emDrive Configuration tool User Manual

Rev. 2.0.

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Revision History:

Version	Author	Date	Changes/Remarks
1.0	/	/	Working version
2.0	A.K.	29.03.2019	User manual for SW release 2.0 or higher

Contents

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1 emDrive Configurator tool (SW version 2.0 or higher)

emDrive Configurator is CAN open tool developed by Emsiso. It was primarily designed for usage with Emsiso products, but it can be used with any third-party device supporting CAN open protocol. emDrive Configurator also has some additional features specific only for Emsiso products (for example unique oscilloscope feature) that will not work on third-party devices. If emDrive Configurator is used with third-party CAN interface specific features (outside CAN open protocol) will also not work (for example oscilloscope feature will not work).

1.1 Installation

Download emDrive Configurator from web page and follow installation information (in case of security warning message proceed by selecting Run/Install option). After application first run unselect "Always ask before opening this file". Licence Management window will appear if valid licence was not found (follow application instructions for getting and applying licence). In case of upgrade from version less than 2.0 to version 2.0 or higher notification window regarding old licence type will appear. It is advised to contact us for new licence type. Without new licence type emDrive Configurator will work as before, but some new features may not be available.
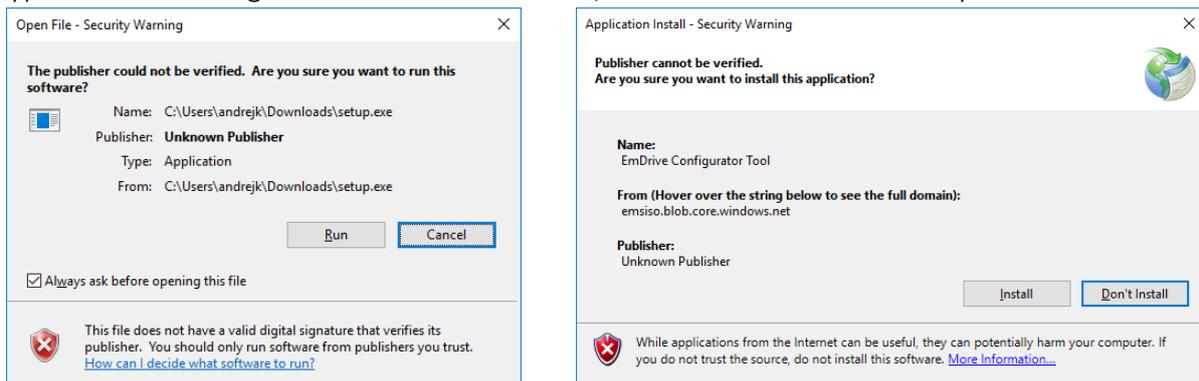

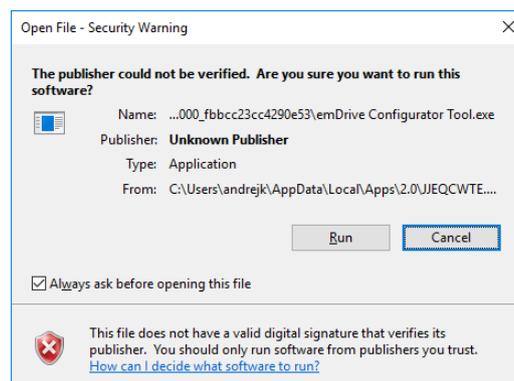*Fig. 1: emDrive Configurator application installation security warning*

Fig. 2: emDrive Configurator application run security warning

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1.2 emDrive Configurator user interface

emDrive Configurator is divided to menu bar, status panel, main window, docked window and status bar. All main and docked windows can be shown or hidden in View menu and they can be freely docked anywhere or even floated separately (double mouse click or left mouse click on window name).
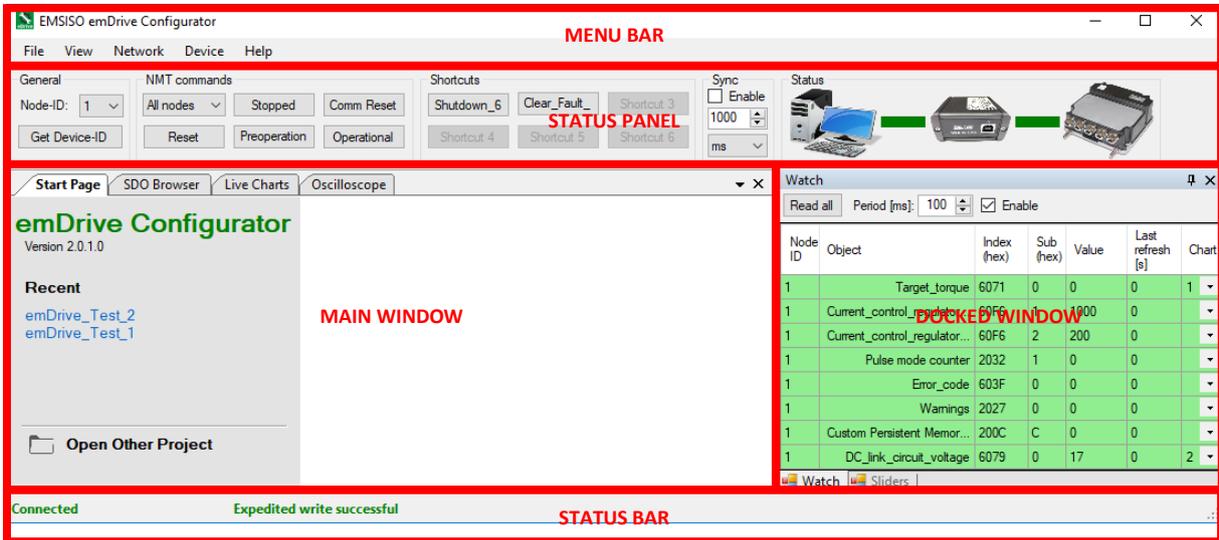
Fig. 3: emDrive Configurator user interface

