



Servo Controllers

ESCON2

User Guide



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READ THIS FIRST

These instructions are for qualified technical personnel only. Before you start any work:

- *Read this manual carefully.*
- *Make sure that you understand this manual.*
- *Follow all instructions in this manual.*

1 ABOUT

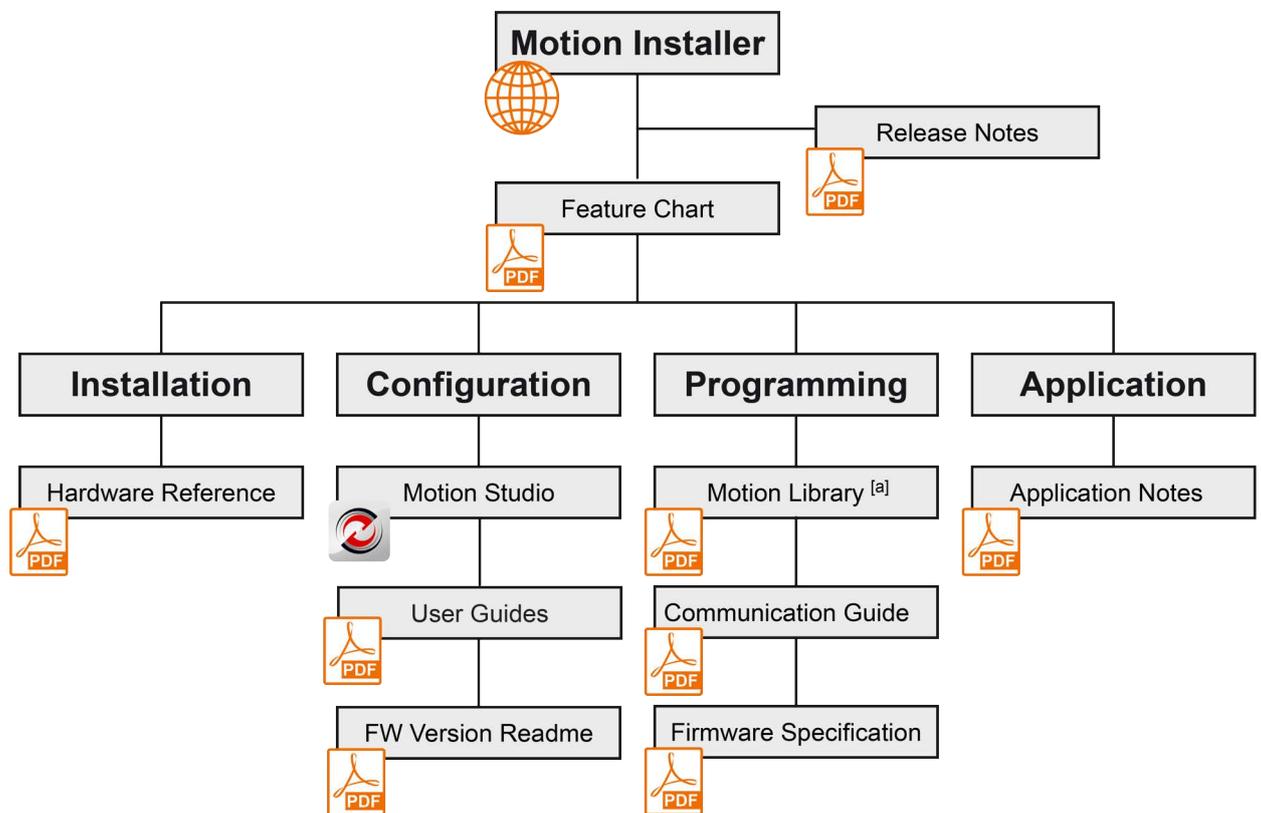
1.1 About this document

1.1.1 Intended purpose

This document provides you with information on how to install, commission, configure, operate and monitor ESCON2 Servo Controllers with Motion Installer and Motion Studio application software (GUI). Follow the instructions:

- to avoid dangerous situations,
- to keep installation and/or commissioning time at a minimum,
- to increase reliability and service life of the described equipment.

This document is part of a documentation set. The overview below shows the documentation hierarchy and how its parts are related:



[a] including software programming examples

Figure 1-1 Documentation structure

Find the latest edition of this document, along with additional documentation and software for ESCON2 Servo Controllers, at: <http://escon.maxongroup.com>

1.1.2 Target audience

This document is intended for trained and skilled personnel. It provides information on how to understand and perform the respective tasks and duties.

1.1.3 How to use

Follow these notations and codes throughout the document.

Notation	Meaning
ESCON2	stands for «ESCON2 Servo Controller»
«Abcd»	indicating a title or a name (such as of document, product, mode, etc.)
(n)	refers to an item (such as a part number, list items, etc.)
*	refers to an internal value
➔	denotes “check”, “see”, “see also”, “take note of” or “go to”

Table 1-1 Notations used in this document

1.1.4 Symbols & signs

In the course of the present document, the following symbols and signs will be used:

Type	Symbol	Meaning
Safety alert WARNING		Indicates a potential hazardous situation . If not avoided, it can result in death or serious injury .
Requirement, Note, Remark		Indicates an activity you must perform prior to continuing, or gives information on a particular point that must be observed.
Best practice		Indicates an advice or recommendation on the easiest and best way to further proceed.
Material Damage		Indicates information particular to possible damage of the equipment.

Table 1-2 Symbols and signs

1.1.5 Trademarks and brand names

All trademarks, brand names or other signs mentioned in this manual remain the property of their respective owners. They are protected by trademark, copyright, and/or other applicable laws. For easier reading, no symbols such as ® or ™ are being used with respect to the trademarks or brand names mentioned herein.

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1.2 About the safety precautions

- Read and understand the note →«READ THIS FIRST»!
- Do not start any work unless you have the required skills →Chapter “1.1.2 Target audience” on page 1-3.
- Refer to →Chapter “1.1.4 Symbols & signs” on page 1-4 to understand the symbols used.
- Follow all applicable health, safety, accident prevention, and environmental protection regulations for your country and work site.



WARNING

Risk of injury

Operating the device without full compliance of the surrounding system with EU Directive 2006/42/EC may cause serious injuries.

- *Do not operate the device unless you are certain that the other machinery fully complies with the EU directive's requirements.*
- *Do not operate the device, unless the other machinery fulfills all relevant health and safety aspects!*
- *Do not operate the device, unless all respective interfaces have been established and fulfill the requirements stated in this document!*

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2 INSTALLATION

2.1 Software installation

As a first step, use maxon's Motion Installer software to install the required software, firmware, and documentation components. Within Motion Installer, different «Use Cases» can be selected, allowing for a customized installation.

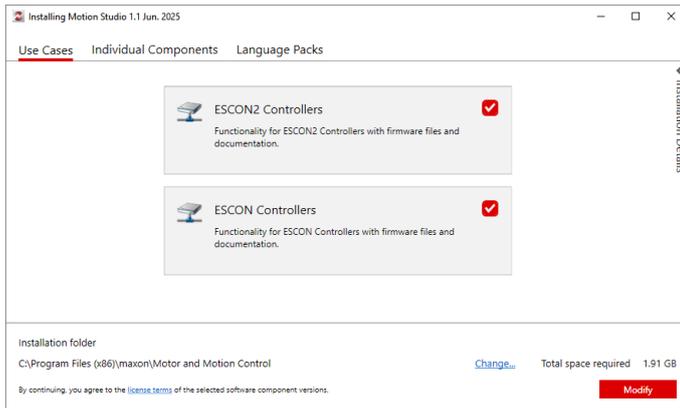


Figure 2-2 Motion Installer use case definition

If desired, «Individual Components» can be selected or deselected for installation. The default settings ensure a complete installation of all necessary components starting from Motion Studio application software (GUI), necessary controller and communication software plug-in's as well as current and previous standard firmware file versions and manuals.



Find the latest software version as well as documentation for ESCON2 servo controllers on the Internet: <http://escon.maxongroup.com>

Minimum system requirements	
Operating system	Windows 11, 10
Monitor	Screen resolution 1366 x 768 pixel at high color (16-bit)

Table 2-3 Minimum system requirements

2.2 Wiring and hardware pre-settings

The wiring of ESCON2 servo controllers is product individual and described in the according Hardware Reference documentation in detail. Nevertheless, in order to put a drive system into operation, the following minimal wiring is necessary:

- Power supply (X1) | make sure to observe the maximum supply voltage
- Motor (X3) | choice between brushed DC or brushless EC motor (BLDC)
- Sensor 1 (Hall sensor) (X4) and/or Sensor 2 (Encoder) (X5) | depending on drive combination in use
- USB (X13) or CAN (X11, X12) | for commissioning with Motion Studio

Depending on the product derivative, you may have the option to configure specific settings such as CAN Node-ID, automatic bit rate detection, and bus termination using DIP switches. Additionally, the switching levels for I/O may be adjustable.

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3 COMMISSIONING

The following is a step-by-step guide for commissioning an ESCON2 servo controller with installed Motion Studio application software (GUI).

3.1 Initial steps

- 1) Make sure a USB or CANopen interface is connected
- 2) Turn on the power supply
- 3) Double-click the «Motion Studio» application icon on the desktop
- 4) «Motion Studio» will start.



3.2 Project setup

- 1) Create an «Empty Project» by clicking in the «File» menu register under «New» to the corresponding entry.

