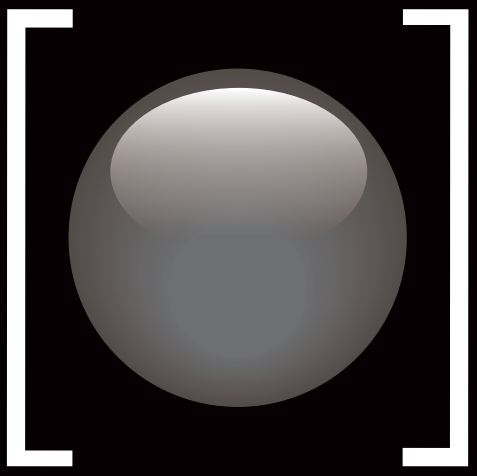
MotionLab

Product manual



MotionLab

Configuration and setup
for **Ingenia Servo Drives**

ingenia motion control

MotionLab

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Scope

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Contents

Icons

Icons that the reader may find in this manual are shown below, together with their meanings.

Additional information

Provides the user with tips, tricks and other useful data.

Warning

Provides the user with important information. Ignoring this warning may cause the device not to work properly.

Critical warning

Provides the user with critical information. Ignoring this critical warning may cause damage to the device.

1 Introduction

MotionLab is software designed by Ingenia to enable you to quickly and easily set up and tune your motion control system using Ingenia's digital servo drives.

MotionLab allows for:

- Detect compatible servo drives connected to the software network.
- Connect to one servo drive, configure, tune and test it.
- Configure and test different motion modes (position, velocity, torque, etc.).
- Program/load/test macros for stand-alone operation.
- Update the firmware of the connected servo drive.
- And many other motion control related features.

System requirements

System requirements to run MotionLab on your computer are:

- Operating System: Microsoft Windows 2000, XP or Vista
- Processor: 1GHz or higher
- At least 32MB RAM
- Disk space: 100MB free space
- RS-232 port if you want to use RS-232 communication
- CAN board for CANopen communication
- Ethernet interface for EtherCAT communication
-

MotionLab installation

You can install the MotionLab software by using the CD-ROM delivered with your Ingenia servo drive.
To install the MotionLab, ensure that you have the "administrative rights" before proceeding with installation.

Execute the **MotionLabInstaller.exe** installer that you will find in the CD and follow the wizard instructions.

To always use the latest version of MotionLab download the software from the Ingenia website.

Before you begin

In order to ensure successful drive setup, you should verify that the following conditions are met:

- If you are using CANopen networking, be sure that the required CAN board(s) have been successfully installed.

- The system should be properly balanced; that is the motor speed should be 0 when zero current is injected to it.
- The motor axes should be free to move plus or minus several electric poles.
- The encoder and motor should have suitable wiring.

2 Accessing the MotionLab

You access the MotionLab in one of two ways:

- By clicking the 

shortcut icon on the desktop.
- By selecting **Star – Programs – Ingenia – MotionLab** from the Windows taskbar.

The MotionLab will start as follows:

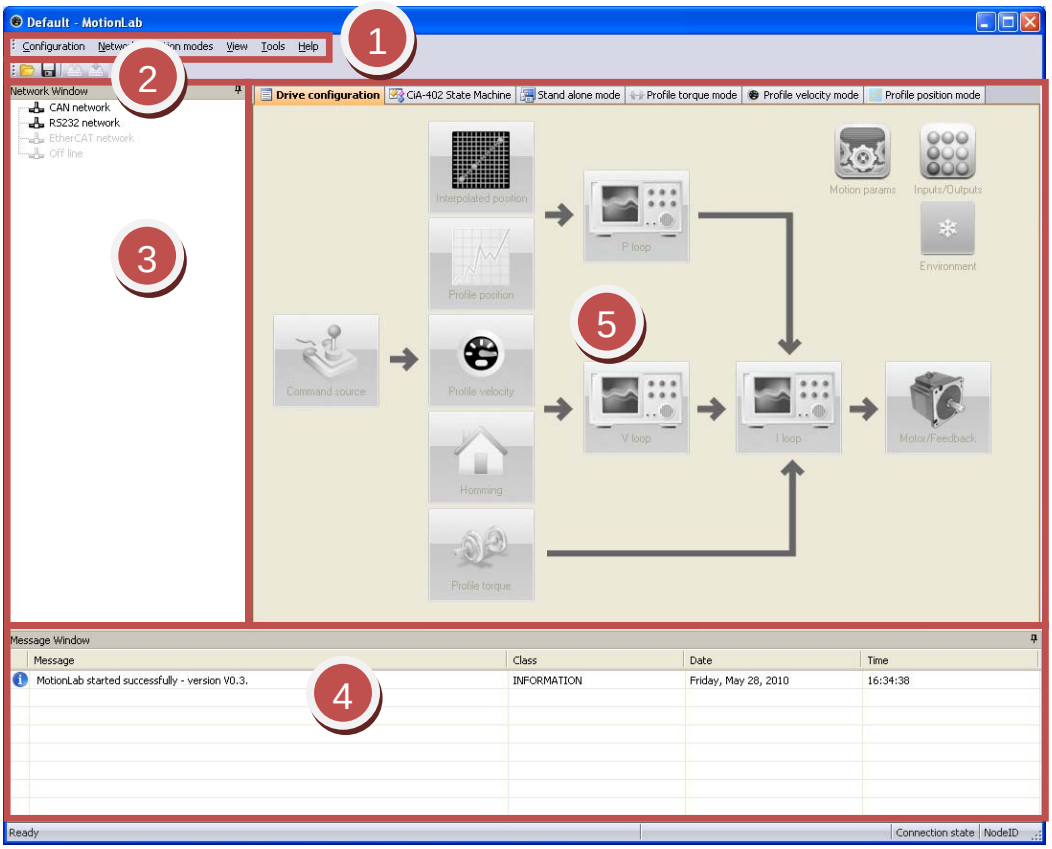

Figure 1: General layout of MotionLab

The MotionLab application is made up of:

- One top **menu bar** 1.
- One **configuration toolbar** 2.
- Two dockable panes, called **Network window** 3 and **Message window** 4.
- And one **tab manager** including several tabs 5.

3 Network scan and drive detection

The first thing you need to do in order to work with your drive (configure, tune or test it) is establish a connection with it.
To that end you need to select the network type your drive is plugged in, configure it and start scanning for drives.
Several networks are supported (RS232, CAN-CANopen, EtherCAT). Choose the appropriate network for your drive and make sure it is properly powered before to continue.

The selection of the network can be made through *Network wizard* pop-up dialog (see Figure 2). To open this dialog, select **Network-Network wizard** from the MotionLab menu bar.
Once the network is properly configured, you can start scanning for drives or directly connect to a specific one if you know its node.ID.

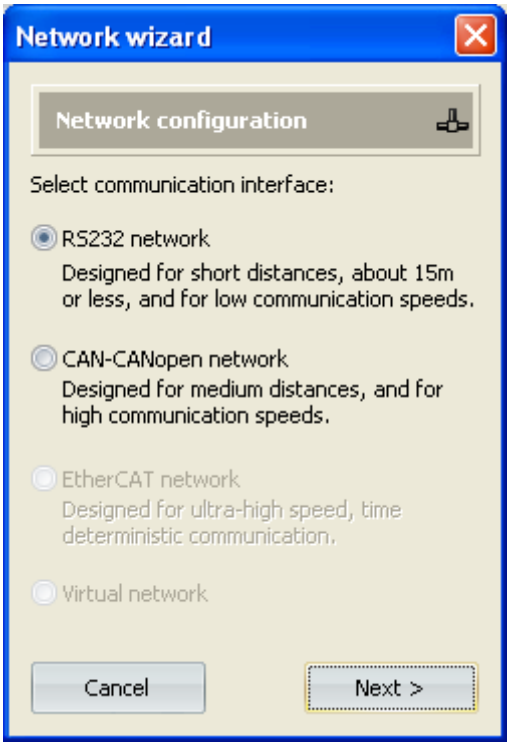

Figure 2: Network scan dialog

The results of the scan/connection process will be displayed at the Message window (see Figure 3).

