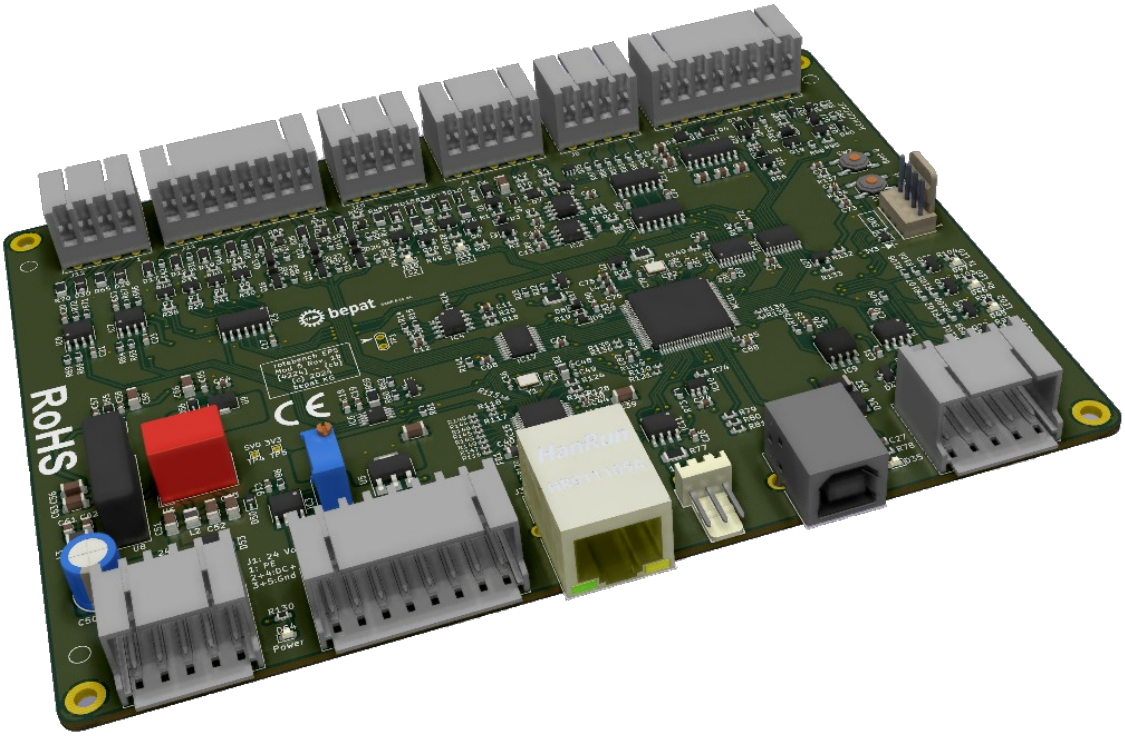
bepat GmbH & Co. KG



rotabench® EPS Mod. 5 PCB

Test Bench Control PCB /w Ethernet- and CAN-Connectivity

For controlling an industrial drive via 24 V digital I/O and ±10 V setpoint channels, and a Kistler 4503 torque sensor via digital I/O and RS232.

+49 211 416 6441 sales@rotabench.com http://www.rotabench.com

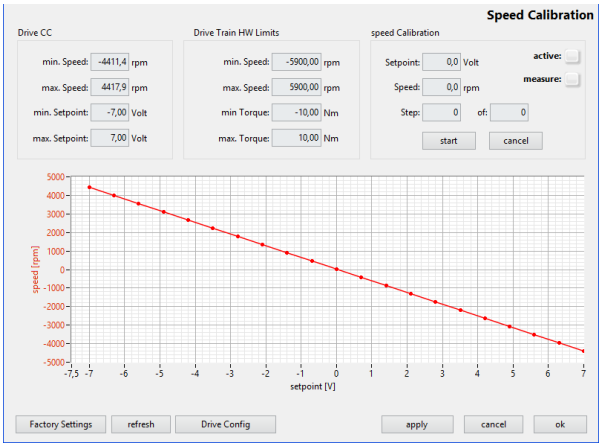
USE CASES

OVERVIEW

The rotabench® EPS Mod. 5 board was developed to provide a fast and easy connection between a test bench software and the test bench hardware (drive, torque sensor) via Ethernet or CAN bus. The loading unit is controlled via analog setpoint channels and 24 V digital I/O. Furthermore, the board features all necessary I/Os and an RS232 interface to operate a Kistler 4503 (A, B) torque sensor, including an encoder. A typical application is the retrofitting of legacy test benches to integrate them into modern control software. In combination with a rotabench 6P frequency inverter, this board can be used to implement an electric motor test bench with streamlined functionality.

