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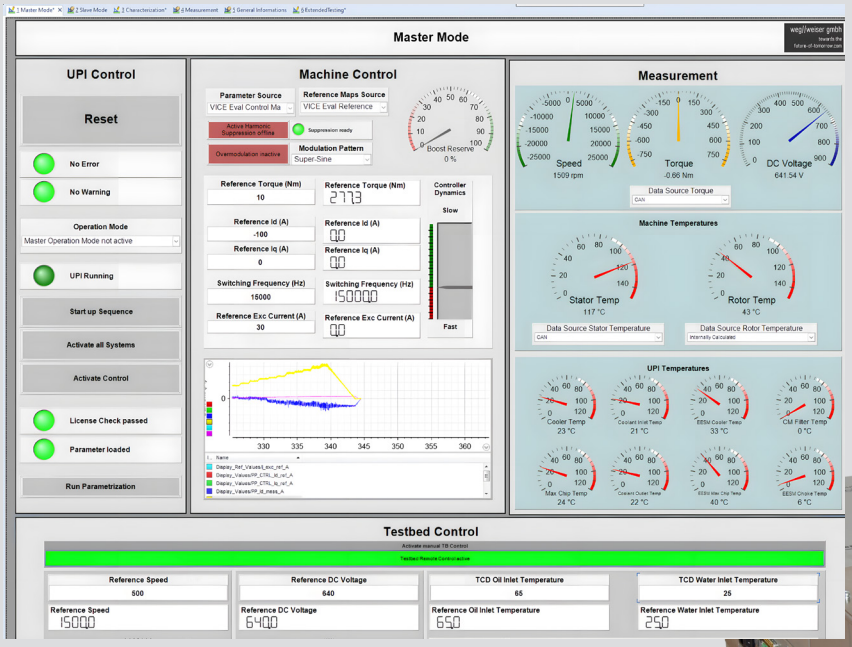
towards the
future-of-tomorrow.com

Fully automated characterization and operation of all Electric Machine Types



All about e-mobility

Our Mission

“Enable our customers to perform their tests in the shortest time with highest performance.”

Who should use our System

- **Developers of electric machines**, who want to carry out in-depth analyzes of the machines on the test bench
- **Test engineers** who carry out component, function, or system validations
- **Application engineers**, who need to determine operating data, system performance and thermal tests of unknown electrical machines
- **Software developers**, who need to quickly test self-developed functions in the real environment

Key Benefits

Fast commissioning:
Typical machines are fully operational within two days including sufficient torque accuracy, peak power, and torque dynamic

Easy to use:
User-friendly operating concept offers a "one-click" solution for commissioning, characterization, and evaluation of electric machines, power, and torque dynamic

Highly adoptable:
Be ready for every machine type, angle sensor and test environment that might occur in the future. Our software offers a wide range of configurations to be prepared for all test scenarios

High performance:
With switching frequencies up to 50 kHz, a maximum DC link voltage range from 48 V to 1250 V and currents up to 2000 Arms the test system is ready for future challenges

Easy integration:
The system can be integrated in existing testbed systems. Your testbed automation and predefined test scenarios can be used as before. No limitation to individual testbed manufacturers

Hardware

Universal test bench inverter UPI for 3/5/6-phase electrical motors

UPI800 (800 V/500 Arms)

UPI1000 (1000 V/1000 Arms)

UPI1250 (1250 V/700 Arms)

19″ rack with MicroLabBox®

- Power electronics with SiC modules with suitable driver control
- Control and data acquisition via dSPACE MicroLabBox® with 50-pin DSub connectors
- AC and DC voltage acquisition (± 0,6%, 0 – 800 kHz)
- DC and AC current acquisition (± 1%, 0 – 72 kHz)
- Heat sink temperature sensing
- Connection possibilities for resolver and incremental encoders via interface cards
- Protection against overcurrent and overvoltage
- DC power supply via battery simulator or vehicle battery possible
- Internal FPGA logic for self-protection (max. frequency, hot branch, heat sink temperature)

