

TMCM-1310 Getting Started and Parameterization with USB Interface

This application note describes how to connect and parameterize the TMCM-1310 using the USB interface and a dedicated parameterization software tool.

Further, a short introduction into writing programs using the TMCL-IDE software tool is included.

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1 Preliminary Note

The TMCM-1310 is mainly designed to be addressed and controlled via EtherCAT interface. Nevertheless, it can be comfortable to start with the USB interface and just one module. If so, this getting started document gives basic information to put the TMCM-1310 into operation and to find optimum parameter values for specific applications and further program developments.

ATTENTION!

Before getting started with the TMCM-1310 it is necessary to read the other manuals, also. This application note is perceived as addition to the hardware and firmware manuals of the TMCM-1310.

2 Putting the TMCM-1310 into Operation

Here you can find basic information for putting your TMCM-1310 into operation.

THE THINGS YOU NEED:

- TMCM-1310
- USB interface suitable to your module with cables
- Nominal supply voltage +24V DC or +48V DC for your module
- TMCM-1310/1311-GUI parameterization software, TMCL-IDE program, and PC
- Stepper motor
- ABN encoder, mounted on stepper motor

PRECAUTIONS

Do not connect or disconnect the TMCM-1310 while powered!

Do not connect or disconnect the motor while powered!

Do not exceed the maximum power supply voltage of 48 V DC!

Note, that the module is not protected against reverse polarity!

START WITH POWER SUPPLY OFF!

