Baumer

Sensor Solutions • Motion Control • Vision Technologies

# User Manual

## CANopen Toolsuite

Software version 2

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## Content



## Appendix

# 1 Introduction

## 1.1 Product assignment

The PC software CANopen Toolsuite can be used for start-up, product presentation, diagnosis and test of the following Baumer products:

Table 1: Product assignment

| Product family | Product |
|---|---|
| Encoder | BMxx xxxxx24Bxx/xxxxx |
| Encoder | BMxx xxxxx24Rxx/xxxxx |
| Drive | MSxA xxCxxx-xxxxxx |

## 1.2 Safety and operating instructions

**Intended purpose of software and manual**

- This manual is intended as a supplement to already existing documentation (catalog, product information, assembly instructions and related product manual).
- Please read this manual carefully before initial appliance of software and related product.
- The described software is intended to be used in combination with the products listed in the product assignment. For further details, see corresponding product manual.
- The described software is intended to be operated in combination with an electronic device (CAN adapter) described in chapter Hardware installation.

**Supplementary information, disclaimer**

- This software is available free of charge.
- CANopen® is registered trademark, licensed by CiA - CAN in Automation e.V., Germany
- Baumer Electric AG accepts no liability and no warranty that the described software operates error–free.
- Baumer Electric AG accepts no liability and no warranty for consequential damages followed using the described software
- Baumer Electric AG has the right to modify the described software or its documentation at any time without prior warning

*Failure to comply with the safety remarks can result in malfunctions, personal injury or damage to property.*

# 2 Functional description

The CANopen Toolsuite software allows configuring Baumer encoders and drives with CANopen interface by setting numerous parameters.

System Requirements:

To use the CANopenToolsuite (or parts of it like CANMaster, FirmwareMaster, etc.) beware of the following requirements:

- Operating system: Windows XP, Windows 7, Windows 8
- .NET Framework 3.5
- VCI driver version 3.2 or higher (Windows XP), VCI Driver 3.5.1 or higher (Windows 7, Windows 8), (http://www.ixxat.de/download_vci_v3_de.html)

*Important: In order to install software and drivers administrator rights are needed.*
*Please read the "CANOpen Toolsuite Installation Manual".*

# 3 Hardware installation

The PC software CANopenToolsuite needs an USB-to-CAN adapter to communicate with the CANOpen device. At the moment only adapters from IXXAT with VCI V3 Driver can be used.

| product | source of supply |
|---|---|
| Hardware converter: *USB-to-CAN compact*<br>Corresponding software driver: CAN-driver VCI 3.5.1 or newer | www.ixxat.de |

Install the VCI Driver before the CANopen Toolsuite.

Connect the USB-to-CAN adapter with the PC.

Make sure the CAN network is correctly built, refer to specific CAN literature.

# 4 Software installation

Start the installation by double-clicking on “SetupCANopenToolsuite_basic_2_x_x.exe”. Follow the instructions in the graphical user interface.

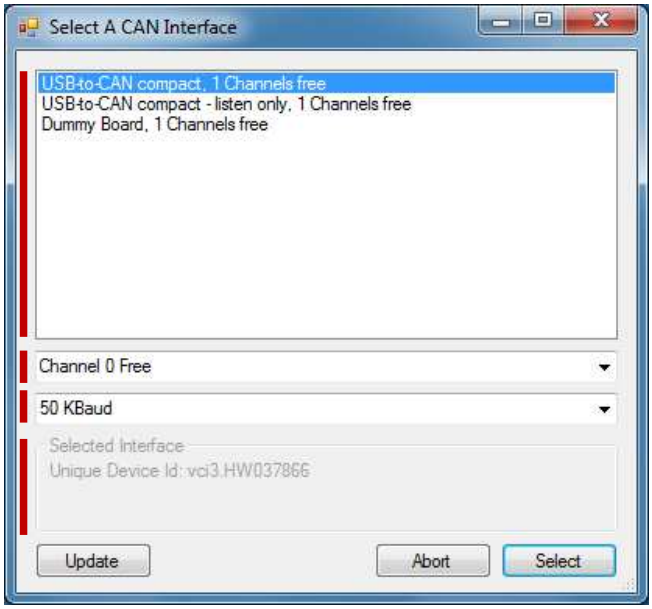
# 5 User instruction for CANopen Toolsuite software

After connecting the encoder or drive with the USB-to-CAN adapter and the PC the CANopen Toolsuite software can be started. Click on the icon on your desktop or click on *Start – Programs – CANopen Toolsuite – CANopen Toolsuite*.

## 5.1 Start CANopen Toolsuite

### 5.1.1 Select a CAN device:

After starting up the software you will be asked to select a CAN interface:




1.) All available CAN interfaces are listed:
   - USB-to-CAN compact. For sending and receiving CAN messages. (default)
   - USB-to-CAN compact – listen only. For only receiving CAN messages
   - Dummy Board. For testing and configuring the software offline without CAN network.
2.) This field allows to choose the channel if you have a Multi-Channel Device (e.g. USB-2-CAN II).
3.) Select the baudrate of your CAN network
4.) Additional information

The button “Update” is actualizing the list.

Click on the button “Select” when you have chosen the right device.

### 5.1.2 Select tool

Select one of the following tools by double-clicking:

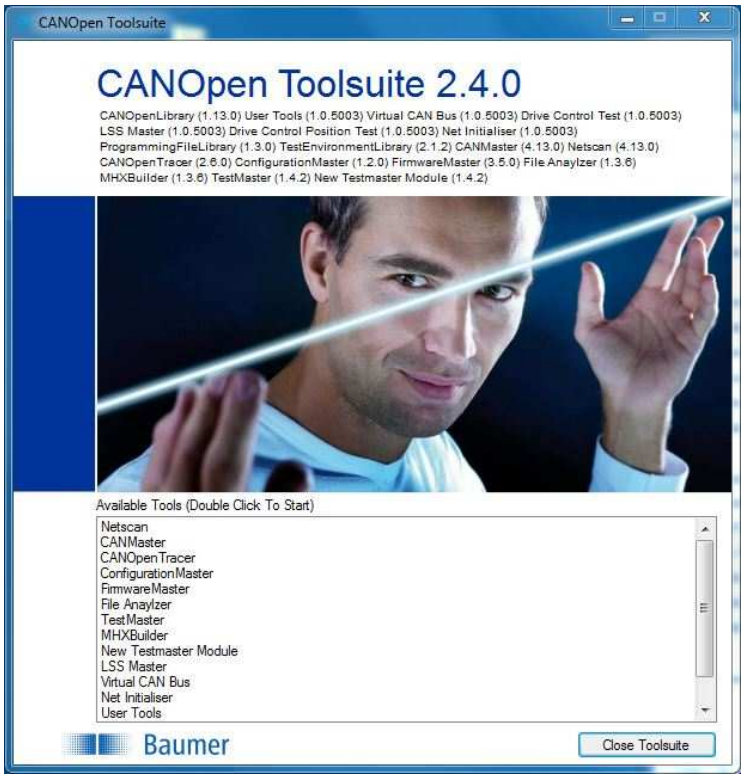
**Netscan**
This tool allows finding all devices which are connected with your network. It is searching through all baudrates and all node-IDs. The result is a list of all connected devices including all node-IDs and baudrates. If you are not sure if all your devices have a correct baudrate and node-ID, start with a Netscan.