1.2.1 Menu bar

Table 1: emDrive Configurator Menu bar options

Menu name	Menu option	Short description
File	Save project	Save current project
	Load project	Load project
	Save EDS	Save Electronic Data Sheet
	Save DCF	Save Device Configuration File
	Load DCF	Load Device Configuration File
	Exit	Exit/close emDrive Configurator
View	Start page	Main window enable/disable page.
	SDO browser	Main window enable/disable page
	Live chart	Main window enable/disable page
	Oscilloscope	Main window enable/disable page
	Watch	Docked window enable/disable page
	Sliders	Docked window enable/disable page
	EMCY messages	Docked window enable/disable page
Network	Connection	Connection menu. See pictures following this table
	Nodes	Nodes menu. See pictures following this table
Device	Firmware update	Firmware update. See pictures following this table
	Save parameters (Ctrl + S)	Save parameters (on emDrive device)
	Set parameters to default (Ctrl + D)	Set parameters to default (on emDrive device)
	Script	Edit/running scripts. See pictures following this table
Help	View help (Ctrl + F1)	Help
	About emDrive Configurator	About information

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File menu

Save/Load project. emDrive Configurator allows user to save/load project file for later use on PC drive. Project file includes Network description (EDS files), Watch, Shortcuts, Sliders and other user settings.

Save EDS. Electronic Data Sheet (EDS) is standard CANopen file that contains list of all objects supported by device with their parameters. With this command user can download EDS file directly from emDrive device. Downloaded EDS file is standard text file with .eds extension.

Save/Load DCF. Device Configuration File (DCF) is standard CANopen file that contains list of objects with values in moment that was saved. DCF can be saved and loaded with any CANopen software that supports this functionality. To save or load DCF file make sure that connection to the device is working and communication port is opened with right Node-ID selected. Select **Save DCF** or **Load DCF** from menu and browse computer for file path.

View menu

Menu options in View are described in Main and Docked window chapter.

Network menu

Connection window. To obtain bitrate of the USB-CAN interface click **Read** CAN card bitrate. To select different CAN bitrate, use **Change CAN bitrate** dropdown menu and click **Apply** to confirm new setting. Click **Read** CAN card protocol to obtain information about selected protocol. To select different CAN protocol, use **Set CAN protocol** dropdown menu and click **Apply** to confirm new setting (if dropdown menu is disabled licence for this option is not installed). In **Manual connecting** mode select from dropdown menu **COM Port** (use **Refresh** button to update list of available communication ports). For opening/closing communication port use **Open** and **Close** buttons. In **Automatic connecting** mode application will automatically select and open connection based on device name (for Emsiso USB-CAN interface correct string is already set by default). If **Show connection menu** checkbox is selected additional connection menu will be shown under menu bar for quick access to communication setting control. If **Check connection** is selected emDrive Configurator will send periodically CAN requests to device to verify if device is still connected. If **Read on click** is selected, reading object values in SDO browser is done by single click on SDO browser object structure (if read on click is not selected reading object value is done by additional click on read button). Addition information about communication is visible in **Status of command queue**. Waiting queue is cleared with click on **Clear buffer** button.
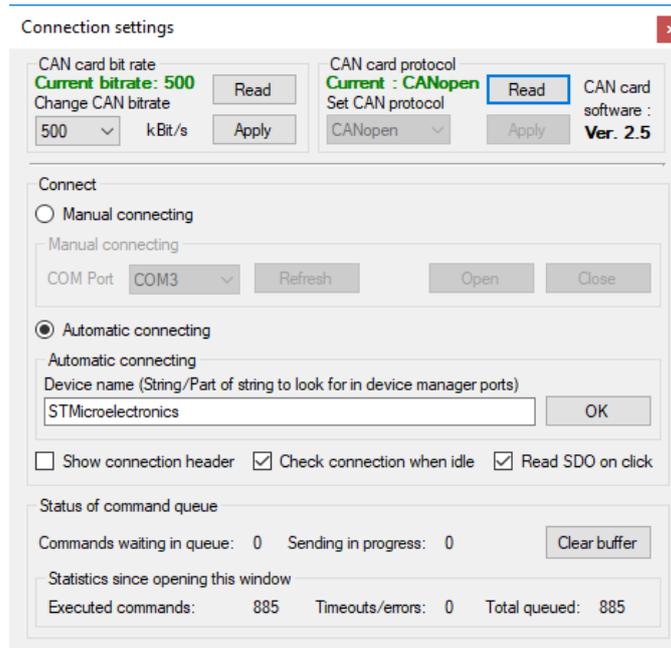
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Fig. 4: emDrive Configurator Menu bar -> Network -> Connection

Fig. 5: emDrive Configurator Menu bar -> Network -> Connection (show connection menu)

Nodes window allows scan network and loading existing EDS file from computer or downloading it from device. **Start scan** will start scan for available network nodes. This step can be skipped if ID number of devices is already known (in this case Node-ID number is entered in table). Scanning process can also be stopped when Node reaches the ID number of connected devices. Normally default emDrive device node ID is 1. **Refresh** button will check only status of Node-IDs that are already in table. **Download** button is used to get EDS information from device. If EDS file of device is already available loading file is possible instead of downloading file again. Select "**…**" and **browse** for EDS file. After loading EDS file SDO browser is automatically updated.
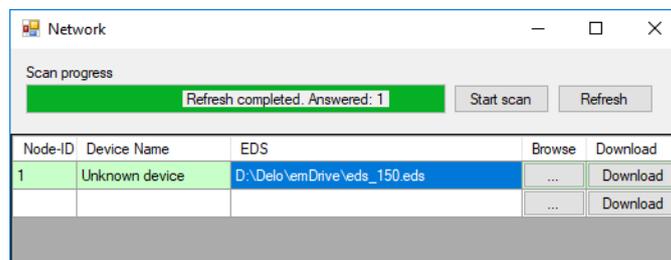