2.1 Connecting the TMCM-1310

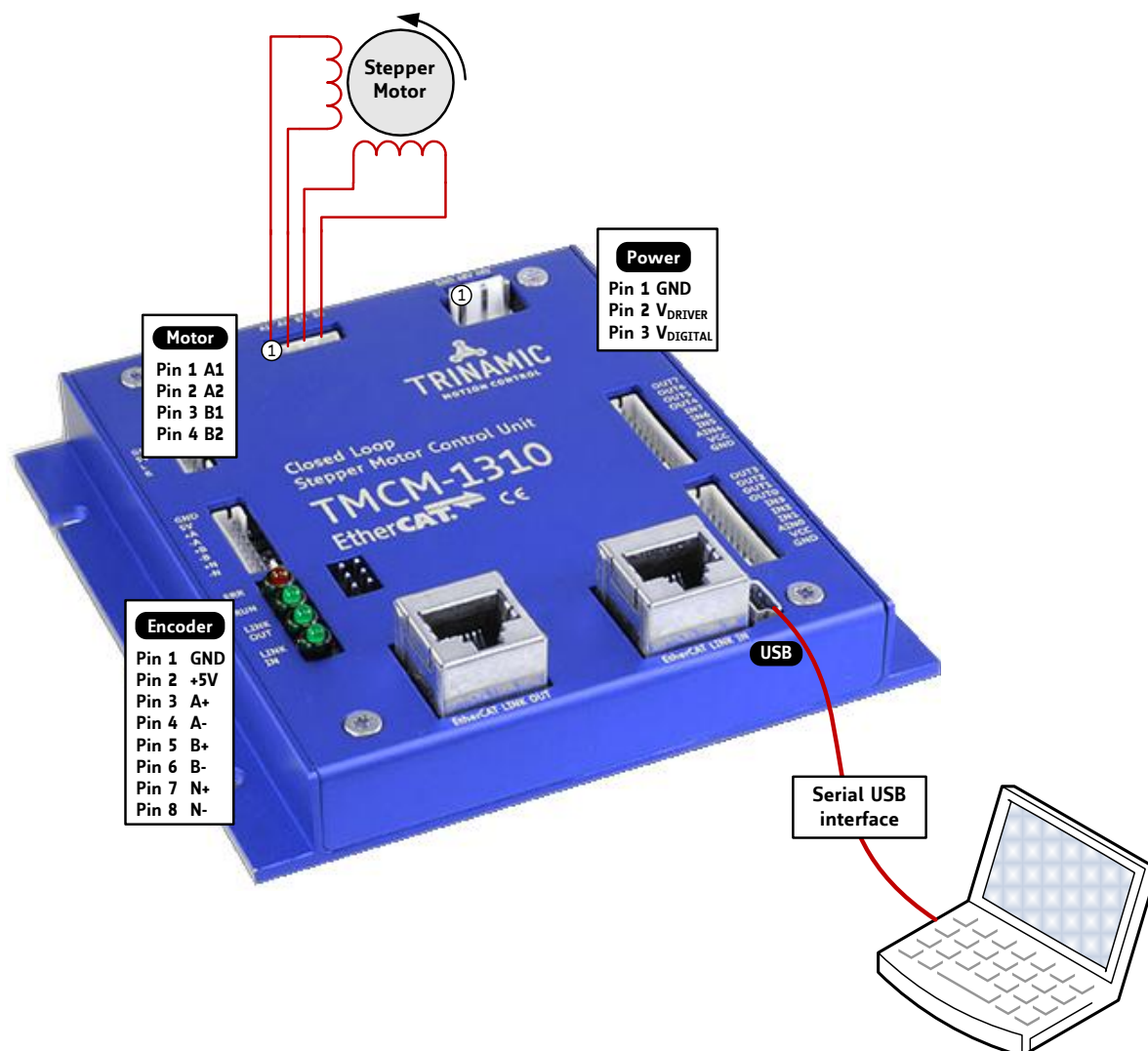


Figure 2.1 Starting up

1. CONNECT USB INTERFACE

For using USB interface download and install the file *TMC1310.inf* (www.trinamic.com).

Pin	Label	Direction	Description
1	VBUS	Power (+5V input)	+5V supply from Host
2	D-	Bi-directional	USB Data -
3	D+	Bi-directional	USB Data +
4	ID		Connected to signal and system ground
5	GND	Power (GND)	Signal and System ground

2. CONNECT THE MOTOR

Pin	Label	Direction	Description
1	A1	Output	Pin 1 of motor coil A
2	A2	Output	Pin 2 of motor coil A
3	B1	Output	Pin 1 of motor coil B
4	B2	Output	Pin 2 of motor coil B

3. CONNECT THE ENCODER FOR CLOSED LOOP OPERATION (OPTIONAL)

Pin	Label	Direction	Description
1	GND	Power (GND)	Signal and system ground
2	+5V	Power (supply output)	+5V output for external circuit
3	A+	Input	Encoder channel A+ input (differential, non-inverting)
4	A-	Input	Encoder channel A- input (differential, inverting)
5	B+	Input	Encoder channel B+ input (differential, non-inverting)
6	B-	Input	Encoder channel B- input (differential, inverting)
7	N+	Input	Encoder zero / index channel input (differential, non-inverting)
8	N-	Input	Encoder zero / index channel input (differential, inverting)

4. CONNECT THE POWER SUPPLY

Pin	Label	Direction	Description
1	GND	Power (GND)	Common system supply and signal ground
2	V _{DRIVER}	Power (supply input)	Stepper driver supply voltage. Without this voltage the stepper driver and any motor connected will not be energized.
3	V _{DIGITAL}	Power (supply input)	Supply voltage for everything else apart from the stepper motor driver. The on-board voltage regulator generates the necessary voltages for the digital circuits from this supply. The pin can be left unconnected. In this case a diode between V _{DRIVER} and V _{DIGITAL} ensures the supply for the digital parts. ATTENTION: <ul style="list-style-type: none"> - The diode has a current rating of 3A. As V_{DIGITAL} is available at the I/O connectors and at the reference switch connectors also, always connect this pin to positive supply voltage in case substantial amount of current is withdrawn from these pins for external circuits. - It is expected that V_{DIGITAL} and V_{DRIVER} are connected to the same power supply output when both pins are used. Otherwise please ensure that V_{DIGITAL} is always equal or higher than V_{DRIVER} when connected (due to the diode).

5. SWITCH ON THE POWER SUPPLY

Turn power on. The motor is powered but in standstill now.

2.2 Finding Optimum Settings with Parameterization Tool

Evaluating best parameter values for the TMCM-1310 with the TMCM-1310/1311-GUI software tool is quite easy. The TMCM-1310/1311-GUI is available on www.trinamic.com.

