GUIDE

Trinamic CANopen quickstart guide

Document Revision V1.00 • 2021-Sept-10

Contents

1 Introduction

This quickstart guide will show the bring up of a Trinamic CANopen module based on the TMCM-1240. To get started with Trinamic CANopen modules a CANopen master is needed as well as CAN adapter which is supported by the CANopen master. TMCM-CANopen (not TMCL-IDE) is an easy to use CANopen master for the Trinamic CANopen modules. It supports reading and writing of CANopen objects as well as controlling the CiA-402 modes of a CANopen drive.

CAN adapters supported by the TMCM-CANopen tool:

- Kvaser
- ESD
- Peak
- IXXAT

For a detailed list of supported CAN adapters refer to TMCM-CANopen tool manual V1.5.0.0 (chapter 3).

2 Resources

- TMCM-1240 Hardware manual
- TMCM-1240 CANopen Firmware manual
- EDS File

  For other modules, the above mentioned files are provided on their respective product webpages.

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3 Wiring

For the setup following parts are needed:

- TMCM-1240-CANopen
- Stepper motor (e.g. QSH4218-35-10-027)
- CAN adapter (here: Kvaser Leaf Light HS v2)
- Supply Voltage (24V)

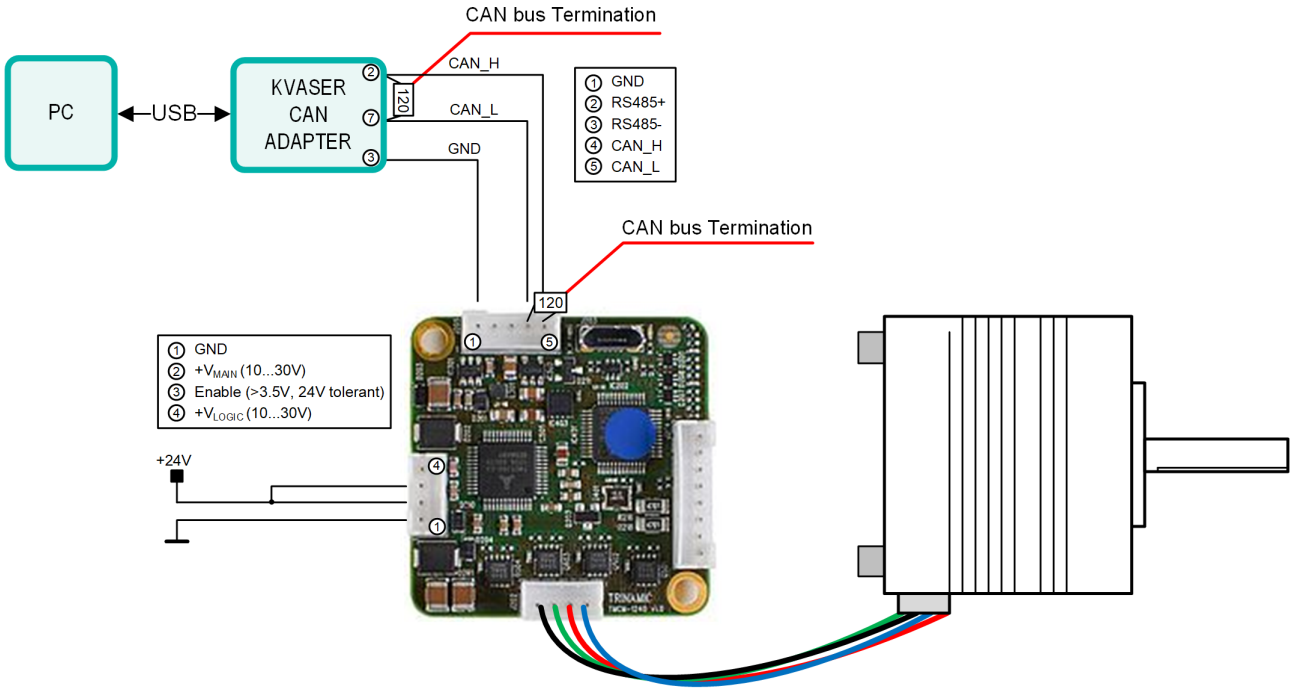

Figure 1

$+V_{MAIN}$ and Enable should be wired. $+V_{LOGIC}$ can be left open as in figure. CAN bus termination resistors must also be added (figure 1).