Fig. 6: emDrive Configurator Menu bar -> Network -> Nodes

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Device menu

Firmware update of device is possible in this window. Check Node ID value of emDrive device value before starting firmware update procedure (if needed change Node ID in Status panel under General Node-ID). **Browse** for Firmware file and click **Update** button. Follow instruction messages that appear during procedure.
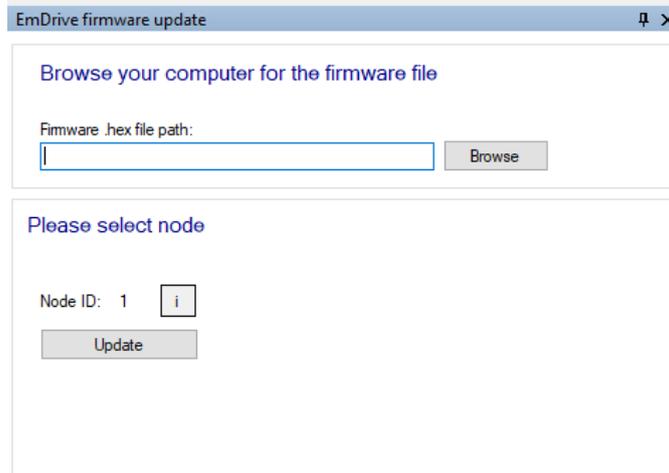

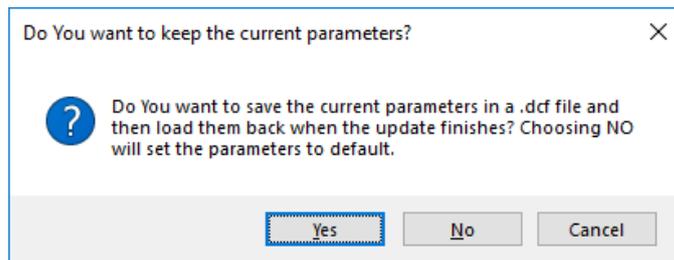*Fig. 7: emDrive Configurator Menu bar -> Device -> Firmware update*

Fig. 8: emDrive Configurator Menu bar -> Device -> Firmware update (Save DFC file)
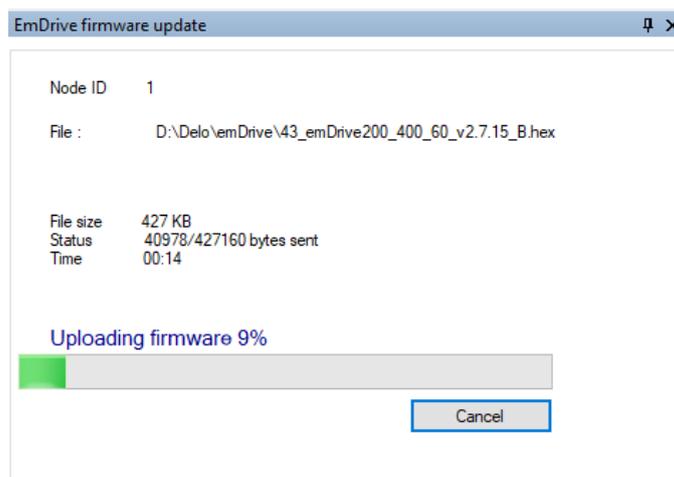
Fig. 9: emDrive Configurator Menu bar -> Device -> Firmware update (Uploading progress)
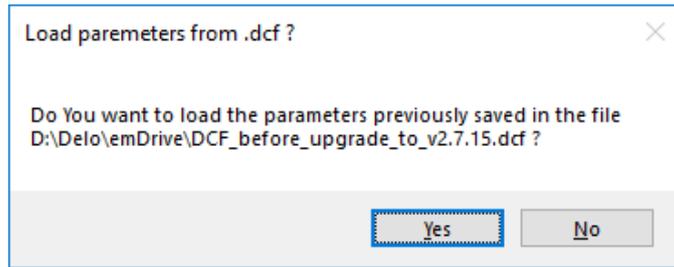
Fig. 10: emDrive Configurator Menu bar -> Device -> Firmware update (Load DFC file)
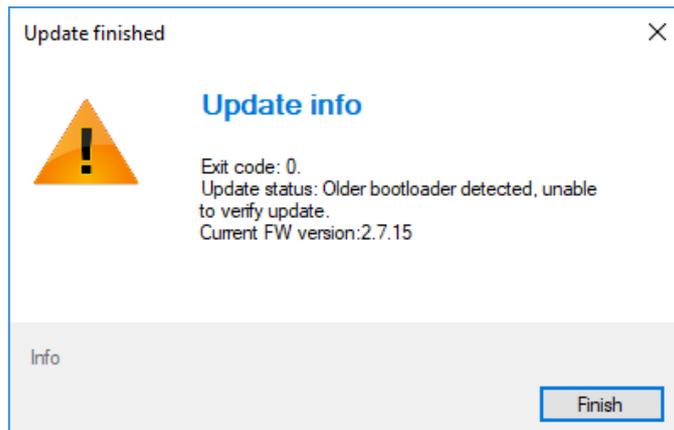
Fig. 11: emDrive Configurator Menu bar -> Device -> Firmware update (end message)

Save parameters (Ctrl + S). Save parameter values to device internal memory (EEPROM).