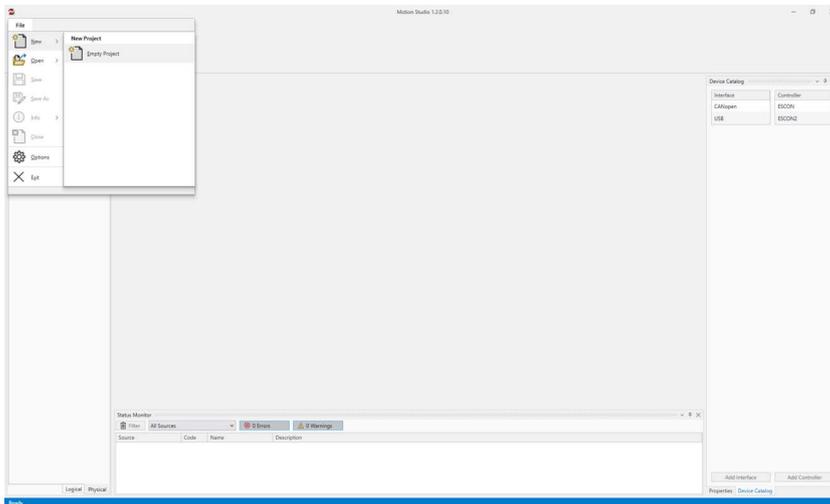


Figure 3-3 Create an empty project

- 2) Modify the project name and storage location according to your needs, then confirm with «OK».

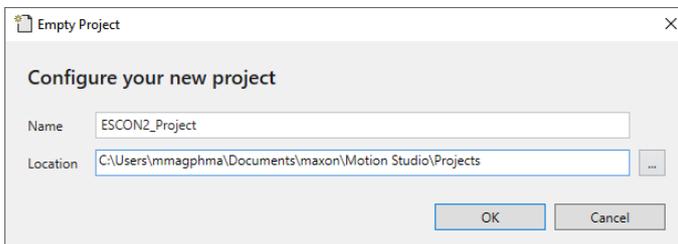


Figure 3-4 Project properties

- 3) Add a «USB» or «CANopen» interface by selecting it in the «Device Catalog» and clicking the «Add Interface» button.
→ Another method to add an interface is by a right mouse button click to the text «USB» or «CANopen» of the corresponding hardware within the «Workspace» view.
The following steps are based on the example of a USB interface. They apply analogously to CANopen.

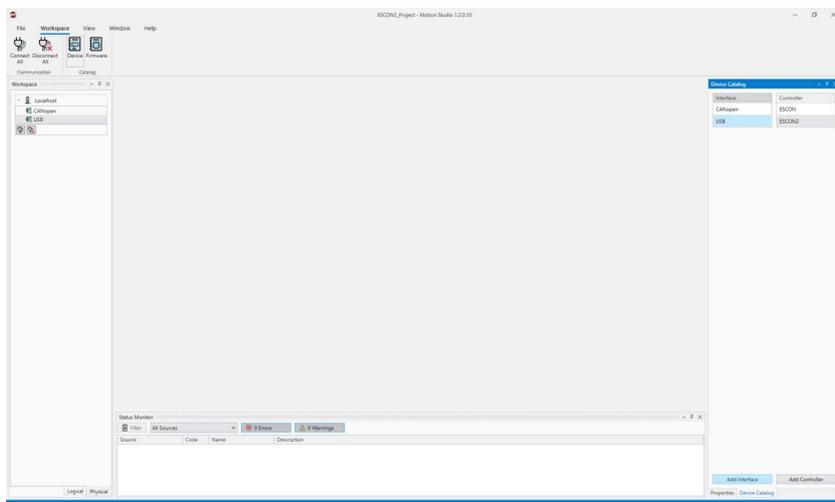


Figure 3-5 Device catalog | Adding an interface

- 4) Select the «USBx» interface within the project structure in the «Workspace» view.

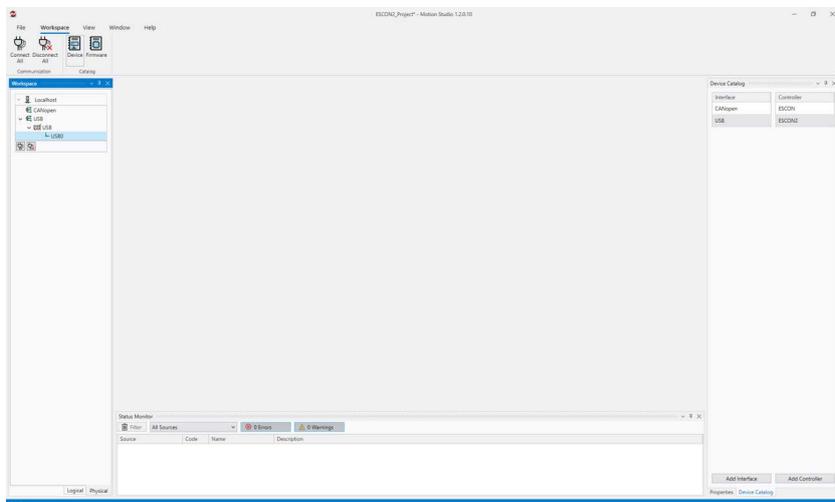


Figure 3-6 Workspace | Selecting an interface

- 5) Add an «ESCON2» Controller by selecting it in the «Device Catalog» and clicking the «Add Controller» button.
 - ➔ Another method to add a controller is by right mouse button click **on the text «USBx»** within the «Workspace» view.

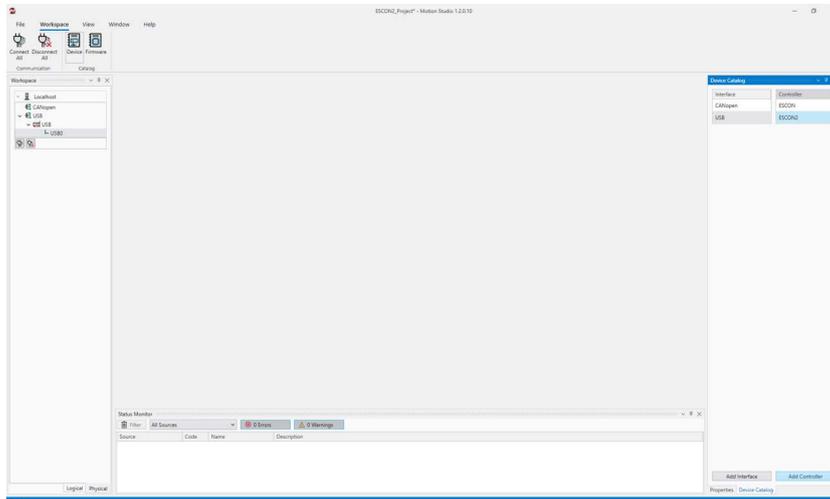


Figure 3-7 Device catalog | Adding a controller

Instead of manually adding a controller, the «Search Controllers» function can also be used. Right mouse button click on the «USB» interface and «Connect» it.

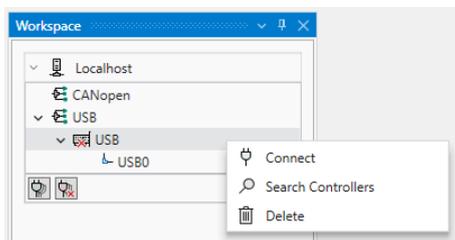


Figure 3-8 Workspace | USB interface context menu

In the same context menu the «Search Controllers» window can be opened. Various «Settings» are available and «Start Searching» will execute the function. Select a found controller and add it to the project with «OK».

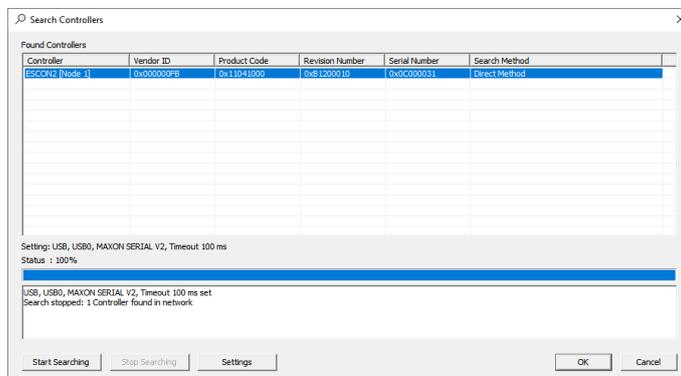


Figure 3-9 Search Controllers

The search function is particularly useful for multi-axis systems that use CANopen communication.

- 6) The controller is automatically connected and refreshed when using the default settings in the «Options» dialog.
 → Another method to handle connection status is by right mouse button click **on the text** of an interface or controller and selecting the corresponding option.

