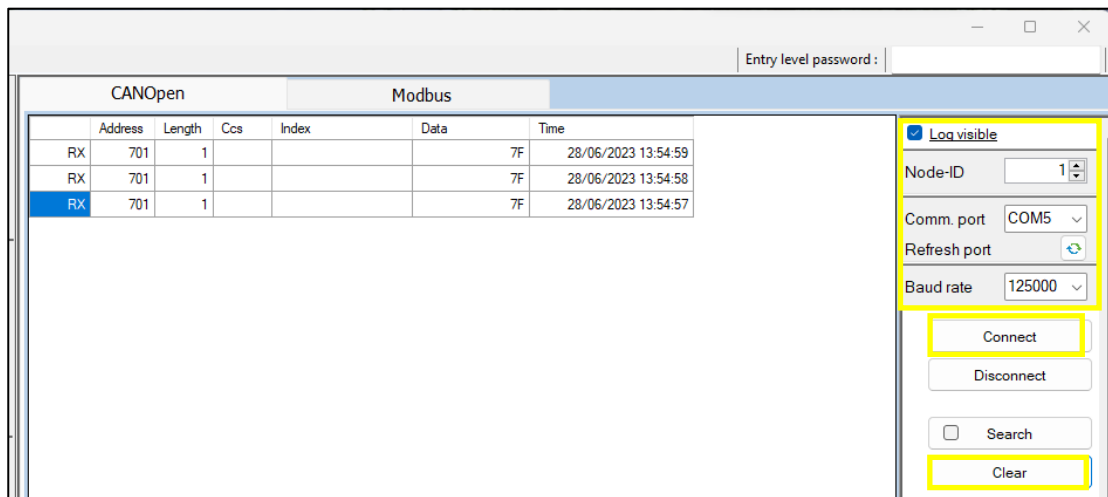
3. CONNECTION

This view (the default view when opening the program) allows the management of the connection to the serial port; select the page of the communication actually used (CANopen or Modbus).



Select the connection settings and then click on "**Connect**".

In the middle there is the message log; it can be re-setted with the "**Clear**" key (highlighted in green below).

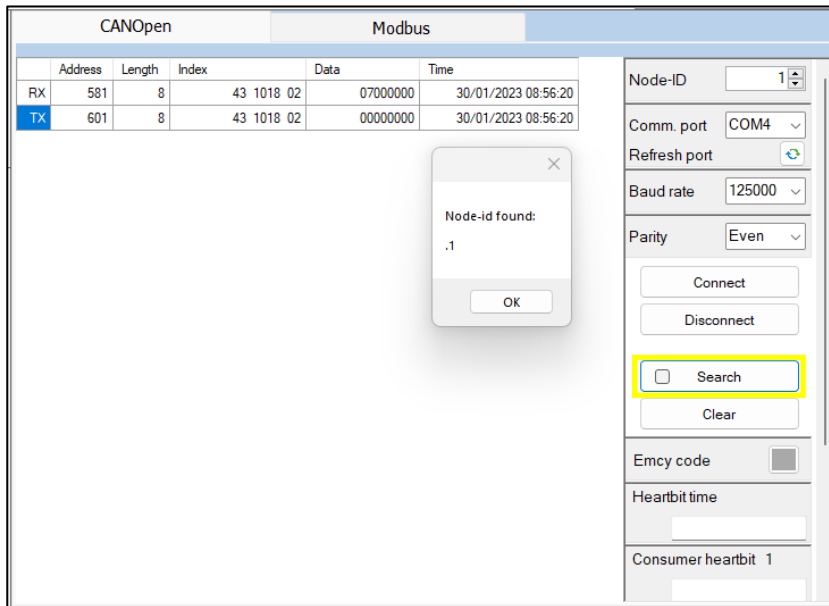


3.1. Search nodes

In case of unknown node-id, search the node through the button "Search".

There are two search modes:

- **Single node/drive search:**

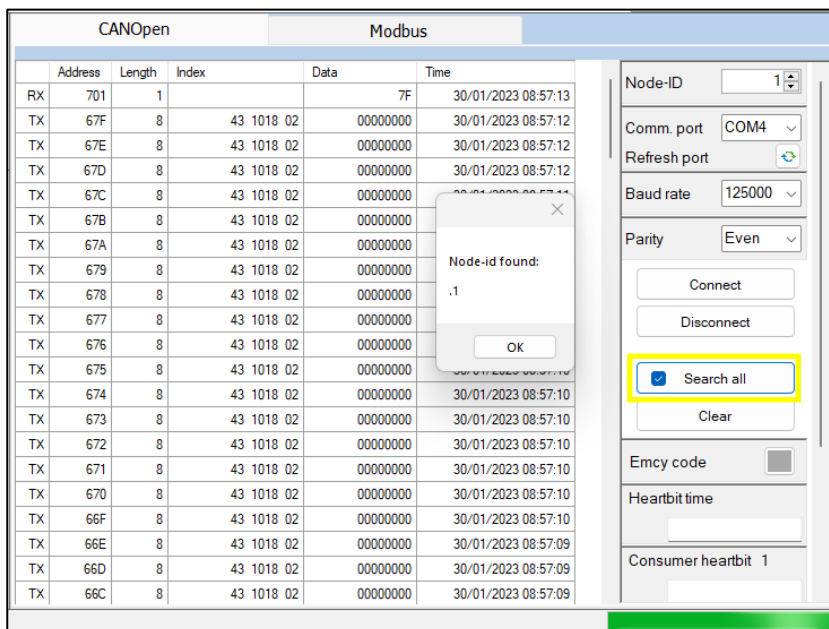


CANOpen		Modbus			
	Address	Length	Index	Data	Time
RX	581	8	43 1018 02	07000000	30/01/2023 08:56:20
TX	601	8	43 1018 02	00000000	30/01/2023 08:56:20

Node-ID: 1
 Comm. port: COM4
 Refresh port: [Refresh]
 Baud rate: 125000
 Parity: Even
 Connect
 Disconnect
 Search
 Clear
 Emcy code: []
 Heartbit time: []
 Consumer heartbeat: 1