**CANmaster**
This tool allows to read out the parameters of your device and to change these parameters

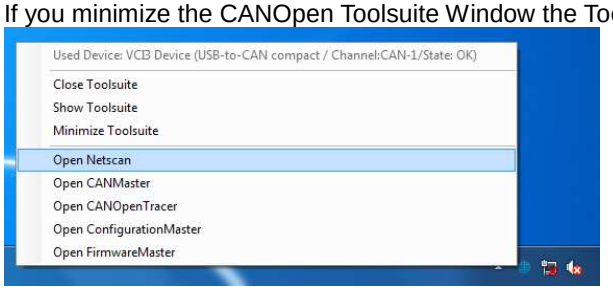
**CANopen Tracer**
This tool allows recording the CAN messages in the connected network.

**ConfigurationMaster**
This tool allows saving/loading a configuration of a CANopen device in/from a configuration file.

**FirmwareMaster**
This tool is installed as option. The FirmwareMaster allows updating firmware of an encoder or a drive.




**TrayIcon**
If you minimize the CANOpen Toolsuite Window the Tools are accessible from the TrayIcon.

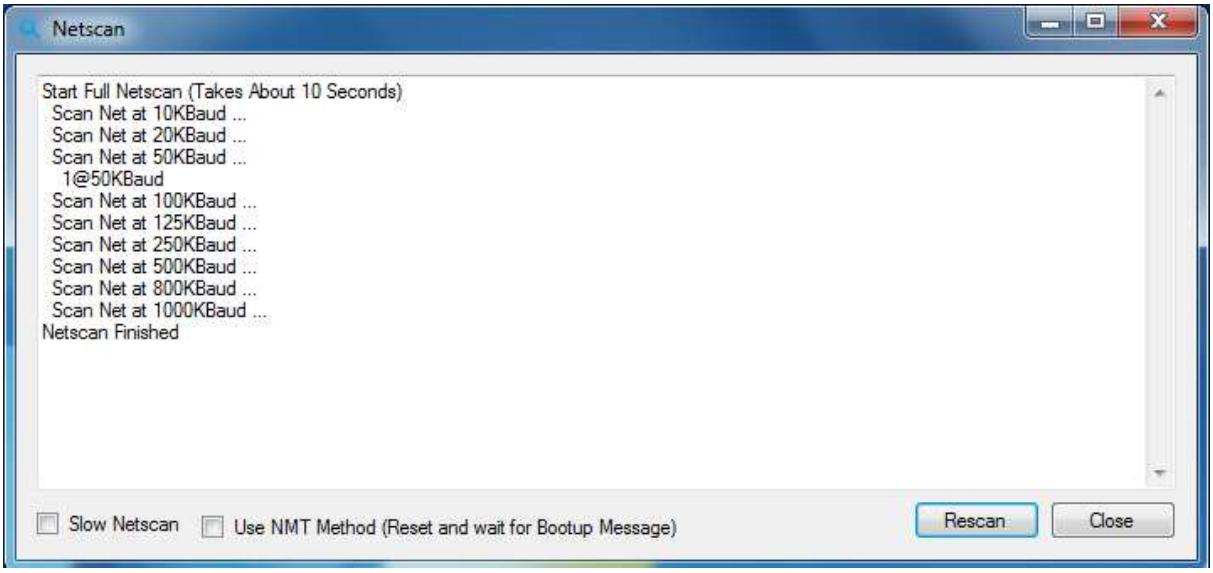


## 5.2 Netscan

**Scan**
To search for a CANopen devices on the connected bus click the “Scan” Button.

**Slow Netscan**
The Slow Netscan waits longer for device response then the normal scan.

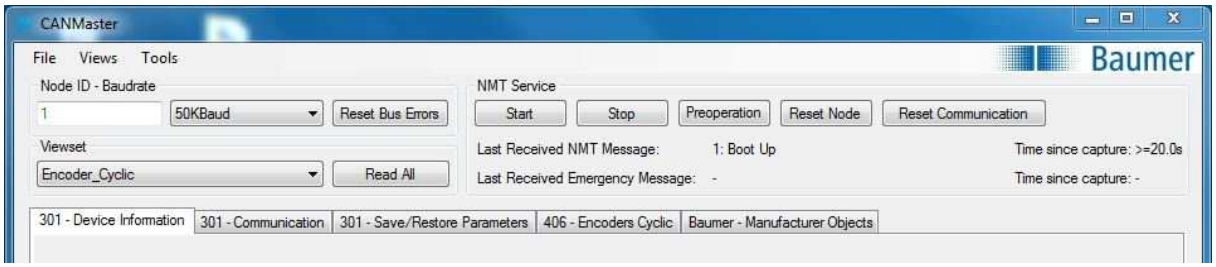
**Use NMT Method**
With this option all devices in the the network will be reset. Only the devices which have successfully sent a bootup message will be listed as found nodes.




1@50KBaud means that a device with node id 1 and baudrate 50 kBaud is connected with your network.

## 5.3 CANmaster

### 5.3.1 General Tool overview




**Node ID – Baudrate**
First of all set the correct node id and baudrate. If you do not know these data, make a Netscan first.

**NMT Service**
The NMT states of the CANopen node can be handled with the buttons “Start, “Stop”, “Preoperational”. Set the device into operational mode by clicking on the button “Start”. The device will start to send PDOs.

**Viewset**
You must choose the device you want to communicate with. This loads a predefined set of Views:

- Encoder_Cyclic rotational encoders
- Encoder_Cyclic_Redundant rotational encoders redundant
- Encoder_Linear cable-pull encoders
- Drive_MSIA positioning drive MSIA
- Drive_MSBA_MSQA positioning drive MSBA or MSQA
- startUp represents the last active Viewset at closing CANMaster

**Views**
Each Viewset exists of different views. The views are displayed as tab elements and contain different SDO fields. The content of a view can be variable adapted.

**SDO fields**
An SDO fields represent an object of the CANopen device. For each SDO field the index and subindex of the object is defined. The Label of the SDO fields can be switched between objectnumber or objectname by clicking “Views – Objectname -> Object-Nr.”.