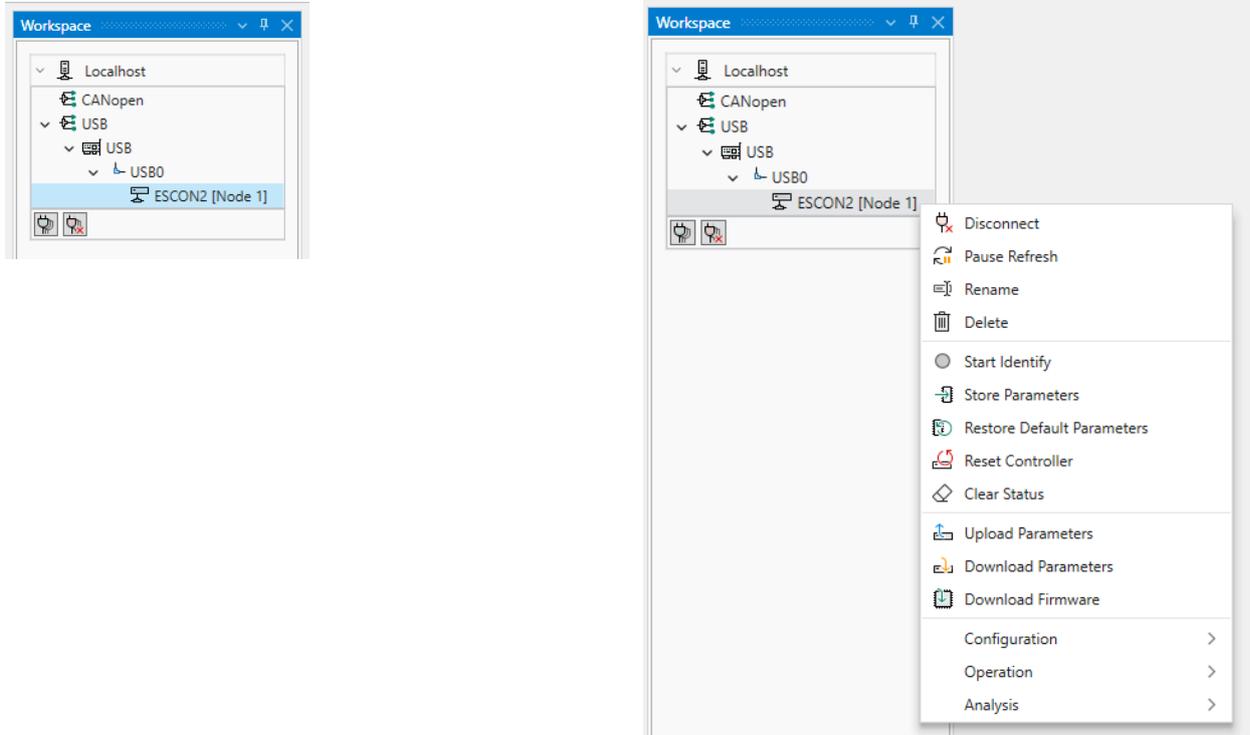


Figure 3-10 Workspace | Connected controller (left) / Controller context menu (right)

- 7) If the CANopen communication interface is used, you can configure the CAN «Bit Rate» under «Properties» when the CANopen interface in the «Workspace» is selected.

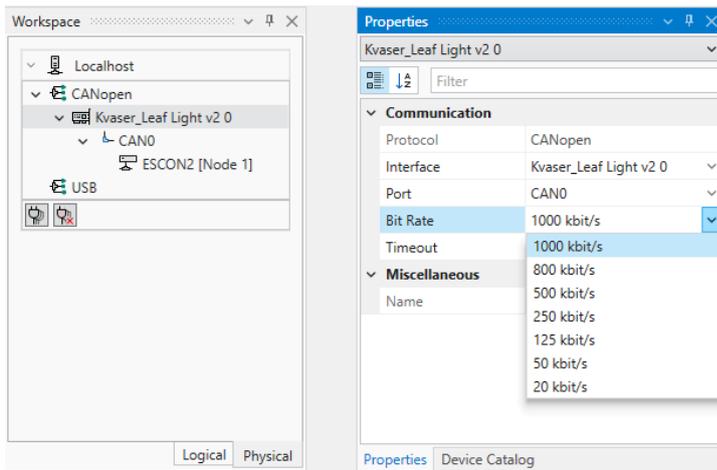


Figure 3-11 Properties | CANopen Bit Rate setting

- 8) Similarly, you can set the «Node-ID» under «Properties» of the device that is selected in the «Workspace».

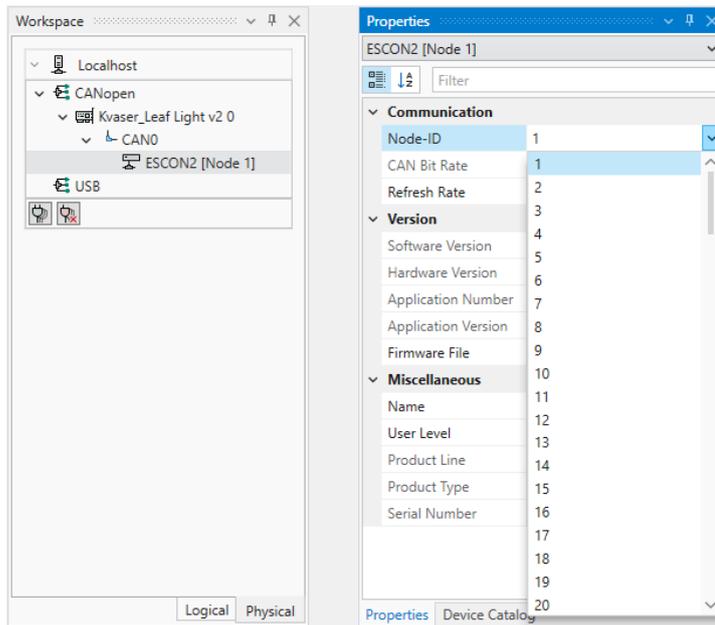


Figure 3-12 Properties | Node-ID setting

- 9) If you intend to use multiple interfaces or controllers within your project, repeat the corresponding steps accordingly. At this point, the ESCON2 servo controller is connected and ready for configuration.

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4 CONFIGURATION

4.1 Startup

The «*Startup*» wizard follows the initial project setup and controller connection, allowing to configure the entire controller functionality based on your requirements.

- 1) You can open the context menu of your connected ESCON2 controller in the «*Workspace*» view by right mouse button click **on its text**.

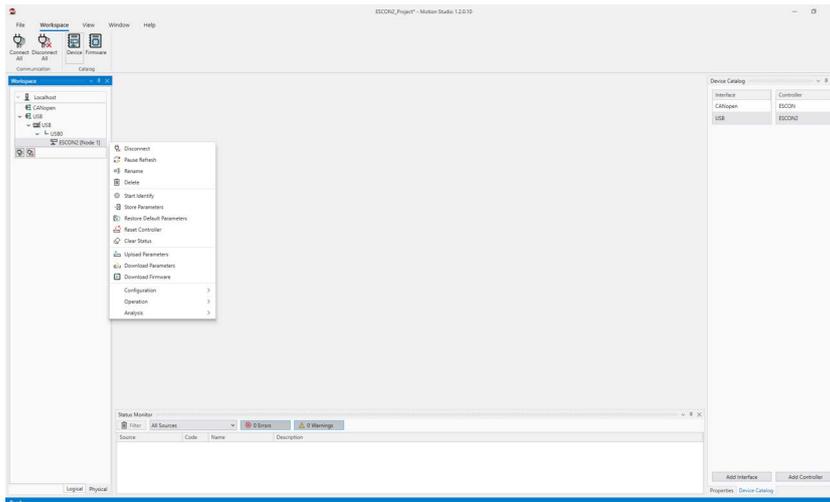


Figure 4-13 Open controller context menu

- 2) To access the «*Startup*» wizard, select the corresponding entry under «*Configuration*».

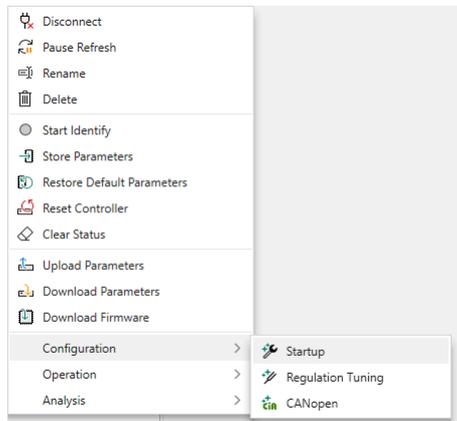


Figure 4-14 Open Startup wizard

- 3) Upon your initial entry into the «*Startup*» wizard for the first time, read, understand, and confirm the «*Safety Instructions*». After completing the «*Safety Instructions*», the wizard will guide you step-by-step through the entire controller configuration. Once the configuration is complete, exit the «*Startup*» wizard by clicking the «*Finish*» button to ensure all settings are persistently stored to your controller. For inquiries about specific configuration options, refer to the ESCON2 Firmware Specification documentation.