4 TMCM-CANopen

In this section the TMCM-1240 will be controlled with TMCM-CANopen.

4.1 Connect with the TMCM-CANopen

1. Open the TMCM-CANopen software
2. Connect the CAN adapter to the PC. Make sure direct USB between TMCM-1240 and PC is disconnected. The CAN adapter will show up in the TMCL-IDE interface tree. Click on the CAN adapter to open the connection interface (figure 2).

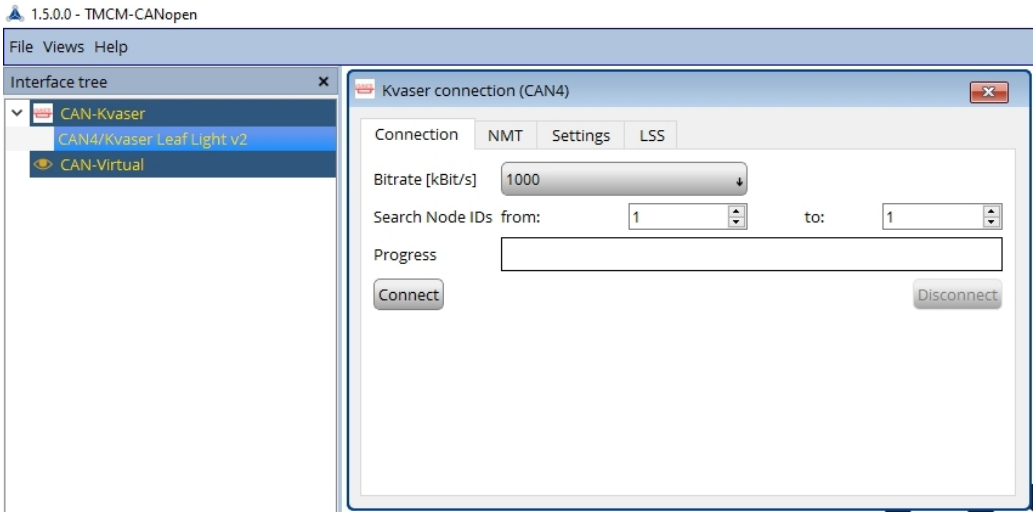

Figure 2

3. Power the module (including +V_{MAIN} and Enable)
   Note: It is recommended to connect to CANopen adapter first and power the TMCM-1240 after.
4. Connect to the TMCM module
   By factory defaults the module is set to node ID 1 and to the bit rate of 1000kBit/s.

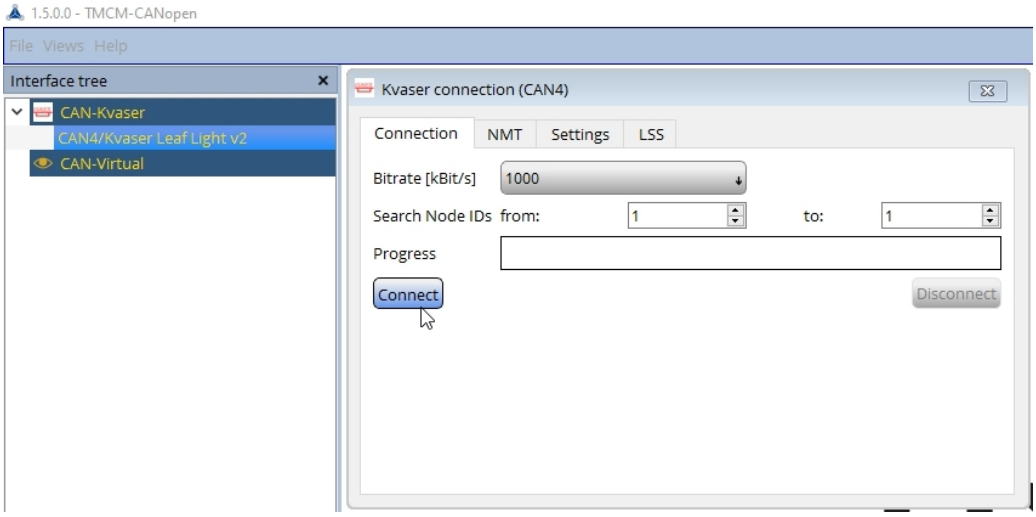

Figure 3

5. The module is now connected to the TMCM-CANopen. The red error led will be off, while the green run led will blink (200ms on, 200ms off).