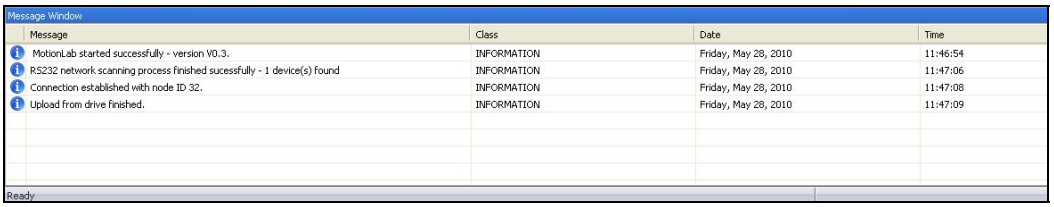

Figure 3: Message Window

Following table summarizes possible scanning errors and their meaning:

Scanning error code	Meaning
-1	Error opening selected communication interface.
-2	Communication errors while detecting connected drives to the network.
-3	Error when releasing communication interface after a scan progress.

Table 1: Scanning error codes

RS232 network

RS-232 interface is designed for short distances, about 15m or less, and for low communication speeds of no more than 20KB. In spite of this, it is very often used at higher speeds with acceptable results.

If you want to select the RS-232 as your communication type, you will need to configure it. Use the **COM port and Baud rate** drop-down lists to select the appropriate settings of each parameter.

Considerations on using RS232-USB converters

It is not recommended to use RS232 to USB converters for RS232 communication. However more and more PC/laptop companies are removing serial connectors in favor of multiple USB connectors, so you might be forced to use one of that converters.
If that is the case, please assure that they do not introduce additional delays in transmission/reception of messages.

Contact Ingenia for further information on the recommended RS232-USB converters to use.

CAN-CANopen network

The CAN-Bus (Controller Area Network-Bus) is a serial communication protocol developed by Bosch for exchanging information between electronic control units on automobiles.
This system makes it possible to share a great amount of information between the nodes or control units appended to the system, which causes a major reduction in both the sensors used and the quantity of cables in the electrical installation.

Most of Ingenia drives include CAN-Bus interface. The protocol used in that case is the CANopen protocol managed by CiA organization.
Ingenia drives fulfill the following CANopen standards:

- CiA 301 DSP: Application layer and communication profile
- CiA 303 DR: Additional specification (only for some drives)
- CiA 305 DSP: CANopen layer setting services (LSS) and protocols
- CiA 402 DSP: Drives and motion control device profile. It is also standardized by IEC organization (IEC 61800-7-1, IEC 61800-7-201 y IEC 61800-7-301)

If you want to select the CAN-CANopen as your communication type, you will need to configure it. Use the **Interface**, **Baud rate**, **Device**, **Channel** drop-down lists to select the appropriate settings of each parameter.

Supported CAN interfaces are listed in the table below.

Interface name	Manufacturer	Devices supported
IXXAT	IXXAT	USB-to-CAN USB-to-CAN compact
PCAN-Light	Peak-System Technik	PCAN-USB
Kvaser	Kvaser AB	Kvaser USBcan Professional Kvaser Leaf Professional Kvaser Leaf SemiPro Kvaser Leaf Light Kvaser USBcan Rugged Kvaser USBcan II
Vector	Vector Informatik	CANcaseXL CANcardXL

Table 2: Supported CAN interfaces

Drive connection

Once the network has been successfully scanned the results will be displayed in the *Network panel window*.
You can establish a connection with a detected drive right-clicking on the drive tree item of *Network panel window* and selecting the **Connect** option from the pop-up menu (see Figure 4).

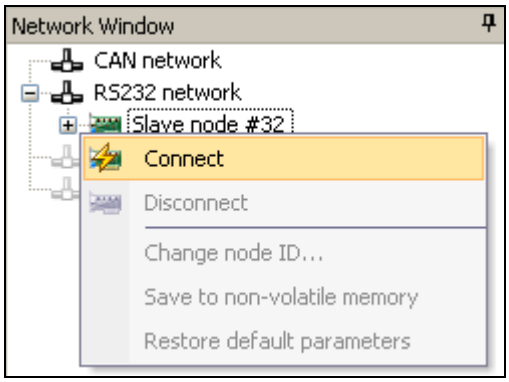

Figure 4: Connect to drive

Keep in mind that only one connection is allowed at a time.

Upon successful completing the connection process, MotionLab will ask you to upload the actual values from drive. Click **Yes** to update local configuration parameters with drive parameters.

You can disconnect from a drive at any time by right-clicking on the drive tree item of *Network panel window* and selecting the **Disconnect** option from the pop-up menu.

Uploading/Downloading drive parameters

Once connected, drive parameters can be uploaded from drive at any time doing one of the following:

- Click the button in the Configuration toolbar.
- Select **Configuration-Upload from drive** from the MotionLab menu bar.

Alternatively you can also download current configuration to drive doing one of the following:

- Click the button in the Configuration toolbar.
- Select **Configuration-Download to drive** from the MotionLab menu bar.

Each configuration dialog described in next chapter allows for uploading/downloading individual parameters configured in there.

4 Drive configuration

Once connected to a drive, the configuration process can start (the buttons in the *Drive configuration* tab will be enabled).
Next subchapters describe in detail how to do that.

Loading/saving configurations

You can load or save configurations at any time. This is very useful when a system has been completely set up and you want to store the parameters to download them to other identical systems.

To load a configuration, you can do one of the following:

- Click the  button in the Configuration toolbar.
- Select **Configuration-Load from file** from the MotionLab menu bar.

In the Load dialog box, select the configuration file and click **Load**.

Keep in mind that after loading a configuration the parameters will be **just set locally in MotionLab, but not downloaded to the drive**. To do that you need to explicitly perform a *download to drive* operation.

To save a configuration, you can do one of the following:

- Click the  button in the Configuration toolbar.
- Select **Configuration-Save to file** from the MotionLab menu bar.

In the Save As dialog box, enter a name for the file, browse to the location at which it should be saved, and click **Save**.

Drive services

MotionLab uses layer setting services (for CANopen communication) and other Ingenia proprietary services to allow configuration of some base parameters of drives.
The services allowed are described in next subchapters.

Change drive node-ID

To change the drive node number, right-click on the drive tree item of *Network panel window* and select the **Change device node-ID** option from the pop-up menu.
The *New node ID* dialog box will pop up (see Figure 5). Enter the new node ID for the drive and click **OK**.

Figure 5: Change node ID

To maintain the new node ID after a system reboot, check the **Save to non-volatile memory** checkbox.

Change drive baud rate

To change the drive baud rate, right-click on the drive tree item of *Network panel window* and select the **Change device baudrate** option from the pop-up menu.
The *Device baudrate* dialog box will pop up (see Figure 6). Enter the new baud rate for the drive and click **OK**.

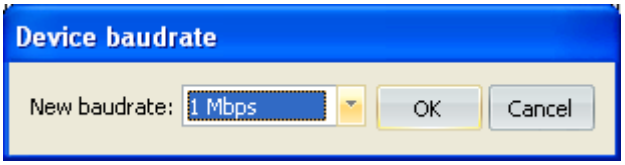

Figure 6: Change baud rate

To apply new baud rate, you will need to save configuration to non-volatile memory, power cycle the drive and reconnect with it using the new baud ate.

Save to non-volatile memory

Some drive parameters can be stored into the non-volatile memory of the MCU. They will be loaded after each new system reset or power cycle.

Refer to the software manual of your drive in order to check which parameters can be stored in the non-volatile memory.

To perform a save to non-volatile memory operation, right-click on the connected drive tree item of *Network panel window* and select the **Save all parameters to non-volatile memory** option from the pop-up menu.
Current configured drive parameters will be stored in the non-volatile memory.

Restore default parameters

The default values of parameters can be easily restored at any time by right-clicking on the connected drive tree item of *Network panel window* and select the **Restore default parameters** option from the pop-up menu.
New values will be valid after the drive is reset or power cycled.

Configuring the motor

To configure the motor connected to your drive, click on the **Motor/Feedback** button in the *Drive configuration* tab. The **Motor/Feedback** dialog box will pop-up (see Figure 6).