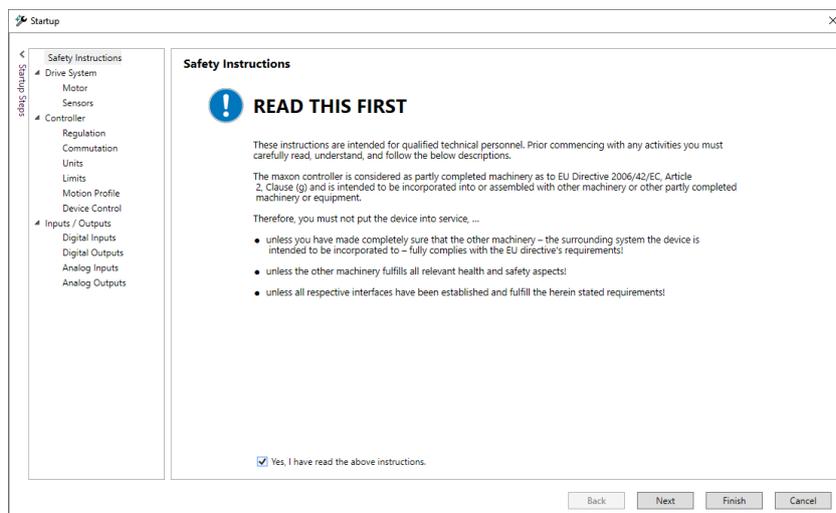


Figure 4-15 Startup wizard

4.2 Regulation tuning

«Motion Studio» offers a fully automated «Regulation Tuning» wizard to optimize controller parameters for your drive-train in both current and velocity control modes.

- 1) You can open the controller context menu by right mouse button click **on the text** of your connected ESCON2 controller in the «Workspace» view.

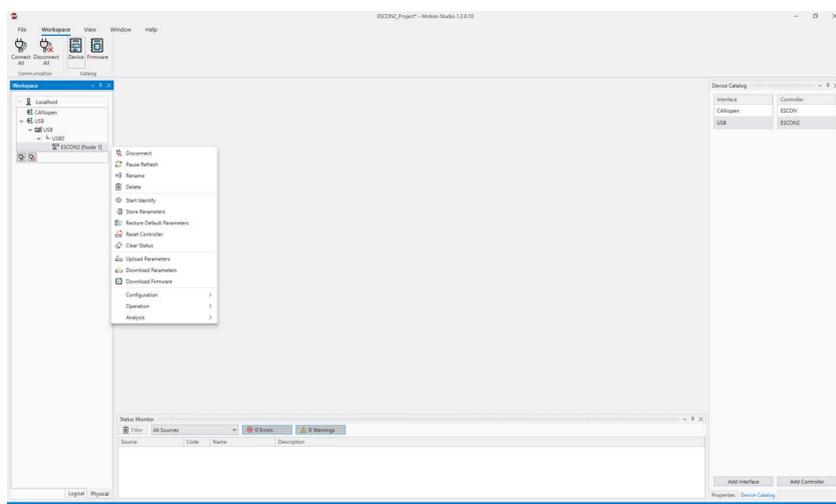


Figure 4-16 Open controller context menu

- 2) Access the «Regulation Tuning» wizard by selecting the corresponding entry under «Configuration» and clicking on it.

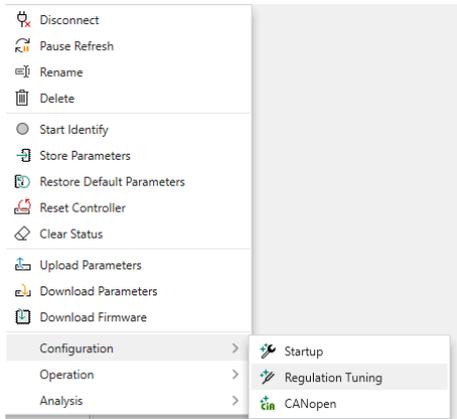


Figure 4-17 Open regulation tuning

- 3) To initiate the automated «Regulation Tuning» of the «Current Control Loop», click on the «Auto tune» button. Alternatively, you can manually perform the system identification and verification steps one after the other, adjusting their parameters in the corresponding sections.

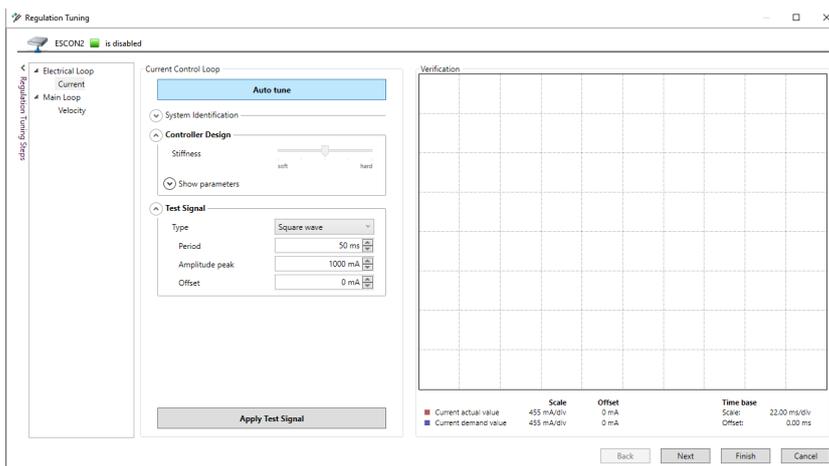


Figure 4-18 Regulation tuning wizard | Current control loop tuning

- 4) If the parameters align with your requirements, you can continue by selecting the «Next» button.

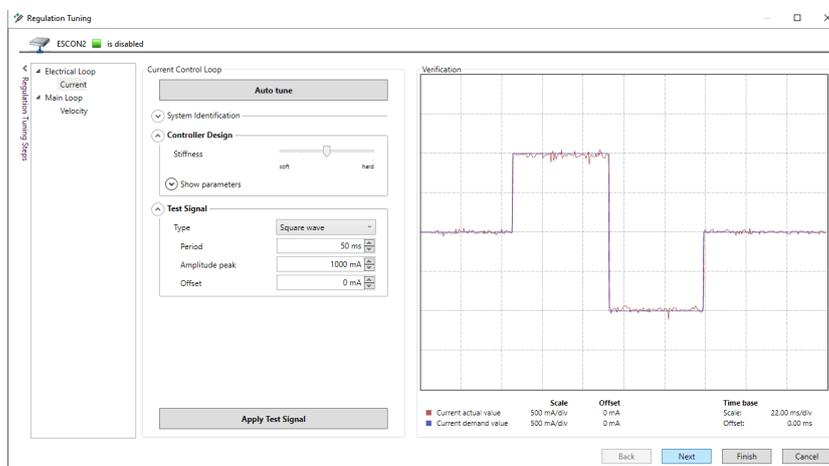


Figure 4-19 Regulation tuning wizard | Proceed to velocity control loop tuning

- Now, you can initiate the automated «Regulation Tuning» of the «Velocity Control Loop» by selecting the «Auto tune» button. Alternatively, you have the option to manually execute the system identification and verification steps sequentially, adjusting their parameters in the appropriate sections.

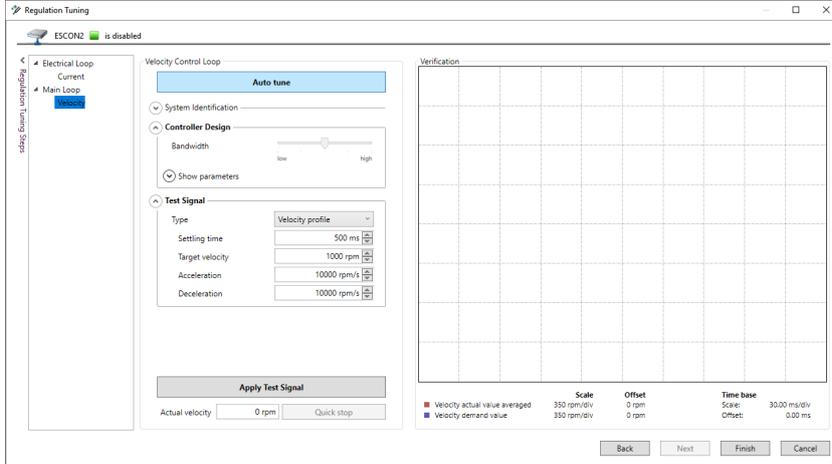


Figure 4-20 Regulation tuning wizard | Velocity control loop tuning

- If the parameters align with your requirements, you can exit the «Regulation Tuning» wizard by clicking the «Finish» button to ensure that all settings are saved persistently to your controller.

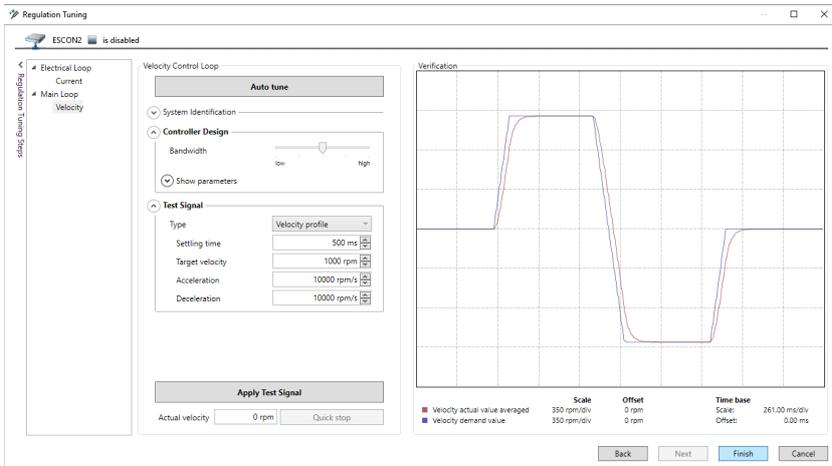


Figure 4-21 Regulation tuning wizard | Finish and saving parameters

4.3 CANopen

- 1) The «CANopen» wizard allows for the easy configuration of the primary CANopen communication objects SDOs and PDOs. Parameters for the heartbeat protocol can also be configured.