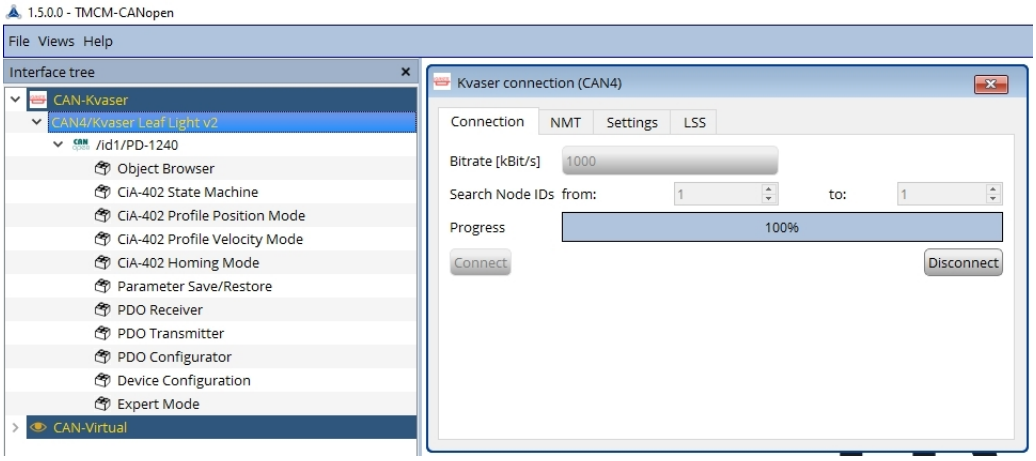

Figure 4

Usually an .eds needs to be added to the CANopen Master. However, this is not necessary for Trinamic modules in TMCM-CANopen. For adding other .eds files to TMCM-CANopen refer to the TMCM-CANopen tool manual V1.5.0.0 chapter 4.3.

4.2 Motor run current

In this section the motor run current will be adjusted. It should be made sure that the motor run current is within the rated current of the stepper motor. The current setting (and other module settings) can be changed by using CANopen service data objects (SDO) as following:

1. Open the Object Browser toolbox
2. Scroll to object 0x2003 (Absolute Max Current 1).
3. Click on *Read* button to read out the motor run current setting. In the example (figure 5) the motor run current is 128 (equals 1A rms). A value of 255 means 100% of the maximum current of the drive.
4. Enter a new current value and *Write* to update the setting. In the example the new motor run current is 64 (equals 0.5A rms).

