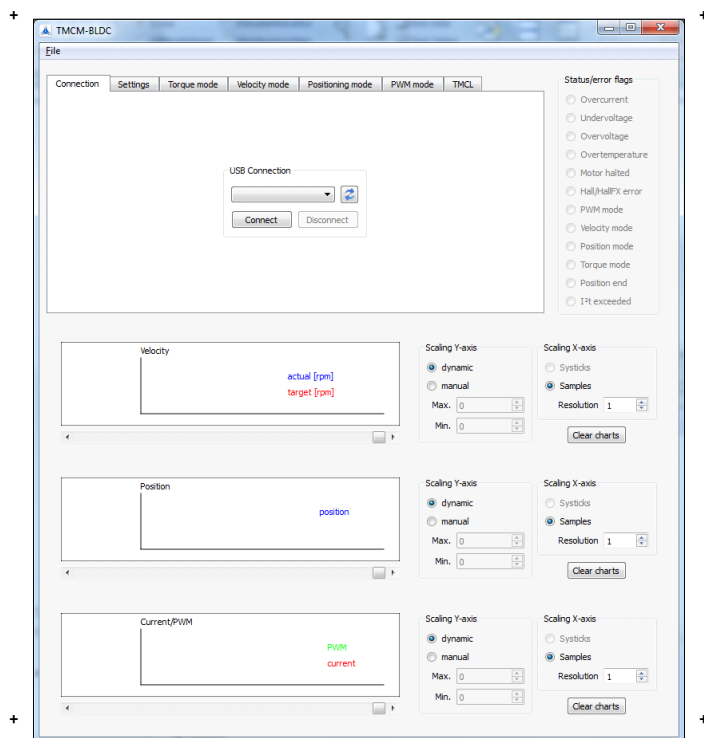


V 1.02

TMCM-BLDC USER MANUAL

TMCM-BLDC

adjusting tool for
BLDC modules
compatible with the TMCL-IDE



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1 TMCB-BLDC overview

The TMCB-BLDC is a special small firmware program for adjusting and testing settings of TMC modules for BLDC motors. This software tool offers dialogues for all modes of operation. The TMCB-BLDC can be downloaded from www.trinamic.com and is compatible with the TMCL-IDE.

The TMCB-BLDC is a PC application running under Windows XP/Vista/Windows 7 (Windows 3.x is not supported) that includes

- a connection dialogue for connecting the module,
- a dialogue for basic settings (motor settings, encoder settings, commutation mode, trace controller),
- four dialogues for operation modes, each for one mode of operation (torque mode, velocity mode, positioning mode, PWM mode),
- a dialogue for entering and executing TMCL™ commands in direct mode,
- a file menu for exporting/importing settings, storing or restoring them. Further, settings can be exported to TMCL™ for use with the TMCL-IDE.

The TMCB-BLDC is designed for finding initial settings, e.g. the values for P, I, and D parameters of a specific mode of operation. Each value can be changed on the fly and the results are shown immediately on the diagrams. After optimum values are found they can be exported to the TMCL-IDE for developing programs that run standalone on the module later on. TRINAMIC recommends using this TMCB-BLDC tool first and proceed afterwards with the TMCL-IDE.

Note: The TMCL-IDE offers another BLDC dialogue for setting and testing parameter values. At least, a customer may decide himself, which software tool comes up to his requirements best.

2 Getting started

The first step is to connect the module. Please refer to the specific manuals of your module, too. Go on when the communication between module and PC is established.

The tab structure of the TMCB-BLDC software tool shows clearly how to work with the program. On the right side of the window the status and the error flags are shown. Under the input area are diagrams for velocity, position and current/PWM. These diagrams and the status/error information can be used for controlling new settings visually in order to identify best results as well as deficient settings. It is possible to scale each X-axis and Y-axis to get a comfortable report. Status/error flags and diagrams are for diagnostic tasks only and remain visible, while the program is used. The input area on top can be chosen by selecting a specific tab.

Please note that the status/error information and the charts have to be activated by starting the trace controller on the settings tab.