Set parameters to default (Ctrl + D). Command will Reset all parameters to default values.

Script window allows **Run** or **Edit** created scripts. Script usage is only for advanced users (usually Emsiso provides script file and customer uses only **Browse** and **Run script**).

Fig. 12: emDrive Configurator Menu bar -> Device -> Script

1.2.2   Status panel

Status panel is divided to **General**, **NMT commands**, **Shortcuts**, **Sync** and **Status** section.

Fig. 13: emDrive Configurator Status panel

General section. **Node-ID** of device that we want to control/monitor is selected. With **Get Device-ID** button unique identification number of connected device is obtained.

Fig. 14: emDrive Configurator Status panel (General)

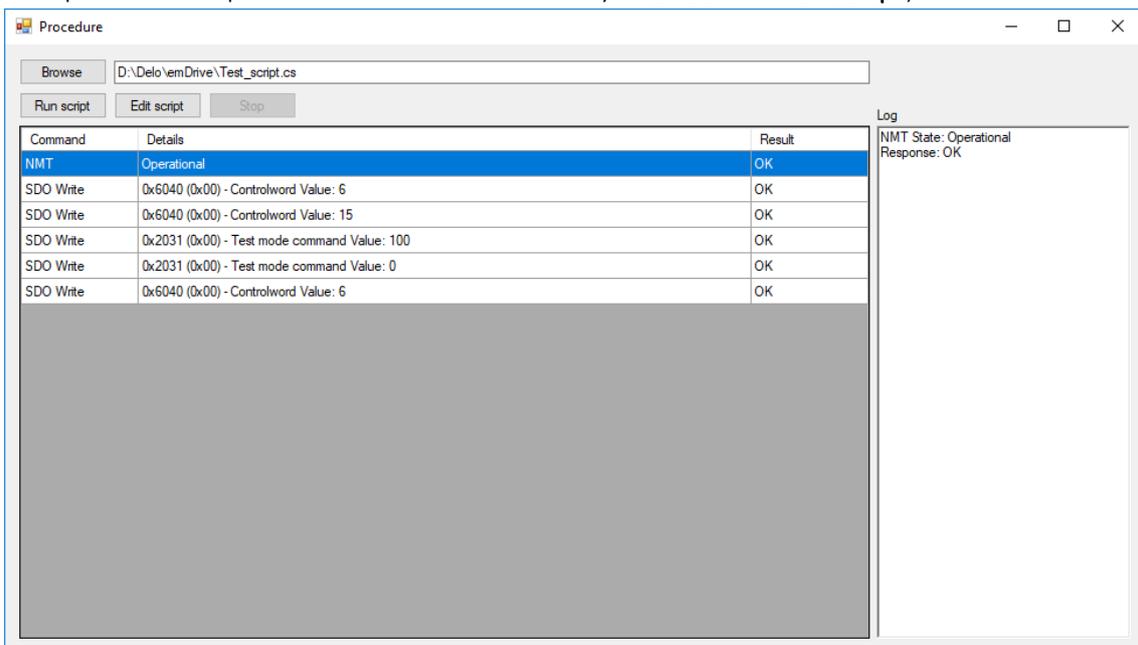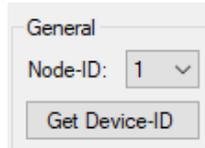**NMT commands** (Network Management) section allow user to set state of **one or all** nodes on CAN network. **Stopped** disables transmit or receive any messages except node guarding or heartbeat messages as well NMT messages. **Comm Reset** will reset CAN communication. **Reset** will reset controller. **Preoperational state** is mainly used for making changes of CAN node parameters (it disables DSP402 state machine so that parameters can be safely changed. In this state power stage of the controller is disabled). Putting CAN node device into **Operational** will start DSP402 state machine and enable PDO communication. Operational state is mandatory condition to run motor.
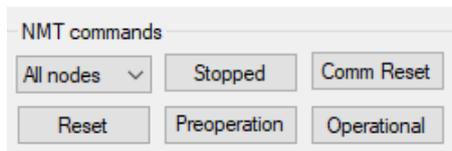
Fig. 15: emDrive Configurator Status panel (NMT commands)

Shortcuts section is part of status panel and is designed to allow user easy and fast access to six predefined object writes. Shortcuts offers user six ready to be customized buttons. Shortcuts are also triggered with keyboard hotkeys F1 to F6. To **Add object to shortcut**, browse for object in **SDO Browser**, **right click object**, chose **Add to shortcut** menu and **select shortcut number**. To edit shortcut **right click on shortcut**, click **Edit**, edit **Value** and **Shortcut text**, click **Apply**.

Fig. 16: emDrive Configurator Status panel (Shortcuts and edit shortcut)

Sync section. Sync is used to produce Sync messages with Emsiso USB-CAN interface.