The background color of the fields has the following meaning:

| | |
|---|---|
| Green | Reading of parameters was successful |
| Red | Reading of parameters was not successful |
| Blue | Parameter is updated by PDO |

**Read parameters of the device**
Read out all parameters:
Click on “Views” in the menu bar on top of the window. Click on “Read All Values” or press CTRL+R, this reads out all parameters which are stored in the encoder or drive.

Read out one specific parameter:
Click into a field an press CTRL + Enter

**Setting of specific parameters**
Click into the field which you want to change and type the new value. Press enter to send the value to the device. notice that the background color of the field become green if the write access was successful.

## 5.4 CANopen Tracer

The CANopen Tracer allows logging the current traffic in a CAN network. This can be very useful for debugging and analyzing in a CAN network.

### 5.4.1 General tool overview

**Timestamp**
The timestamp of the recorded CAN message. The time unit is second.milisecond.microsecond

**Type**
Describes the recorded CANopen protocol type.

**Node**
Displays the node id of the affected can device.

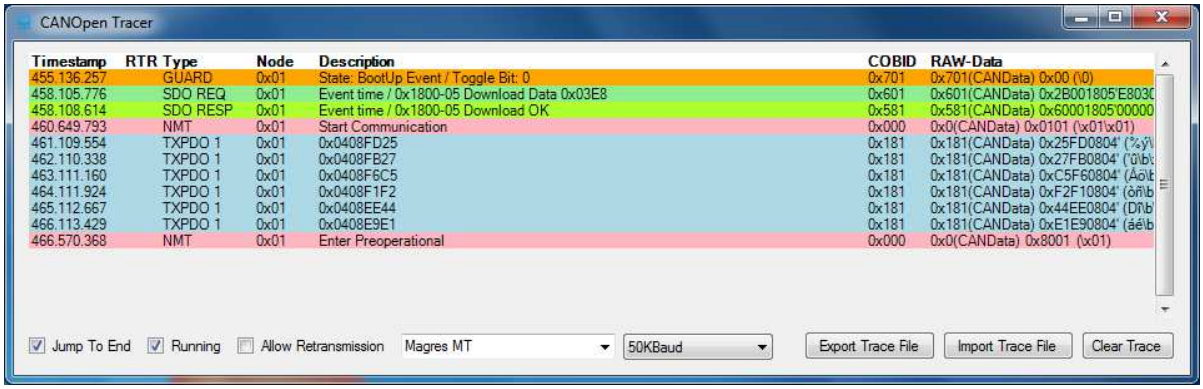
**Description**
The description shows the message information. For SDO protocol the description contains the index, subindex, transfer direction and data value of the SDO transfer.

**Jump To End**
Forces the Trace list to automatically scroll to the last received message.

**Running**
Starts / Stops the message tracing.

**Export\Import Trace file**
The recorded traffic can be exported into a CSV file. The columns will be stored separated with semicolons. It is also possible to import an earlier created CSV file.

**Clear Trace**
By pressing this button the whole trace list can be cleared.




### 5.4.2 Start tracing

1. By selecting the used device type in the drop down field the raw CAN traffic will be decoded into a better readable display.
2. Check the “Running” checkbox to start the trace.
3. Every CAN message on the bus will be listed.
4. Uncheck the “Running” checkbox to stop the trace.

## 5.5 ConfigurationMaster

The ConfigurationMaster allows reading out the current parameter configuration of a CANopen device and storing the parameter values in to a CANopen standardized format called DCF file. The opposite, to send a configuration out of a file to a CANopen device, is also possible.

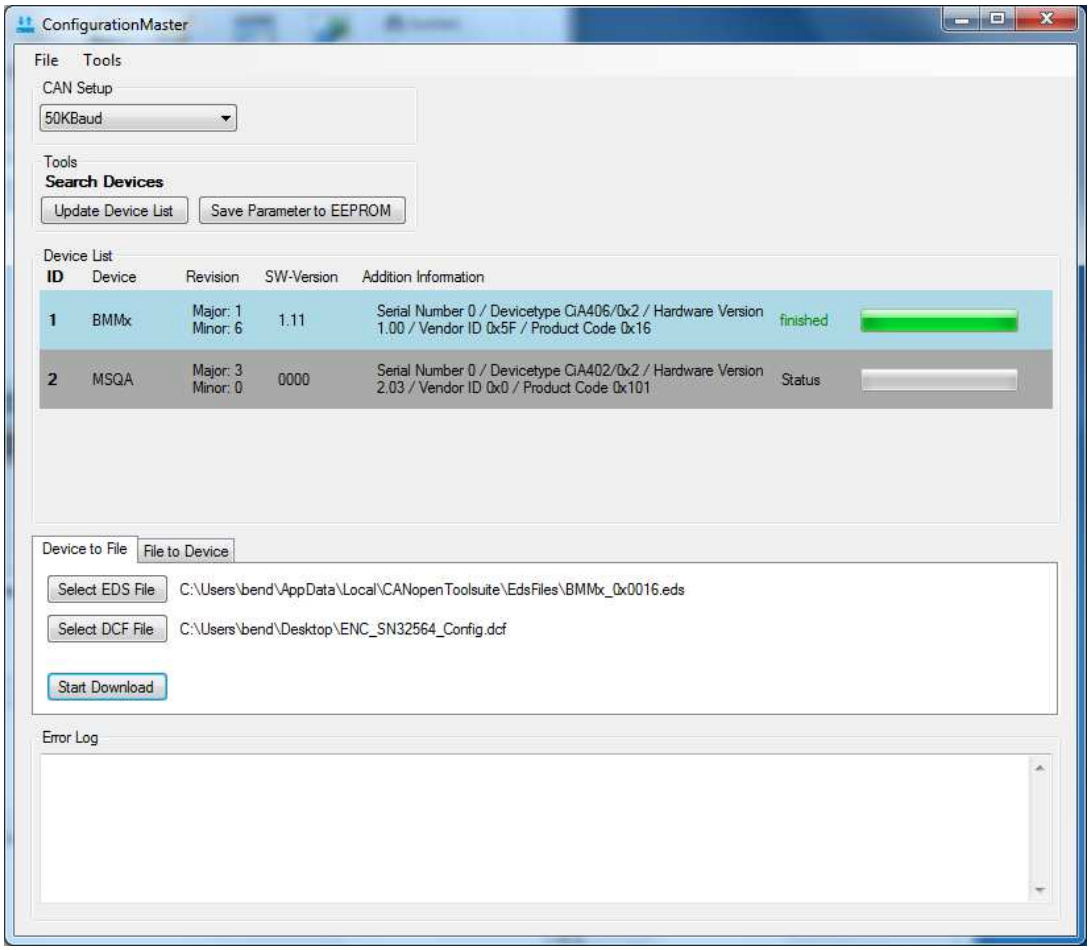
### 5.5.1 General tool overview

**CAN Setup**
The baudrate can be selected in the drop down list.

**Search Devices**
By pressing the “Update Device List” the CAN network will be scanned for devices.

**Device List**
Found devices will be listed in this section. A list entry displays different device information like devicename, sw-version and additional information. A device can be selected by a left click to the desired line. A selected device will be shown with blue background color.