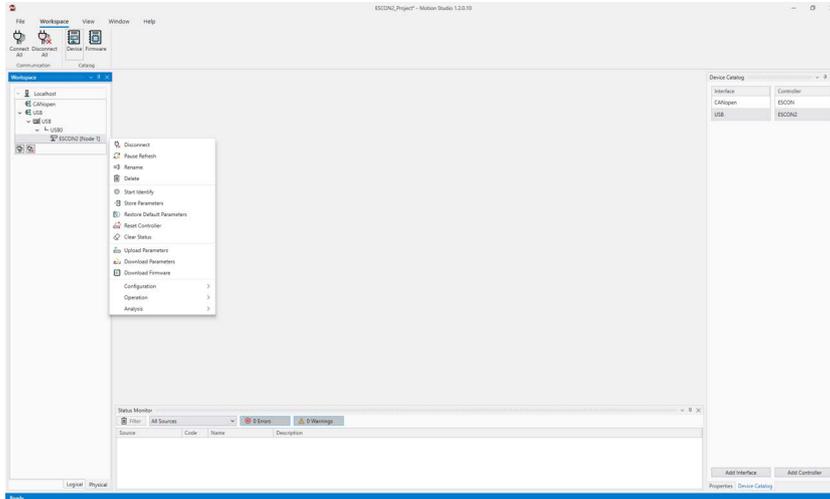


Figure 4-22 Open controller context menu

- 2) Under «Configuration», select «CANopen» and click on it to open the wizard.

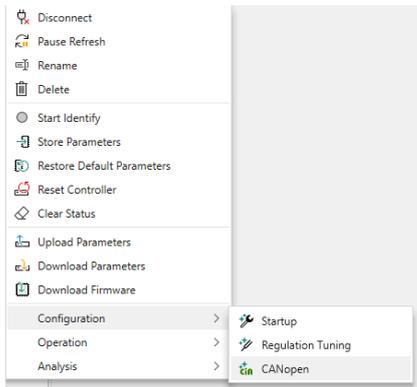


Figure 4-23 Open CANopen wizard

- 3) The displayed Service Data Objects are for information only to configure the CANopen Master accordingly.

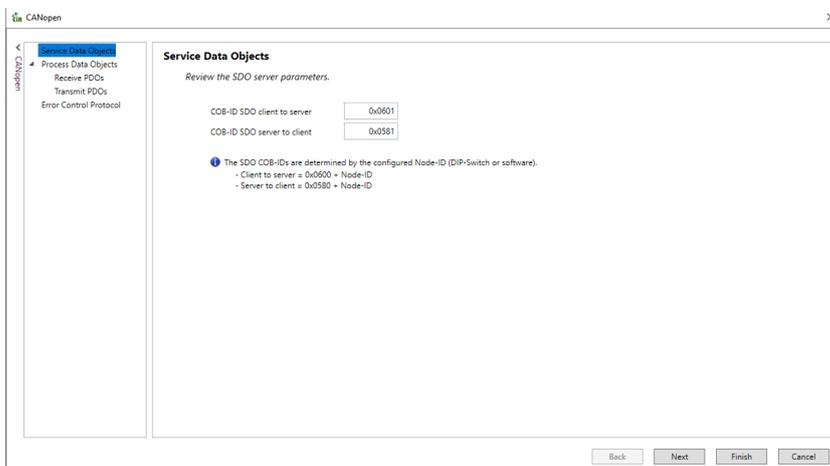


Figure 4-24 CANopen wizard Service | Data Objects

- In the next step you can configure the Receive and Transmit PDOs. With a right mouse button click, the default configurations can be restored.

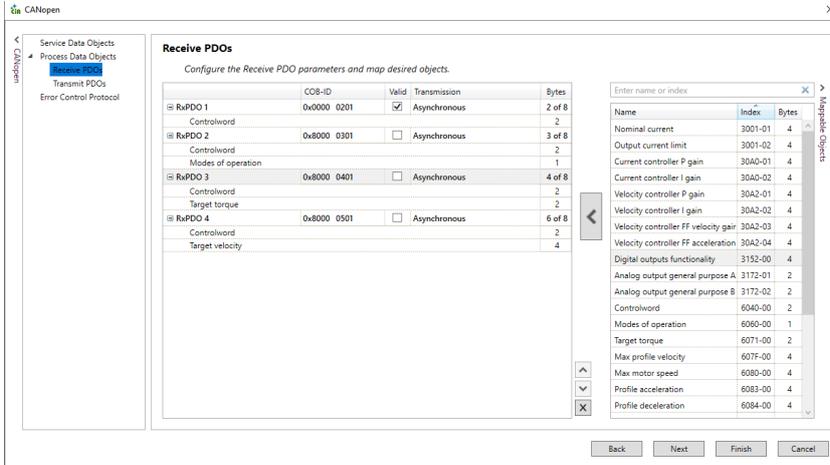


Figure 4-25 CANopen wizard | Process Data Objects

- Finally, the parameters for the heartbeat protocol can be configured. When the configuration is complete, click «Finish» to exit the «CANopen» wizard and to ensure all settings are persistently stored to the controller.



Note: The «Consumer time» must be higher than the heartbeat time that is set on the CANopen device that produces the heartbeat time. Additionally, the «Consumer time» should be set to at least 20 ms higher than the «Producer time».

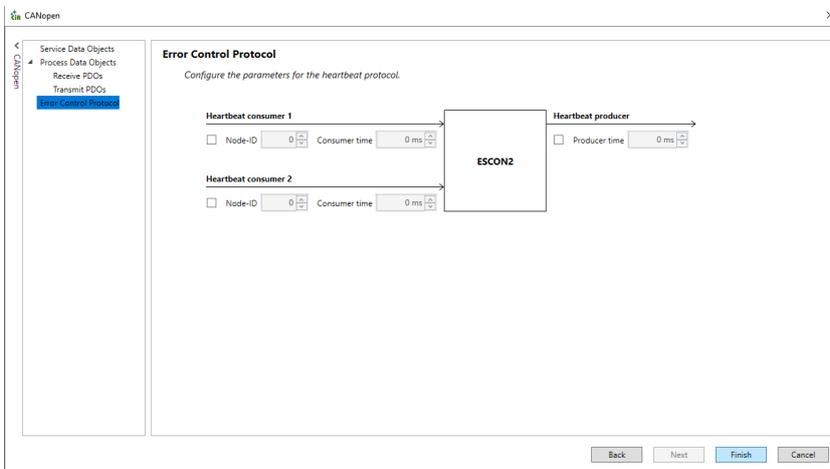


Figure 4-26 CANopen wizard | Error Control Protocol

4.4 Upload / download parameters

Upon completion of the wizards, you have finalized the configuration of your controller and may wish to upload the corresponding settings into a parameter file on your PC for backup purposes or for duplicating them to other controllers at a later time.

- 1) The respective tools can be accessed by right mouse button click **on the text** of your connected ESCON2 controller in the context menu.

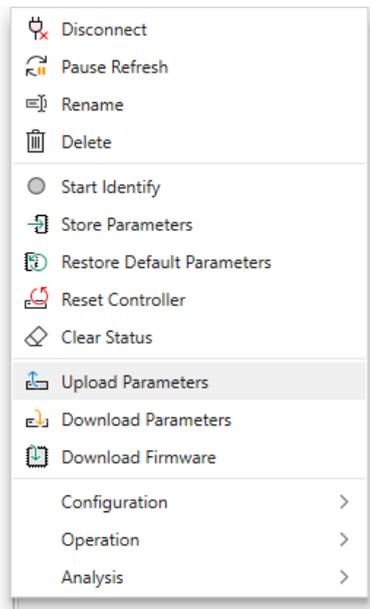


Figure 4-27 Open upload parameters

- 2) In the «*Upload Parameters*» tool, you have the option to select the controller from which you want to upload parameters and specify the name of the parameter file. Clicking the «*Upload from Controller*» button will store the parameter file in your project.

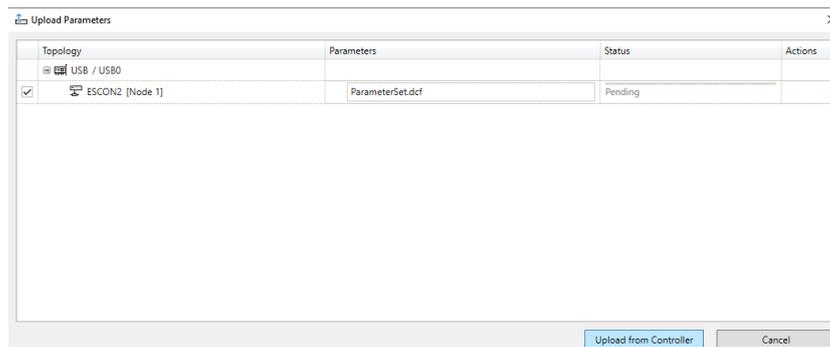


Figure 4-28 Upload parameters tool

- 3) When you switch to the «*Logical*» structure in the «*Workspace*» view, you can locate the parameter files. File operations can be accessed by right mouse button click **on the text** of the desired parameter file.