Node-id found:
.1
OK

- **Multiple searches of node/drive:**



CANOpen		Modbus			
	Address	Length	Index	Data	Time
RX	701	1		7F	30/01/2023 08:57:13
TX	67F	8	43 1018 02	00000000	30/01/2023 08:57:12
TX	67E	8	43 1018 02	00000000	30/01/2023 08:57:12
TX	67D	8	43 1018 02	00000000	30/01/2023 08:57:12
TX	67C	8	43 1018 02	00000000	30/01/2023 08:57:12
TX	67B	8	43 1018 02	00000000	30/01/2023 08:57:12
TX	67A	8	43 1018 02	00000000	30/01/2023 08:57:12
TX	679	8	43 1018 02	00000000	30/01/2023 08:57:12
TX	678	8	43 1018 02	00000000	30/01/2023 08:57:12
TX	677	8	43 1018 02	00000000	30/01/2023 08:57:12
TX	676	8	43 1018 02	00000000	30/01/2023 08:57:12
TX	675	8	43 1018 02	00000000	30/01/2023 08:57:12
TX	674	8	43 1018 02	00000000	30/01/2023 08:57:10
TX	673	8	43 1018 02	00000000	30/01/2023 08:57:10
TX	672	8	43 1018 02	00000000	30/01/2023 08:57:10
TX	671	8	43 1018 02	00000000	30/01/2023 08:57:10
TX	670	8	43 1018 02	00000000	30/01/2023 08:57:10
TX	66F	8	43 1018 02	00000000	30/01/2023 08:57:10
TX	66E	8	43 1018 02	00000000	30/01/2023 08:57:09
TX	66D	8	43 1018 02	00000000	30/01/2023 08:57:09
TX	66C	8	43 1018 02	00000000	30/01/2023 08:57:09

Node-ID: 1
 Comm. port: COM4
 Refresh port: [Refresh]
 Baud rate: 125000
 Parity: Even
 Connect
 Disconnect
 Search all
 Clear
 Emcy code: []
 Heartbit time: []
 Consumer heartbeat: 1

Node-id found:
.1
OK

3.2. Communication log

At the center of the page there are the records of the transmissions of requests and answers between the drive and the master (PC). Transmission is indicated by "**TX**" and reception is indicated by "**RX**".

- CANopen

	Address	Length	Ccs	Index	Data	Time	
RX	581	8	60		6040 00	00000000	23/03/2023 15:38:43
TX	601	8	2B		6040 00	06000000	23/03/2023 15:38:43

- Modbus

	Address	Function	Index	Register	Data	CRC	Time	
RX	01	10	009B			0001	7026	30/01/2023 09:07:15
TX	01	10	009B	000102		0006	3A79	30/01/2023 09:07:15

3.3. Communication parameters

When connected to the network (Modbus or CANopen) the communication settings should be selected.

The first data at the top, is the drive ID (see the **Search Nodes** section)

The serial port (**Comm. port**) is used to identify which COM of the PC the drive is connected to.

The "**Refresh port**" button is used to update the list of serial ports.

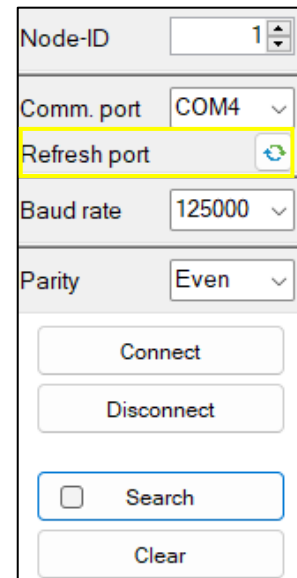
The "**Baud rate**" and the "**Parity**" standard values are set on:

CANopen

- Baudrate = 125000 bps

Modbus

- Baudrate = 19200 bps
- Parity = "Even"



The screenshot shows a control panel for communication settings. It includes a 'Node-ID' dropdown set to '1', a 'Comm. port' dropdown set to 'COM4', a 'Refresh port' button with a circular arrow icon, a 'Baud rate' dropdown set to '125000', and a 'Parity' dropdown set to 'Even'. Below these are four buttons: 'Connect', 'Disconnect', 'Search' (with an unchecked checkbox), and 'Clear'.

3.4. Modify address node and Baudrate (CANopen)

Change the drive node ID and Baudrate under the connection settings.

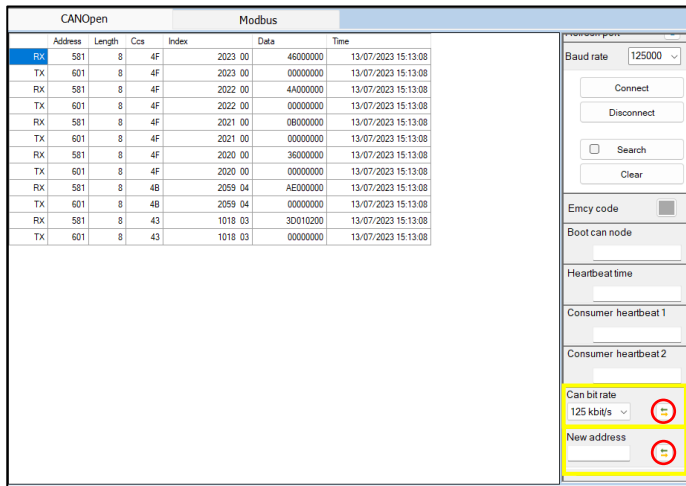
3.4.1.ADDRESS

In the "New address" panel, enter a valid numeric value for the new node (from 1 to 127) and send the request by pressing the button (in the image below circled in red).

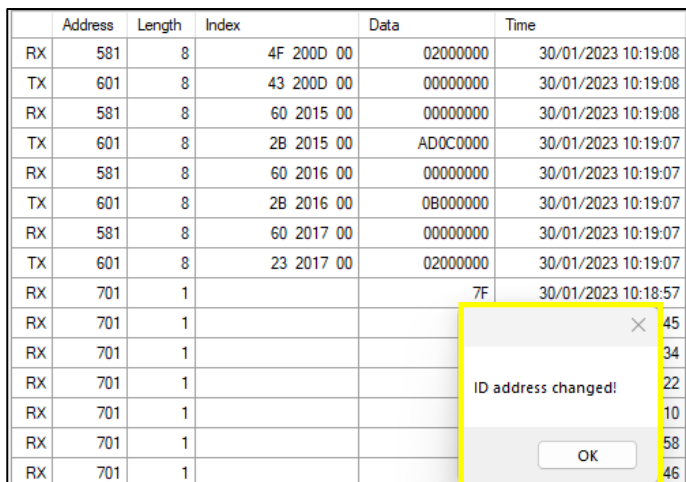
At the end of the procedure a pop-up will confirm the changed address node. Push the "Save configuration on drive" button and restart the drive to complete the procedure.