After connecting the module as described in chapter 1, start the TMCM-1310/1311-GUI with a double click. The following window will appear on the screen (see Figure 2.2).

The software detects your module and the related virtual com port for USB automatically if the file *TMCM-1311.inf* is installed correctly. Now, click **Connect** to connect the module and start the trace controller in case you like to work with graphs for velocity, positioning, or torque.

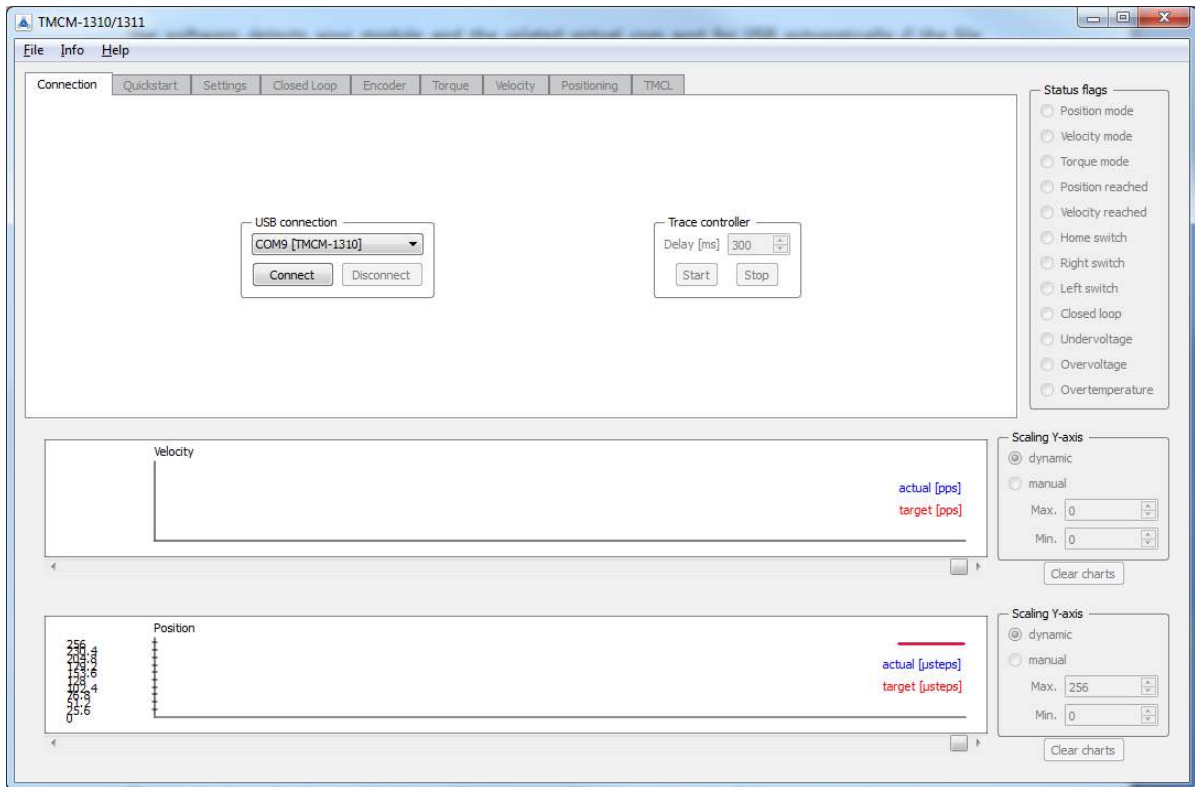


Figure 2.2 Welcome window of TMCM-1310/1311-GUI

The graphs for velocity, positioning, and torque can be selected via the *Info* menu as shown in Figure 2.3.

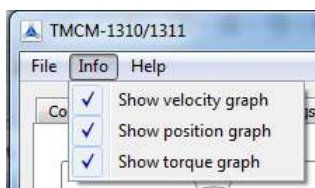


Figure 2.3 Info menu

QUICKSTART

Using the default values of the TMC1310, it is possible to proceed with a **quickstart**. This way, you can check how the module drives your specific stepper motor using these default values. Calibrate them after first tests to find optimum values.