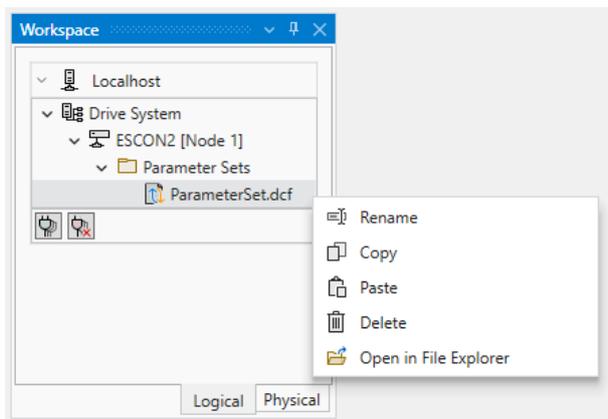


Figure 4-29 Parameter files in Workspace view, logical structure

- 4) The «Download Parameters» tool can be accessed in the same manner as described in → step 1. You have the option to select the controller to which you want to download the parameters and specify the parameter file. Clicking the «Download to Controller» button will save the parameters to your controller.

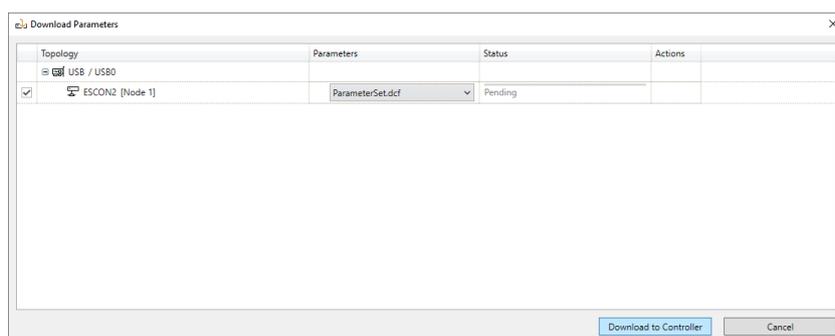


Figure 4-30 Download parameters tool

5 OPERATION

«Motion Studio» offers user-friendly tools that assist with motion control tasks, whether you are operating in velocity or current control mode. Additionally, I/O configuration and monitoring tasks can be easily managed. The opened operation tools are stored as part of the project.

These tools can be accessed by right mouse button click **on the text** of your connected ESCON2 controller in the context menu.

