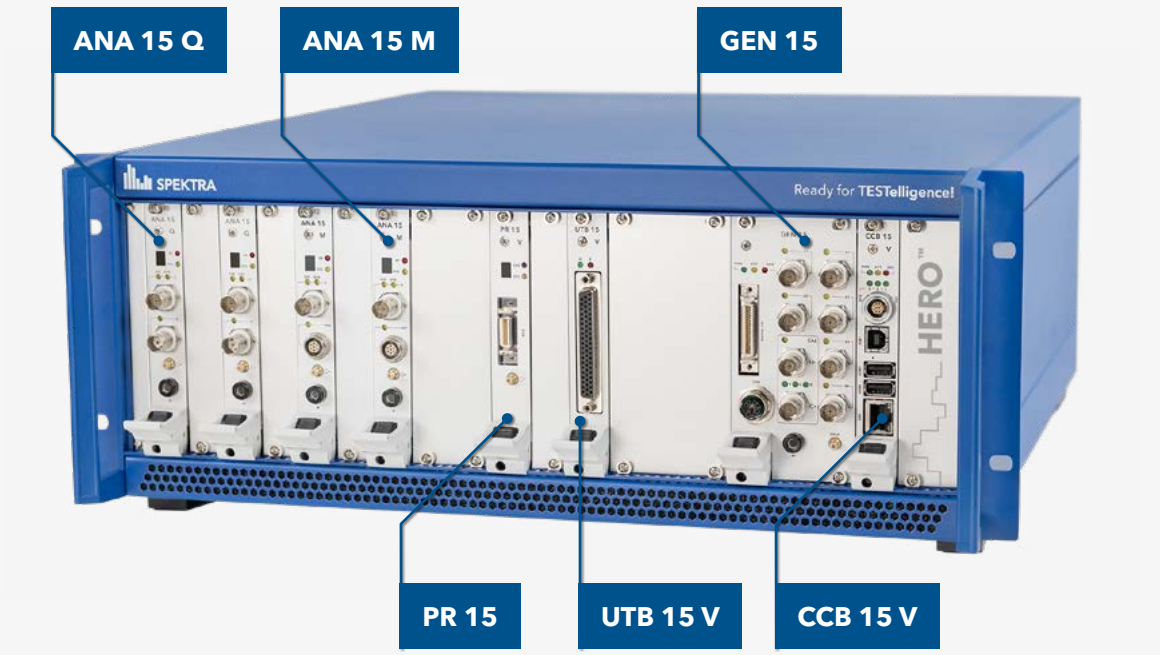
HERO™

Measurement system and vibration controller



Application

- real-time vibration controller for use in testing systems and calibration systems
- measurement system for precise measurement of AC signals in the frequency range 1 mHz … 350 kHz

Selected data

- signal generator 1 mHz … 350 kHz
- second signal generator (optional)
- up to eight analog inputs (max. 24-bit resolution; up to 2.5 MS/s)
- up to four inputs for digital sensors

Features

- flexible configuration with ANA 15 analog inputs and UTB 15 digital inputs
- integrated analog signal conditioners
- universal UTB 15 interface card (I2C, SPI, CAN-FD, etc.) for connecting digital sensors
- traceable to PTB (for measuring analog signals in the range 0.1 Hz … 100 kHz)
- powerful real-time signal processing
- digital connection of laser vibrometers via S/P-DIF or LVDS interface

Technical data

Supply voltage	115 V / 230 V
Supply frequency	50 Hz / 60 Hz
Power consumption, max.	350 VA
Dimensions (H × D × L)	• 177 mm × 485 mm × 565 mm (7 in × 19 in × 22 in) for rack mounting, with front handles • 190 mm × 485 mm × 565 mm (7.5 in × 19 in × 22 in) incl. feet, for desktop use
Weight	15 kg … 20 kg (33 lbs … 44 lbs) depending on configuration
Temperature range (for operation)	+23 °C / ±10 °C (+73.4 °F / ±18 °F)
Temperature range (for storage)	-25 °C … +55 °C (-13 °F ... 131 °F)