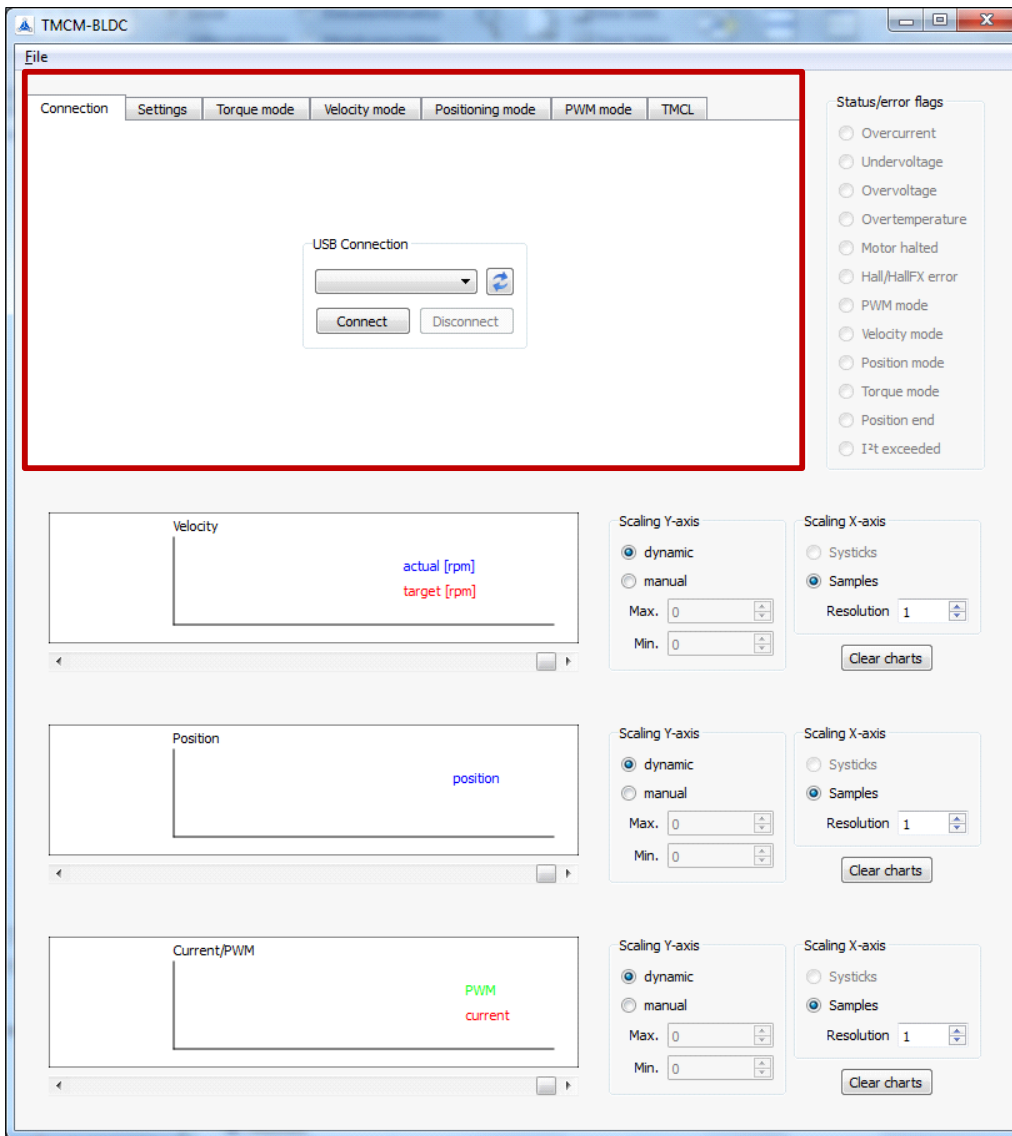


Figure 2.1: Connection tab of TMCB-DC

TMCB-DC tabs:

Settings
Torque mode
Velocity mode
Positioning mode
PWM mode
TMCL™

The *settings* tab is needed for general settings of the module. The next four tabs are designed for testing the four *modes of operation* (torque mode, velocity mode, positioning mode, PWM mode).

On the tabs for *torque mode*, *velocity mode*, and *positioning mode* is a block for the PID control of the operation mode. Here are fields for filling in values of set 1 and set 2. Set 1 is intended for lower velocities, set 2 for higher velocities. Below them is a value field for filling in the threshold between both PID sets. The BLDC module manages the switch-over between set 1 and set 2 smoothly avoiding disruptive factors.

The last tab is used for controlling the module with *TMCL™* direct mode. All *TMCL™* commands can be entered as usually.

2.1 Dialogues of TMCM-BLDC

2.1.1 Settings

After connecting the module with the *connect* button you can choose the *settings* tab and fill in basic values: *motor settings*, *encoder settings* and *commutation mode*. All settings correspond to specific axis parameters of your module. Please refer to the Firmware Manual of your module for more information about setting axis parameters.

The *trace controller* has to be started for displaying the curves on the diagrams below. Clicking the *start* button of the trace controller enables the status/error flags, too.

