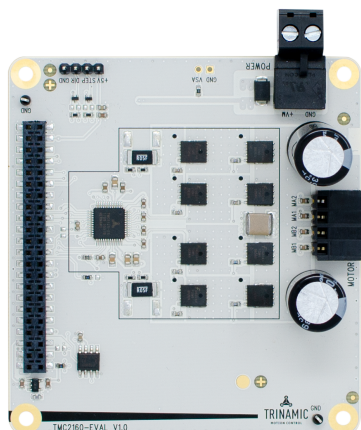


# TMC2160-EVAL Evaluation Kit

Document Revision V1.02 • 2020-FEB-27

The TMC2160-EVAL is designed for evaluating all features of the TMC2160. The evaluation board is part of TRINAMICs user-friendly plug-in system for chip evaluation. Just connect the TMC2160-EVAL with Landungsbruecke, the associated base board. Therefore, use the dedicated connector board, called Eselsbruecke. Eselsbruecke offers test points for every connector pin.



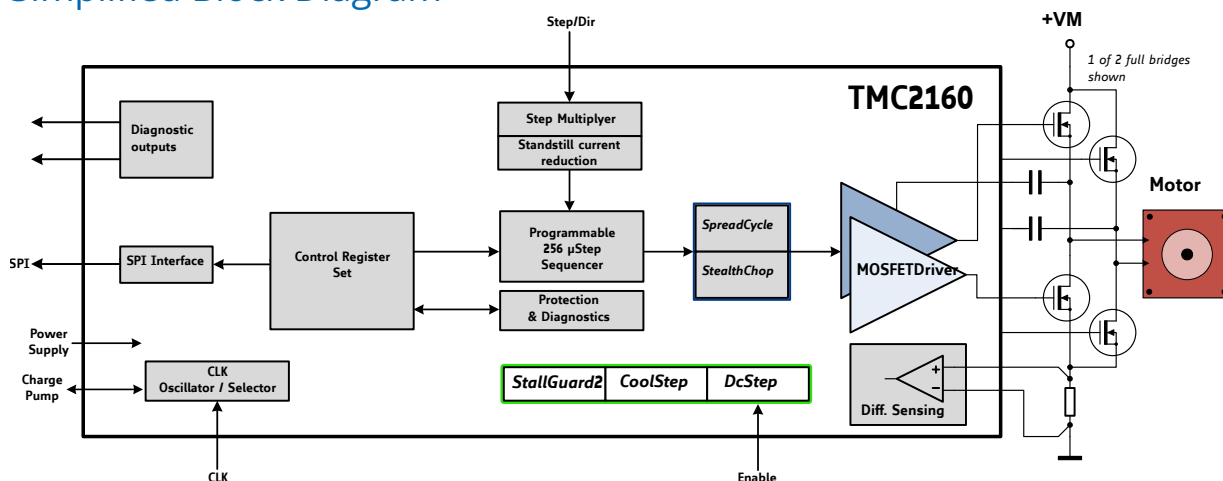
## Features

- **2-phase** stepper motor up to 4.6A coil current (6.5A peak)
- **Supply Voltage** 8...55V DC
- **SPI interface**
- Step/Direction interface with microstep interpolation **MicroPlyer™**
- **StealthChop™** silent PWM mode
- **SpreadCycle™** smart mixed decay
- **StallGuard2™** load detection
- **CoolStep™** automatic current scaling

## Applications

- Laboratory Automation
- Factory Automation
- Sewing Machines
- 3D Printers
- Office Automation
- Liquid Handling
- CCTV
- ATM
- Pumps and Valves

## Simplified Block Diagram



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# 1 Getting Started

## You need

- TMC2160-EVAL
- Landungsbruecke or Startrampe with latest firmware (We recommend using the Landungsbruecke as it offers faster USB communication.)
- Eselsbruecke
- Stepper motor
- Power Supply
- PC with USB interface
- Latest TMCL-IDE V3.0 and PC
- Cables for interface, motor and power

## Precautions

- Do not mix up connections or short-circuit pins.
- Avoid bounding I/O wires with motor wires.
- Do not exceed the maximum rated supply supply voltage!
- Do not connect or disconnect the motor while powered!
- **Start with power supply off!**

Connect together Landungsbruecke or Startrampe and the TMC2160 evaluation board using the Eselsbruecke as shown in figure 1.