THERE ARE ONLY TWO THINGS THAT HAVE TO BE DONE BEFORE THE QUICKSTART:

- For closed loop mode, initialize the encoder with the appropriate command fields (see **Figure 2.5**) first. To open up the *encoder initialization* window, click on the **Init encoder** button on the **quickstart** tab.
- Now, choose **closed loop** mode or **open loop** mode operation.

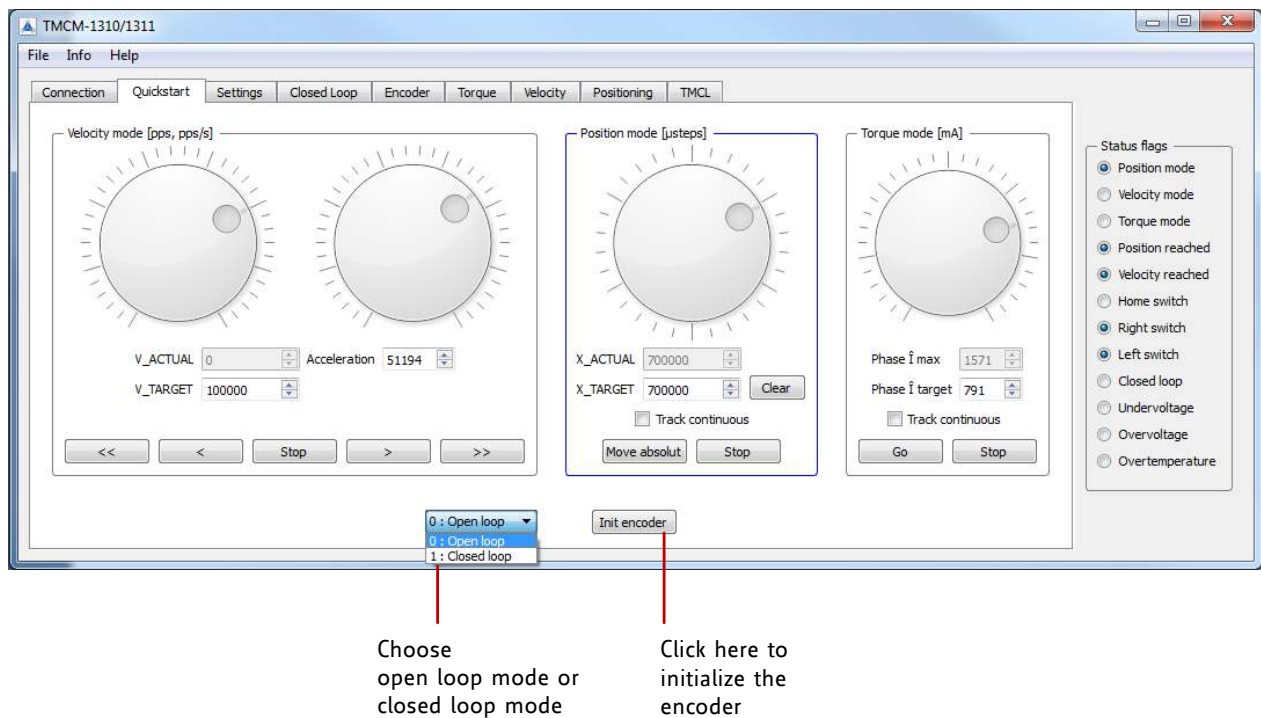


Figure 2.4 Quickstart tab

HOW TO INITIALIZE THE ENCODER

Fill in the **fullstep resolution** of your motor and click **Start encoder initialization**. The motor will rotate just one round to initialize the encoder. If the encoder has been detected successfully, the appropriate initialization status will be shown. In case an error occurred, this will be shown in the status field also (state 3 = encoder detection failed). In this case check your hardware connections and the motor fullstep resolution.