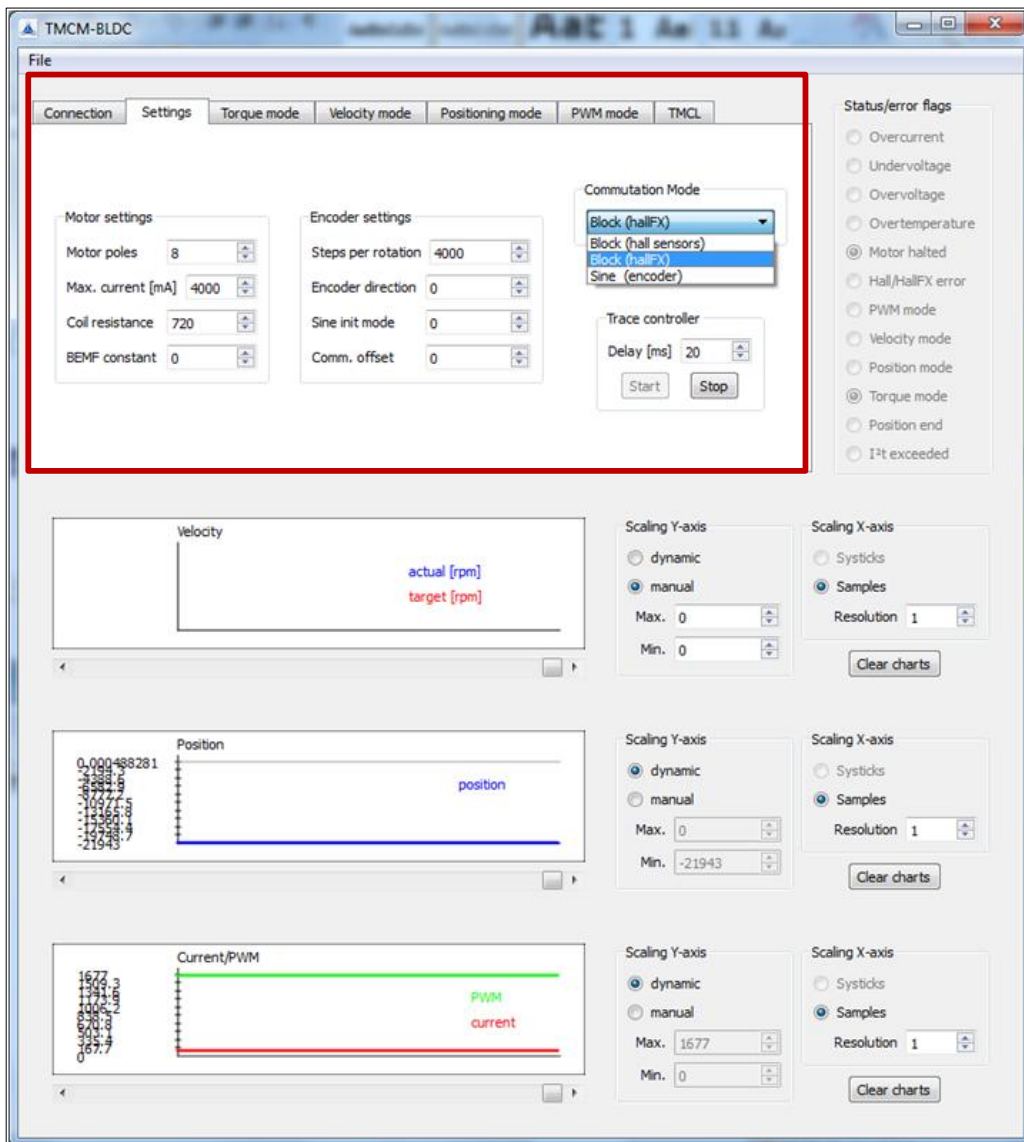


Figure 2.2: Settings tab of TMCM-BLDC

2.1.2 Torque mode

The *torque mode tab* offers the possibility to test different current settings and to evaluate the *current PID control* by choosing values for the P, I, and D parameters of set 1 and set 2. Further the I clipping value for each set can be chosen and the threshold for the switch-over between set 1 and set 2 can be set.

The drive can be started (in positive and negative direction) and stopped with the buttons in the *current control* field. The values can be calibrated on the fly while the drive is still active. The results will be shown immediately on the diagrams below.