**Error Log**
Occurred errors while an process are listed in the “Error Log” section.



### 5.5.2 Device to File

Press the “Update Device List” button for actualizing the list of available CAN devices. Select the desired device by a left click.

To declare which CANopen parameters can be read out from the device an EDS (Electronic Data Sheet) file is required. Press the “Select EDS File” to browse to the EDS File location. Be sure to select the correct EDS File.

The destination file which contains the parameter values which have been read can be defined by the “Select DCF File” Button.

To start the transfer press “Start Download”.
Occurred errors during the process will be listed in the “Error Log” Textbox.

Notice that the send parameter values are not stored permanent in the device. After a reset the parameters values will be lost. To safe these permanently press the “Save Parameter to EEPROM” button.

### 5.5.3 Device to File

Change the tab to “File to Device”. Select the DCF file which contains the desired device configuration by pressing the “Select DCF File” Button. Press Start “Upload” to send the values to the device.

**NOTE**
Depending on the CANopen device some SDO errors can occur. This is because some objects are dependent to each other or requires special writing sequences.

## 5.6 FirmwareMaster

### 5.6.1 General tool overview

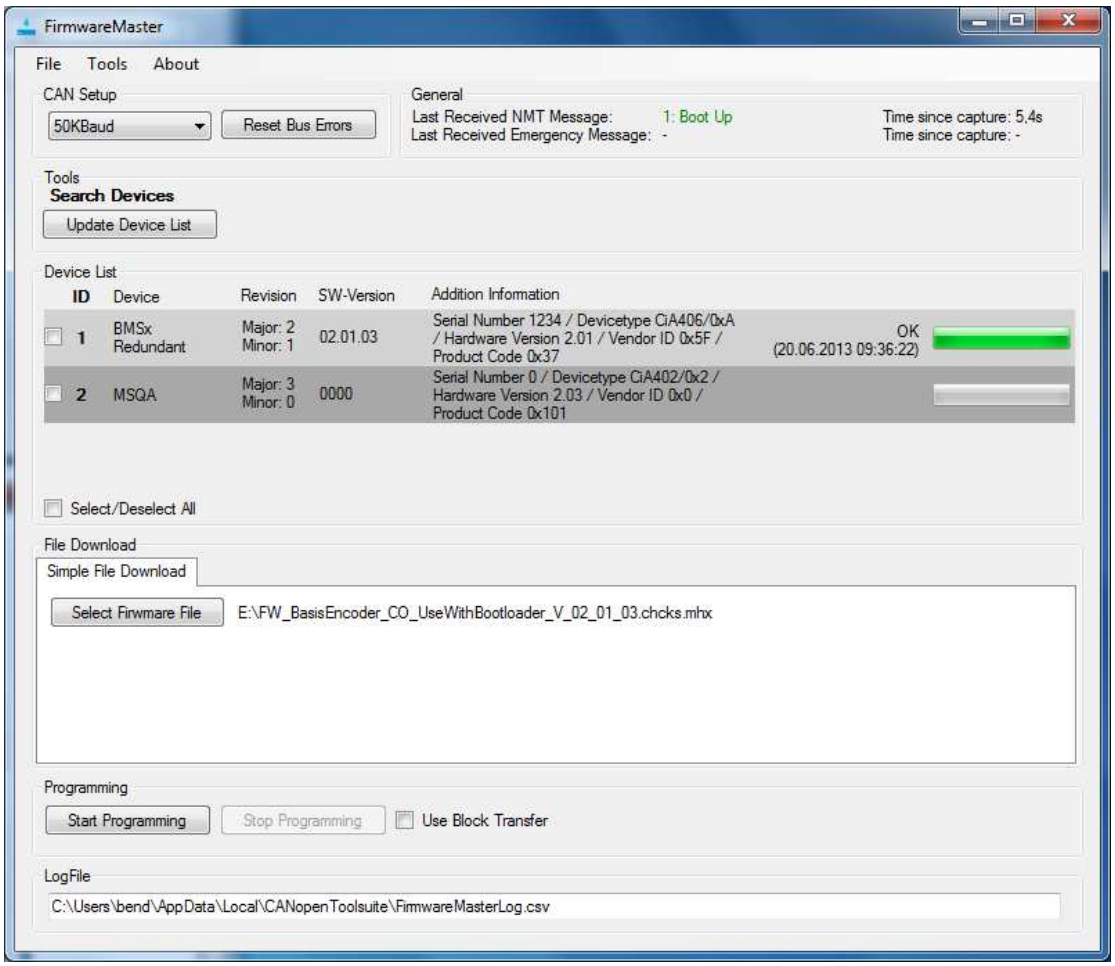
**CAN Setup**
The baudrate can be selected in the drop down list. The “Reset Bus errors” button reset the CAN interface which is connected with the PC and resets its errors

**Search Devices**
By pressing the “Update Device List” the CAN network will be scanned for devices.

**Device List**
Found devices will be listed in this section. A list entry displays different device information like device name, sw-version and additional information. A device can be selected by checking the check box at start of the line. Multiple selections are possible.

**Select Firmware File**
Select the firmware file which will be loaded onto the devices.

**WARNING**
Make sure to select the correct firmware file. A wrong file could make the product inoperable such that it has to be sent to the factory. The device cannot check if the new firmware is compatible.



**Start/Stop Programming**
Start and stop the firmware download
As a standard each device runs through this procedure:

1. Device reset
2. Wait 40ms
3. Contact the bootloader
4. Erase flash
5. Send firmware to the device
6. Start firmware

**Use Block Transfer**

The Block Transfer allows sending the firmware data packets without confirmation. The Transfer will be faster with block transfer.

**LogFile**
Defines the path of the log file

### 5.6.2 Standard procedure for a firmware download

1. Select baudrate of CAN network
2. Click on "Update Device List"
3. Select the devices which will receive the firmware download
4. Select firmware file

   **WARNING**
   Make sure to select the correct firmware file. A wrong file could make the product inoperable such that it has to be sent to the factory. The device cannot check if the new firmware is compatible.
5. Start the firmware download
6. Wait until the download is finished
7. Check the Revision and SW-Version if the correct new firmware has been loaded.