Configurations

The HERO™ offers flexible configurations with the modules described on the following pages. Note, however, that the following basic conditions must be observed:

Minimum basic configuration required

- housing with power supply unit
- CCB 15 communication module
- GEN 15 signal generator module

Maximum possible configuration

- up to 8 × ANA 15 analog input channels
- up to 2 × UTB 15 V boards for communication with digital sensors
- up to 4 × PR 15 input boards (signal conditioners for piezoresistive sensors)

CCB 15 V module	
Description	The CCB 15 is required for the HERO™ to communicate with a control PC. It features an Ethernet interface, through which a TCP/IP connection is established with the control computer. Data exchange and the parametrization of the HERO™ are achieved using a protocol based on (but not compatible with) IEEE 488.2.
Technical data	• 1000BASE-T Gbit/s Ethernet as per IEEE 802.3ab • fixed IP4 address (recommended) or DHCP configurable

GEN 15 module	
Description	The GEN 15 is responsible for signal generation and consists of a DSP 15 base board with up to two expansion modules. The optional second expansion module allows a second independent signal generator to be implemented. The DSP 15 base board acts as an FPGA-based, flexibly configurable signal processor for real-time signal filtering and control. The GEN 15 also includes a module for conditioning the output signals for electrical measurement purposes (voltage/charge conversion, precise AC voltage divider and IEPE sensor simulation).
Frequency range	**Periodic signals:** 1 mHz … 350 kHz
Frequency sweep	**Periodic signal** **Stationary:** adjustable in steps of 1 mHz **Swept sine signal:** Rate of change adjustable 0.01 Hz/min …12 000 Hz/min (linear) 0.01 octaves/min…20 octaves/min (logarithmic)
Amplitude range	**Periodic signals:** 1 mV…10 V (peak values) **Adjustable DC offset:** -2.5 V… +2.5 V
Signal types	**Periodic signals:** Sinusoid (incl. swept sine) / squarewave / triangular / sawtooth / user-defined
Signal conditioning	Precise, calibratable signal output: voltage / charge / voltage-controlled CCLD dummy sensor (IEPE) via CAL socket **IEPE current sink:** 2 mA…20 mA **Charging amplitude:** 1 pC…10 nC (peak) using switchable 1 nC/V and 100 pC/V transfer factor **Voltage amplitude:** 1 mV…10 V (peak) using switchable 1:1, 8:1, 64:1, 512:1 signal splitters from max. input voltage 10 V (peak)
Other interfaces	S/P-DIF as per IEC 958 type II 96 kHz and LVDS for capturing digital output signals from a laser vibrometer (e.g. Polytec) incl. synchronization of the analog ANA 15 modules with the laser vibrometer. Universally programmable digital inputs/outputs for connecting devices to be controlled by the HERO™.

ANA 15 Q Module	
Description	The ANA 15 Q is used for measuring analog AC signals. It transfers the digital measurement data via a backplane to the GEN 15 or CCB 15 module for processing. All ANA 15 modules of a HERO™ work synchronously. Each ANA 15 Q represents one analog input channel. The module has integrated signal conditioners for IEPE sensors and piezoelectric sensors with charge output. It can receive analog signals from other signal conditioners, which are available as optional modules, via the backplane. The inputs are galvanically isolated.
Adjustment / Calibration	The adjustment data (electrical correction data) are stored in a non-volatile configuration memory in the ANA 15 Q and are automatically used by the HERO™ firmware or appropriately qualified PC software to precisely correct the measurement data.
Signal inputs	**Charge input:** Input impedance: 1 GΩ static, electrometer Amplitude range: 10 fC … 100 nC (peak) **Voltage input:** Input impedance: 1.33 MΩ // 10 pF (40 V range: 1 MΩ // 10 pF) Amplitude range: 5 µV … 40 V (peak) **Constant-current line drive input (CCLD for IEPE sensors):** Can be connected at voltage input Current: 2 mA … 20 mA, adjustable in 2 mA increments, max. 27 V bias voltage
Frequency range	DC ... 350 kHz
High-pass filter	**Voltage input:** DC / 0.1 Hz / 2 Hz (switchable via software) **Charge input:** 0.2 Hz / 2 Hz (switchable via software)
Anti-alias low-pass	Directly before the ADC, with cut-off frequency coupled to sampling frequency
Monitor output	Additional analog output that provides the analog input signal after the signal conditioner and input amplifier via a buffer amplifier for external processing or quality monitoring.
Analog-digital converter	**Resolution, max.:** 24 Bit **Sampling frequency, max.:** 2.5 MS/s
Other characteristics	Reading and writing of TEDS (IEEE 1451) at the DIR/ICP input