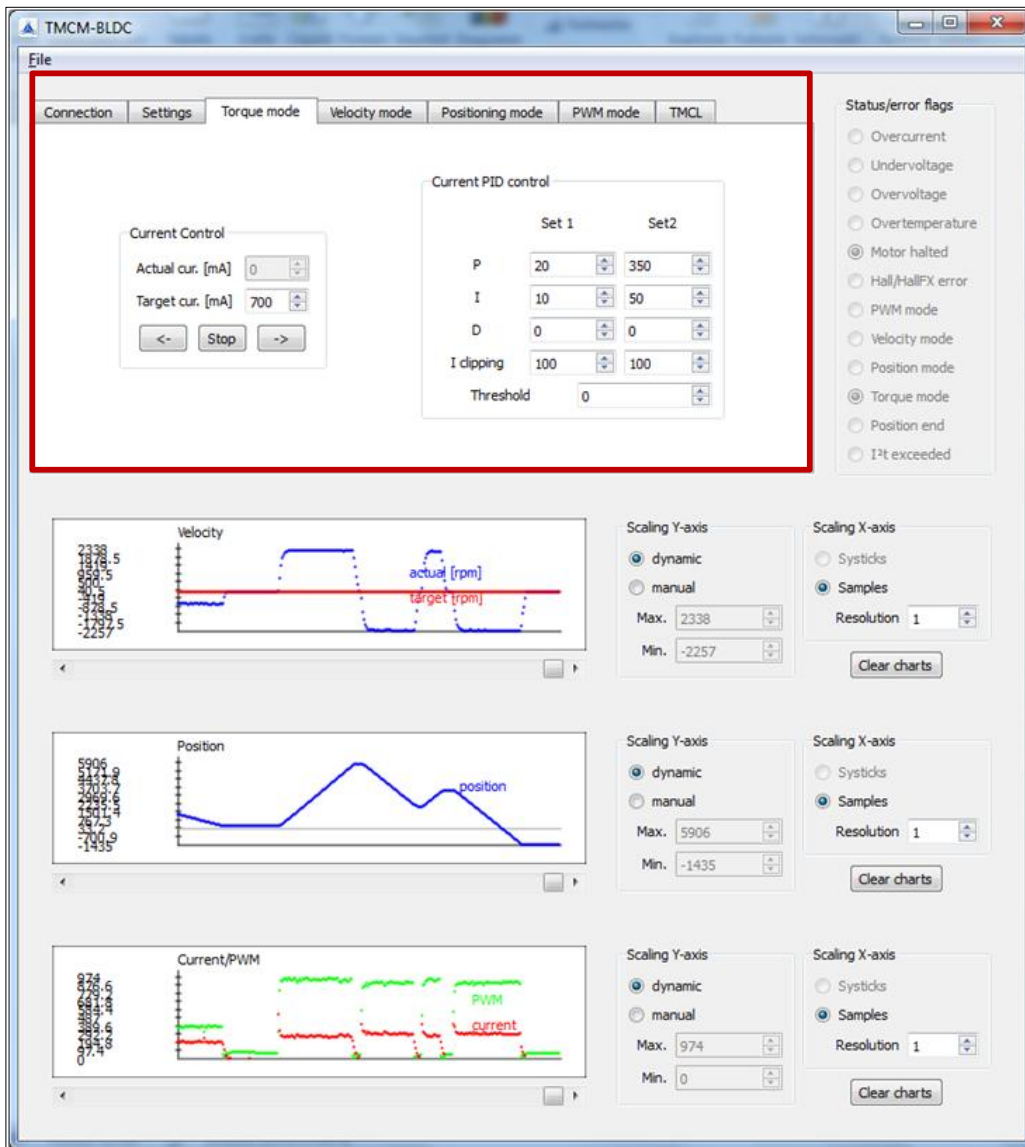


Figure 2.3: Torque mode tab of TCM-BLDC

2.1.3 Velocity mode

The input area of the *velocity mode tab* has three parts: the *velocity ramp control*, the *velocity control* and the *velocity PID control*. In the middle of the input area is the *velocity control*, which is used to start the drive (in positive and negative direction) in velocity mode with a chosen speed [rpm] or stop it. The *velocity ramp control* is needed for setting the maximum velocity [rpm] and the acceleration [rpm/s]. Further, the velocity ramp can be enabled by ticking the appropriate field. Disabling the velocity ramp leads to a hard stop.

On the right side is the *velocity PID control*. Here, the P, I, D, and I clipping parameter values for set 1 and set 2 as well as the threshold value for the switch-over between set 1 and set 2 can be set. The values can be calibrated on the fly while the drive is still active. The results will be shown immediately on the diagrams.