OPERATION

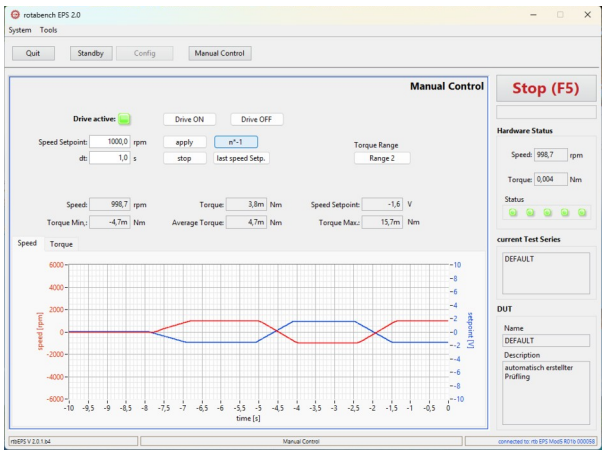
The board features four 24V digital inputs, three 24V digital outputs, and two analog ±10V setpoint outputs for controlling the frequency inverter of a drive unit. The scaling of the setpoint outputs is determined (one-time) via a "calibration run" and stored in the board's flash memory.



The Kistler 4503 torque sensor is connected to the board using both cables ("Control" and "Signal") and is also powered from the board. The sensor configuration is read out via RS232. If required, the configuration of the integrated encoder can also be modified via RS232. Measuring range switching can be performed via digital I/O.

The board can be integrated into an Emergency Stop (E-Stop) circuit. The Connection is established via a 2-channel current loop, which is protected against external power injection, inverted lines and reverse polarity.

Setpoints for the drive are provided by a control software—such as the rotabench EPS software or the rotabench 6P software with the EPS add-on—and are transmitted as control commands via Ethernet or CAN. The analog setpoints are calculated according to the stored calibration table and output as ramps. Setpoint steps (step changes) are also possible.

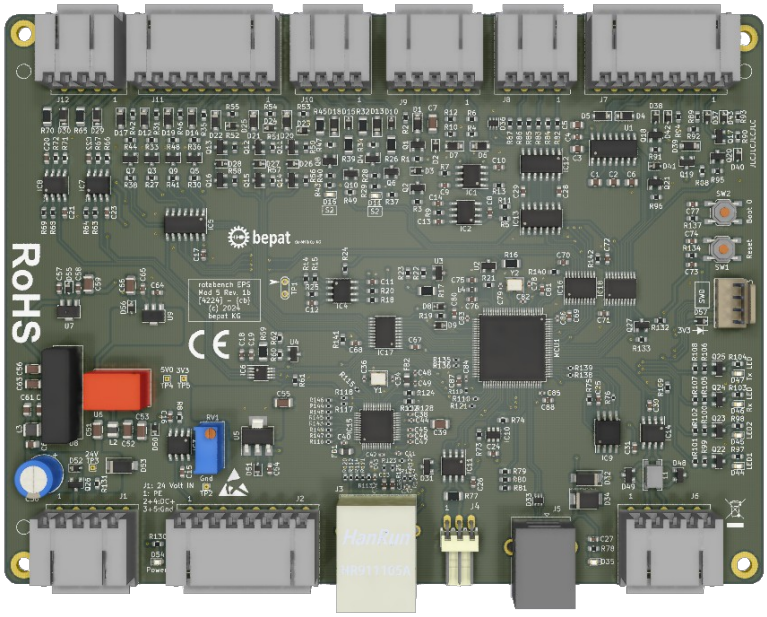


Key measurement and status data, such as speed and torque, as well as the status of the torque sensor and the drive, are continuously streamed to the control software for purposes such as visualization. Since the analog inputs of the rotabench EPS Mod. 5 board are not intended for high-precision measurements, the torque signal from the sensor is passed through directly for connection to a high-precision measuring device.

rotabench® EPS Mod. 5 PCB HARDWARE

OVERVIEW

The rotabench® EPS Mod. 5 board is a control electronics unit for test benches, featuring 24 V digital I/O, ±10 V analog outputs, RS232, an encoder input (5 V TTL), and an Emergency Stop circuit with a current loop. An Ethernet or CAN interface is used for communication with control software. Additionally, RS485 or USB interfaces can be used for parameterization and configuration. Connection to a higher-level controller is established via Ethernet, CAN, or by using a DLL (LabVIEW).