# Appendix

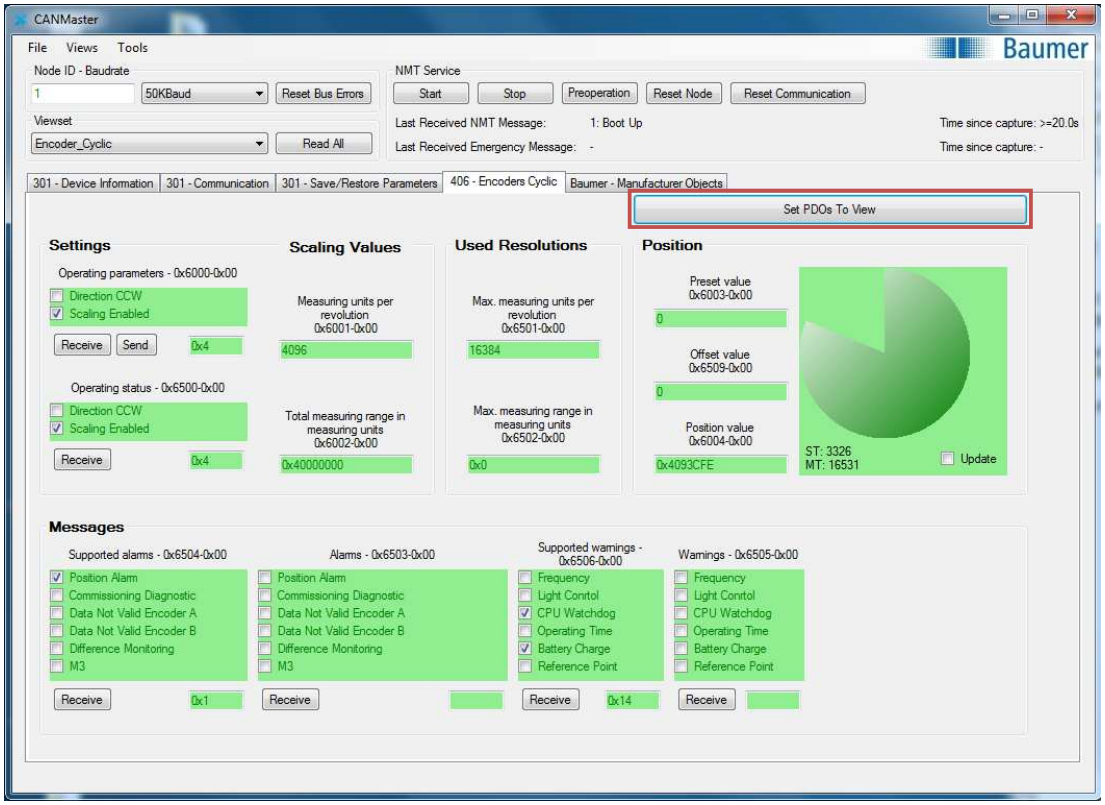
# A. CANMaster example configurations

## A.1 Encoder example 1: View position value via PDO

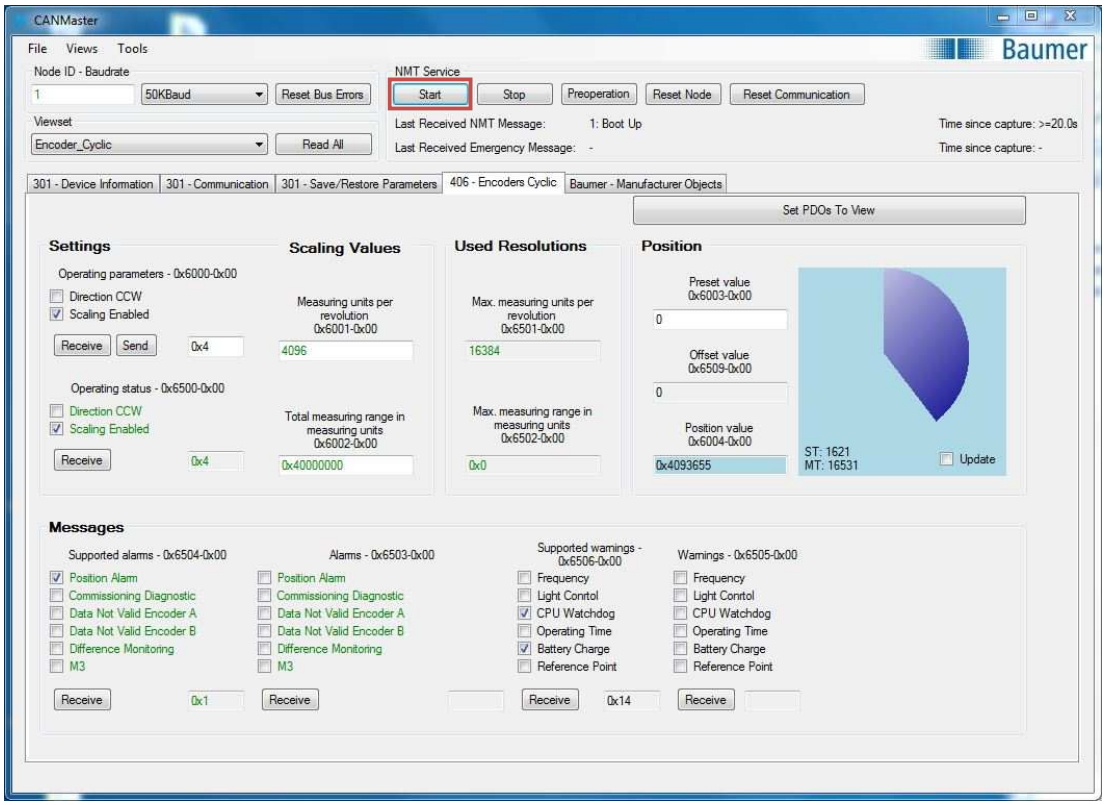
Start the CANMaster and enter the node id and baudrate of the device. The default setup is node id 1 and baudrate 50KBaud.

Select the “Encoder_Cyclic” Viewset and switch to the “406 – Encoders Cyclic” View. Read out all values (CTRL+R) and notice the actual encoder position value in the diagram.

Press the “Set PDO To View” button.