Fig. 17: emDrive Configurator Status panel (Sync)

💡 *NOTE: To use Sync feature it is necessary to use Emsiso USB-CAN interface! Sync time is not guaranteed!*

Status shows status of connection between PC and USB-CAN interface and status of connection between USB-CAN interface and emDrive device with green/red colored line.
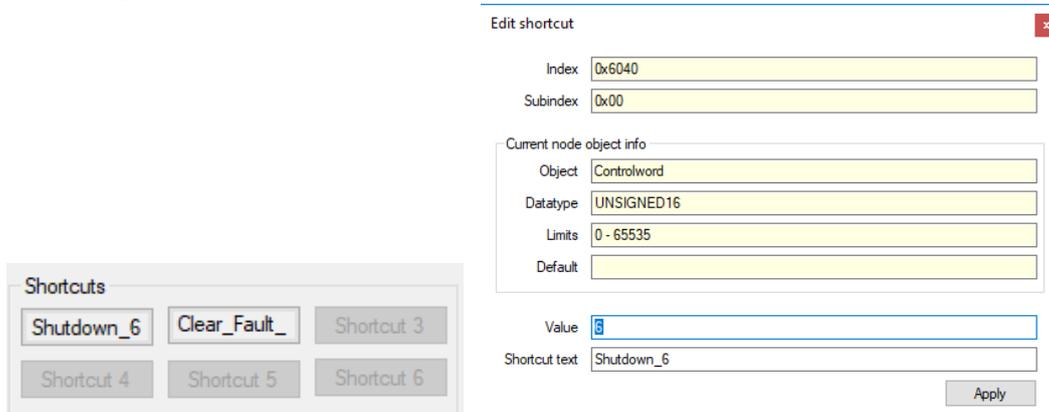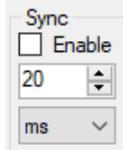

Fig. 18: emDrive Configurator Status panel (Status)

1.2.3 Main Window

In Main Window **Start page**, **SDO browser**, **Live Charts** and **Oscilloscope** are visible if enabled in View menu.

Start Page shows list of **saved recent** projects and **Open Other Projects** button.
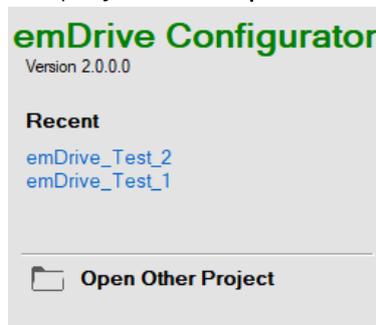
Fig. 19: emDrive Configurator Main Window (Start Page)

SDO Browser. To open this window chose SDO Browser from View menu. SDO Browser is used to **Read** or **Write** value to any object that is supported in device dictionary. SDO Browser is also used to Add objects to Watch, Oscilloscope, Shortcuts and Slider (with right click on object). Search and select wanted object in SDO browser by scrolling or use **search dialog box** to enter object text string. Representation of object read and write value can be hexadecimal or decimal (right mouse click inside object **Value** box).

Fig. 20: emDrive Configurator Main Window (SDO browser)

1.2.4   Main window - Live Charts

To open Live Chart window chose Live Chart from View menu. It is possible to select up to **four charts** (with checkbox) and on every chart one or more parameters can be shown. Parameters are added to chart in watch window (described in docked window). Any object in watch can be added to chart. In **watch window** select **chart number** and object will be available in Live Chart at selected chart number. In Live charts Main controls, Enable charts and Automatic scaling section are available.
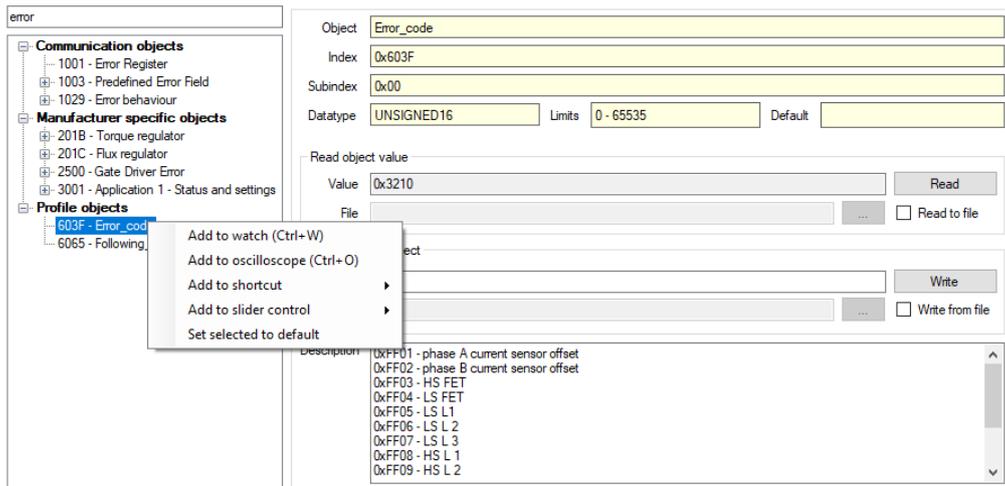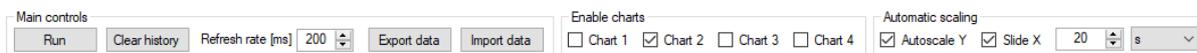

Fig. 21: emDrive Configurator Main Window (Live Charts controls)

In Live charts **Main controls** section **Run/Pause, Clear history, Refresh rate, Export and Import data** are available. To show/pause drawing logged data of selected object click **Run/Pause button** in Live Chart. **Clear history** button will clear currently logged object data (data collecting will start from beginning). **Refresh rate** setting is used to optimize chart response and overall application performance (for example if large number of data is expected in chart then value for refresh rate can be adjusted to improve performance). **Export data** will save all data monitored in watch window to .csv file. **Import data** will load all data stored in .csv file.

NOTE: Run/pause button is only for running/pausing Live Chart. Run/pause button will not stop collecting data. To stop collecting data unselect Enable checkbox in watch window or remove object from watch window.

NOTE: Importing data from file will clear live charts and watch window. Watch Enable checkbox is unselected. To compare live and imported values add SDO objects into watch window after importing data.