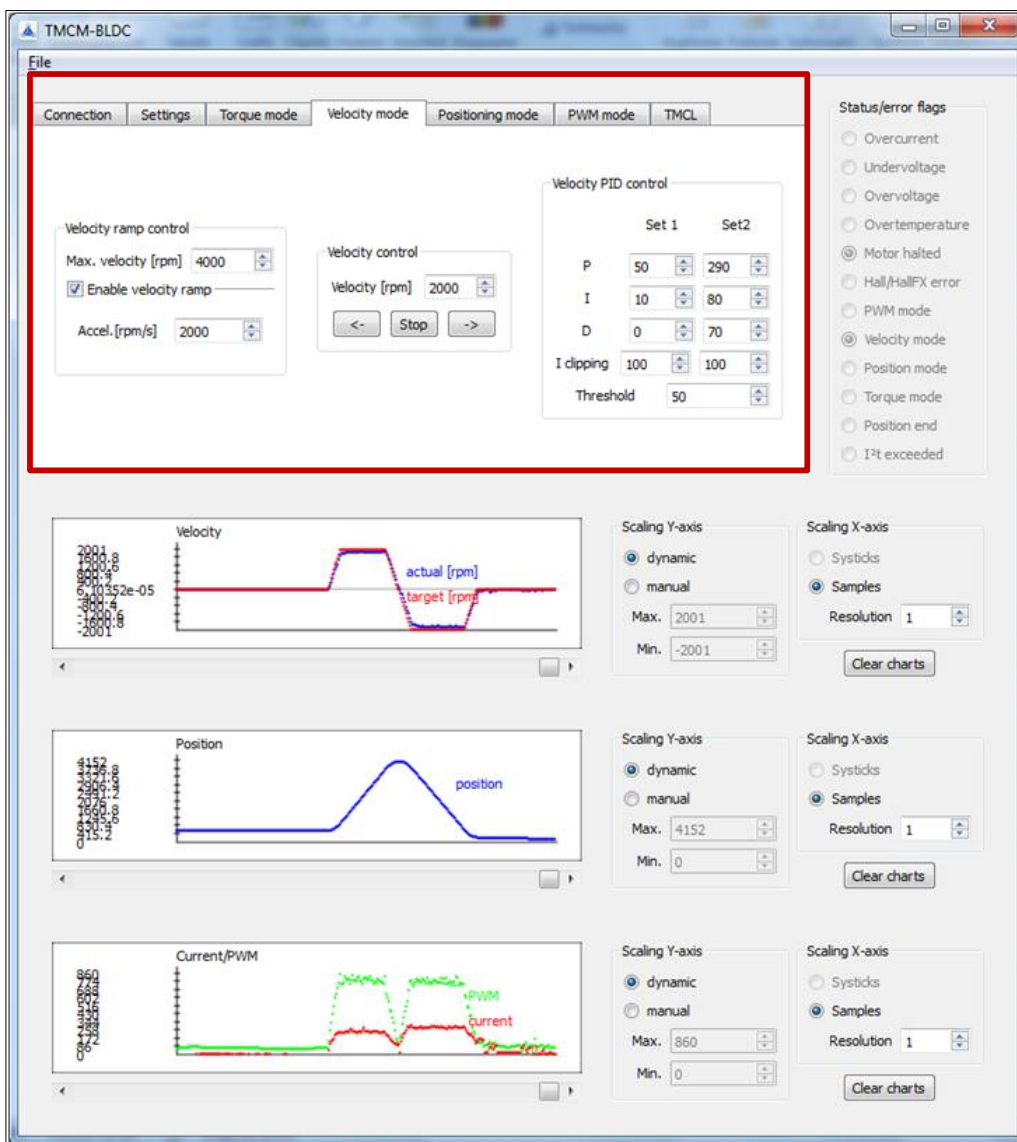


Figure 2.4: Velocity mode tab of TCM-BLDC

2.1.4 Positioning mode

The input area of the *positioning mode tab* has three parts: the *velocity ramp control*, the *positioning control*, and the *positioning PID control*.

The *velocity ramp control* is the same as on the velocity mode tab. Maximum velocity and acceleration can be chosen and the velocity ramp can be enabled or disabled. In the middle of the positioning mode input area is the *positioning control* field. This is adequate designed to the TMCL™ command MVP (*move to position*). There are two possibilities to move in positive or negative direction: move absolutely or relatively to the actual position. Units for different commutation modes are as follows:

- The unit of the target position is *encoder steps per rotation* (operation with encoder, only).
- The unit for positioning with hall sensors is $\frac{6 \times \text{motorpoles}}{2}$ *steps per motor rotation*.

The button *clear* sets the counter for positioning to zero. *Clear on NULL* is used with encoder. The actual position is set to zero when crossing the next N channel.

On the right side of the positioning mode tab input area is the *position PID control*. Here, values of the P, I, D, and I clipping parameters (set 1 and set 2) for the position PID control can be filled in and the specific threshold between both sets can be set. The values can be calibrated on the fly while the drive is still active. The results will be shown immediately on the diagrams.