3.4.2.BAUDRATE

In "CAN bit rate" panel, select one element from the dropdown menu and wait, at the end of the procedure a pop-up will confirm the changed baudrate. Push the "Save configuration on drive" button, restart the drive and disconnect the AZCANconvert from your PC. Reconnect the AZCANconvert to complete the procedure.



The screenshot shows the TEM interface with two data tables and configuration panels. The top table is labeled 'CANOpen' and the bottom one 'Modbus'. On the right, there are configuration panels for 'Baud rate' (set to 125000), 'Emergency code', 'Boot can node', 'Heartbeat time', 'Consumer heartbeat 1', and 'Consumer heartbeat 2'. At the bottom of the configuration panels, 'Can bitrate' is set to 125 kbit/s and 'New address' is highlighted with a red circle. Another red circle highlights a button next to the 'New address' field.



The screenshot shows a data table with columns: Address, Length, Index, Data, and Time. The table contains several rows of RX and TX data. A pop-up dialog box is overlaid on the table, with a yellow border. The dialog box contains the text 'ID address changed!' and an 'OK' button. The dialog box is positioned over the row where Address is 701 and Index is 1.

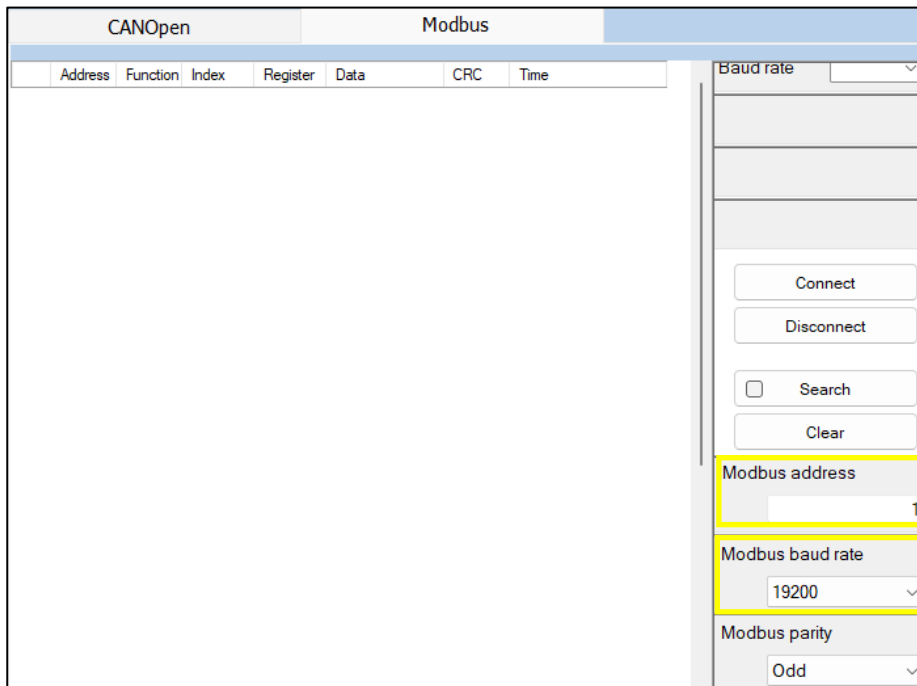
Address	Length	Index	Data	Time
RX	581	8	4F 200D 00	02000000 30/01/2023 10:19:08
TX	601	8	43 200D 00	00000000 30/01/2023 10:19:08
RX	581	8	60 2015 00	00000000 30/01/2023 10:19:08
TX	601	8	2B 2015 00	AD0C0000 30/01/2023 10:19:07
RX	581	8	60 2016 00	00000000 30/01/2023 10:19:07
TX	601	8	2B 2016 00	0B000000 30/01/2023 10:19:07
RX	581	8	60 2017 00	00000000 30/01/2023 10:19:07
TX	601	8	23 2017 00	02000000 30/01/2023 10:19:07
RX	701	1		7F 30/01/2023 10:18:57
RX	701	1		
RX	701	1		
RX	701	1		
RX	701	1		
RX	701	1		
RX	701	1		

3.5. Modify address node and Baudrate (Modbus)

3.5.1.ADDRESS

In the "**Modbus address**" panel, enter a valid numeric value for the new node and send the request by pressing "**Enter**" from the keyboard.

Push the "**Save configuration on drive**" button and restart the drive to complete the procedure.



3.5.2.BAUDRATE

It is possible to modify the Baudrate saved on the drive. Select one element from the dropdown menu. Push the "**Save configuration on drive**" button and restart the drive. On startup the communication settings will be changed.

4. PARAMETERS LIST

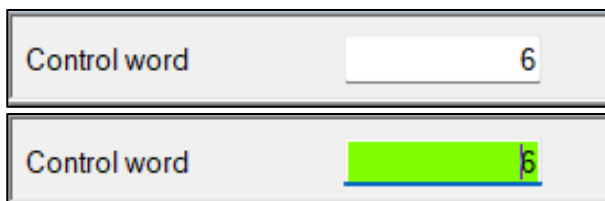
Selecting the "Parameters" button from the left sidebar will display the list of all the parameters of the drive.

They are divided on different pages and displayed depending on the type of parameter.

There are three types of parameters:

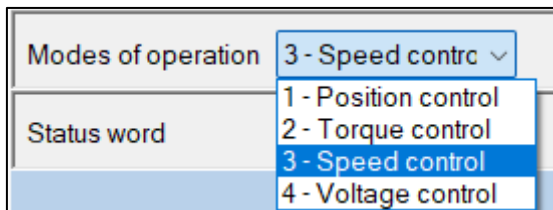
- **Textbox** (classic numeric value)

To modify the parameter, press in the box and after entering the desired value press **Enter** from the keyboard. It will turn green when the software send the request to the drive.



- **Combobox** (selection of an item from the drop-down menu)

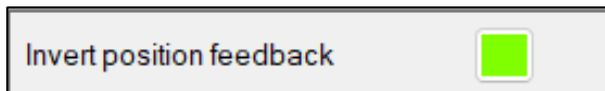
Comboboxes have pre-defined values. To change the value, select the box and from the generated drop-down menu, select an item. The edges will turn green when the software send the request to the drive.