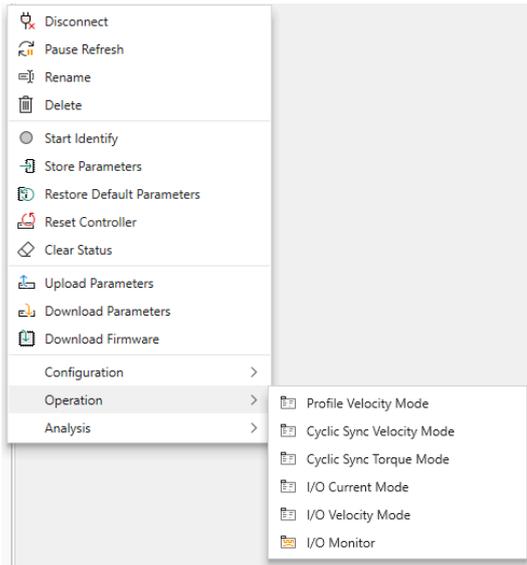


Figure 5-31 Operation tools

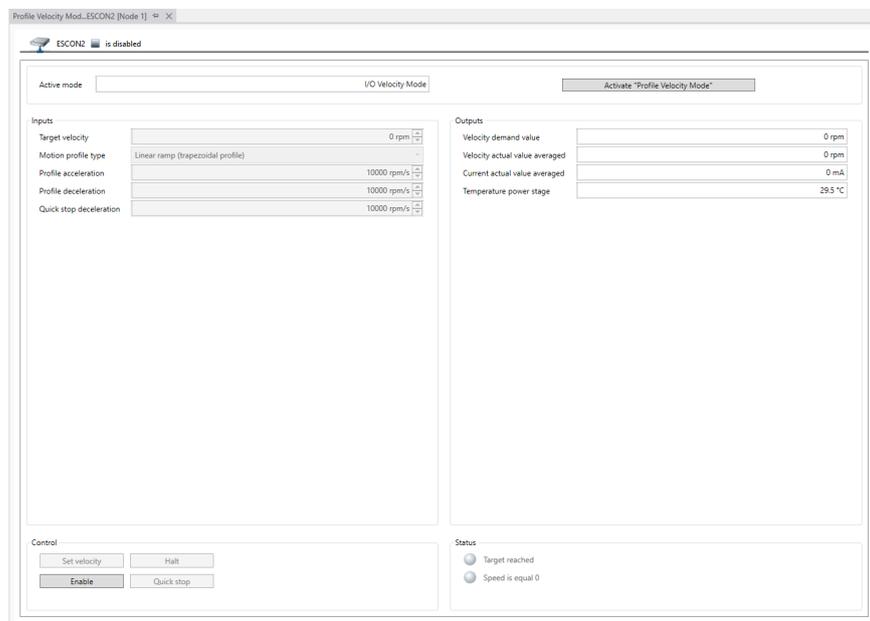


Figure 5-32 Profile Velocity Mode tool

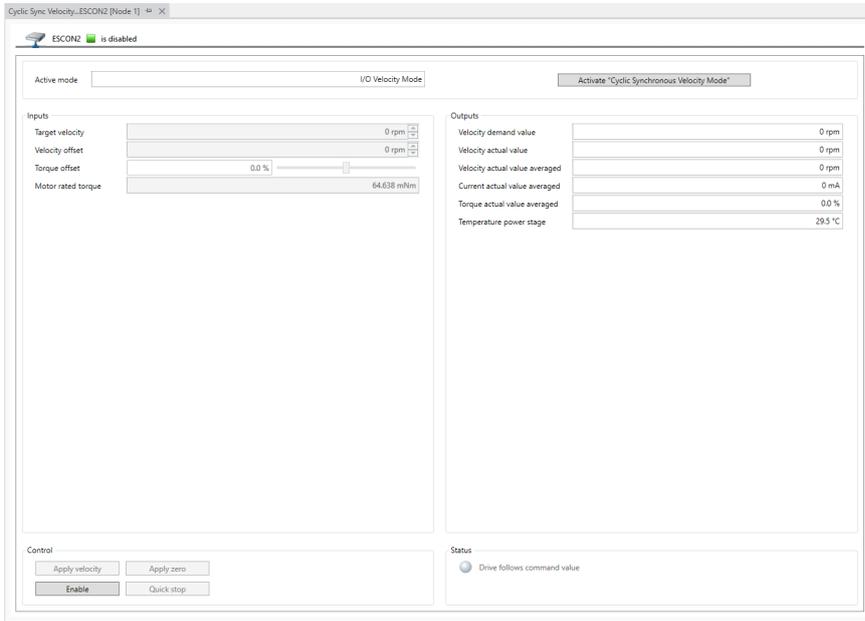


Figure 5-33 Cyclic Synchronous Velocity Mode tool

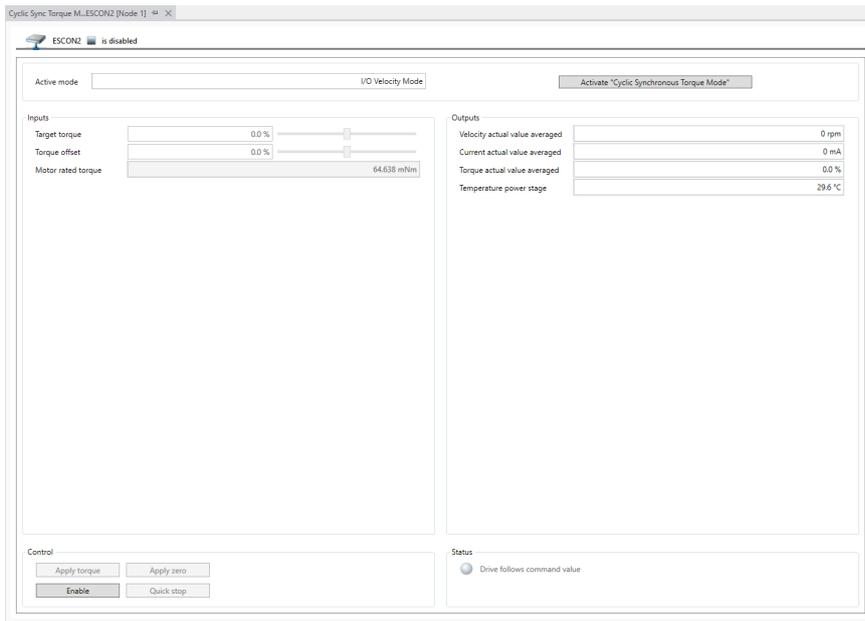


Figure 5-34 Cyclic Synchronous Torque Mode tool

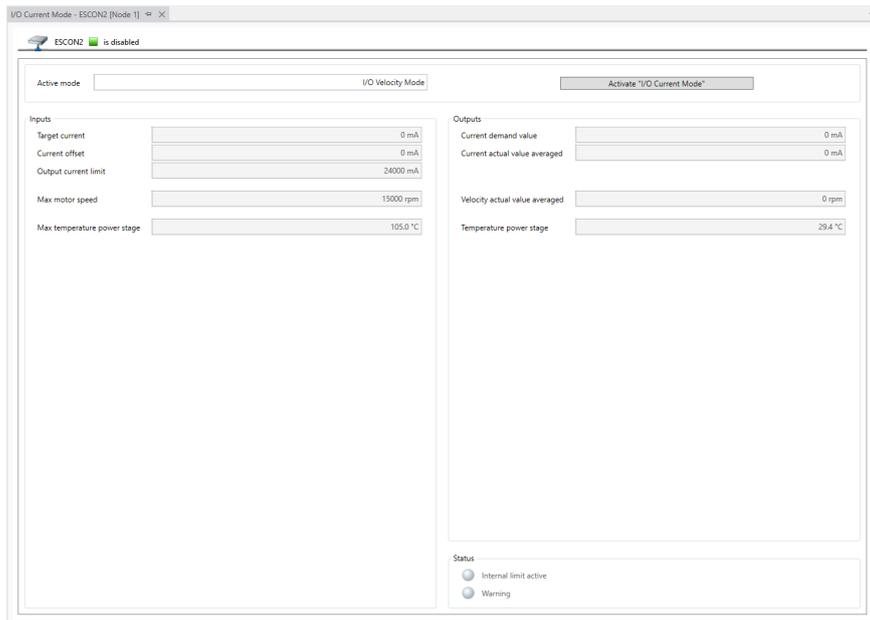


Figure 5-35 I/O Current Mode tool

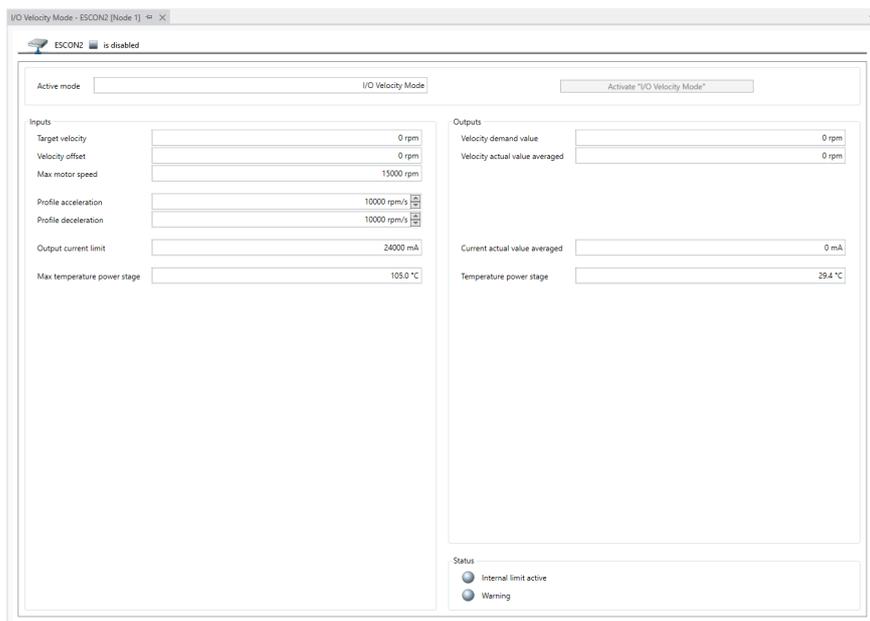


Figure 5-36 I/O Velocity Mode tool

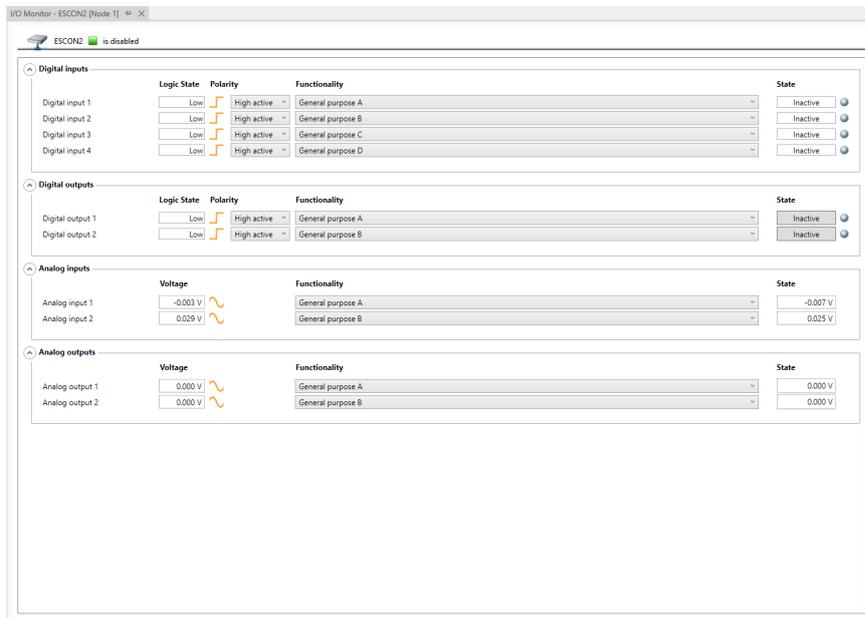


Figure 5-37 I/O Monitor tool

6 ANALYSIS

«Motion Studio» offers user-friendly tools that assist with motion analysis tasks, regardless of whether you are operating in velocity or current control mode. The opened analysis tools are stored as part of the project.



The visibility of parameters in the «Analysis» tools is dependent on the «User Level» setting which is accessible in the «Properties» view.

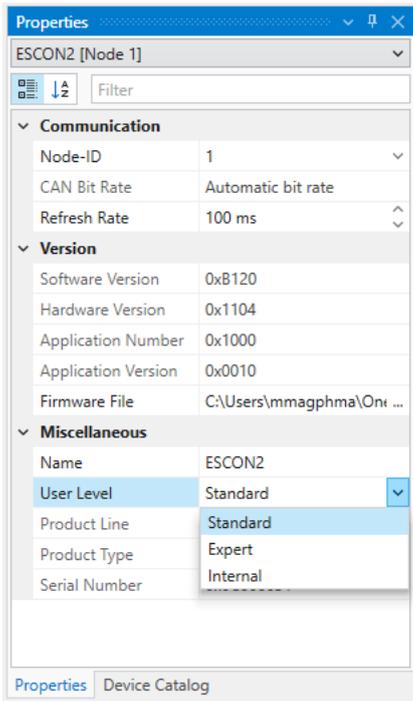


Figure 6-38 Properties | User Level setting

The according tools can be accessed by a right mouse button click to the text of your connected ESCON2 controller in the context menu.

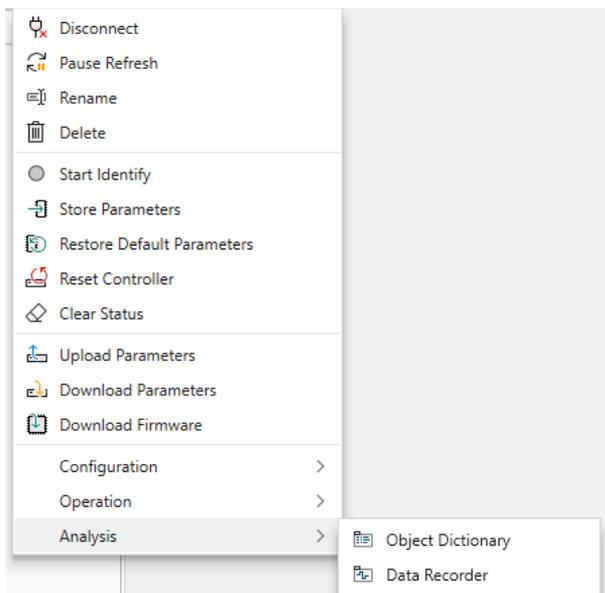


Figure 6-39 Analysis tools

6.1 Object Dictionary

- 1) The «Object Dictionary» tool stores all parameters and enables filtering, setting, and monitoring of them.



Parameter settings made in the «Object Dictionary» tool are volatile until you save them with a right mouse button click and the «Store Parameters» command.

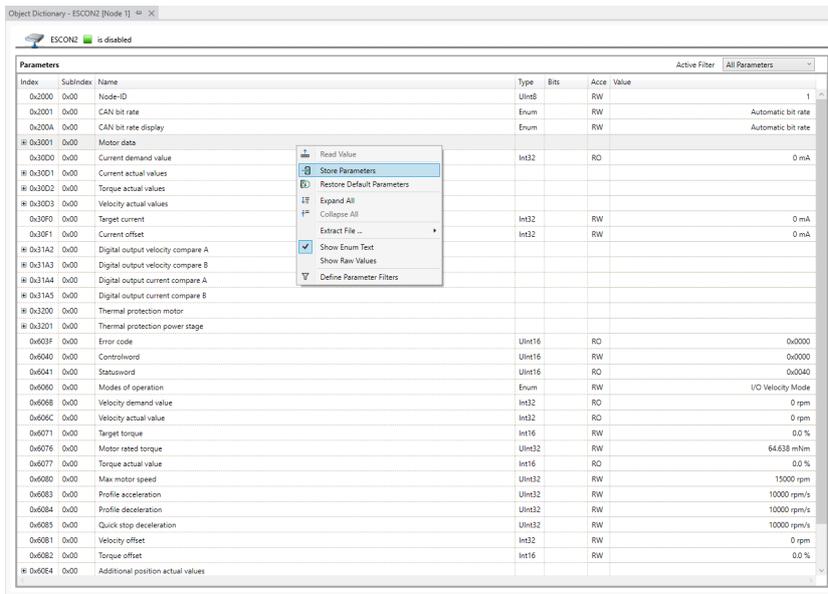


Figure 6-40 Object Dictionary tool

- 2) In the upper right corner of the tool, a filter selection can be made if desired. The list includes both predefined and user-created filters.