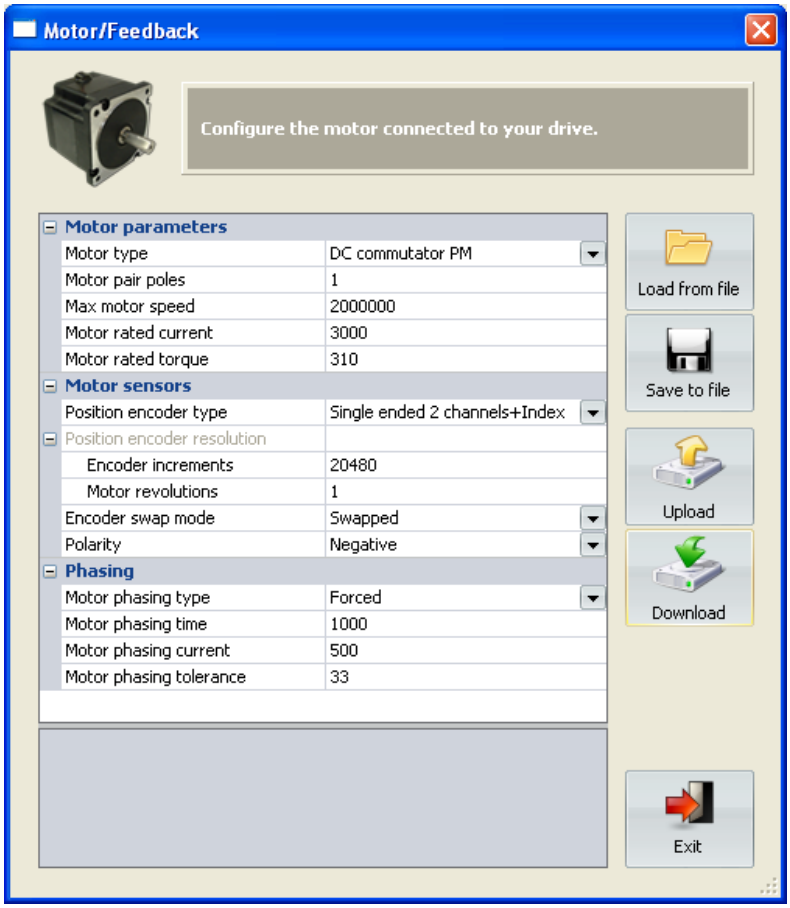

Figure 7: Motor/Feedback dialog box

In the property grid enter the following parameters:

- **Motor type:** for your specific drive select **DC commutator PM**, **Trapezoidal PM BL motor** or **Sinusoidal PM BL motor**.

Motor type	Commutation feedback	Phasing	Control feedback
DC commutator PM	-	-	Encoder
Trapezoidal PM BL	Halls	-	Halls
Sinusoidal PM BL	Encoder	Forced	Encoder
	Digital Halls + Encoder	Halls based	

Table 3: Motor and feedback

- **Motor pair poles:** number of pair poles (only used for Sinusoidal BL motors).
- **Motor rated current:** current consumed at rated conditions (in mA).

- **Motor rated torque:** torque at rated operation (in mNm).

Rated torque definition refers to rotating motors. When using linear motors all "torque" objects refer to a "force" instead.
In that case the motor rated “force” value shall be entered as multiples of mN (milliNewton).

- **Position encoder type:** for your specific drive select the appropriate encoder.
- **Position encoder resolution:** for your specific drive select the appropriate encoder resolution. The resolution is calculated as the **encoder increments** per **mechanical revolution** of the motor.
- **Encoder swap mode:** indicates whether to swap or not swap the channels A and B of the quadrature encoder.

For a correct operation of the system the positive sense of movement based on encoder and hall must match.

- **Polarity:** sets the system polarity. The current position and the target position will be multiplied internally by 1 or -1, depending on the polarity value.
- **Motor phasing type:** In Permanent magnet synchronous motors the position of the rotor is initially unknown. Phasing is a process that determines the position of the rotor detecting the transition of halls sensors (**Halls based** method) or by forcing the rotor position using excitation (**Forced** method).
- **Motor phasing time:** When using forced phasing this parameter determines the duration in milliseconds of the whole process.
- **Motor phasing current:** When using forced phasing this parameter determines the current used by the process. The value is expressed as per thousand of rated current.
- **Motor phasing tolerance:** When using forced phasing this parameter determines the maximum tolerated error of expected encoder increments in process. The value is expressed as a percentage.

Once the motor is fully configured, you can download the configuration to the drive by clicking on the **Download** button.
You can also load/save motor configurations from/to file by clicking on the **Load from file** / **Save to file** buttons.

Tuning the current loop

To tune the current loop of your drive, click on the **I loop** button in the *Drive configuration* tab. The **Current loop** dialog box will pop-up (see Figure 7).

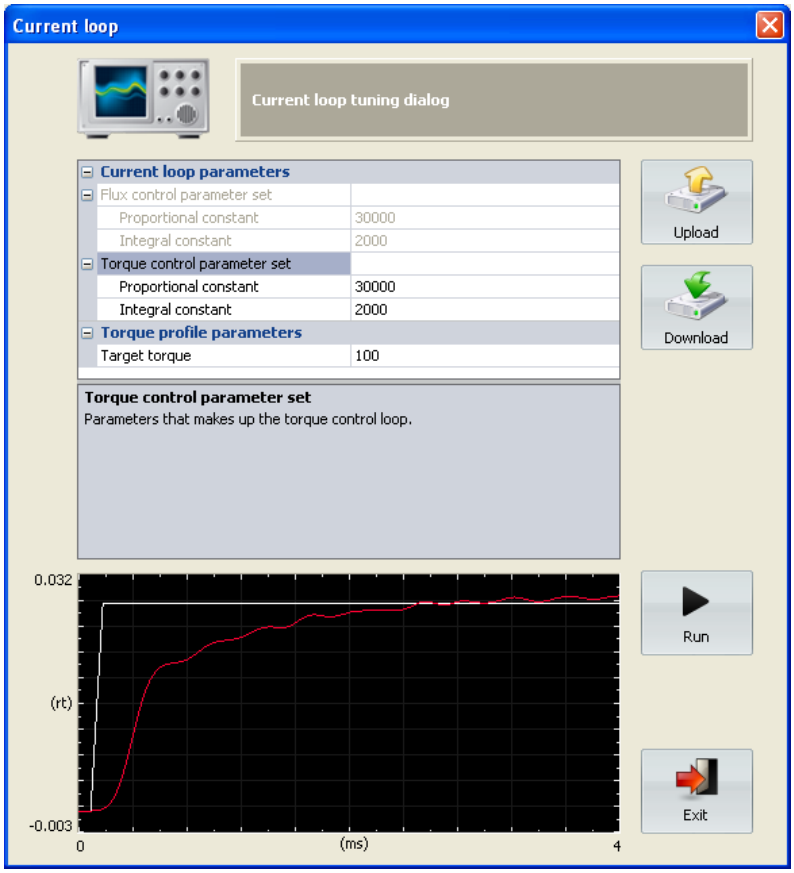

Figure 8: Current loop dialog box

The current controller must be properly tuned before any other process can be successfully carried out.

To tune the current loop:

1) Set test parameters (**torque profile parameters**) used for the tuning.
   It is recommended to set **target torque** parameter to **100 per thousand** of rated torque when tuning a system.
2) Set the desired **proportional** and **integral** gains in the property grid of current loop dialog box.
3) Click on the **Download** button to set the new parameters to drive.
4) Click on the **Run** button to begin the current loop tuning.
5) Evaluate the results in the graph and repeat steps 2 to 4 until your graph indicates optimal tuning.

Be aware that the motor shaft may move while the current loop is being tuned. Therefore, take the necessary precautions for the unlikely event of an undesired movement.

Tuning the velocity loop

To tune the velocity loop of your drive, click on the **V loop** button in the *Drive configuration* tab. The **Velocity loop** dialog box will pop-up (see Figure 7).