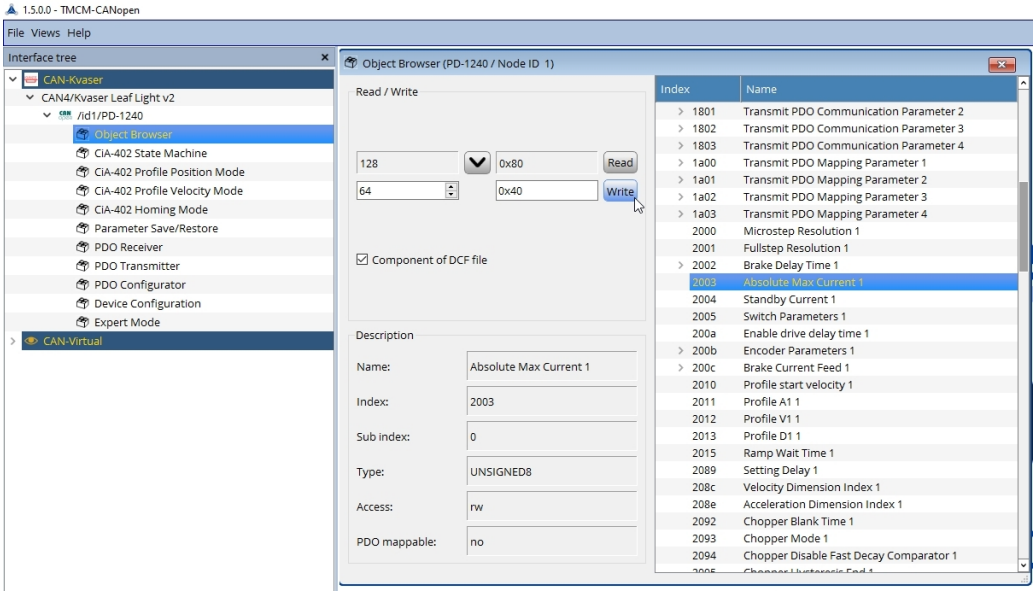

Figure 5

5. The new motor current setting can be confirmed using the *Read* button.

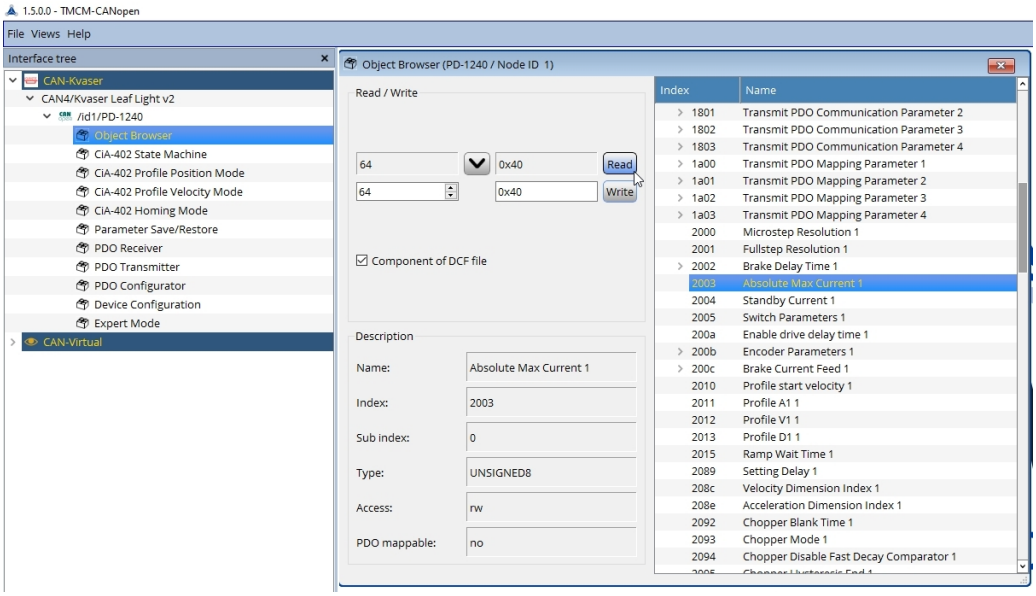

Figure 6

4.3 Position Mode

In this section the motor will be controlled in position mode. For this the limit switches must be disabled (if they are not being used). The limit switches configuration can only be changed in state *switch on disabled*. Then the state machine is switched to the state *Operation enable* to run the motor.

CANopen DS402 state machine

In CANopen the DS402 (or CiA-402) state machine defines the states of the CANopen drive (e.g. which objects can be written, motor status). The state of the state machine can be changed by the object 0x6040 (Controlword). The state of the state machine can be read by the object 0x6041 (Statusword). The following figure shows the DS402 state machine and transitions:

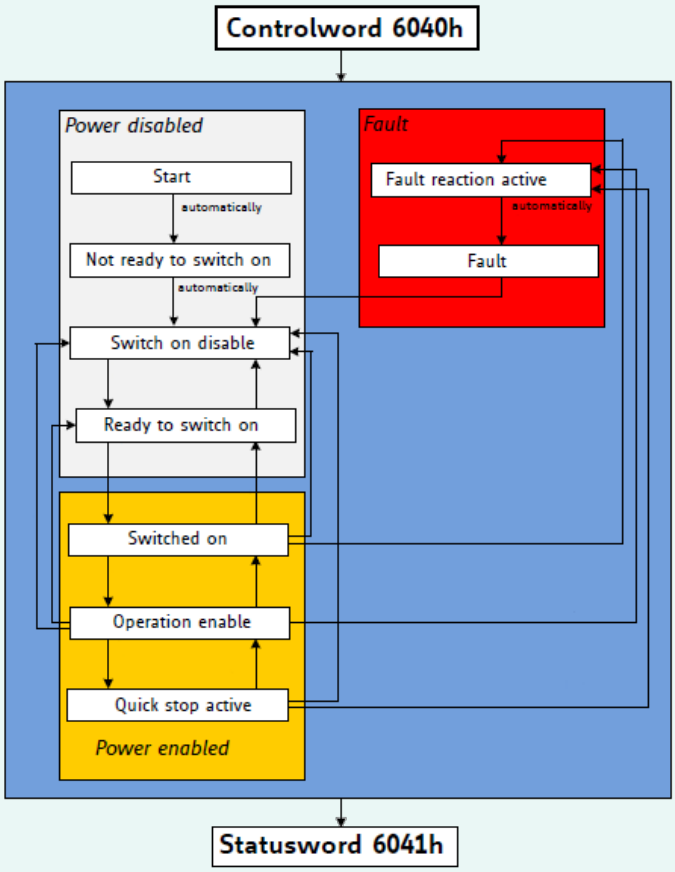

Figure 7

The below table gives an overview on common states and the possible operation.

	Switch on disabled	**Ready to switch on**	**Switched on**	**Operation enabled**	**Fault**
High-level power applied	No	No	Yes	Yes	No
Drive function enabled	No	No	Yes	Yes	No
Configuration enabled	Yes	Yes	Yes	No*	No*