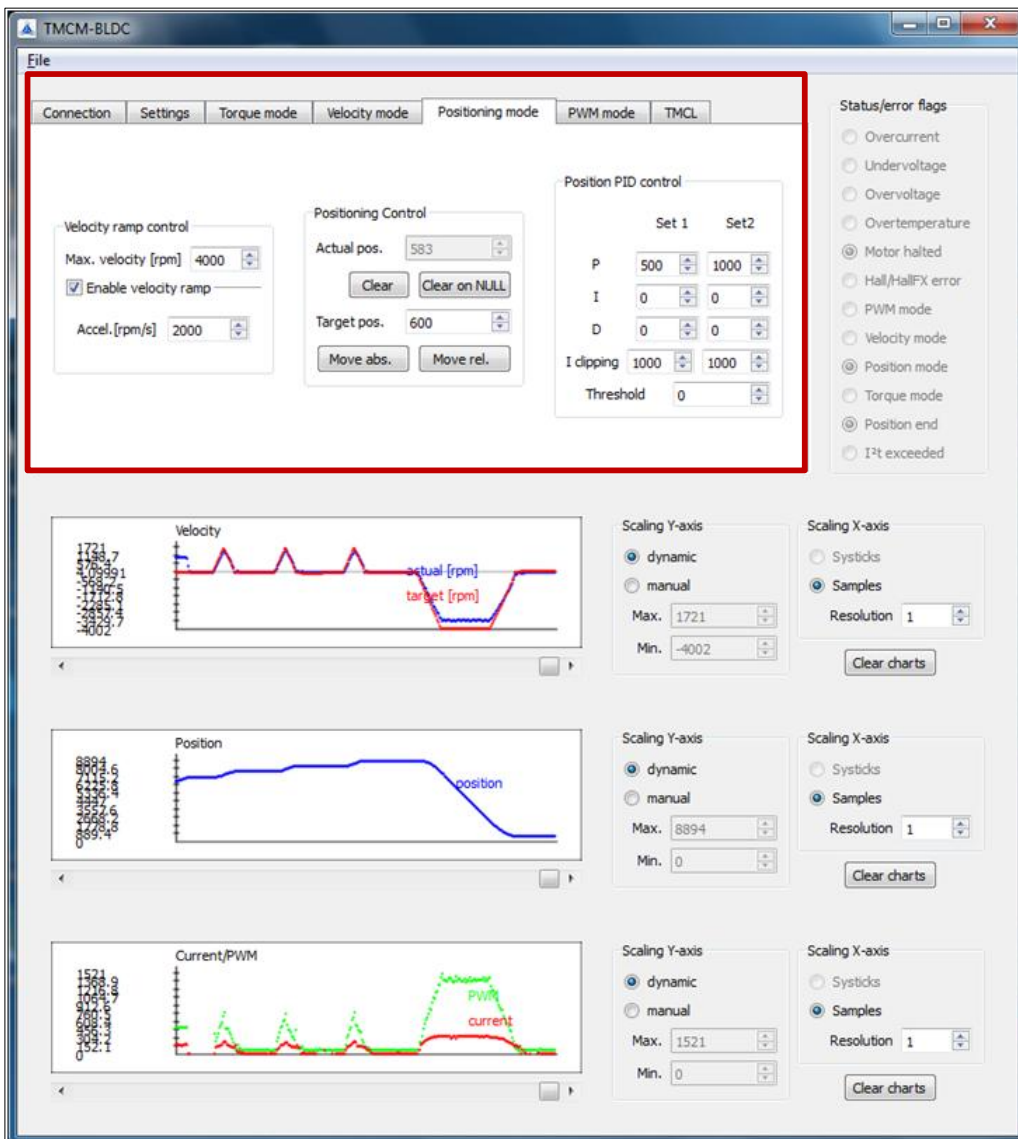


Figure 2.5: Positioning mode tab of TMCB-LED

2.1.5 PWM mode

On the *PWM mode* tab is the *PWM control* field, where a target PWM can be chosen. The drive can be started and stopped as on the other tabs with the appropriate buttons below the value field of the target PWM. The target PWM value can be changed on the fly while the drive is still active. The results will be shown immediately on the diagrams.