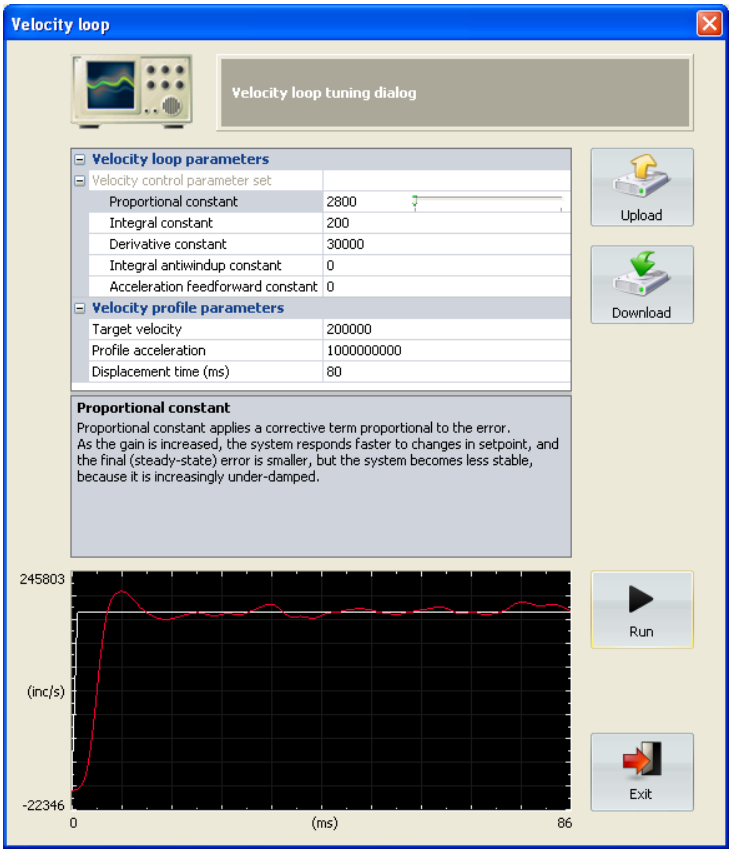

Figure 9: Current loop dialog box

To tune the velocity loop:

1) Set test parameters (**velocity profile parameters**) used for the tuning. It is recommended to set **target velocity** parameter to **10% of rated velocity** when tuning a system.
2) Set the desired gains (**proportional**, **integral**, **derivative**, **integral anti-windup** and **acceleration feed-forward**) in the property grid of velocity loop dialog box.
3) Click on the **Download** button to set the new parameters to drive.
4) Click on the **Run** button to begin the velocity loop tuning.
5) Evaluate the results in the graph and repeat steps 2 to 4 until your graph indicates optimal tuning.

Be aware that the motor shaft may move while the velocity loop is being tuned. Therefore, take the necessary precautions for the unlikely event of an undesired movement.

Tuning the position loop

To tune the position loop of your drive, click on the **P loop** button in the *Drive configuration* tab. The **Position loop** dialog box will pop-up (see Figure 9).

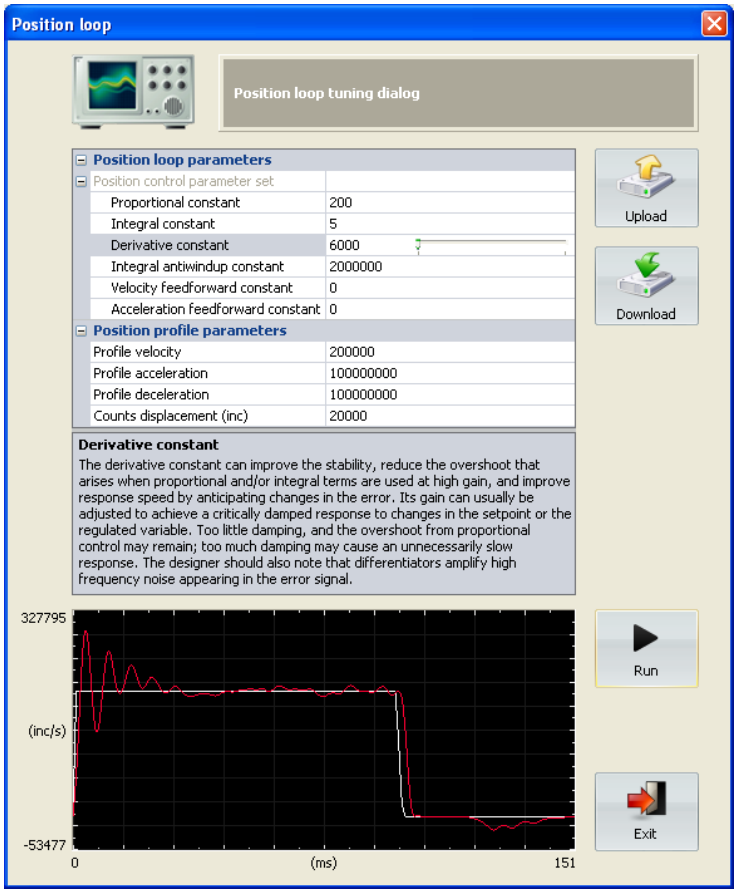

Figure 10: Position loop dialog box

To tune the position loop:

1) Set test parameters (**position profile parameters**) used for the tuning. It is recommended to set **profile velocity** parameter to **10% of rated velocity** when tuning a system.
2) Set the desired gains (**proportional**, **integral**, **derivative**, **integral anti-windup**, **velocity feed-forward** and **acceleration feed-forward**) in the property grid of position loop dialog box.
3) Click on the **Download** button to set the new parameters to drive.
4) Click on the **Run** button to begin the position loop tuning.
5) Evaluate the results in the graph and repeat steps 2 to 4 until your graph indicates optimal tuning.

Be aware that the motor shaft may move while the position loop is being tuned. Therefore, take the necessary precautions for the unlikely event of an undesired movement.

Configuring the motion parameters

Several general motion parameters can be configured by clicking on the **Motion params** button (see Figure 10) in the *Drive configuration* tab.

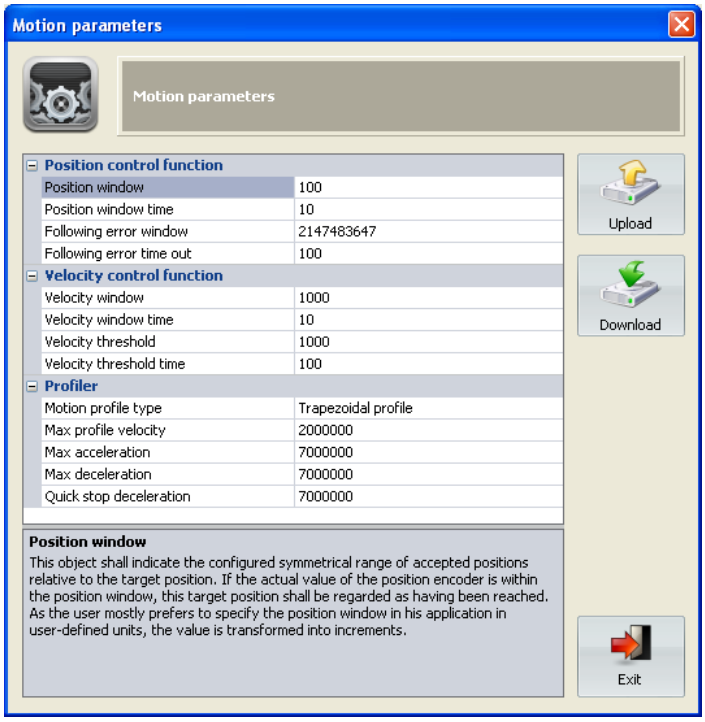

Figure 11: Motion parameters dialog box

The **position control function** parameters work in conjunction with position loop. The position loop is powered from the output of the profiler and from the position detector or feedback output.
The output of the position loop will be input to the flux-torque or current loop.

Parameters of position control function are:

- **Position window**: this parameter indicates the configured symmetrical range of accepted position relative to the target position. If the actual value of the position encoder is within the position window, this target position shall be regarded as having been reached. As the user mostly prefers to specify the position window in his application in user-defined units, the value is transformed into increments.
- **Position window time**: this parameter indicates the configured time, during which the actual position within the position window is measured.
- **Following error window**: this parameter indicates the configured range of tolerated position values symmetrically to the position demand value.
- **Following error time out**: this parameter indicates the configured time for a following error condition, after that the bit 13 of the *statusword* shall be set to 1.

The **velocity control function** parameters work in conjunction with velocity loop. The velocity loop is powered from the output of the profiler and from the velocity detector or feedback output.
The output of the velocity loop will be input to the flux-torque or current loop.

Parameters of position control function are:

- **Velocity window**: this parameter indicates the configured symmetrical range of accepted velocity relative to the target velocity. If the actual value of the velocity is within the velocity window, this target velocity shall be regarded as having been reached.
- **Velocity window time**: this parameter indicates the configured time, during which the actual velocity within the velocity window is measured.
- **Velocity threshold**: this parameter indicates the configured zero velocity threshold.
- **Velocity threshold time**: this parameter indicates the configured zero velocity threshold time.

The **profiler** or trajectory generator is generating the position/velocity demand values for the position/velocity loops.
Parameters of profiler are:

- **Motion profile type**: this parameter indicates the configured type of motion profile used to perform a profiled motion.
- **Max. profile velocity**: this parameter indicates the maximal allowed velocity in either direction during a profiled motion.
- **Max. acceleration**: this parameter indicates the configured maximal acceleration. It is used to limit the acceleration to an acceptable value in order to prevent the motor and the moved mechanics from being destroyed.
- **Max. deceleration**: this parameter indicates the configured maximal deceleration. It is used to limit the deceleration to an acceptable value in order to prevent the motor and the moved mechanics from being destroyed.
- **Quick stop deceleration**: this parameter indicates the deceleration used to stop the motor when the quick stop function is activated.