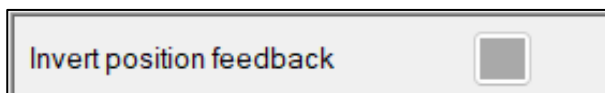
- **Coil** (Type values like ON/OFF or 1/0).

To modify the value, click on the LED.

- Bright green value -> 1



- Dark grey value -> 0



Pages list on tabs:**• Functional:**

From this view is possible to set the functional parameters such as DS402 factors.

• Motor:

From this view is possible to set the motor and brake parameters.

• PID:

PID tuning and SPIDAC parameters can be found on this view.

• Input/Output:

From this view it is possible to set the functions associated with digital and analog inputs and digital outputs.

• Encoder:

Set the type and the features of the encoder.

• Phasing:

Contain the phasing data of encoder and the functions for phasing.

• Controls:

Contain control flags and the limits for position and torque control.

• Advanced:

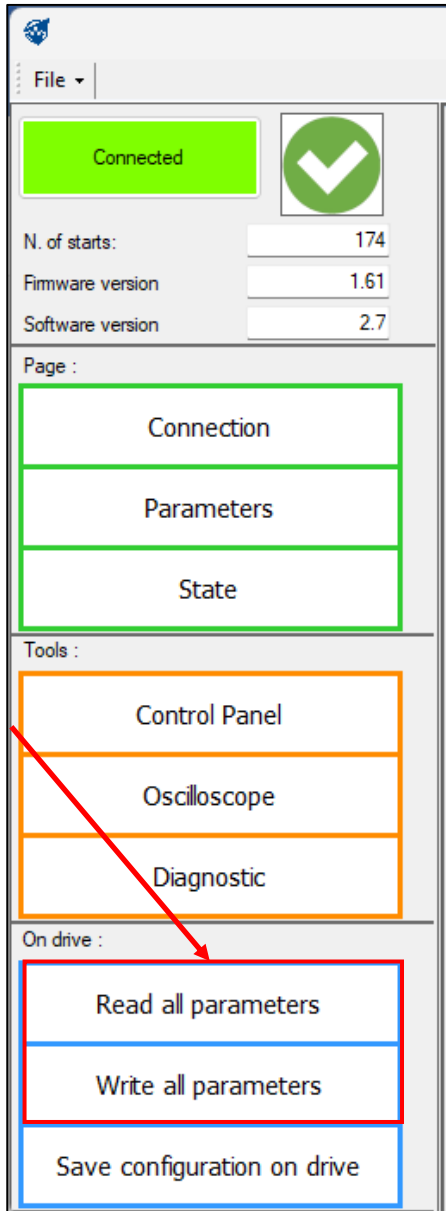
Advanced parameters and coil.

5. WRITE/READ PARAMETERS

5.1. Parameters

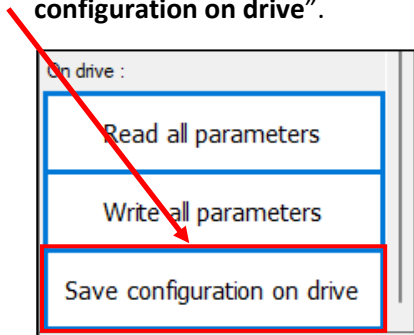
In the left sidebar you can act on the parameters of the drive by clicking on the buttons “**Read all parameters**” or “**Write all parameters**”.

When clicking, they will start the procedure to read or write all parameters, from 10 to 20 seconds read; from 20 to 30 seconds write maximum waiting time.

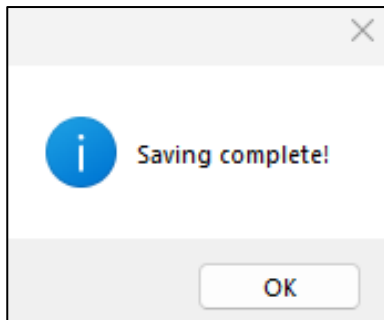


5.2. Saving on drive

To make the changes made on the drive effective, save the parameters on EEPROM by clicking “**Save configuration on drive**”.



Wait a few seconds for the pop-up confirmation of the save to appear.



6. CONFIGURATION

It is possible to load/download a new configuration on the drive.

6.1. Load new configuration

Select the "File" drop-down menu in the upper left and press "Load...".

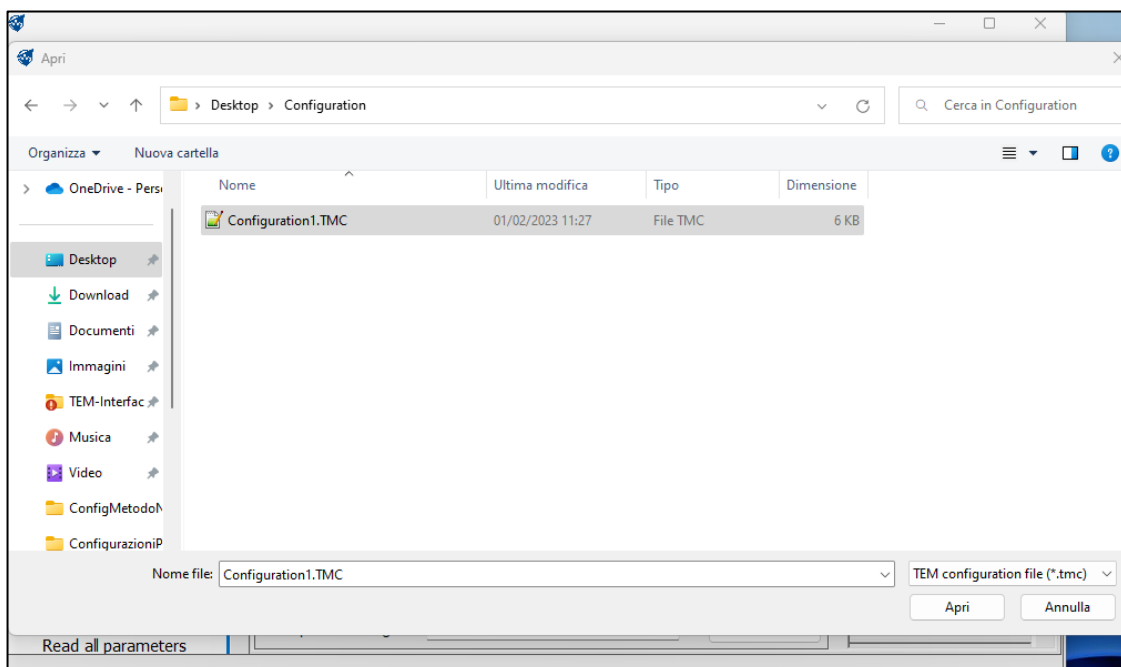
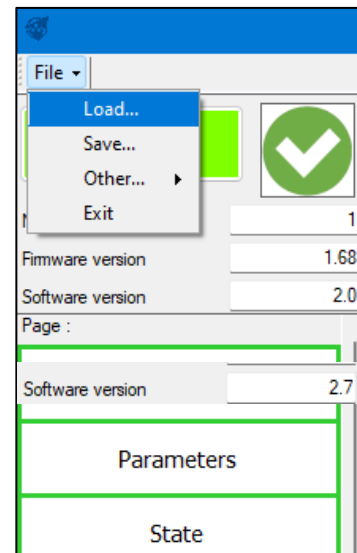
Select the file (with the correct format), confirm by clicking on "Open".