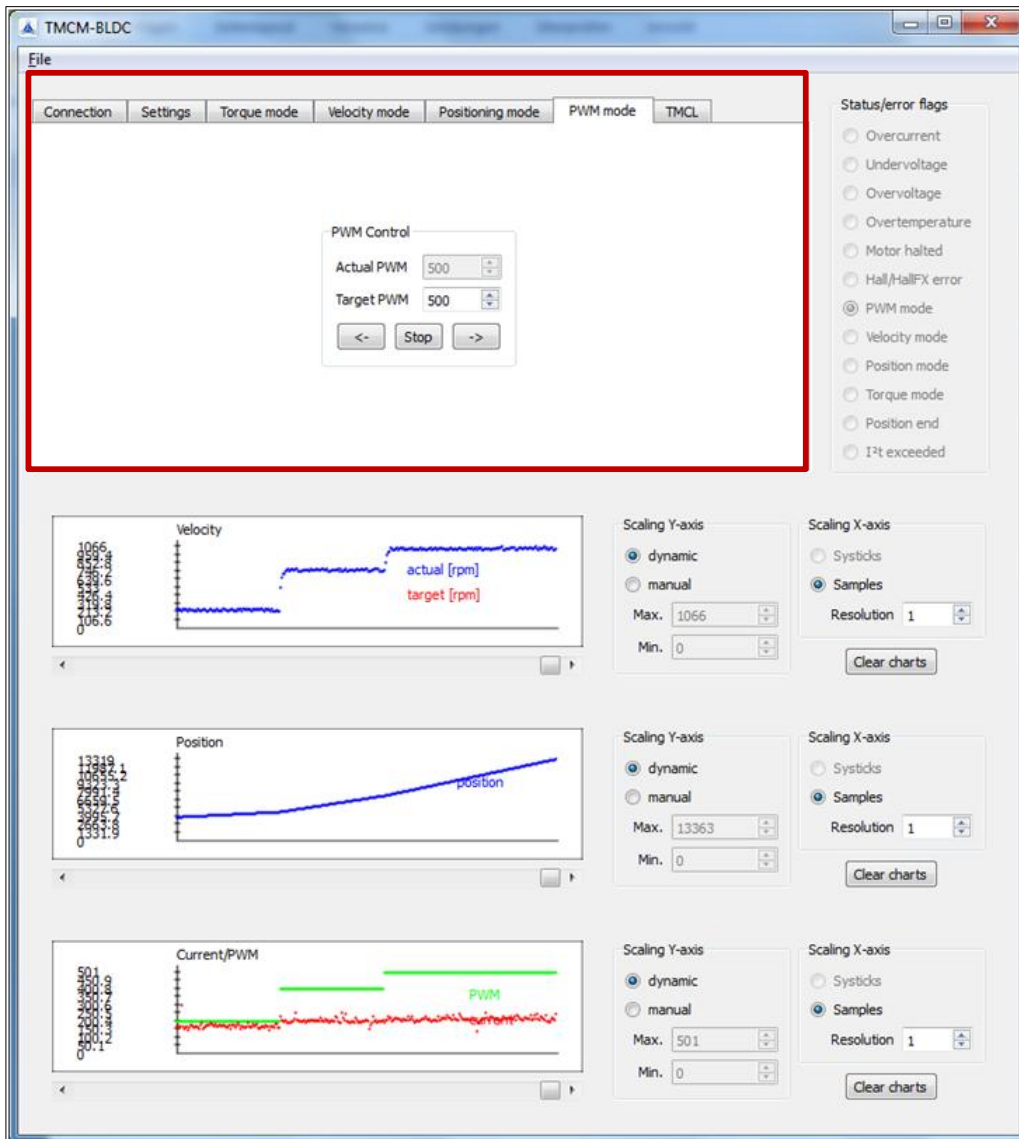


Figure 2.6: PWM mode tab of TCM-BLDC

2.1.6 TMCL™

The input area of the TMCL™ tab has the same structure as the appropriate window for *TMCL™ direct mode* of the TMCL-IDE. *Command number, type, motor/bank* and a chosen *value* can be set. By clicking the *Send* button the request will be sent to the module. Immediately the reply of the module will be displayed in the *Reply* field.

Please refer to the complete lists of axis parameters and global parameters of your module in the appropriate Firmware Manual, too.