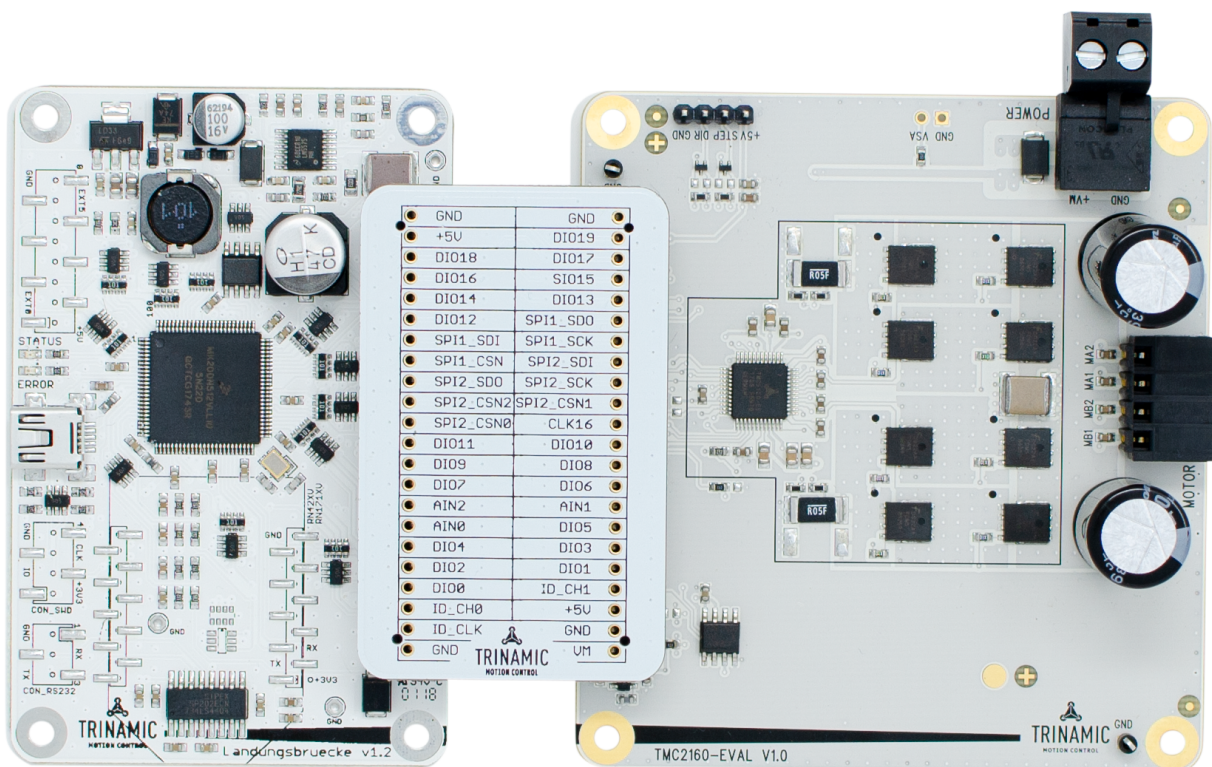


Figure 1: Getting started

## NOTICE

The Landungsbruecke or Startrampe operates on USB Power Supply. All other voltages are generated from V\_M. The evaluation kit only works when V\_M is applied.



## 1.1 First Start-Up

1. Make sure that the latest version of the TMCL-IDE is installed. The TMCL-IDE can be downloaded from [www.trinamic.com/support/software/tmcl-ide/](http://www.trinamic.com/support/software/tmcl-ide/).
2. Open the TMCL-IDE and connect the Landungsbruecke or Startrampe via USB to the computer. For Windows 10 no driver is needed, on Windows 7 and 8 systems the TMCL-IDE will install the driver automatically.
3. Verify that the Landungsbruecke or Startrampe is using the latest firmware version. The firmware version is shown in the device tree which is displayed in the TMCL-IDE main window.