* depending on the configuration object

1. Open the toolbox *CiA-402 State Machine* and read out the status word of the DS402 state machine

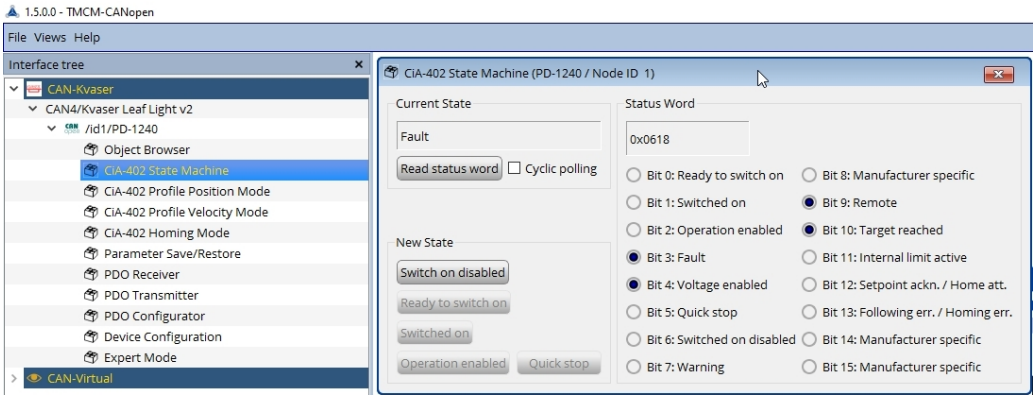

Figure 8

2. Change the status of the DS402 state machine to *switch on disabled*.

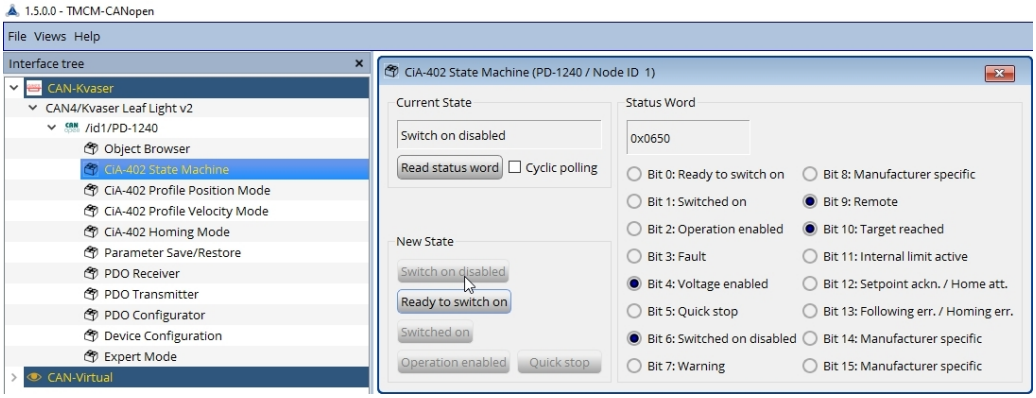

Figure 9

3. Open the *Object Browser* and select object 0x2005 (Switch Parameters 1).
4. Read out object 0x2005. It should be set to 0 by default. Write 3 to disable the limit switches

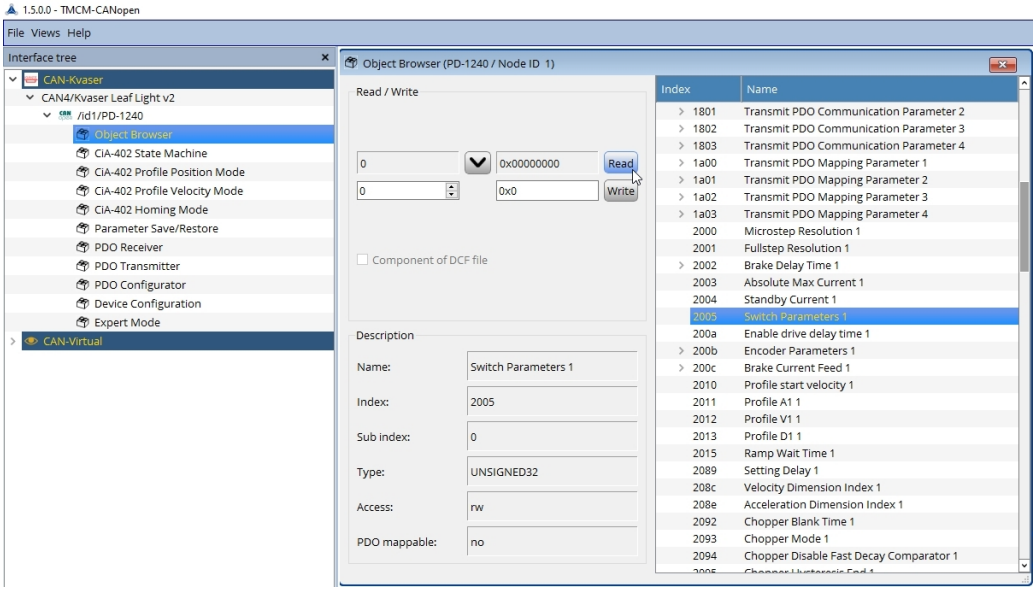

Figure 10

5. Open the *CiA-402 State Machine*.
6. Switch from *Switch on disabled* to *Ready to switch on*.
7. Switch to *Switched on*