In Live charts **Enable charts** section **Chart 1** to **Chart 4** checkbox are available.
In Live charts **Automatic scaling** section **Autoscale Y, Slide X** and **value for** slide X are available. With selected **Autoscale Y** checkbox Y-axis will automatically adjust to values in chart. For X-axis scaling enable **Slide X** and set **window period** that is shown for X-axis. Live charts chart **drawing area**. With **left mouse and selection** or **mouse scroll** inside graph window zooming is done (use

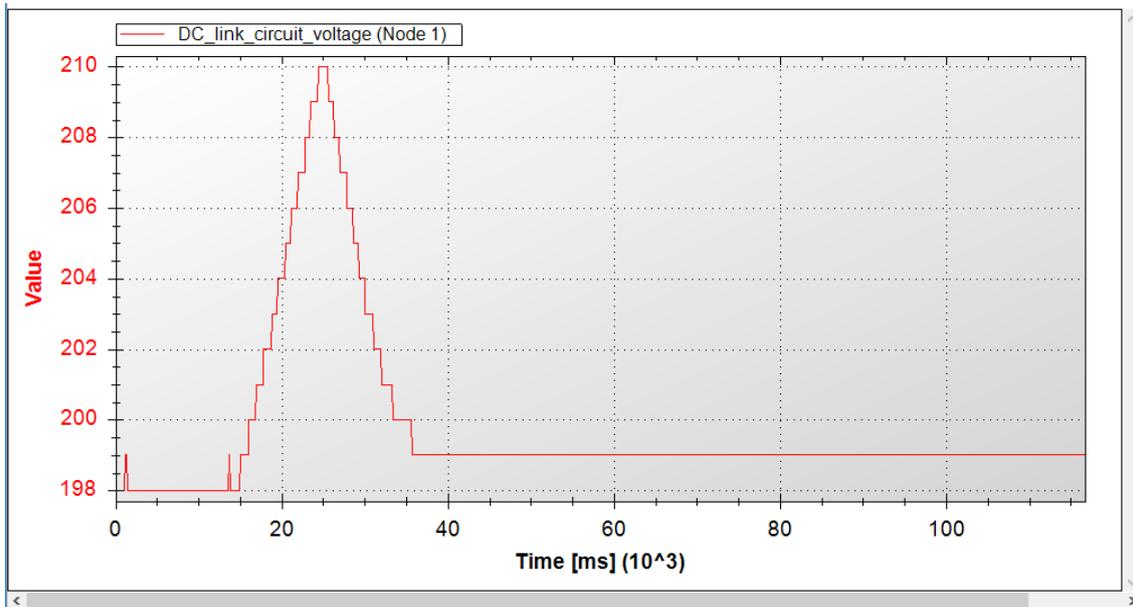Pause button before using zoom). Other graph options are available with **right mouse click** inside graph window.

Fig. 22: emDrive Configurator Main Window (Live Charts)

1.2.5   Main window - Oscilloscope

Oscilloscope is Emsiso special functionality for advanced analysis of device behavior. With oscilloscope user can set device to record any object values in real time and save them to internal RAM or EEPROM memory. For later analyze export/import of CSV file is possible. Oscilloscope window is divided to **Chart area**, **Settings**, **Trigger** and **Channels** section.
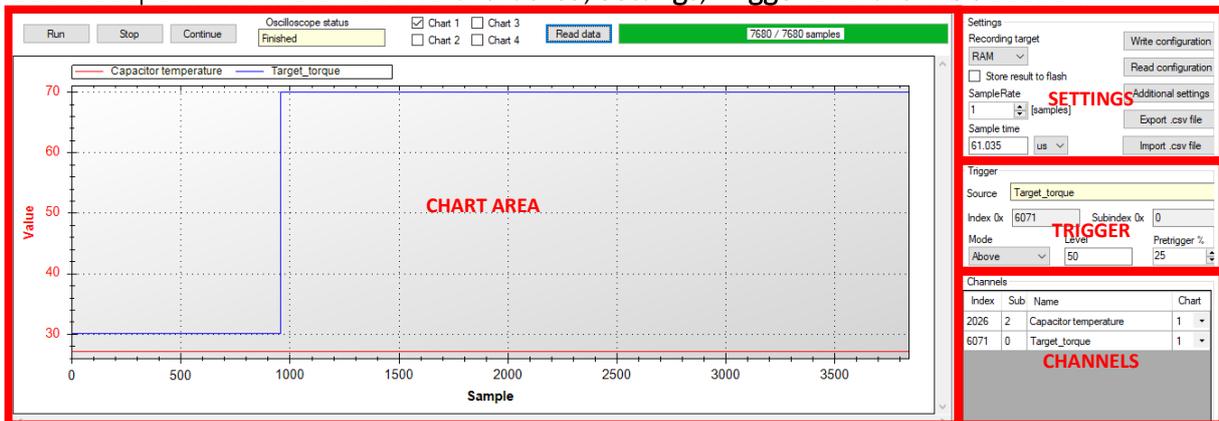
Fig. 23: emDrive Configurator Main Window (Oscilloscope)

Parameters for oscilloscope are selected and added in SDO browser. After parameter is added to oscilloscope it needs to be configurated. Available options for configuration for every oscilloscope section are described below. In general, basic steps that are needed to use oscilloscope are: **add object/parameter to oscilloscope**, **select Chart no.**, a**dd and set trigger settings**, **set settings** and at the end **click WriteConf**. After basic settings use **Run/Stop** button and **Read Data** button.

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Chart area. Recording of parameters is done with **Run** and **Stop** button. **Continue** button allows continuing recording parameters without clearing previous recorded data. Oscilloscope **status** shows current status of oscilloscope. It is possible to select up to **four charts** (with checkbox) and on every chart one or more parameters can be shown. **Read data** reads and shows recorded data in chart (reading progress is shown in Read progress). With **left mouse and selection** or **mouse scroll** inside chart window zooming is done. Other chart options are available with **right mouse click** inside chart window.