After a few seconds a confirmation pop-up will come out. Download the parameters to the drive pushing "Write all".

To fix the parameters on the drive and save them in the eeprom memory it is necessary to push "Save configuration on drive" (chapter 5.2).

In **CANopen** to change ID-node and Baudrate set the value as described in the paragraph:

3.4.Modify address node and Baudrate (CANopen)

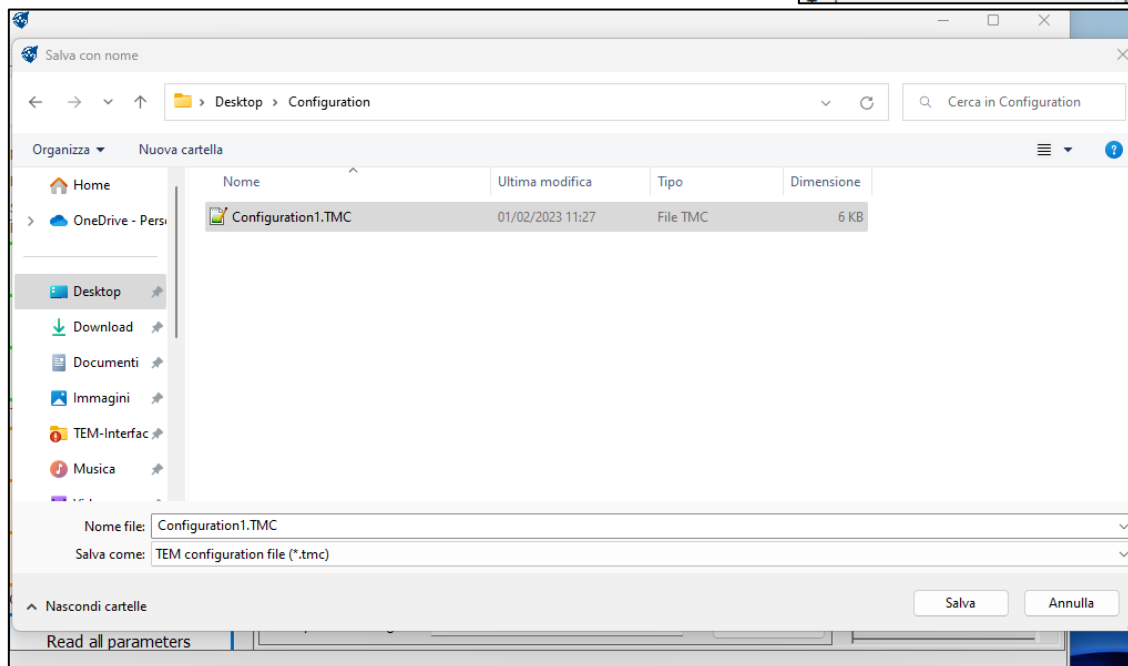
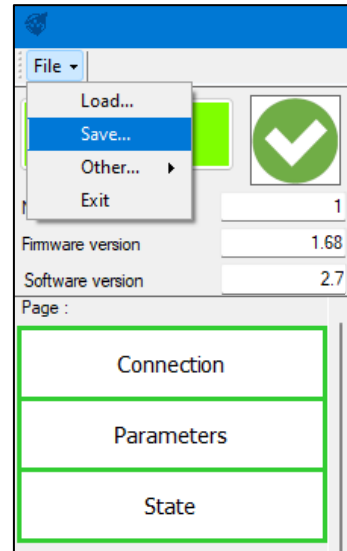


6.2. Save new configuration

Select "**File**" from the drop-down menu and press "**Save...**".


Choose the desired path and then confirm by clicking on "**Save**".

After a few seconds will come out a confirmation pop-up.




7. STATE

Below the state window.

Digital input			
DI1	<input type="checkbox"/>	DI2	<input type="checkbox"/>
DI3	<input type="checkbox"/>	DI4	<input type="checkbox"/>
DI5	<input type="checkbox"/>	DI6	<input checked="" type="checkbox"/>
DI7	<input type="checkbox"/>	DI8	<input type="checkbox"/>
Refresh digital input state			
Reset tools			
Reset error	<input type="checkbox"/>	Software reset	<input type="checkbox"/>
Error code			
Drive status :	<input type="button" value="OK!"/>		
Errorcode1	<input type="text" value="0"/>	Errorcode5	<input type="text" value="0"/>
Errorcode2	<input type="text" value="0"/>	Errorcode6	<input type="text" value="0"/>
Errorcode3	<input type="text" value="0"/>	Errorcode7	<input type="text" value="0"/>
Errorcode4	<input type="text" value="0"/>	Errorcode8	<input type="text" value="0"/>

The status of the digital inputs of the drive is visible in the "State" panel. Update the state of the digital inputs via the button "Refresh digital input state".

Refresh digital input state


Check the status of the drive (diagnostic errors) and the codes of the last 8 errors since the start of the drive.

In the "Drive status" panel it is showed the current state of the drive. In case of error the code and the type of the error is showed.

The "Software reset" send a message for the reset of the device.

The "Reset error" send a message for the reset of the errors.