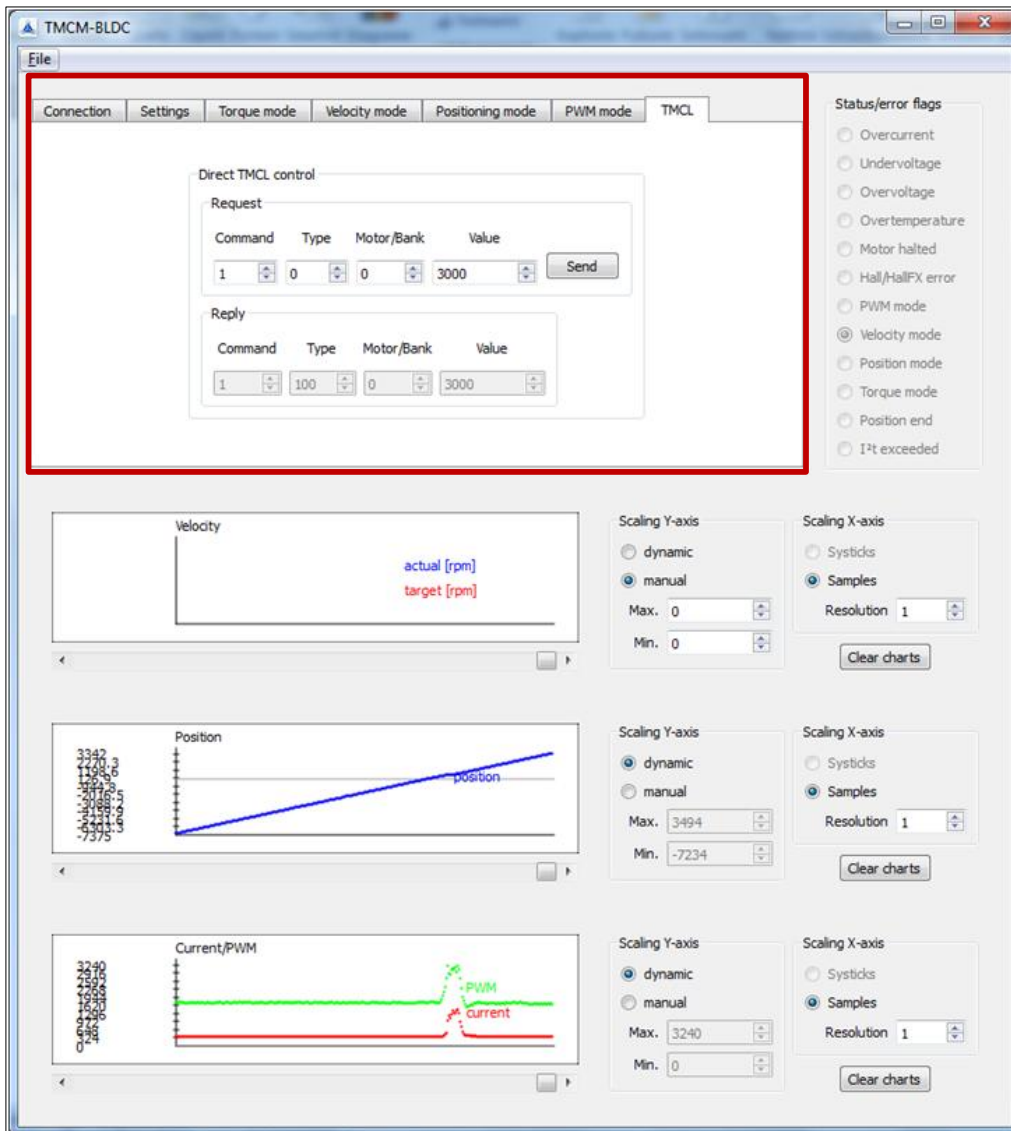


Figure 2.7: TMCL™ tab of TMCM-BLDC

2.2 File menu of TMCB-DC

The file menu of the TMCB-DC offers the possibility to import and to export settings. This is useful for transferring settings from one module to another. Settings can be exported (*Export settings to *.ini*) and afterwards imported to another module with the command *Import settings from *.ini*.

Further, it is useful to export evaluated adjustments of the TMCB-DC program to a TMCL™ script used later in the TMCL-IDE. Therefore choose *Export settings to TMCL*.

Certainly actual values can be stored and restored on the module.

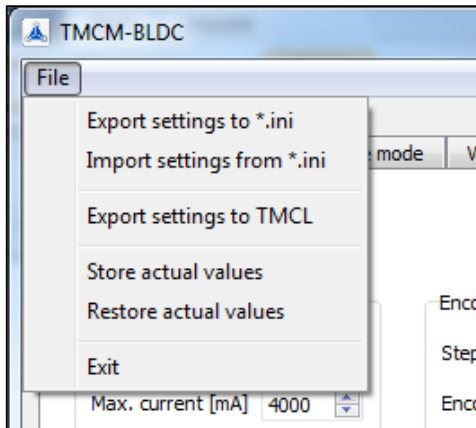


Figure 2.8: File menu of TMCB-DC

3 Revision history

Version	Date	Author OK – Olav Kahlbaum SD – Sonja Dwersteg	Description
1.00	2011-NOV-08	SD	Initial release
1.01	2011-NOV-09	SD	Minor changes
1.02	2011-DEC-07	SD	Minor changes

Table 3.1: Document revision

4 References

[TMCL-IDE] TMCL-IDE User Manual (www.trinamic.com)

Please refer to the Hardware Manual and the Firmware Manual of your module, too.