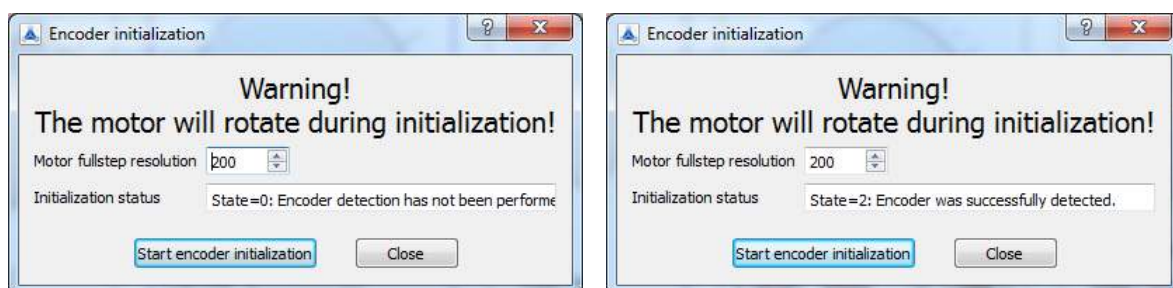


Figure 2.5 Encoder initialization window before initialization and afterwards

Now, first steps are made. Parameterize your module using the other tabs of the software tool.

2.3 Using the TMCL-IDE to Develop Programs

The TMCL-IDE is available on www.trinamic.com.

INSTALLING THE TMCL-IDE

Make sure the COM port you intend to use is not blocked by another program.

Open TMCL-IDE by clicking **TMCL.exe**.

Choose **Setup** and **Options** and thereafter the **Connection tab**.

Choose **COM port** and **type** with the parameters shown in Figure 2.6 (baud rate 9600). Click **OK**.

If the file *TMCM-1310.inf* is installed correctly, the module will be identified automatically.

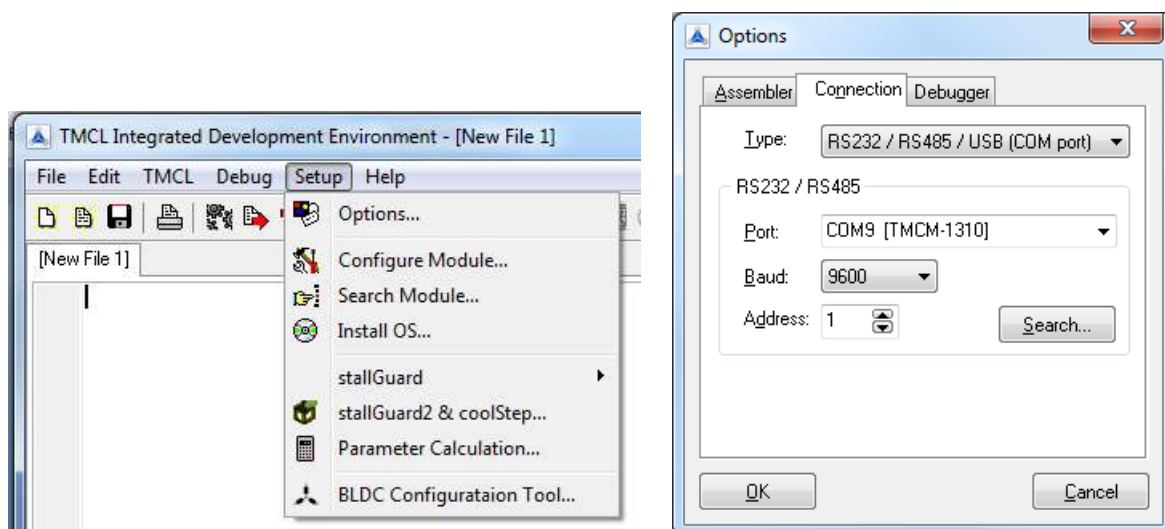


Figure 2.6 Setup dialogue and connection tab of the TMCL-IDE.

Please refer to the *TMCL-IDE User Manual* for more information (see www.TRINAMIC.com).