Reset error

Software reset

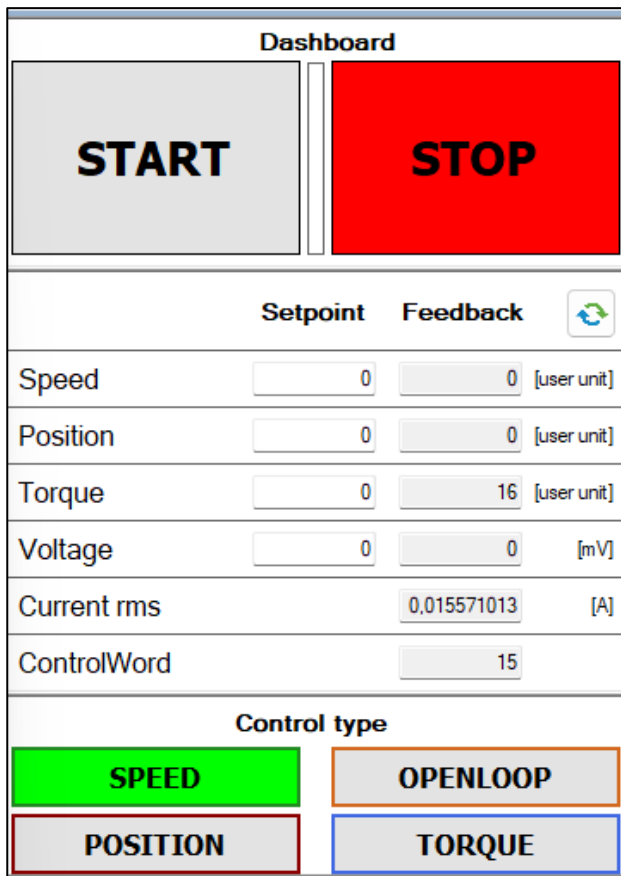
8. TOOL

Tools can be used to operate on drives:

- Control panel.
- Oscilloscope.
- Diagnostic.

8.1. Control panel

From the control panel it is possible to control the motor.




The screenshot shows a control panel interface titled "Dashboard". At the top, there are two large buttons: a grey "START" button and a red "STOP" button. Below these is a table with two columns: "Setpoint" and "Feedback", and a refresh icon. The table contains the following data:

	Setpoint	Feedback	
Speed	0	0	[user unit]
Position	0	0	[user unit]
Torque	0	16	[user unit]
Voltage	0	0	[mV]
Current rms		0,015571013	[A]
ControlWord		15	

Below the table is a "Control type" section with four buttons: "SPEED" (green), "OPENLOOP" (orange), "POSITION" (red), and "TORQUE" (blue).

In the central part there are the setpoints and the feedbacks.

To update these parameters, press the button circled in red in the image.

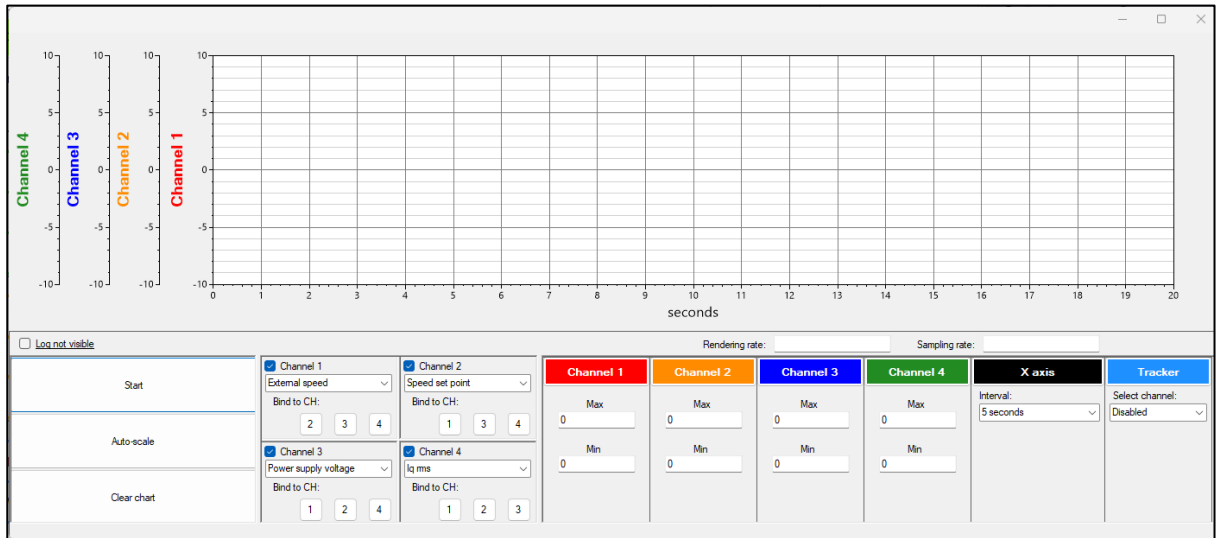
	Setpoint	Feedback	
Speed	<input type="text" value="0"/>	<input type="text" value="0"/> [user unit]	
Position	<input type="text" value="0"/>	<input type="text" value="0"/> [user unit]	
Torque	<input type="text" value="0"/>	<input type="text" value="16"/> [user unit]	
Voltage	<input type="text" value="0"/>	<input type="text" value="0"/> [mV]	
Current rms		<input type="text" value="0,015571013"/> [A]	
ControlWord		<input type="text" value="15"/>	

Below it is possible to select the mode of control.

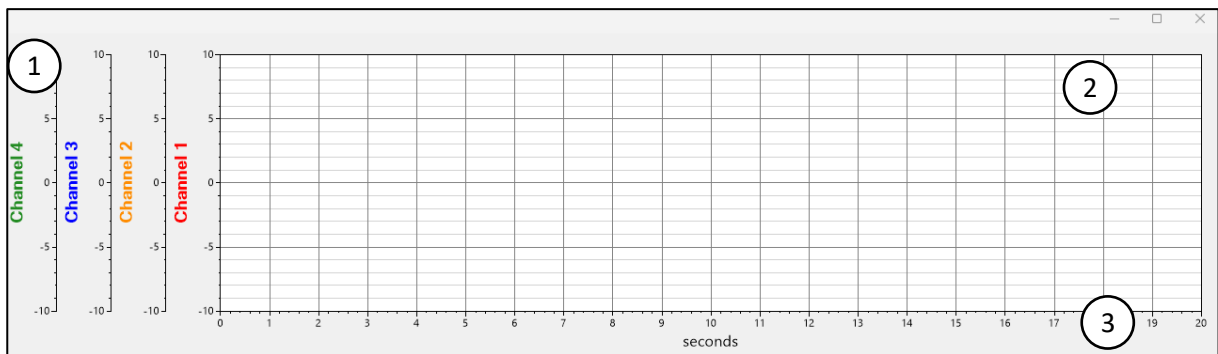
Control type	
SPEED	OPENLOOP
POSITION	TORQUE

8.2. Oscilloscope

To read the real-time data processed by the drive use the oscilloscope.