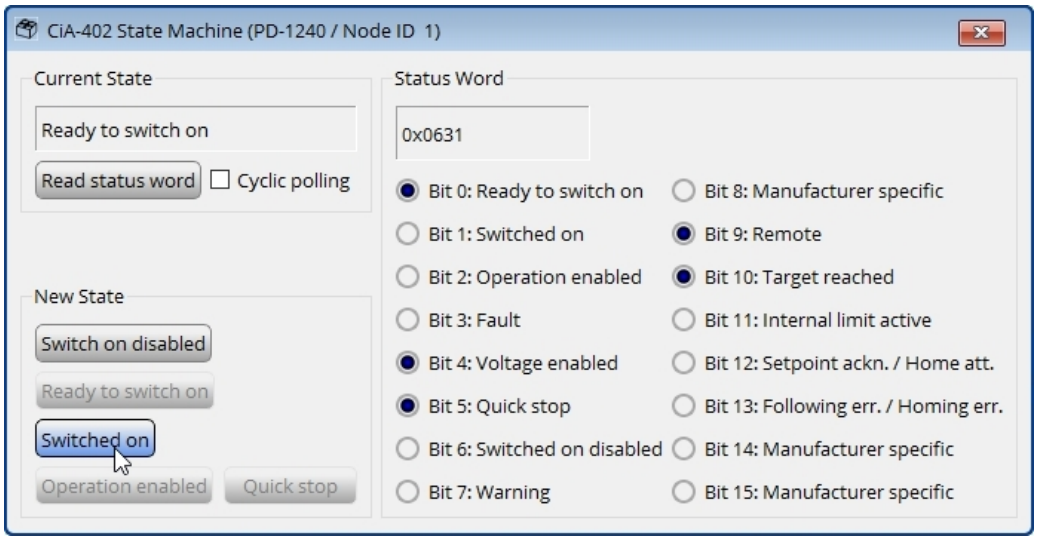

Figure 11

8. Switch to *Operation enabled*
   The motor is powered with hold current.

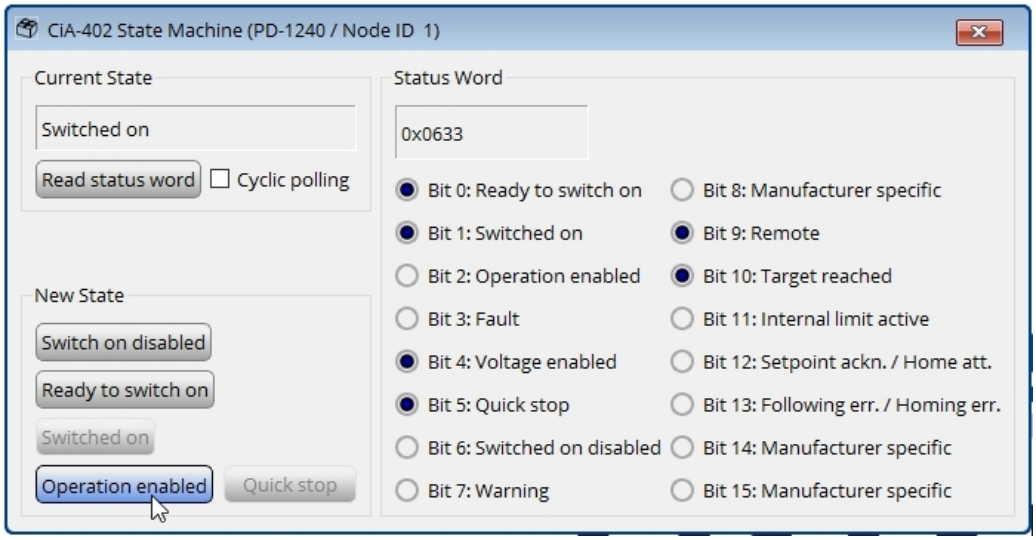

Figure 12

9. Open CiA-402 Profile Position Mode

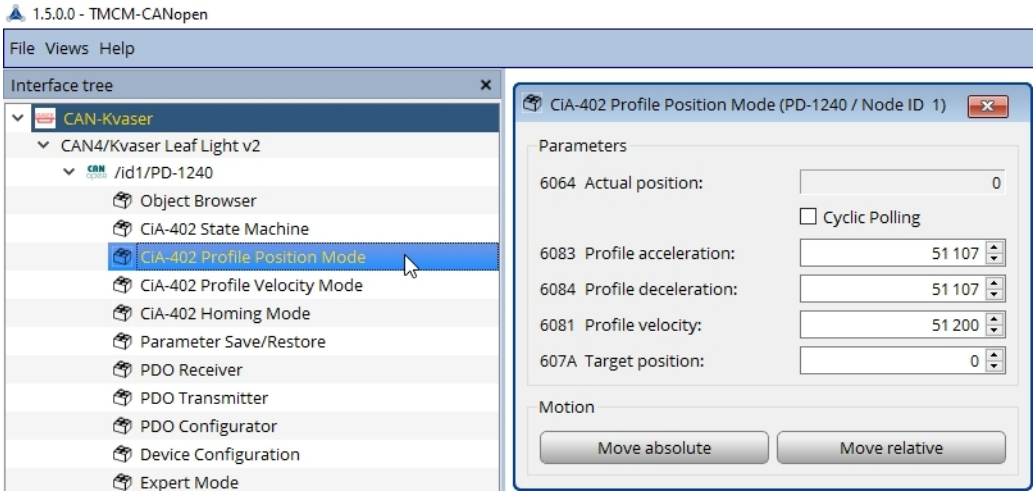

Figure 13

10. Set target position to 51200 and use *Move relative* or *Move absolute* to move the motor one motor revolution.

4.4 Velocity Mode

In this section the motor will be controlled in velocity mode.