Settings section. Select recording target **Memory** (RAM, FLASH) from dropdown menu and set **Sample rate** or **Sample time** (Sample rate and sample time values are connected. Changing one will change other). **Store results to flash** will record data to controller flash memory. Recorded information in controller flash memory is permanent and can be readed if controller was turned off in meantime. Once all Oscilloscope settings are done write setting configuration with **Write configuration** (Settings, Trigger and Channels list are saved to controller). With **Read configuration** existing oscilloscope configuration is loaded from device and shown. **Export .csv file** will export data to CSV file that can be later loaded with **Import .csv file**. In **Additional settings** window **Oscilloscope frequency** can be set **Automatic** or **Manual**. In manual mode value can be manually entered. Default values are set with **emDrive** and **BMS** button. In section **Osciloscope unit** select between **Samples** or **Time** setting. If parameters have been changed save changes with **Save settings** button.
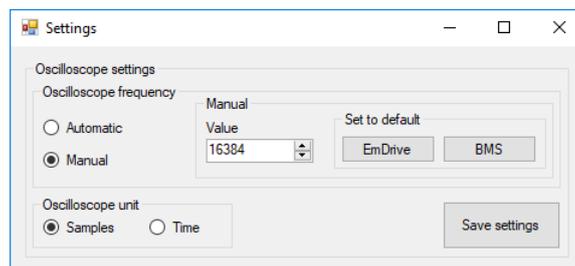

Fig. 24: emDrive Configurator Main Window (Oscilloscope additional settings)

NOTE: Read configuration and Import .csv file will not load Chart no. numbers. After Read configuration or Import .csv file select Chart no. numbers manually.

Trigger section. To set trigger Source **right click** on parameter in **Channels section** and chose **Set trigger**. Different trigger options are selected with trigger **Mode** dropdown menu. Trigger **Level** is decimal value used for trigger condition. **Pretrigger %** value represent percentage of data that was measured and shown in oscilloscope chart before trigger condition was fulfilled. For Pretrigger % decimal values from 0 to 99 are valid.

Channels section. Search in SDO browser for wanted objects and add them to Oscilloscope with **right mouse click** in SDO browser (select **Add to oscilloscope**). After objects for oscilloscope have been added to Oscilloscope select **Chart no.** in channel section. With **right mouse click** and selecting **Remove** or **Remove all** objects are removed from channel list. With **right mouse click** and selecting **Set trigger** object is added to trigger section where more options for trigger are available.

1.2.6 Docked Window

In Docked Window are visible **Watch, Sliders** and **EMCY messages** (if enabled in View). In docked window also Firmware update window will appear (if selected in Device menu). Firmware update is described under Device menu.

Watch window is used to periodically read multiple values from device. If **Enable** checkbox is selected watch window readings will periodically refresh. **Period** of reading values is set in ms. With **Read all** button manual reading of all object/parameters in watch is done. Direct **value write** for objects that are write type is done by entering new value to value column. Watch window is also used to add/remove objects in Live Charts (in watch window set **Chart value** from 1 to 4 to add object or empty for removing object). Use **right mouse click** to select hexadecimal or decimal representation of object value. Other watch options are available with **right mouse click** inside chart window.

Fig. 25: emDrive Configurator Docked Window (Watch)

NOTE: If Enable checkbox is checked object data will be logged until checkbox is unselect. To clear previous data use right mouse and select Clear history (will clear only selected objects) or Clear history for all.

Sliders. To see Sliders select Sliders from View menu. Object/parameter is added to slider in SDO browser (with right click on object). It is possible to add only objects that are write type. If needed set **maximum** and **minimum** value (value must be inside object absolute limits). If **Sync (1s)** is enabled reading of object value will be done every second. To change value, move **Slider up/down** with mouse or manually type value in **Current value** box.
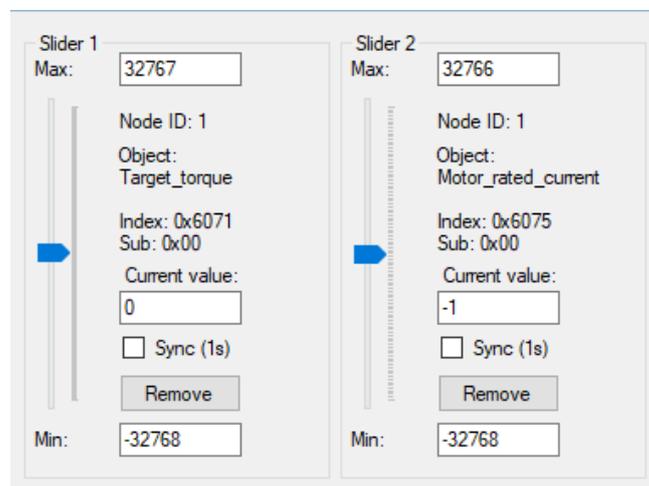

Fig. 26: emDrive Configurator Docked Window (Sliders)