TECHNICAL DATA (BRIEF)

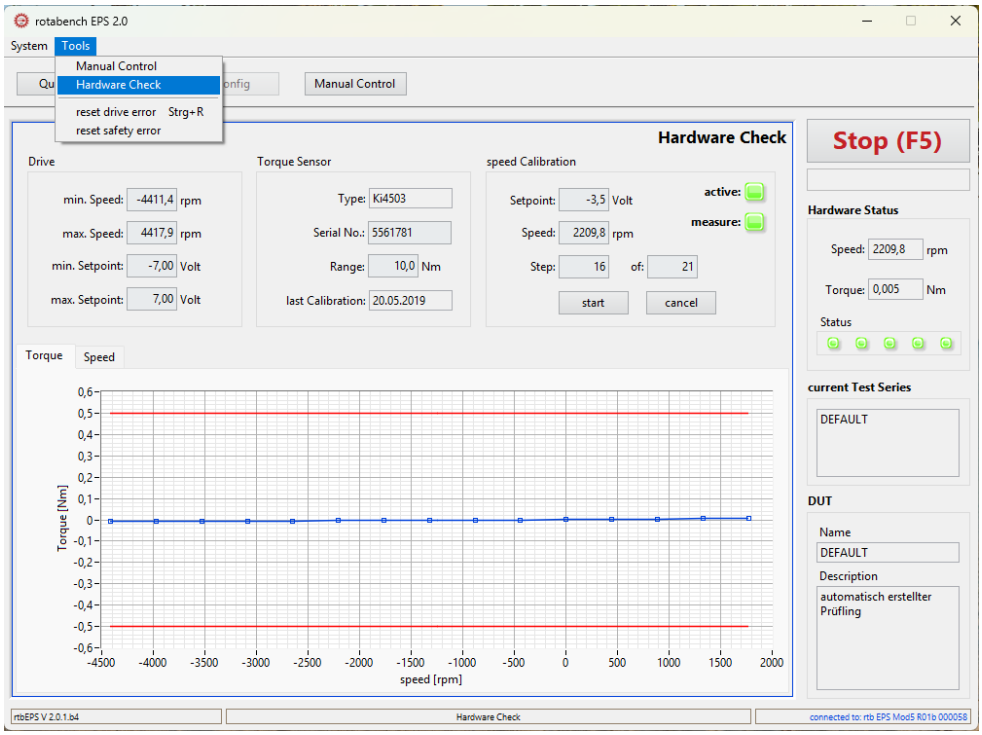
Name:	rotabench® EPS Mod. 5 PCB R01b
Mech. Dimensions:	160 x 120 mm, Height ca. 20 mm
Weight:	< 1 kg
Processor:	STM32H723 MCU @ 550 MHz
Memory:	16 MB Flash Memory on board
Communication:	WIZnet W5500 Ethernet IC 10/100 MBit
Power Supply:	24 Volt DC ±10%
Current Consumption:	ca.200 mA cont., plus the current consumption of the Torque Sensor
Connectors:	WAGO 2091 Cage-Clamp Connectors (Pitch 3.5mm), RJ45, USB-A

CONNECTIONS

Drive:	4 x digital In (24V), 3 x digital Out (24V), 2 x ±10 Volt analog Out
Kistler 4503 Torque Sensor:	digital IO 24Volt, ±10 Volt analog IO, RS232
Encoder (in 4503):	5 Volt TTL Inputs /w A, B- and Z-Signal
Output Speed & Torque Setpoints:	±10 V analog output, 16 bit, 5 kHz
Interlock / Safety:	2 channel current loop, 5V 2mA
Communication:	10/100 Mbit LAN, CAN, RS485, USB 1.1

rotabench® EPS SOFTWARE

OVERVIEW



The software included with the rotabench® EPS Mod. 5 board consists of two parts: the board's firmware, developed in 'C', and the operating software ('rotabench EPS v2 Basic', developed in 'LabVIEW'). The latter is installed on a Windows PC and used to parameterize and configure the board. The board can be operated without the operating software, as the on-board firmware functions independently. Typically, the operating software is only used during commissioning. For easy integration into third-party software, a DLL is provided.

DIAGNOSTIC SOFTWARE FUNCTIONS

- Setting / Modifying the configuration
- Calibration of analog I/Os
- Calibration run" for automatic determination of setpoint channel scaling
- Hardware diagnostics and visualization of the operating status
- "Manual Control": manual setting of speed setpoints

FIRMWARE FUNCTIONS

- Control of an industrial frequency inverter via digital and analog I/O
- Setpoint output according to stored scaling (e.g., +5 V corresponds to 2000 rpm) as a "ramp" with programmable ramp time
- Communication with a Kistler 4503 torque sensor via RS232; control of the sensor (e.g., setting encoder resolution or reading serial number and measuring range)
- Monitoring of a safety circuit and resetting setpoints to 0 rpm upon interruption of the safety circuit
- Torque measurement (for monitoring purposes; NOT for high-precision data acquisition!)
- Speed measurement
- Communication via Ethernet or CAN with a test bench control system