1. Configure the limit switches as described in section 4.3 step 1 to 8
2. In the *Interface tree* select the toolbox *CiA-402 Profile Velocity Mode*

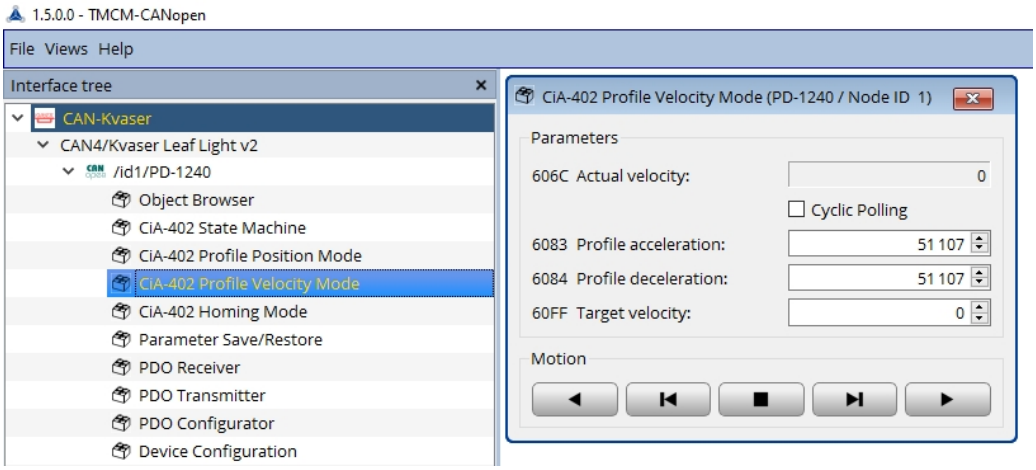

Figure 14

3. Input the motor target velocity (0x60FF) of 51200 (equals 1rps) and click on the play button. The motor runs in velocity mode with the target velocity.

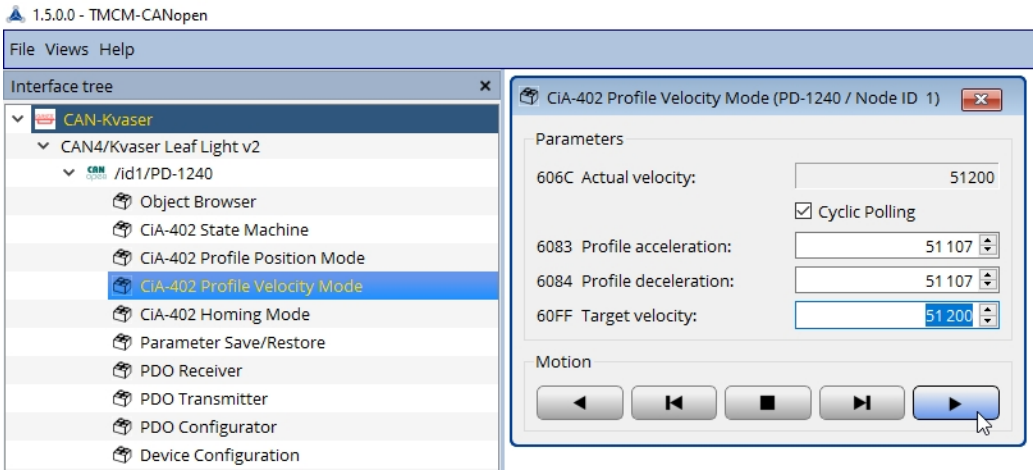

Figure 15

4. Activate the checkbox *Cyclic Polling* to continuously update the actual velocity (0x606C).

5 Additional Resources

- TMCM-CANopen tool manual V1.5.0.0

6 Revision History

Version	Date	Author	Description
V1.00	10.09.2021	JPX	initial version

Table 1: Document Revision