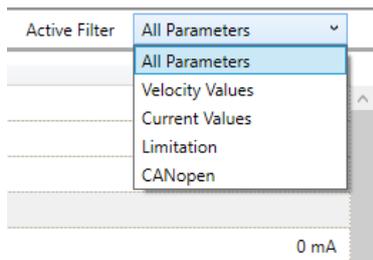


Figure 6-41 Object Dictionary tool | Filter selection

- 3) You can define, modify, store, and load custom filters using the «*Define Parameter Filters*» dialog, which can be accessed by right mouse button click on any parameter within the «*Object Dictionary*» tool.

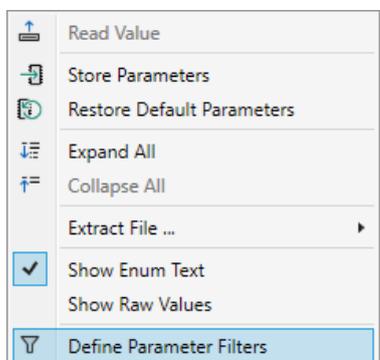


Figure 6-42 Open Define Parameter Filters dialog

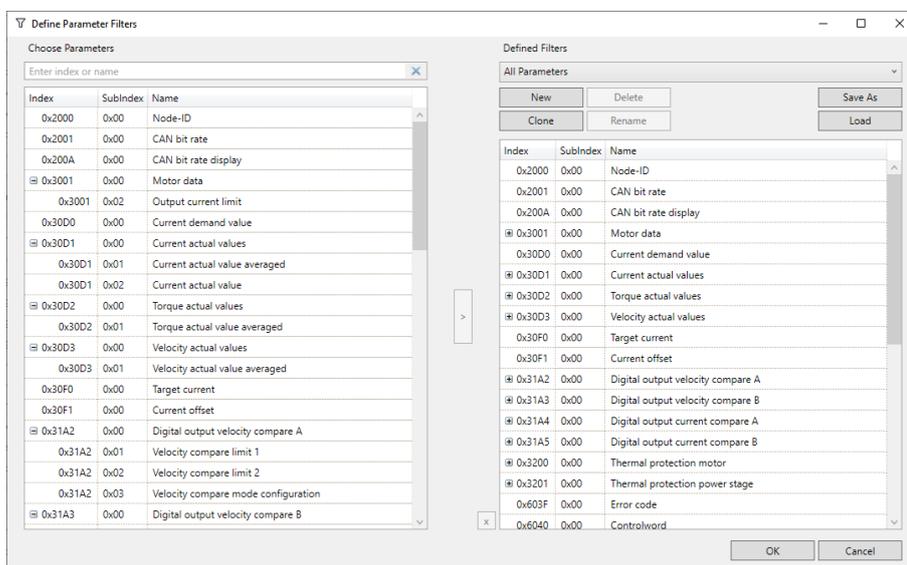


Figure 6-43 Define Parameter Filters dialog

6.2 Data Recorder

The «Data Recorder» tool provides a flexible, high-performance 4-channel oscilloscope function. It offers a variety of parameters and trigger functions for selection. Recorded measurements can be exported as a .csv file by right mouse button click, allowing for external processing or later comparison by reimporting.

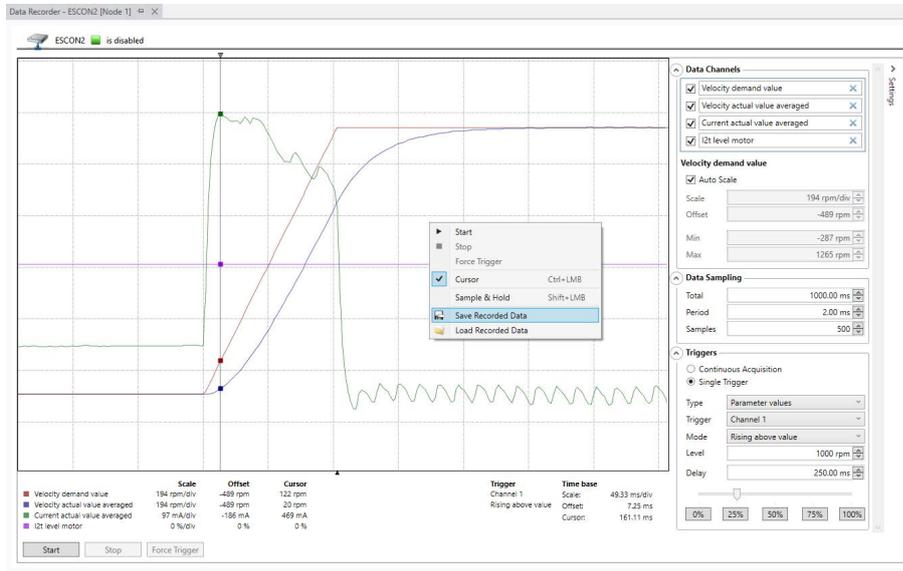


Figure 6-44 Data Recorder tool

7 SUPPORTING FUNCTIONS

You can access additional supporting functions by right mouse button click **on the text** of your connected ESCON2 controller in the Workspace view, which opens the context menu.

7.1 Communication and parameter behavior functions

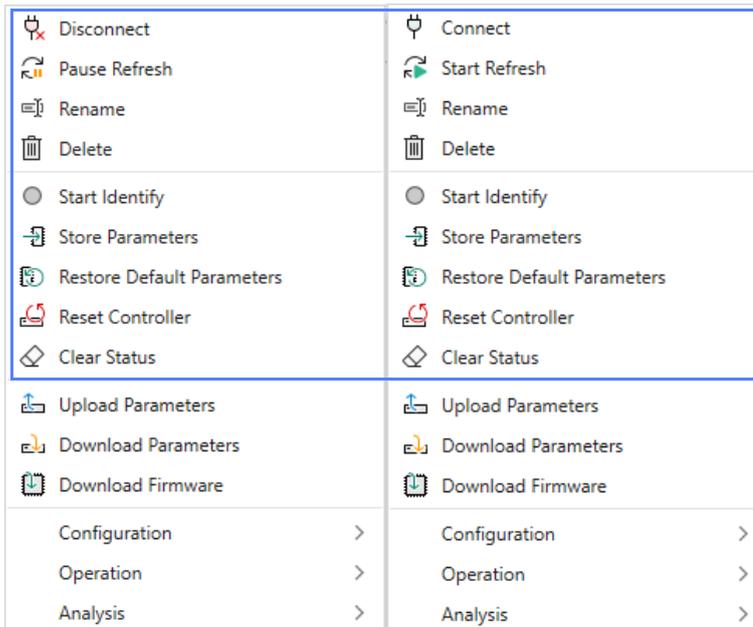


Figure 7-45 Controller context menu

Function	Description
Disconnect/Connect	Depending on connection status, controller can be disconnected/connected to Motion Studio
Pause Refresh/Start Refresh	Depending on connection status, parameter value refresh from controller to Motion Studio can be paused/started
Rename	Allows to rename your controller
Delete	Allows to delete a controller from a project structure. Remark: Please be aware that also all related contents like parameter files will be deleted the same time.
Start Identify/Stop Identify	Allows to activate/deactivate LED flashing on the controller for easy visual identification
Store Parameters	Stores all actual parameter values persistently to the controller
Restore Default Parameters	Restores default parameter values to the controller
Reset Controller	Performs a reset of the controller
Clear Status	Clears actual error conditions

Table 7-4 Communication and parameter behavior functions

7.2 Download Firmware

Using the «*Download Firmware*» tool, you can ensure your controller remains up to date by performing available firmware updates. You have the option to select the controller to which you want to download the firmware, specify the firmware file and choose to keep the actual parameters, restore default parameters or load a parameter set (if available). Initiating the firmware download process is achieved by clicking the «*Download*» button.



Avoid any interruption of the firmware download process due to loss of the communication interface or the supply voltage. Such a situation can cause an inconsistent device configuration, which makes a repair return necessary.

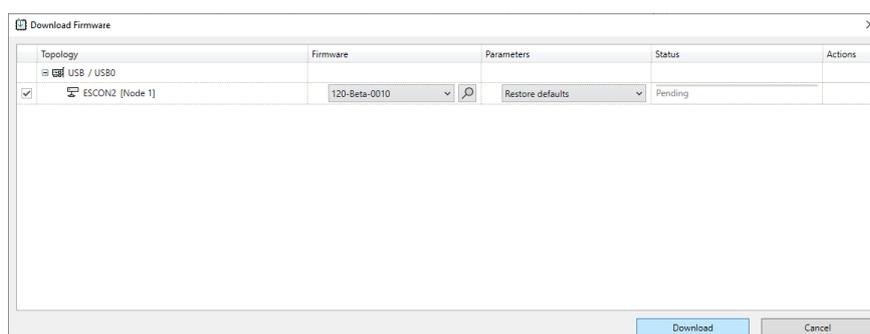


Figure 7-46 Download Firmware tool

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