EMCY messages window is used to periodically read EMCY messages from device. EMCY messages are CANopen emergency messages. If **Enable** checkbox is selected EMCY window readings will periodically refresh. **Period** of reading values is set in ms. **Clear history** button will clear EMCY messages window. EMCY message information has Time, Node-ID, Error code and Description. For detailed error description read device user manual and chapter with errors and warnings.
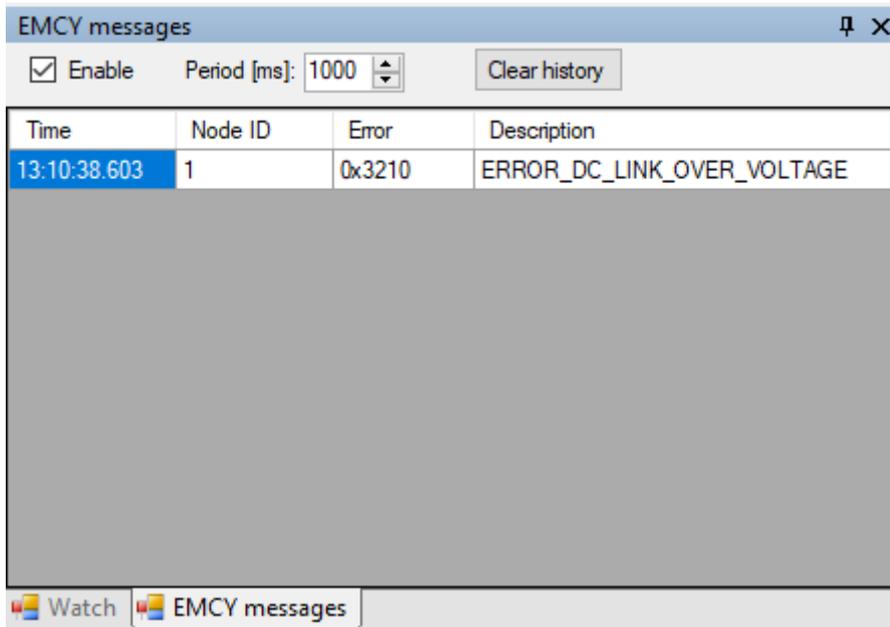

Fig. 27: emDrive Configurator Status panel (Error log window)

NOTE: EMCY message time is application (computer) time of reading EMCY and not the time when error appeared on device.

1.2.7 Status bar

Status bar shows basic information about connection status and errors related to communication or device status (for example connection status and EMCY message reception).
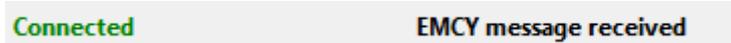

Fig. 28: emDrive Configurator Status bar

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1.3 First time use of emDrive Configurator and SDO Browser

Check if device, USB-CAN interface, cables, power supply are correctly connected and working. Run emDrive Configurator application. At first run application will ask for licence (follow application instructions for getting licence). After licence was applied emDrive Configurator is ready for usage. For using emDrive Configurator with emDrive devices correct connection setting are needed and get device information. Procedure is described in steps below.

Document assumes that reader has an understanding of CAN protocol and its usage. CAN open device parameters are described by its Object Dictionary. emDrive Configurator SDO Browser is used to Read or Write values off any object that is in device dictionary. An Electronic Data Sheet (EDS) is a text file representing the Object Dictionary structure which doesn't contain data values. Device Configuration File (DCF) is a text file similar to an EDS except that it contains data values as well as the Object Dictionary structure.

NOTE: It is assumed that everything is correctly connected and working. It is also assumed that emDrive Configurator is used with emDrive USB-CAN interface.

NOTE: It is assumed that reader is familiar with CAN open protocol. For this reason, only basic information needed for reading and using this user manual is provided.

NOTE: For future connections to same device this procedure/steps can be skipped if project was already saved (menu File->Save project). In such cases only Load project is needed (menu File->Load project)

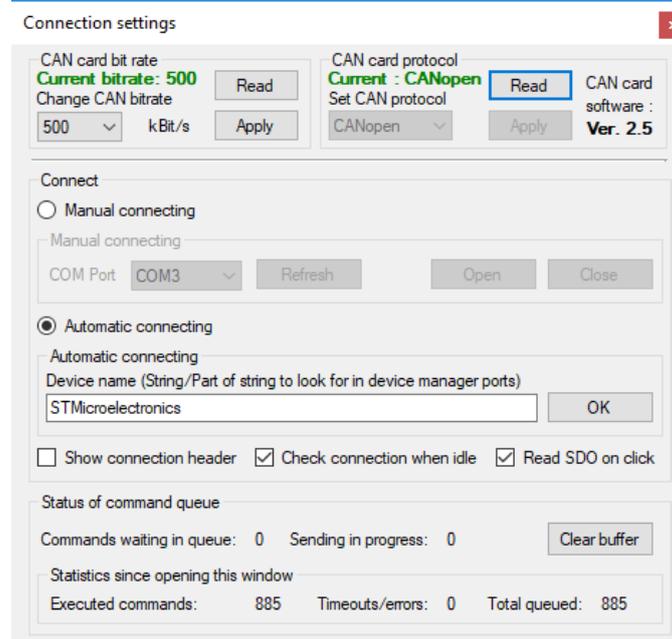**Step 1:** Select menu **Network -> Connection** -> select **Automatic connecting**

Fig. 29: emDrive Configurator connection example

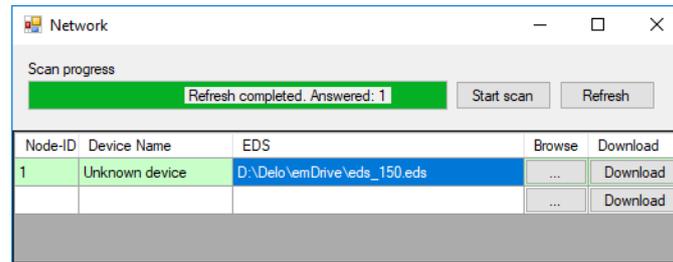*NOTE: For manual connection read emDrive Configuration user manual chapter.*

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Step 2: Select menu **Network -> Nodes**

Fig. 30: emDrive Configurator Scan network example

> 💡 *NOTE: If ID number of devices is known, ID can be entered manually and device status is just checked with Refresh.*

After these steps device dictionary structure is visible in SDO browser. Meaning and usage of individual parameters is not described in this user manual.

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