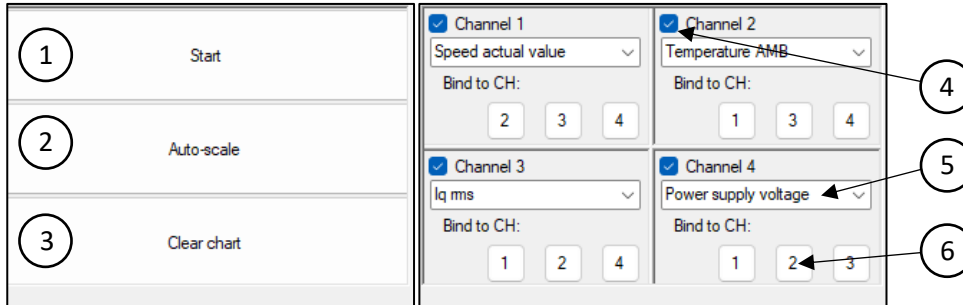
It is possible to use 4 channels with 4 parameters simultaneously. Select the parameters to be displayed on each channel and press the "Start" button.



On the Y axis there is the scale of the visible channels, on the X axis there is the time scale.

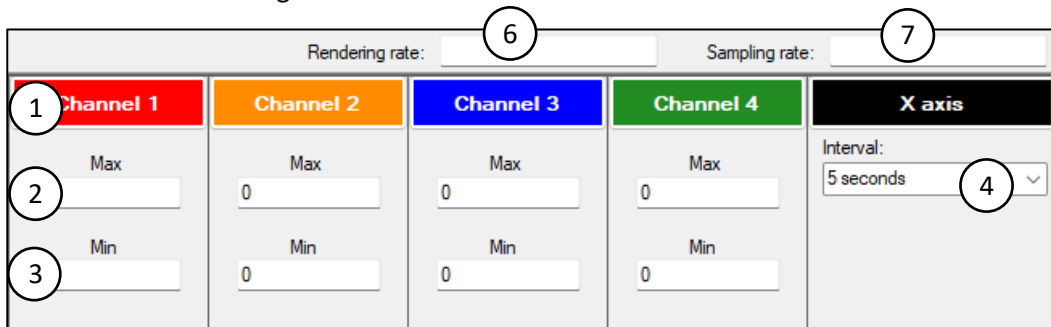
1. Axis of channels.
2. Curve display chart.
3. Axis of time.

Below the buttons to start the oscilloscope and channel selection:

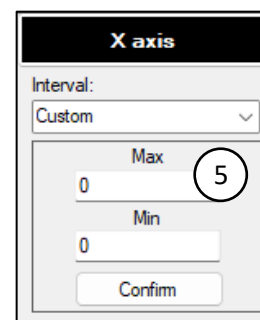


1. **Start** – Click to start collecting data.
2. **Auto-scale** – Adjust the channel scales.
3. **Clear chart** – Delete graph and stop collection.
4. **Channel selector** – When the channel is active the box is checked. If the channel is not checked the curve is not visible.
5. **Combobox** – Select the displayed parameter.
6. **Bind channel** – Allow the copy of the scales on other channels.

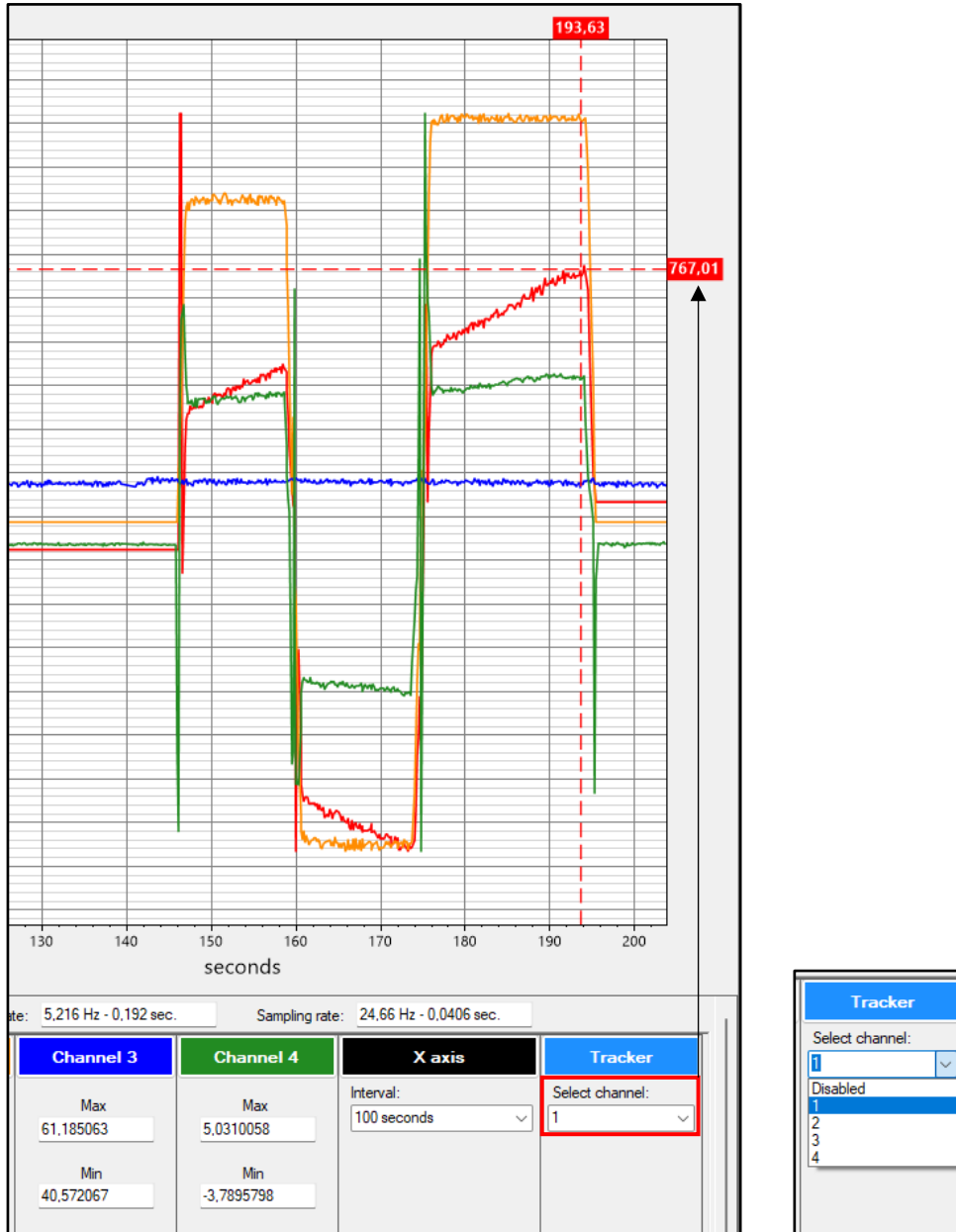
Below the scales setting view.