UPI Overview

	UPI800	UPI1000	UPI1250
Max. voltage DC:	800 V	1000 V	1250 V
Continuous output AC:	490 kVA @ 560 Veff	1200 kVA @ 700 Veff	1060 kVA @ 880 Veff
Continuous current AC:	500 Arms (3-phase), 250 Arms (6-phase)	1000 Arms (3-phase), 500 Arms (6-phase)	700 Arms (3-phase), 350 Arms (6-phase)
Switching frequency:	1 kHz – max. 20 kHz	1 kHz – 25 kHz (max. 50 kHz)	1 kHz – 25 kHz (max. 50 kHz)
DC link capacity:	1,2 mF	1,68 mF	1,12 mF
Protection class:	1, PE connection with min. 70 mm^2	1, PEconnection with min. 70 mm^2	1, PEconnection with min. 70 mm^2
Protection:	IP30	IP30	IP30
Permitted ambient temperature:	5 – 40 °C, non condensing humidity	5 – 40 °C, non condensing humidity	5 – 40 °C, non condensing humidity
Auxiliary power supply:	230 V (max. 500 VA) for inverter 230 V (max. 100 VA) for MicroLabBox	230 V (max. 500 VA) for inverter 230 V (max. 100 VA) for MicroLabBox	230 V (max. 500 VA) for inverter 230 V (max. 100 VA) for MicroLabBox

EESM Extension

Main features:

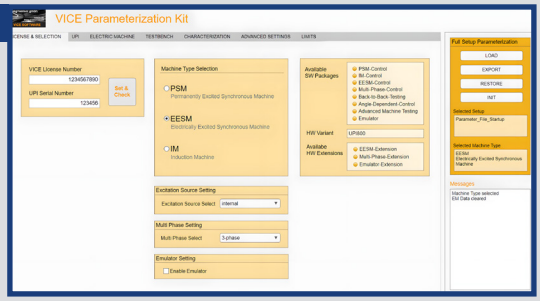
- Extension module to the UPIxxx for supplying externally excited machines (the module is integrated into the UPIxxx and must therefore be taken into account when ordering)
- Control and measured value acquisition via the UPIxxx's control module
- Monitoring of coolant temperature, overcurrent and overvoltage
- Internal communication with the UPIxxx control board
- DC power supply directly from UPIxxx or externally via additional source possible
- Integrated buck converter to reduce the excitation voltage
- Current regulator for setting the excitation current
- Prepared for contactless and transformer-based transmission of the excitation current

Technical data:	
Max. voltage DC:	1000 V
Exciting current:	–40 A ... + 40 A
Continuous output AC:	max. 4 kW
Current dynamics:	depending on the regulation approx. 3 A/ms (>500 V @ L_{exc} = 140 mH and R = 2,9 Ω)
Switching frequency:	10 ... 50 kHz
Housing:	approx. 640 x 675 x 452 mm (L x W x H)
Weight:	approx. 90 kg

Software – Workflow

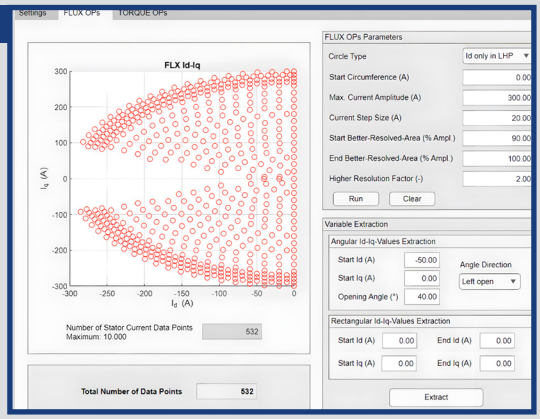
1. Parametrization

- Select machine type (IM, PSM, EESM, RSM ...)
- Setup angle sensor type
- Define limits
- Integrate external sensors (torque, temperature ...)