Configuring the environment

Several environment parameters can be configured by clicking on the **Environment** button (see Figure 11) in the *Drive configuration* tab.

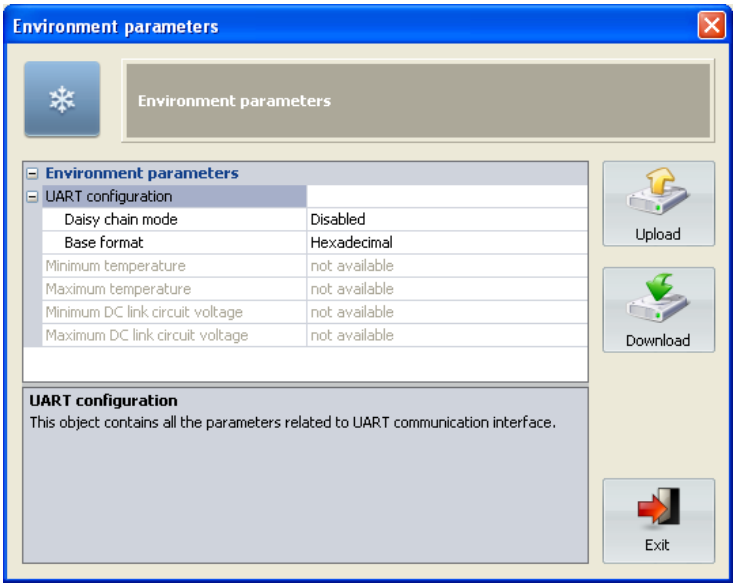

Figure 12: Environment dialog box

For Ingenia drives with UART interface, some parameters can be configured:

- **Daisy chain mode**: this parameter indicates if UART works in daisy chain mode (**Enabled** option) or not (**Disabled** option).
- **Base format**: this parameter configures the format of the value data. Possible values are **Hexadecimal** or **Decimal** base format.

Configuring the Inputs/Outputs

To configure inputs and outputs of your drive click on the **Inputs/Outputs** button in the *Drive configuration* tab. The **Inputs & Outputs** dialog box will pop up (see Figure 12).

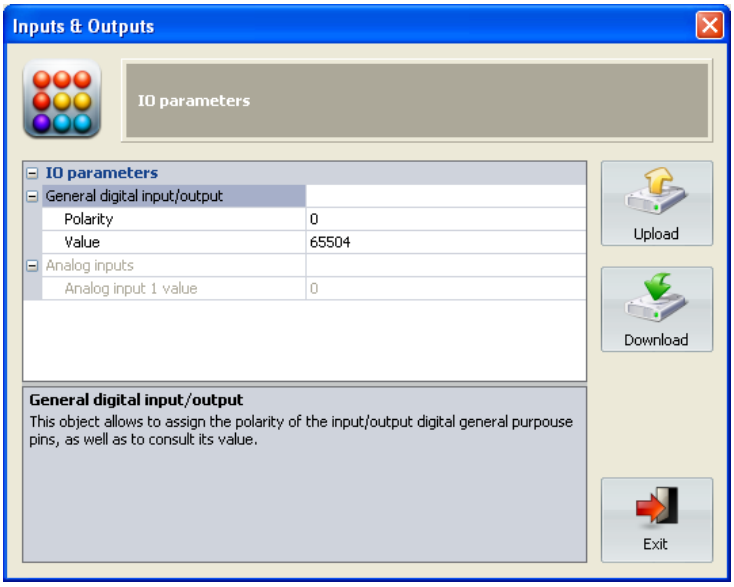

Figure 13: I/O dialog box

The **polarity** and **value** for **general digital input/outputs** can be configured. Each of them is a 16bit binary representation which bit meaning depends on the specific Ingenia drive used. Please refer to your hardware manual for further information.

The **analog input value 1** is a read only parameter. It displays the result of the analog to digital conversion.

5 Drive state machine

The current status of the drive within its internal state machine can be consulted at any time by clicking on the *CiA-402 State Machine* tab (see Figure 13).

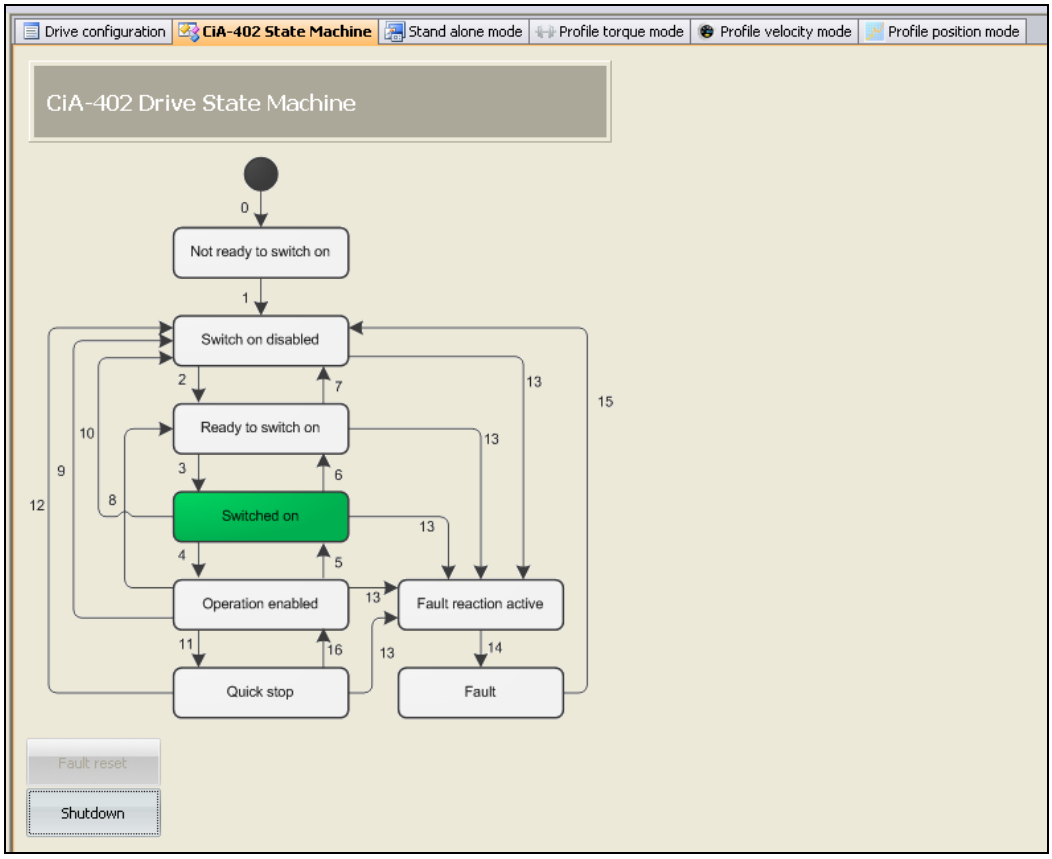

Figure 14: State machine

All Ingenia drives use the power drive system finite state automation defined by CiA organization in CiA 402 DSP specification.

Further information about states and transition can be found in the CiA402 DSP specification.

User can execute the shutdown command at any time by clicking on the **Shutdown** button.
When entering in Fault status, the error code will be displayed and the **Fault reset** button enabled.

6 Profile position mode

The profile position operating mode permits point-to-point movements whose movement parameters are profiled, depending on the profiler configuration.
The values generated at the profiler output are delivered to the position control function, which converts these values into the corresponding electrical parameters for the motor.
The following diagram shows the internal working of this mode.

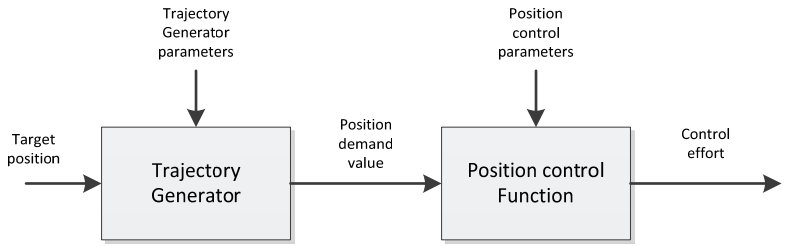

Figure 15: Overall structure for profile position mode

Configuring mode

To configure profile position mode parameters, click on the **Profile position** button in the *Drive configuration* tab. The **Profile position mode configuration** dialog box will pop up (see Figure 15).