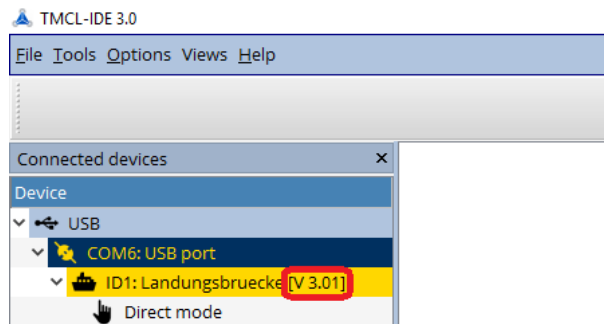
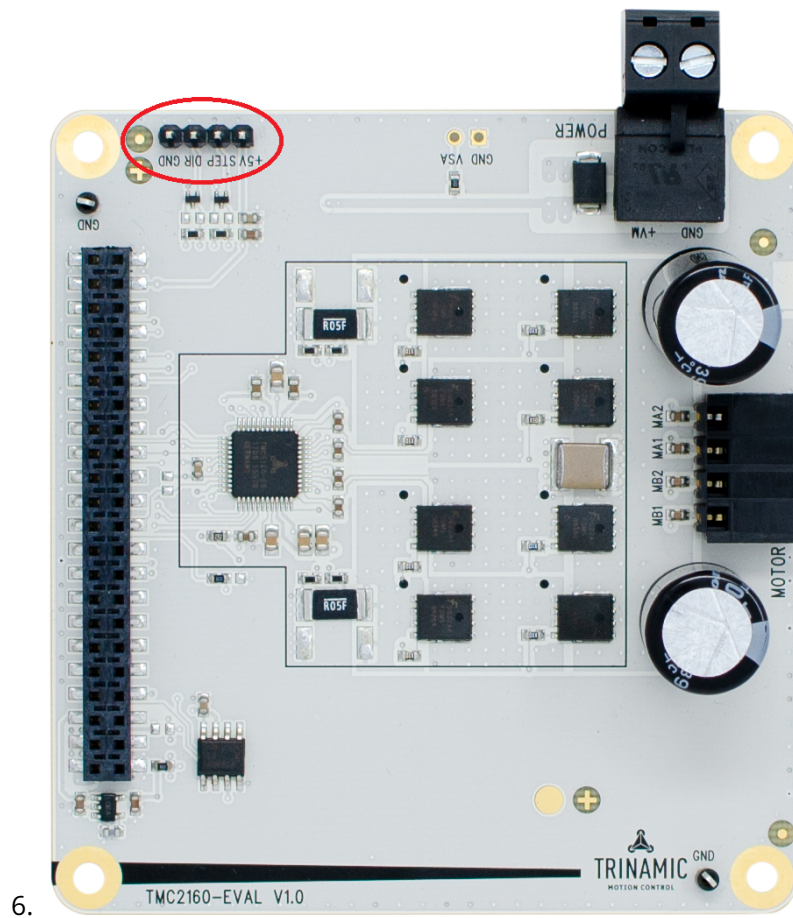


Figure 2: Firmware Version

4. The TMCL-IDE 3.0 needs room to show all important information and to provide a good overview. Therefore, arrange the main window related to your needs. We recommend using full screen. For evaluation boards it is essential to have access to the registers of the TMC2160. Therefore open the Register Browser window by clicking on the Register Browser entry in the tree view on the left side of the TMCL-IDE main window.
5. On the top edge of the evaluation board you can find a pin header for connecting an external step/direction generator (for example a signal generator or a microcontroller board or some other motion controller). These external step/direction inputs are ORed together with the step/direction signals that the Landungsbruecke or Startrampe can generate. Hence it is possible to use the position mode and the velocity mode in the TMCL-IDE for the first tests. Later an external step/direction generator can be used while still using the Landungsbruecke or Startrampe together with the TMCL-IDE for configuring the TMC2160.





6.

Figure 3: Pin Headers on the TMC2160-EVAL

## 2 Hardware Information

All design files for our evaluation boards are available for free. We offer the original ECAD files, Gerber data, the BOM, and PDF copies. Typically, the ECAD files are in KiCAD format. Some (older) evaluation boards may only be available in Eagle, Altium, or PADS format.

Please check schematics for Jumper settings and input/output connector description.

These files can be downloaded from the evaluation boards' website directly at <https://www.trinamic.com/support/eval-kits/>.

### Note

If a file should be missing on the website or anything else should be wrong please send us a note.



### 3 Evaluation Features in the TMCL-IDE

This chapter gives some hints and tips on using the functionality of the TMCL-IDE, e.g., how to use the velocity mode or using the wizards.

#### Note

In order to achieve good settings please refer to descriptions and flowcharts in the TMC2160 data sheet. The register browser of the TMCL-IDE provides helpful information about any currently selected parameter. Beyond that, the data sheet explains concepts and ideas which are essential for understanding how the registers are linked together and which setting will fit for which kind of application. For getting more familiar with the evaluation kit in the beginning of your examinations, drive the motor using velocity mode and/or positioning mode first. Beyond this, the direct mode function can be used. This way, TMCL commands can be sent to the evaluation board system.

#### 3.1 Velocity Mode

To move the motor in velocity mode, open the velocity mode tool by clicking the appropriate entry in the tool tree. In the velocity mode tool you can enter the desired velocity and acceleration and then move the motor using the arrow buttons. The motor can be stopped at any time by clicking the stop button. Open the velocity graph tool to get a graphical view of the actual velocity.

#### Note

In order to get a more accurate graphical velocity view, close the register browser window when using the velocity graph.

