

**bepat** GmbH & Co. KG



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## rotabench<sup>®</sup> 6P 40/30

Frequency Inverter

40A RMS (max.) / Phase continuous – max. 30 VDC DC Link Voltage

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# rotabench® 6P 40/30 HARDWARE

## OVERVIEW

rotabench® 6P 40/30 is a modular frequency inverter for 3-phased automotive electric motors with low DC-link voltages and high phase currents. It consists of a power amplifier (3 MOSFET Half-Bridges), a Digital Signal Processing unit based on LabVIEW™ Real-Time and FPGA (NI cRIO / sbRIO / myRIO) and a Windows Software.

The rotabench® 6P 40/30 with a max. current of up to 40 A RMS per phase and max. 30 VDC DC-link voltage is an ideal solution to run smaller automotive electric motors designed for the 12VDC or 24VDC vehicle electrical system (like e.g. like servo motors) in a laboratory environment or on a test bench.



## TECHNICAL DATA

Type Designation:	rotabench® 6P 40/30
Housing:	10" 4 HE Housing with integrated fan
Weight:	approx. 4 kg
Dimensions:	ca. 33 x 23,5 x 18,5 cm (L x W x H)
Ext. Power Supply DSP & PCB:	100 - 240 VAC, (integrated 12 VDC power supply)
PWM-Base-Frequency:	8 - 25 kHz (selectable)
Temperature Sensor:	integrated (NTC 10k)
Max. DC-Link Voltage:	30 Volt DC
Max. AC-Current:	40 A RMS continuous, temporary overload capacity

## CONNECTORS

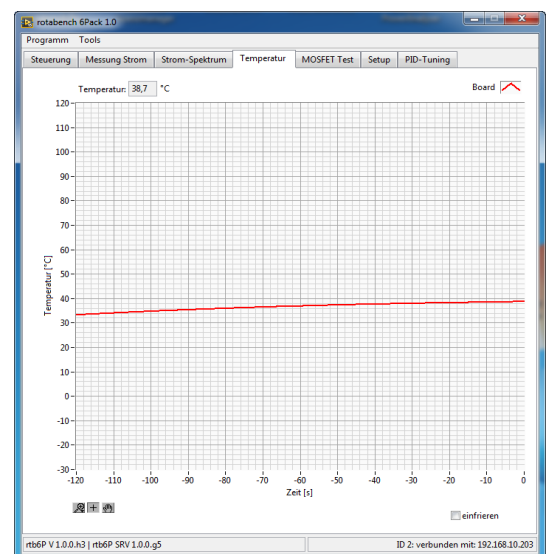
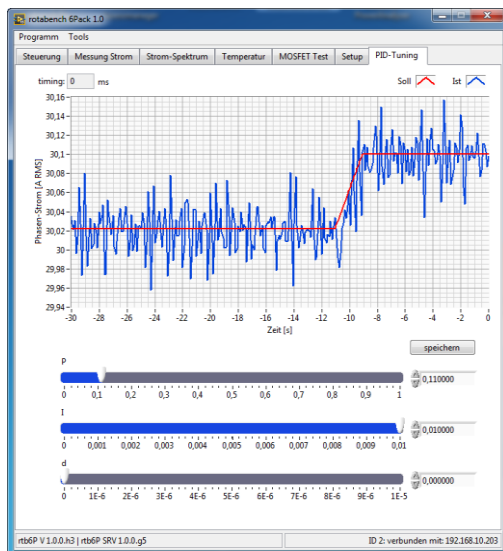
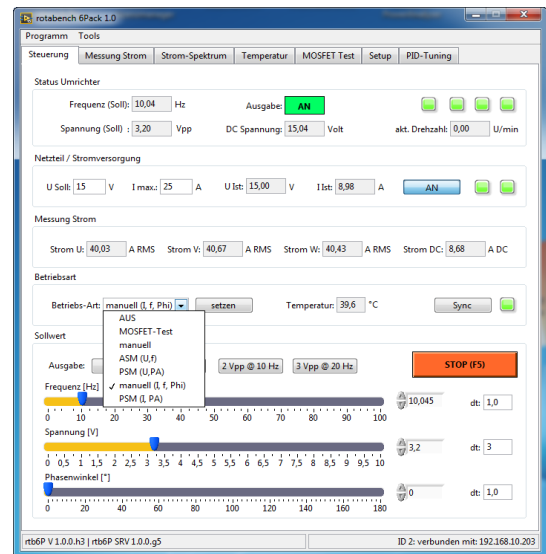
speed / rotor position:	Encoder-Input (A-, B- and Z-Signal, 5 Volt TTL)
DC-Link:	T-Bolts M6 (rated 63 A RMS)
Power Supply:	IEC Plug (with line filter and fuses)
Control / Ethernet:	RJ45 Jack
Digital IO:	Interlock / Run (5 Volt TTL)
External Setpoints:	2 analog Inputs $\pm$ 10 Volt
Encoder Out:	A-, B- and Z-Signal, synchronized to the input signal, 5 V TTL
Motor-Phases L1-L3:	T-Bolts M6 (rated 63 A), for fork cable lugs

# rotabench® 6P SOFTWARE

## OVERVIEW

Our rotabench® 6P software is a distributed system that is made up of two parts, a Real-Time-Software (based on LabVIEW™) and a Client-Software, that can be installed on any off-the-shelf Windows-based computer. Both parts are connected through Gigabit Ethernet as Communication Backbone.