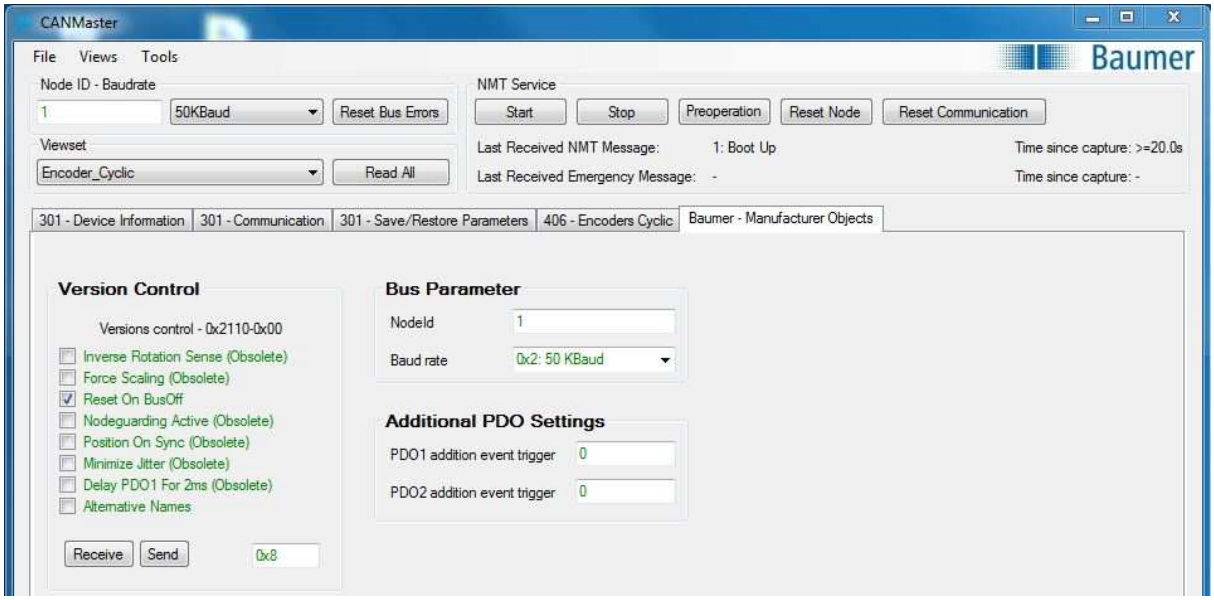
Press the “Start” button in the “NMT Service” section to start the cyclic PDO transmission. The position diagram background color becomes blue and will be updated while rotating the encoder shaft. The “Position value 0x6004-0x00” field will be updated as well by the PDOs and contains the full encoder position.



## A.2 Encoder example 2: Configure node id and baudrate

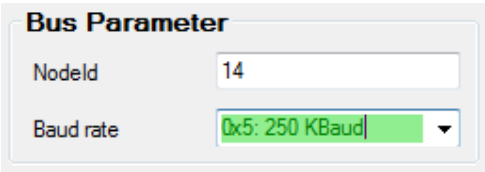
Start the CANMaster and enter the node id and baudrate of the device. The default setup is node id 1 and baudrate 50KBaud.

Select the “Encoder_Cyclic” Viewset and switch to the “Baumer – Manufacturer Objects” View. Read out all values (CTRL+R) and notice the actual “Bus Parameter”.



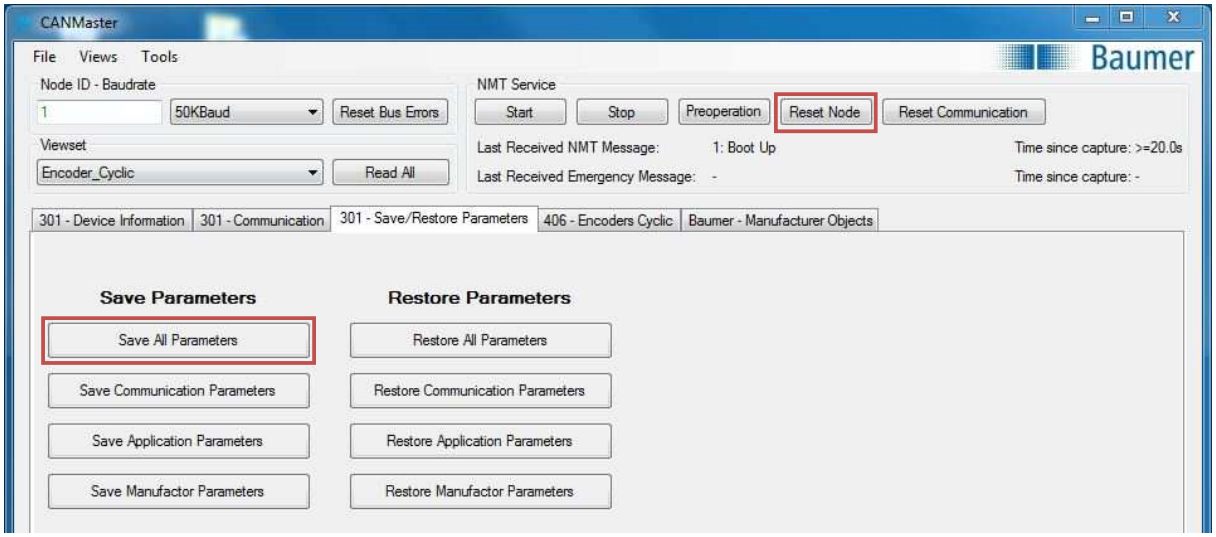

Change the values and press enter. The entered values will be send to object 0x2101 subindex 0 (node id) and 0x2100 subindex 0 (baudrate) of the encoder.

If the encoder has accepted the value the background color of the field changes to green.



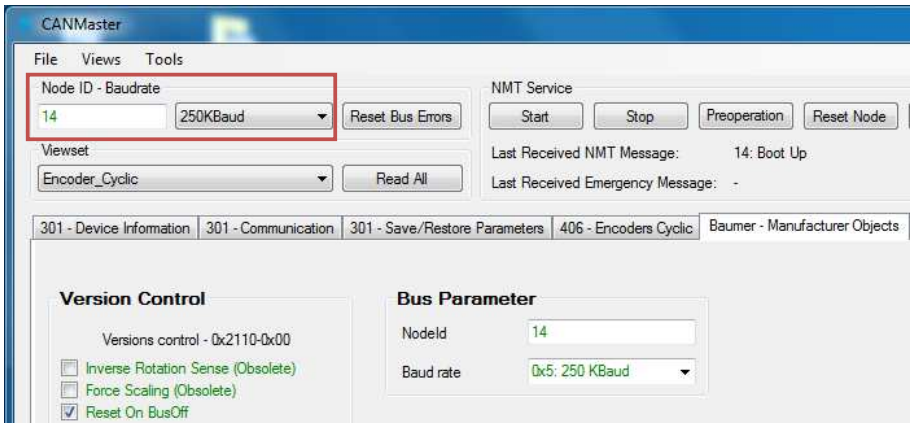

The new node id and baudrate are not active immediately.

Select the “301 – Save/Restore Parameters” View.
Press the “Save All Parameters” button to save all changeable parameters permanently.




The new node id and baudrate will be used after a reinitialization of the encoder. To do this press the “Reset Node” button in the “NMT Service” section or switch OFF/ON the encoder.

To communicate with the encoder again change the node id and baudrate to the entered values before.