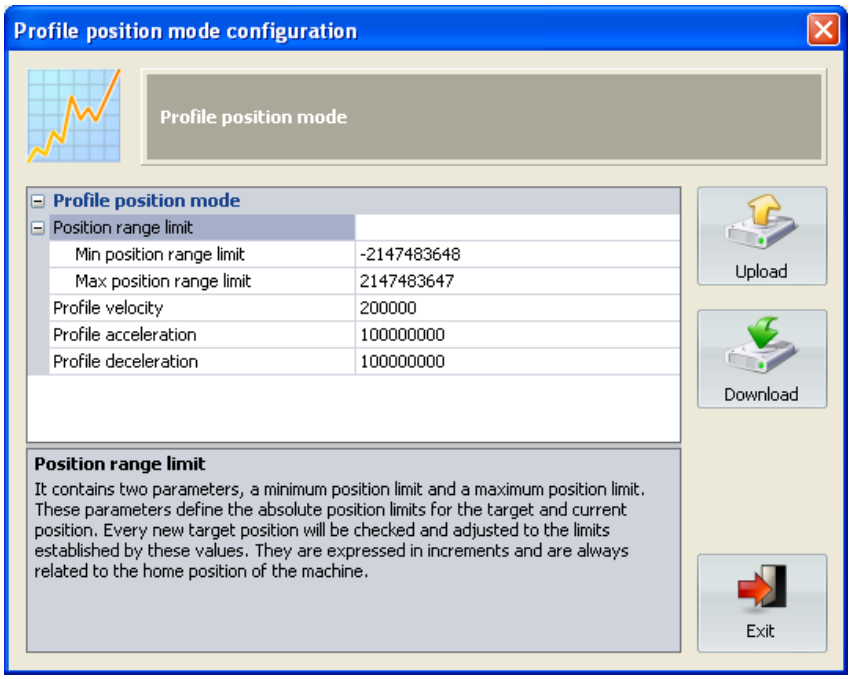

Figure 16: Profile position mode configuration dialog box

The profile position mode configurable parameters are:

- **Position range limit**: It contains two parameters, a minimum position limit and a maximum position limit. These parameters define the absolute position limits for the target and current position.
  Every new target position will be checked and adjusted to the limits established by these values.
- **Profile velocity**: It indicates the desired velocity attained at the end of the acceleration ramp during the profiled motion.
- **Profile acceleration**: It indicates the desired acceleration for the profiled motion.
- **Profile deceleration**: It indicates the desired deceleration for the profiled motion.

Executing mode

To test the profile position mode, click on the *Profile position mode* tab or select **Motion Modes – Profile position** from the MotionLab menu bar.
The profile position mode view will become active (see Figure 16).

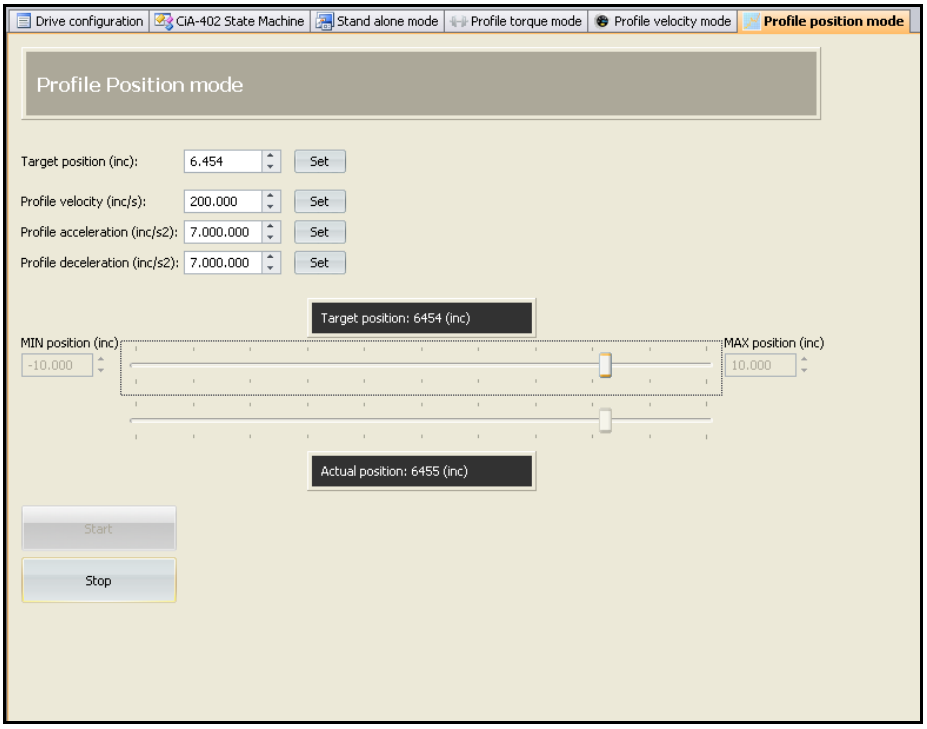

Figure 17: Profile position mode

To perform a profiled position movement:

1) Set the appropriate position limits for your system (**MIN position** and **MAX position** edit boxes).
2) Click on the **Start** button.
3) Edit the desired profile for the movement (**Profile velocity**, **Profile acceleration** and **Profile deceleration** edit boxes) and click on respectively **Set** buttons.
4) Set new **Target position** and click on **Set** button to start the movement.
5) Alternatively you can also use slider control to set a new target position.
6) Repeat steps 3 to 5 as many times as required.
7) Click on the **Stop** button to exit the profile position mode.

The target and the actual position values will be continuously updated in the black boxes while profile position mode is running.

It is recommended to tune the current and position loops before executing profiled position movements.

7 Profile velocity mode

The profile velocity operation mode makes it possible to control the velocity of the motor according to the parameters set by the user. Movement parameters are profiled according to the profiler configuration. Values generated at the profiler output are delivered to the velocity control function, which converts these values into the corresponding electrical parameters for the motor.
The following diagram shows the internal working of this mode.

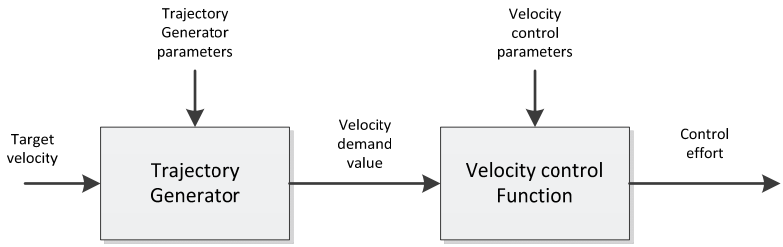

Figure 18: Overall structure for profile velocity mode

Configuring mode

To configure profile velocity mode parameters, click on the **Profile velocity** button in the *Drive configuration* tab. The **Profile velocity mode configuration** dialog box will pop up (see Figure 18).

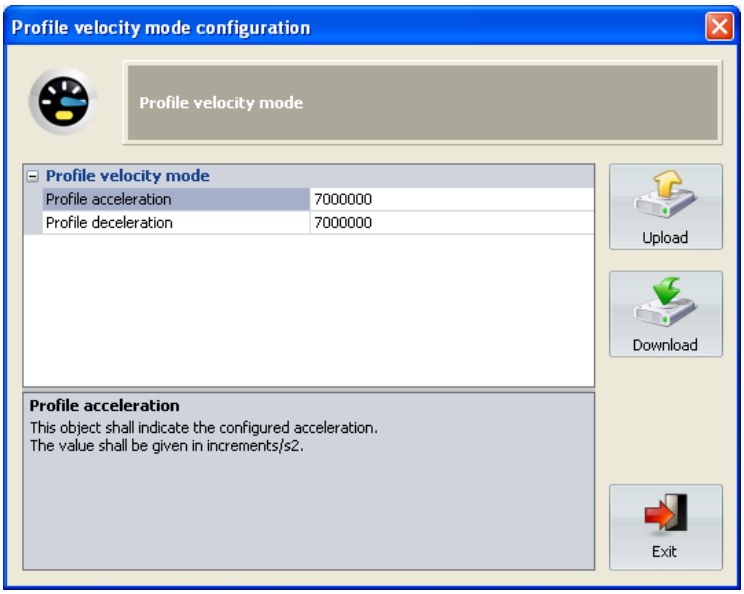

Figure 19: Profile velocity mode configuration dialog box

The profile velocity mode configurable parameters are:

- **Profile acceleration**: It indicates the desired acceleration for the profiled motion.
- **Profile deceleration**: It indicates the desired deceleration for the profiled motion.