The Client-Software is used to operate the inverter and visualizes the current operation status to the user. The user has the full control over DC-Link voltage, phase-voltage, -currents and -angle and the operation mode. Important Parameters, like DC Voltage, AC currents, amplifier temperature are displayed graphically and numerically.



The DSP creates a 3-phase rotary field based on space vector modulation and can be controlled and adjusted through the client software. At the moment the following operation modes are supported:

- MOSFET-Test: Switching the individual voltage states of the space vector modulation
- Manual mode: Adjustment of Frequency, (PWM-)Voltage, Commutation Angle
- ASM (U,f): Adjusting slip and voltage, the rotational speed and direction are given by an angle sensor that is flange-mounted to the test sample (Incremental Sensor, Encoder)
- PSM (U,PA): Adjusting the voltage and phase angle, the rotational speed and direction are given by an angle sensor that is mounted to the test sample (Incremental Sensor, Encoder)
- Manual mode (I): Adjusting the frequency and phase position, current control (PID-controller)
- PSM (I,PA): Adjusting the voltage and phase angle, the rotational speed and direction are given by an angle sensor that is mounted to the test sample (Incremental Sensor, Encoder), current control
- DC: 4-Quadrant operation of DC-Motors using the Phases L1 and L2 as a full bridge

A Driver to control a Delta Electronics Power Supply (e.g. SM18-50 with Power-Sink-Option) via Ethernet is included in the Client Software. The Client Software is available in German and English.

# APPLICATIONS

## OVERVIEW

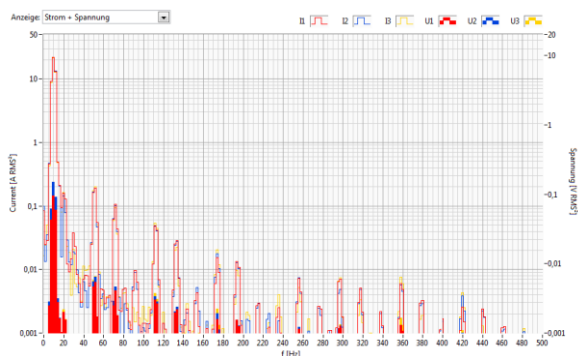
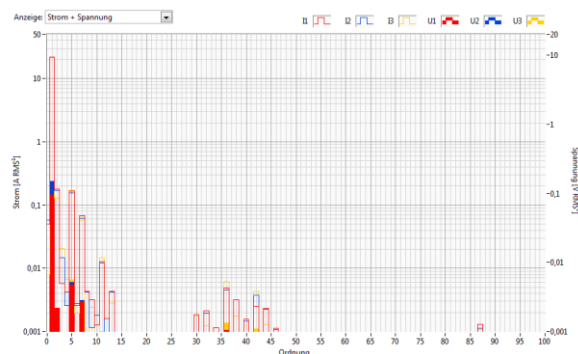
The inverters of the rotabench® 6P series provide developers of 3-phased automotive motors an easy to use tool to drive an electric motor in a laboratory environment or in a test bench environment. Thanks to the integrated power supply control for Delta Electronica power supplies (with TCP/IP interface) a test setup can be created within minutes. To run a motor with rotabench® 6P all you need is: an off-the-shelf Windows PC with the rotabench® 6P Control software installed, the rotabench® 6P Hardware, an appropriate power supply (Delta Electronica with power sink option and TCP/IP interface recommended), a Gigabit Ethernet Switch and Ethernet cables.

## APPLICATION FOCUS

The inverters of the rotabench® 6P series are not limited to a single type of electric motors, but are designed to fit for several motor- and control types. The control type is defined by the software, which can drive asynchronous motors, synchronous motors, electronic commutated synchronous motors, brushless DC-motors and DC-motors.

All devices have in common, that they are designed for motors that are operated at a low DC-link voltage, but relatively high phase currents – as it is common in the automotive industry.

The major difference between rotabench® 6P and conventional inverters is, that rotabench® 6P does not use field oriented control; instead the phase angle is – if necessary – calculated based on a rotor angle sensor (encoder). This helps to reduce the influence of the control loop speed on the current waveform at a considerable amount and creates “cleaner” phase currents.



## CUSTOM SOLUTIONS

If necessary, we can create a custom solution, based on our power amplifiers and DSPs. As a supplier for customer specific test equipment for electric motors with at least 15 years experience in the automotive industry, we know your needs.