PR 15 module	
Description	The PR 15 module is a signal conditioner for sensors that are based on a measurement bridge, e.g. piezoresistive acceleration sensors. The amplified analog signals are passed to an ANA 15 module, where they are converted to digital measurement data. The allocation of the PR 15 to a corresponding ANA 15 channel is carried out automatically by the HERO™ firmware or by qualified PC software. The sensors are connected by an interface box linked to the PR 15. Resistors can be added in the interface box for adding half-bridges or for adding shunt resistors.
Adjustment / Calibration	The adjustment data (electrical correction data) are stored in a non-volatile configuration memory in the PR 15 module and are automatically used by the HERO™ firmware or appropriately qualified PC software to precisely correct the measurement data.
Signal inputs	**Coupling:** DC coupled **Inpt voltage range**: **Unipolar:** +30 V / -15 V **Differential:** ±30 V **Input impedance:** typically > 1GΩ **Signal amplification:** ⅓ / 1 / 10 / 100, switchable by software **Brige resistors:** Half-bridges to which other resistors can be added (interface box)
Bridge supply voltage	Supply voltage adjustable via software. **Asymmetrical:** ±0 V…+30 V **Symmetrical:** ±0 V… ±15 V **Current output, max.:** 100 mA
Adjustment and measurement of supply voltage and offset	**DAC for supply voltage/offset balancing:** 16 bit resolution / 2 channels **ADC for supply voltage/offset measurement:** 24 bit resolution **Offset balancing:** max. ±2.5 V; resolution < 0.5 mV
Low-pass filter	**Filter frequency:** 20 kHz (-0.5 dB) The filter can be switched via the software.
Other functions	**TEDS:** Supports reading and writing for various ID and TEDS modules **Shunts:** Shunt resistors can be connected in parallel to various bridge resistors **Impedance measurement:** Input and output impedance and each individual resistance can be measured **Isulation current:** Measurement of insulation current from EXC+ to ground on the enclosure

UTB 15 module	
Description	The UTB 15 is a universal input board for sensors with a digital output. The UTB 15 should be used for direct communication with these sensors to calibrate them or to use them as sensors for measurement tasks. The module is based on a FPGA that can be used for programming various digital hardware interfaces and by means of which it can also be adapted in future to new interface types. The module also contains a NIOS processor that can be freely programmed for logical communication with the sensors. A power management unit is integrated for power supply to the connected sensors.
Digital sensor interfaces	SPI, I2C, CAN-FD, JTAG, PSI5, LIN, SENT, ZACwire, I3C, TDM, RS232* Depending on the type of interface required, up to four sensors can be connected simultaneously to the module. * Other interfaces can be retrofitted
Sensor power supply	• 4 independently programmable current and voltage sources • voltage range: -2V… +20 V DC • output currents: 5 µA / 20 µA / 200 µA / 2 mA / 50 mA
Universal I/O interface	• 16 I/O channels • data rate up to 20 MHz • output voltage range: -2 V … +6 V • input voltage range: -2V … +25 V