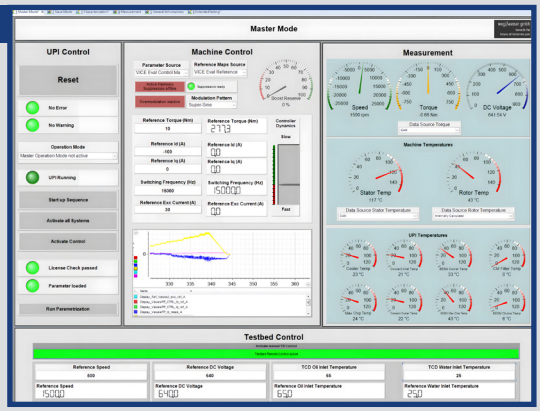
2. Test setup

- Quick definition of I_d and I_q operating points
- Define rotor and stator temperature limits
- Define different speeds, excitation currents, rotor temperature, ...



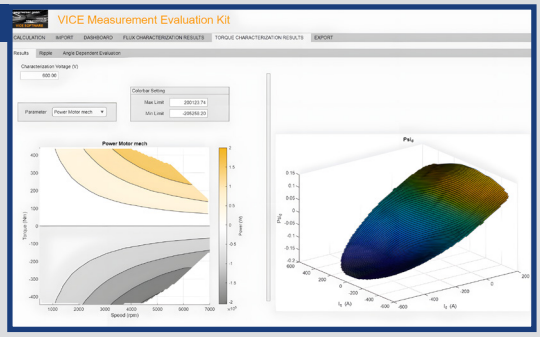
3. Operate machine

- Life visualization and control of all relevant data
- Automatic commissioning for easy setup
- Performing automatic tests or remote control of the system



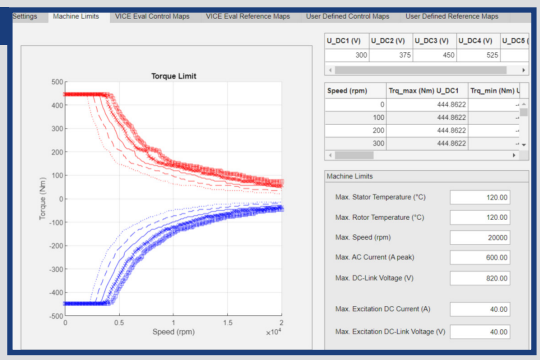
4. Data evaluation

- Derive relevant control parameters
- Calculate reference look-up tables for torque control
- Visualization of measured data and automatic report generation



5. Further tests

- Perform torque characterization for efficiency maps
- Automatic characterization of continuous and overload power
- Analyze results directly in VICE measurement KIT
- Analyze maximum power and torque accuracy
- Derive Temperature models of the motor over whole operating range
- Cost-efficient longduration test with our Back-2-Back feature



Special Features

- Variable switching frequency (1 kHz – max. 20 kHz, can be changed online)
- Fully remote controllable
- “Back-to-Back testing”
- Multiphase operation: 3, 5 and 6 phases
- Repetitive control to eliminate or control harmonics
- Measurement and analyzation of harmonics
- Supervision and reference value saturation of machine, inverter and testbed limits
- Integration of testbed derating in test scenarios
- Flight recorder to analyze system shutdowns in the aftermaths
- Suitable for all common angle sensor types
- Integration of temperature sensors without additional hardware
- Operation of the EESM module
- Analyzation of transient short circuit currents with our TASC module
- Easy set up with angle sensor wiring swap, phase swap, automatic sensor alignment, automatic derivation of lumped parameters
- Variety of modulation methods, overmodulation and six step modulation integrated
- Analyzation of transient short circuit currents with our TASC module
- Detailed data analysis with our VICE evaluation kit, access to all data in MATLAB and EXCEL format
- Fully automated measurement of efficiency maps, torque accuracy maps, peak power maps, continuous power maps, ...
- Easy visualization of measured and evaluated data
- Automatic report generation for quick data visualization

Notes

Let’s get in touch with the future

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