Executing mode

To test the profile velocity mode, click on the *Profile velocity mode* tab or select **Motion Modes – Profile velocity** from the MotionLab menu bar.
The profile velocity mode view will become active (see Figure 19).

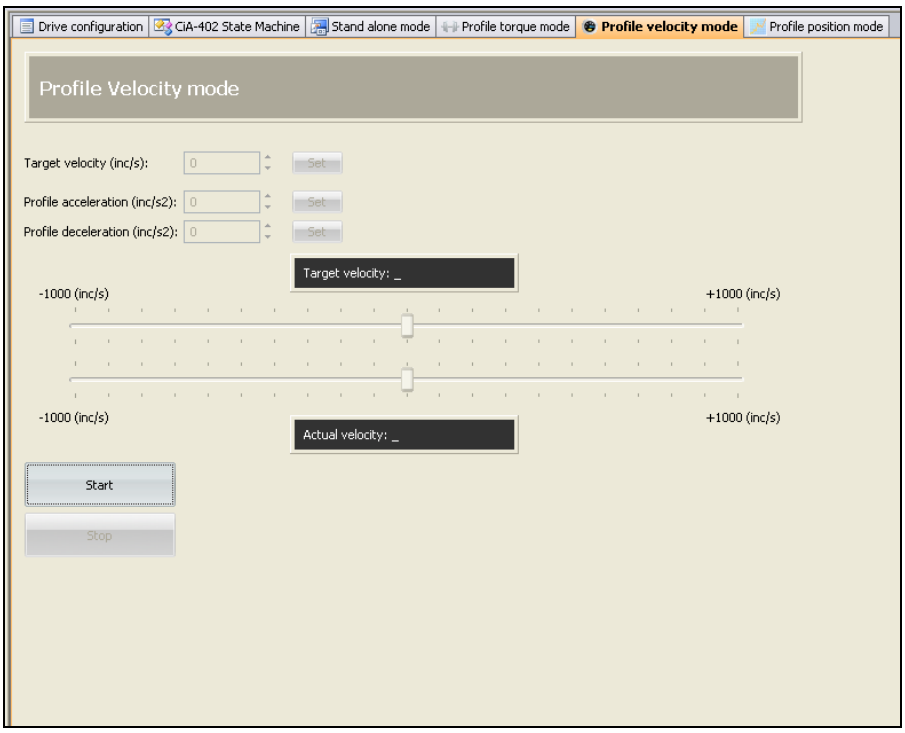

Figure 20: Profile velocity mode

To perform a profiled velocity movement:

1) Click on the **Start** button.
2) Edit the desired profile for the movement (**Profile acceleration** and **Profile deceleration** edit boxes) and click on respectively **Set** buttons.
3) Set new **Target velocity** and click on **Set** button to start the movement.
4) Alternatively you can also use slider control to set a new target velocity.
5) Repeat steps 2 to 4 as many times as required.
6) Click on the **Stop** button to exit the profile velocity mode.

The target and the actual velocity values will be continuously updated in the black boxes while profile velocity mode is running.

The range of allowed velocities is automatically set to the minimum value between max motor speed and max profile velocity.

It is recommended to tune the current and velocity loops before executing profiled velocity movements.

8 Profile torque mode

The profile torque operation mode makes it possible to control the torque of the motor according to the parameters set by the user. Movement parameters are profiled according to the torque slope and torque profile type parameters. Values generated at the profiler output are delivered to the torque control function, which converts these values into the corresponding electrical parameters for the motor.

Configuring mode

To configure profile torque mode parameters, click on the **Profile torque** button in the *Drive configuration* tab. The **Profile torque mode configuration** dialog box will pop up (see Figure 20).

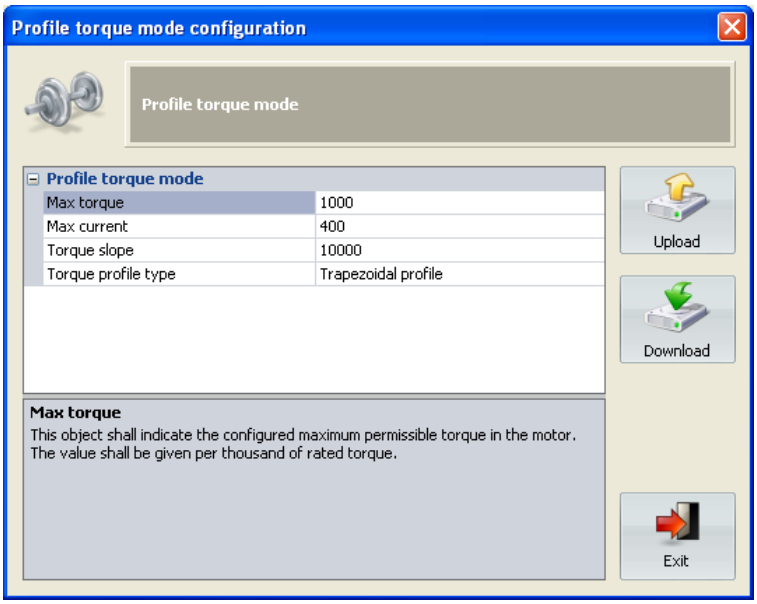

Figure 21: Profile torque mode configuration dialog box

The profile velocity mode configurable parameters are:

- **Max torque**: It indicates the configured maximum permissible torque in the motor.
- **Max current**: It indicates the configured maximum permissible torque creating current in the motor.
- **Torque slope**: It indicates the configured rate of change of torque.
- **Torque profile type**: It indicates the configured type of profile used to perform a torque change.

Executing mode

To test the profile torque mode, click on the *Profile torque mode* tab or select **Motion Modes – Profile torque** from the MotionLab menu bar.
The profile torque mode view will become active (see Figure 21).

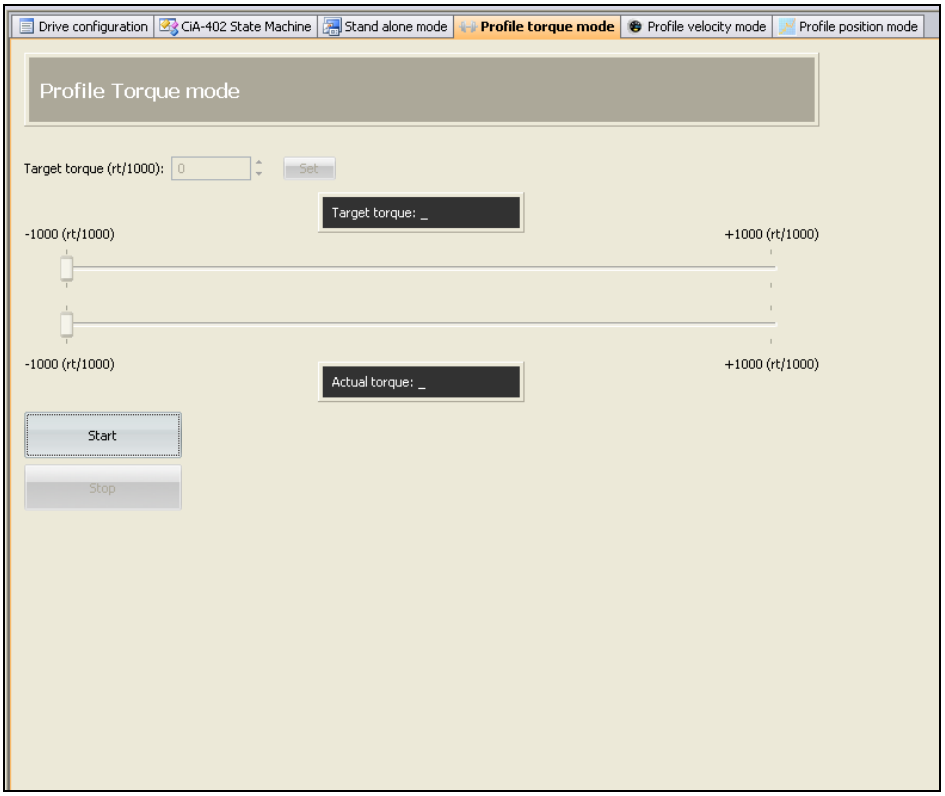

Figure 22: Profile torque mode

To perform a profiled torque movement:

1) Click on the **Start** button.
2) Set new **Target torque** and click on **Set** button to start the movement.
3) Alternatively you can also use slider control to set a new target torque.
4) Repeat steps 2 to 3 as many times as required.
5) Click on the **Stop** button to exit the profile torque mode.