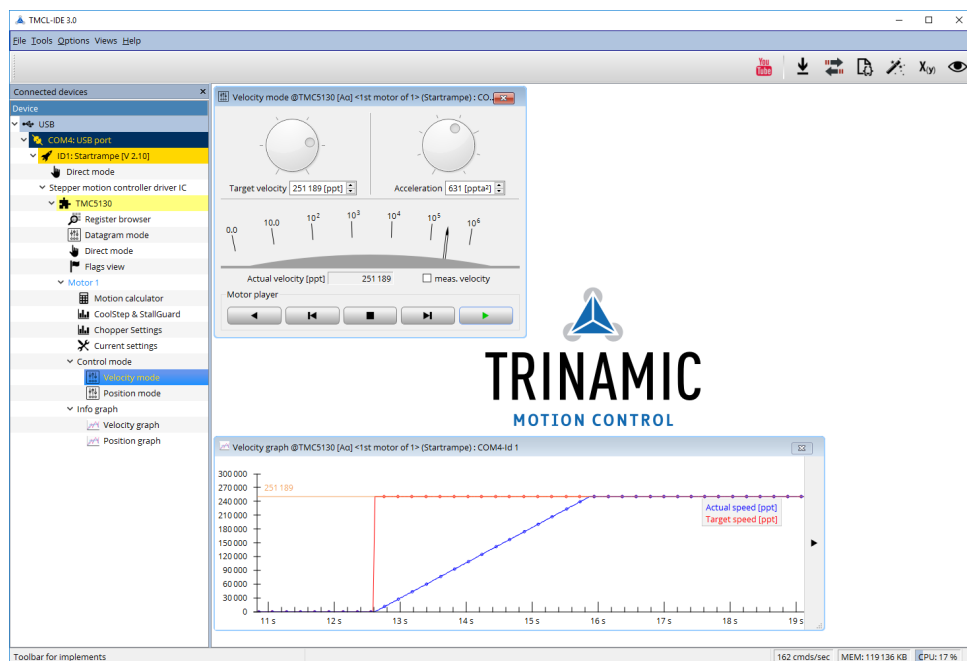


Figure 4: Driving the motor in velocity mode (TMCL-IDE provides similar view for TMC2160-EVAL)





### 3.2 Position Mode

To move the motor in position mode, open the position mode tool by clicking the appropriate entry in the tool tree. In the position mode tool you can enter a target position and then start positioning by clicking the Absolute or Relative Move button. The speed and acceleration used for positioning can also be adjusted here.

Open the position graph tool to get a graphical view of the actual position.

#### Note

In order to get a more accurate graphical position view, close the register browser window when using the position graph.

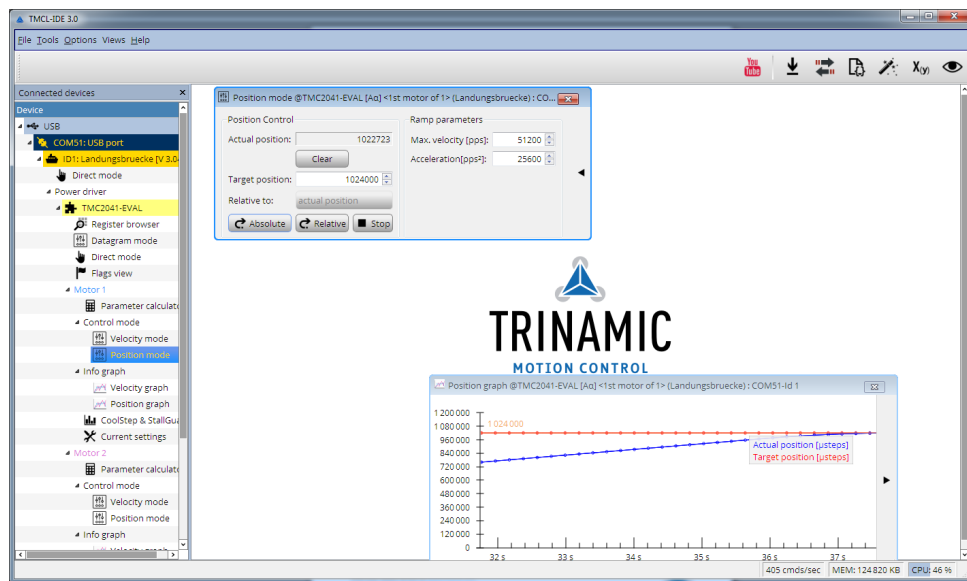


Figure 5: Driving the motor in position mode (TMCL-IDE provides similar view for TMC2160-EVAL)



## 4 Revision History

### 4.1 Document Revision

| Version | Date        | Author | Description                            |
|---------|-------------|--------|----------------------------------------|
| 1.00    | 2018-AUG-30 | OK     | Initial release.                       |
| 1.01    | 2019-MAR-19 | OK     | Maximum motor current value corrected. |
| 1.02    | 2020-FEB-27 | OK     | Changed voltage range.                 |

*Table 1: Document Revision*