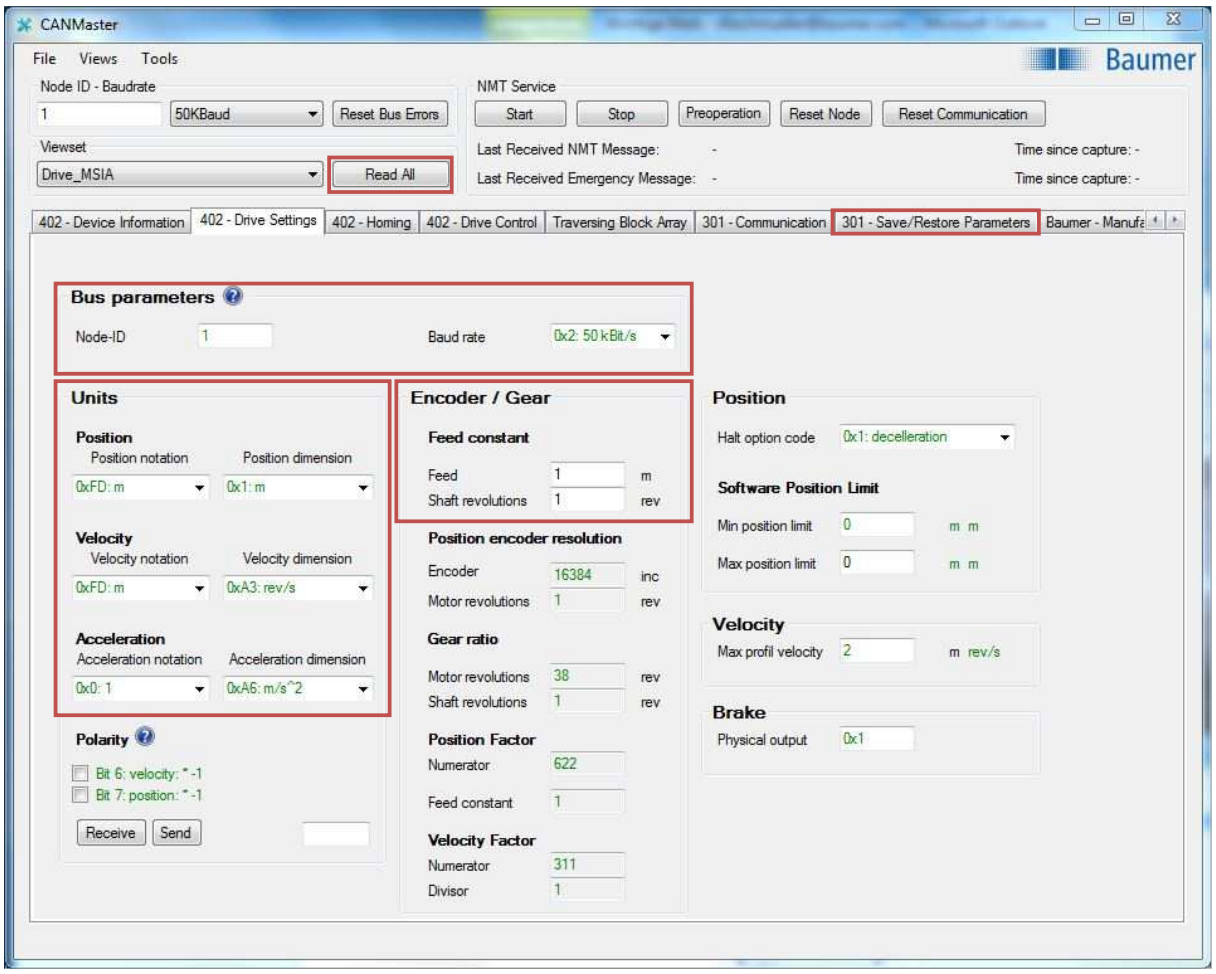


## A.3 Drive_MSIA Instruction

- To read the values of a view press CTRL+R or press the button “Read All”.
- To write values to the drive press enter in the active field. If the write was successful the field is highlighted green, else red.
- To store the parameters permanently, press the button “Save all Parameters” in the view “301 – Save/Restore Parameters”.