1. Channel name.
2. Maximum visible channel value.
3. Minimum visible channel value.
4. Visible time interval.
5. Custom limits.
6. Refresh rate.
7. Speed of data collection.



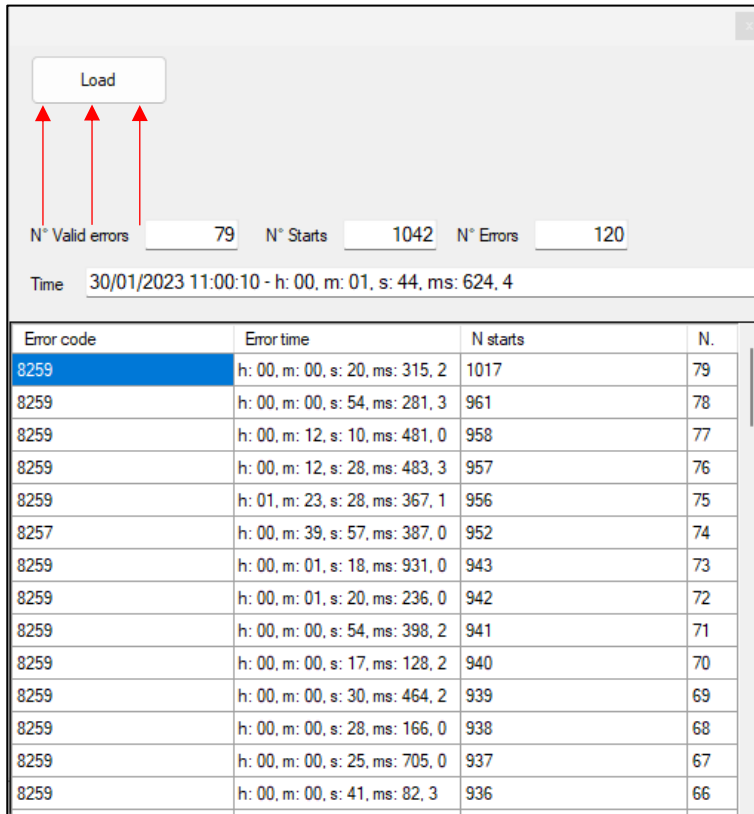
Below is visible the possibility of using a tracker to be able to know the precise value of a curve in a point. It's possible to do this only when data collection is turned off.



The highlighted box (in red) is used to select which channel want to know a point for, the values are present for the Ys on the right edge of the graph, for the Xs on the top edge, both in correspondence with the mouse position.

8.3. Diagnostic

Diagnostic panel collects and shows errors stored by drive.



Load

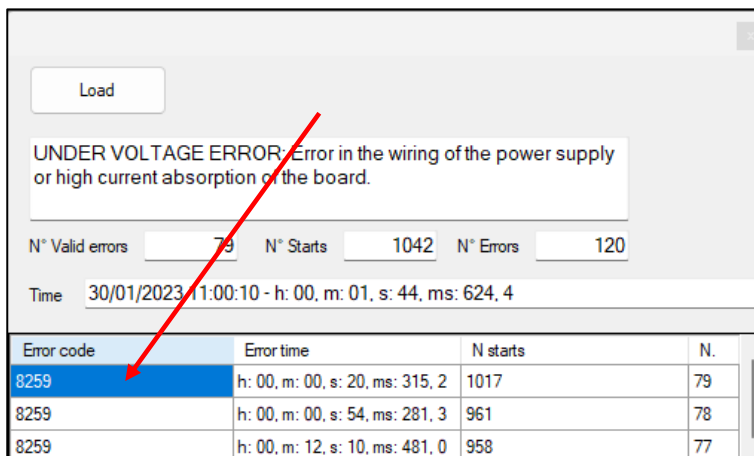
N° Valid errors N° Starts N° Errors

Time

Error code	Error time	N starts	N.
8259	h: 00, m: 00, s: 20, ms: 315, 2	1017	79
8259	h: 00, m: 00, s: 54, ms: 281, 3	961	78
8259	h: 00, m: 12, s: 10, ms: 481, 0	958	77
8259	h: 00, m: 12, s: 28, ms: 483, 3	957	76
8259	h: 01, m: 23, s: 28, ms: 367, 1	956	75
8257	h: 00, m: 39, s: 57, ms: 387, 0	952	74
8259	h: 00, m: 01, s: 18, ms: 931, 0	943	73
8259	h: 00, m: 01, s: 20, ms: 236, 0	942	72
8259	h: 00, m: 00, s: 54, ms: 398, 2	941	71
8259	h: 00, m: 00, s: 17, ms: 128, 2	940	70
8259	h: 00, m: 00, s: 30, ms: 464, 2	939	69
8259	h: 00, m: 00, s: 28, ms: 166, 0	938	68
8259	h: 00, m: 00, s: 25, ms: 705, 0	937	67
8259	h: 00, m: 00, s: 41, ms: 82, 3	936	66

To view the error log, press the "Load" button and wait for the procedure to be complete.

After loading the collected data, it is possible to select an error and the relative information will appear on the box above.



Load

UNDER VOLTAGE ERROR: Error in the wiring of the power supply or high current absorption of the board.

N° Valid errors N° Starts N° Errors

Time

Error code	Error time	N starts	N.
8259	h: 00, m: 00, s: 20, ms: 315, 2	1017	79
8259	h: 00, m: 00, s: 54, ms: 281, 3	961	78
8259	h: 00, m: 12, s: 10, ms: 481, 0	958	77



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