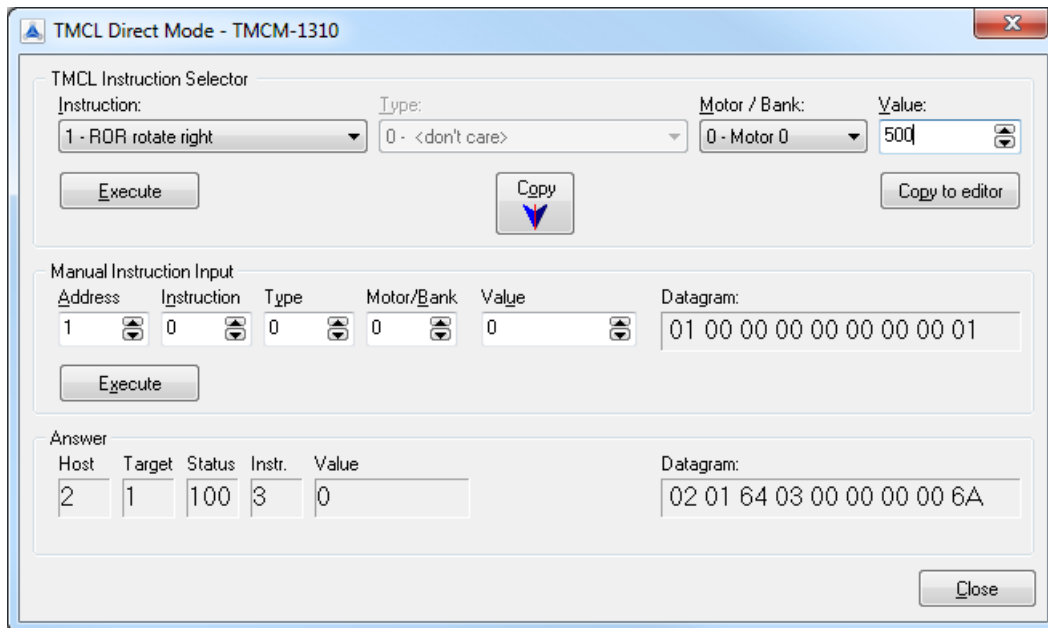
USING TMCL DIRECT MODE

1. Start TMCL **Direct Mode**.



↑
Direct Mode

2. If the communication is established the TMCM-1310 will be detected automatically. *If the module should not be detected, please check all points above (cables, interface, power supply, COM port, baud rate).*



3. Issue a command by choosing **Instruction**, **Type** (if necessary), **Motor**, and **Value** and click **Execute** to send it to the module.

Examples:

- ROR rotate right, motor 0, value 50000 -> Click *Execute*. The motor is rotating now.
- MST motor stop, motor 0 -> Click *Execute*. The motor stops now.

Top right of the **TMCL Direct Mode** window is the button **Copy to editor**. Click here to copy the chosen command and create your own TMCL program. The command will be shown immediately on the editor.

2.2.1 Testing with a Simple TMCL Program

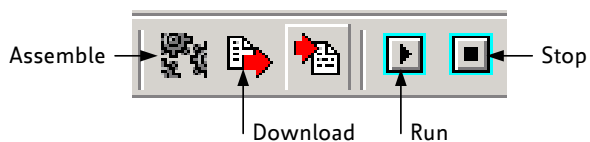
Type in the following program:

```

    ROL 0, 50000           //Rotate motor 0 with speed 50000
    WAIT TICKS, 0, 500
    MST 0
    ROR 0, 50000         //Rotate motor 0 with 50000
    WAIT TICKS, 0, 500
    MST 0

    SAP 4, 0, 50000      //Set max. Velocity
    SAP 5, 0, 50000      //Set max. Acceleration
Loop: MVP ABS, 0, 100000 //Move to Position 10000
    WAIT POS, 0, 0       //Wait until position reached
    MVP ABS, 0, -100000 //Move to Position -10000
    WAIT POS, 0, 0       //Wait until position reached
    JA Loop              //Infinite Loop

```



1. Click the **Assemble** icon to convert the TMCL program into binary code.
2. Then download the program to the TMCM-1310 module by clicking the **Download** icon.
3. Click the **Run** icon. The desired program will be executed.
4. Click the **Stop** button to stop the program.

For further information about the TMCL-IDE refer to the TMCL-IDE User Manual on www.trinamic.com, please.