The target and the actual torque values will be continuously updated in the black boxes while profile torque mode is running.

The range of allowed torques is automatically set to max torque.

It is recommended to tune the current loop before executing profiled torque movements.

9 Standalone operation

Some Ingenia drives have the capability of using commands to form other commands called "macros". These macros are stored in the non-volatile memory and can be executed automatically (stand alone operation).

The stand alone mode of the Ingenia drives is accessible through *Stand alone mode* tab (select **Motion Modes – Stand alone** from the MotionLab menu bar).
The stand alone mode view layout is shown in Figure 22.

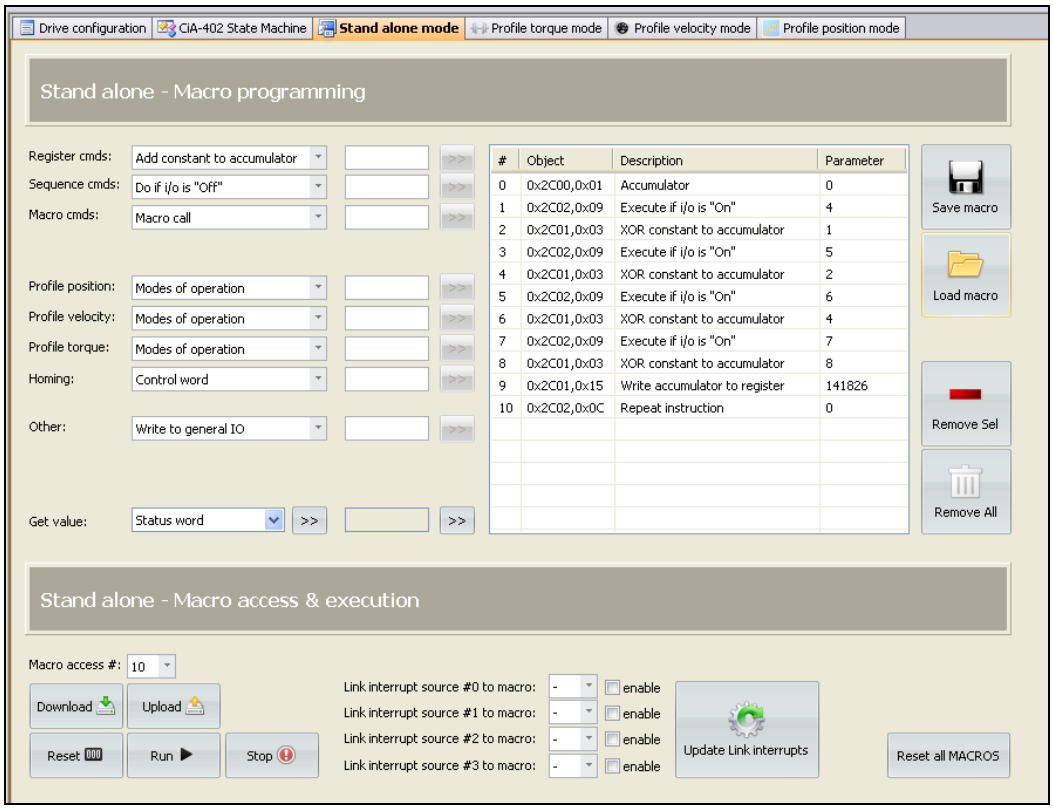

Figure 23: Standalone operation

The stand alone view can be divided into two main zones: **Macro programming** and **Macro access & execution**. Next subchapters describe both of them.

Programming macros

The **macro programming** view allows for creation of macros, using the drop-down lists with the appropriate parameters.

The drop-down lists group objects by their meaning:

- **Register commands** drop-down list: Includes a set of arithmetic operators that could be used with general purpose register.
- **Sequence commands** drop-down list: includes a set of commands that provide for conditional sequence execution, based on register data, input/output, etc.

- **Macro commands** drop-down list: includes instructions for execution and nesting macros.
- **Profile position** drop-down list: includes instructions for setting up profile position mode.
- **Profile velocity** drop-down list: includes instructions for setting up profile velocity mode.
- **Profile torque commands** drop-down list: includes instructions for setting up profile torque mode.
- **Homing** drop-down list: includes instructions for setting up homing mode
- **Other** drop-down list: other instructions.
- **Get value** drop-down list: includes access to several read operations.

Some Ingenia drives have the possibility to automatically execute macro “0” on power-up.

Once a macro has been programmed, user can save it to a file by clicking on the **Save macro** button. Alternatively macros can also be loaded via **Load macro** button.
In the Save As dialog box, enter a name for the macro file, browse to the location at which it should be saved, and click **Save**.

Executing macros

Once a macro has been programmed in the **Macro programming view**, it can be downloaded to the drive and executed.
To download a macro, select the desired number of macro in the drop-down list, and click on the **Download** button. To execute it, click on the **Run** button.

Macro execution can be stopped by clicking on the **Stop** button.

You can get at any time the actual drive's stored macros by clicking on the **Upload** button. Actual macro content (for the drop-down list selected macro) will be displayed in the **Macro programming** view.

To reset the content of the actually selected macro, click on the **Reset** button.
To reset all macros, click on the **Reset all MACROS** button (slow operation).

Ingenia drives employ a "Macro Interrupt System" to provide additional programming versatility. This system comprises 4 interrupt sources with corresponding vectors.

When an interrupt's source is enabled for operation and then becomes active, the current macro being executed is saved to a so called macro stack and execution of the macro specified by that interrupt's vector table entry begins.
You can configure the interrupt's sources and enable them by using the appropriate drop-down lists and checkboxes. Once you have your "Macro Interrupt system" configured click on the **Update Link interrupts** button.

10 Updating your drive

To update the firmware of your drive, be sure that it is not connected to any MotionLab controlled network. If so, disconnect it by right-clicking on the drive tree item of *Network panel window* and selecting the **Disconnect** option from the pop-up menu

Then click on the **Tools – Update firmware** option from the MotionLab menu bar. The *update firmware* Dialog will pop up.

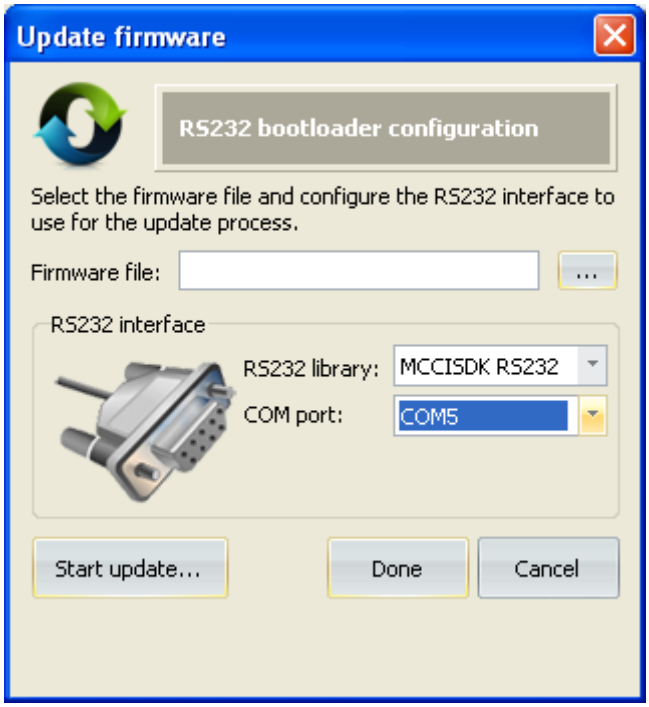

Figure 24: Update firmware dialog

Follow the instructions:

1. Select the firmware file to be loaded (use **browse** button for select the desired file).
2. Select the COM port you want to use to update the firmware of the drive.
3. Power off the drive.
3. Click on the **Start update** button. A progress bar will start.
4. Power on the drive before the progress ends.

The system will start the update process. While the process executes, the messages above the progress bar describe the action that is currently being performed. The progress bar shows the progress of the current stage of the operation.
When the process is done, close the dialog.

Do not disconnect power from the drives while the firmware is loading. Doing so can cause severe damage and you will have to send the unit back to Ingenia for repair.

References

Ingenia - “*Embedded Motion Control Library – Product manual*”