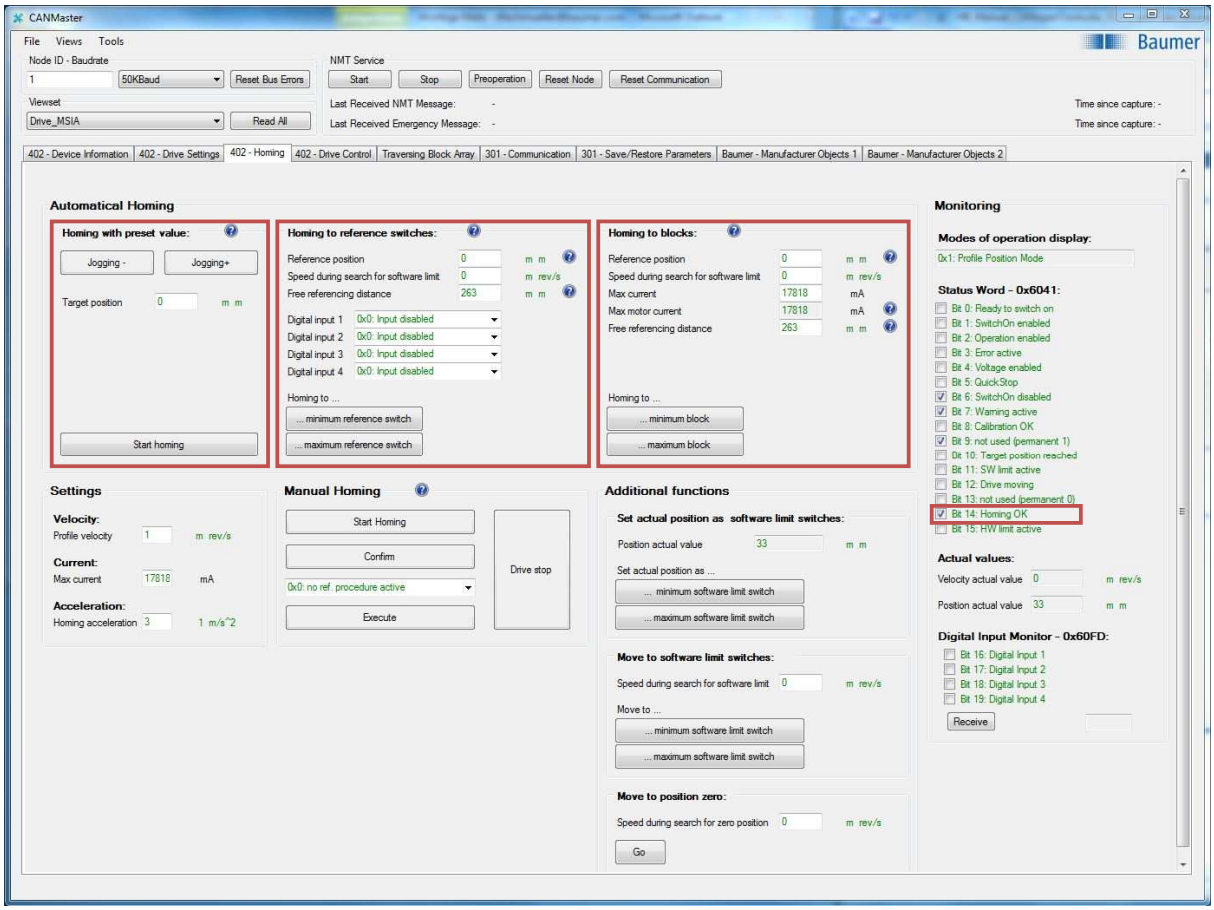
**402 – Drive Settings**

- Start the CANMaster and enter the “Node-ID” and “Baudrate” of the device. The default setup is node id 1 and baudrate 50 KBaud.
- Set the units of the “Position”, “Velocity” and “Acceleration”.
- “Feed constant” describes the calculation factor to convert revolutions of motor or of gear output shaft into movement on user side. Feed constant = Feed / Spindle shaft revolutions.



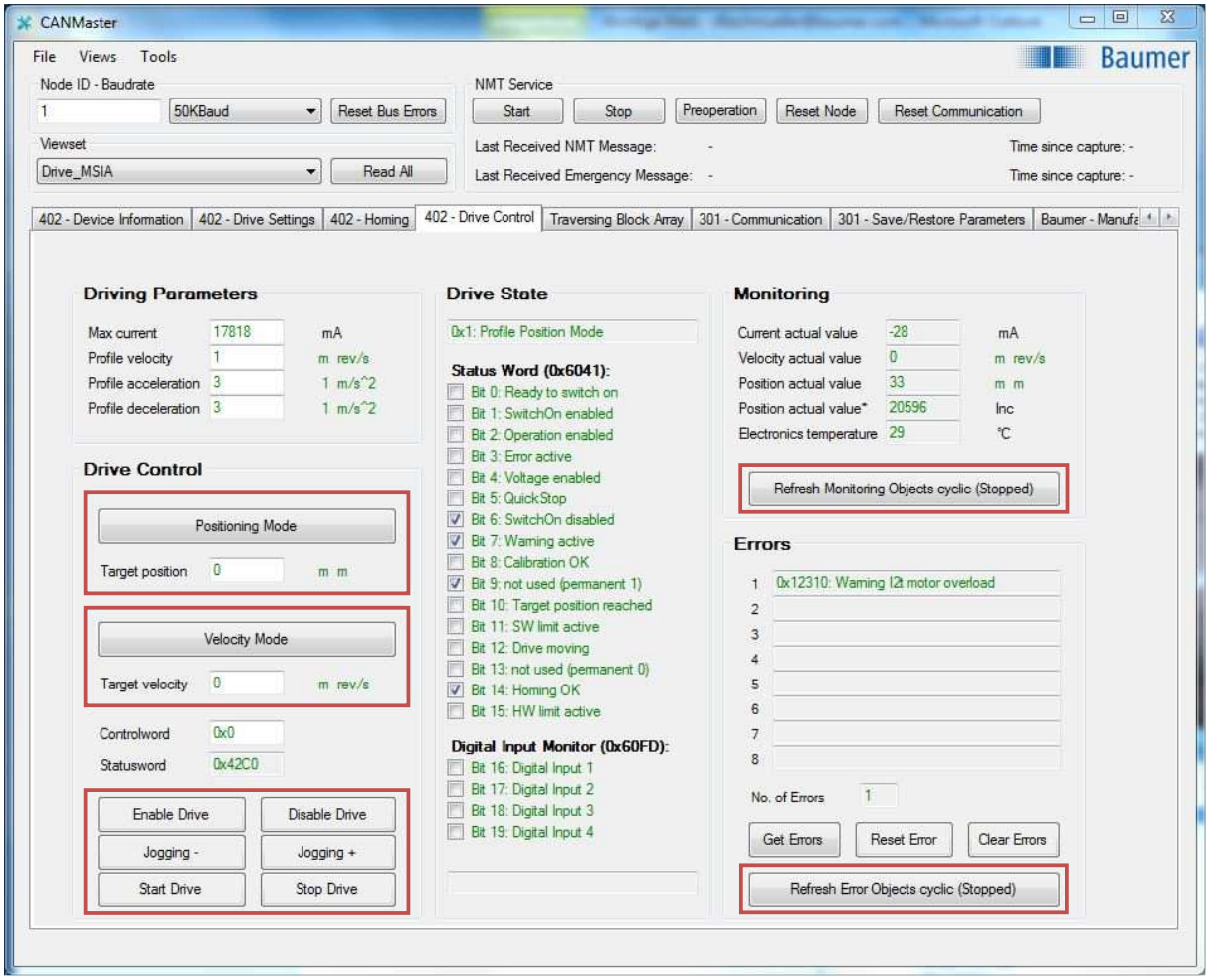
**Referencing**

- There exist three basic methods to reference the drive. You can choose between “Referencing with preset value”, “Referencing to reference switches” and “Referencing to blocks”.
- The method specific parameters are placed directly next to the referencing method.
- When a referencing procedure is completed, Bit 14(Homing OK) in “Status Word” will be set.



**402 – Drive Control**

- Select either “Positioning Mode” or “Velocity Mode”. In “Positioning Mode” the drive will control to the “Target Position”. In “Velocity Mode” the drive will control to the “Target Velocity”.
- Enable the drive with “Enable Drive”
- To drive CW or CCW without a target press “Jogging+” or “Jogging-“.
- Start the drive with the button “Start Drive”.
- Note: The process parameters are not automatically read from the device (except the “Position actual value” when the NMT state is operational). To read the process parameters cyclic, press the buttons “Refresh Monitoring Objects cyclic” and “Refresh Error Objects cyclic”.



# B. CAN network cabling examples

The exact cabling setup of the CAN bus depends on the used CAN device. There are different connector types possible. This chapter just shows some practical examples.

## B.1 Cabling example 1: encoder

The USB-to-CAN adapter does not provide the required supply voltage for the CAN device. Because of this an external power supply is required. In this example the encoder is powered over the bus cable. Assure that a terminating resistor of 120Ohm is connected at the end of the CAN bus.


## B.2 Cabling example 2: drive

The USB-to-CAN adapter does not provide the required supply voltage for the CAN device. Because of this an external power supply is required. Notice that drives need an additional power connection beside to the bus power. Assure that a terminating resistor of 120Ohm is connected at the end of the CAN bus.