

IEPE EMULATOR IV - Versatile IEPE Sensor Simulator

The IEPE EMULATOR IV test set is designed for testing signal conditioning amplifiers for IEPE sensors. It replaces real IEPE sensors for cases where no calibrated test bench (shaker) is available for the generation of accurate, reproducible test signal or the test is to be performed with a sensor-independent signal source.

- Special features**
- Internal sine wave generator or external signal generator
 - Internal battery supply / external mains power supply (not included in delivery)
 - Battery condition monitoring with flashing LED in case of undervoltage

Functional principle

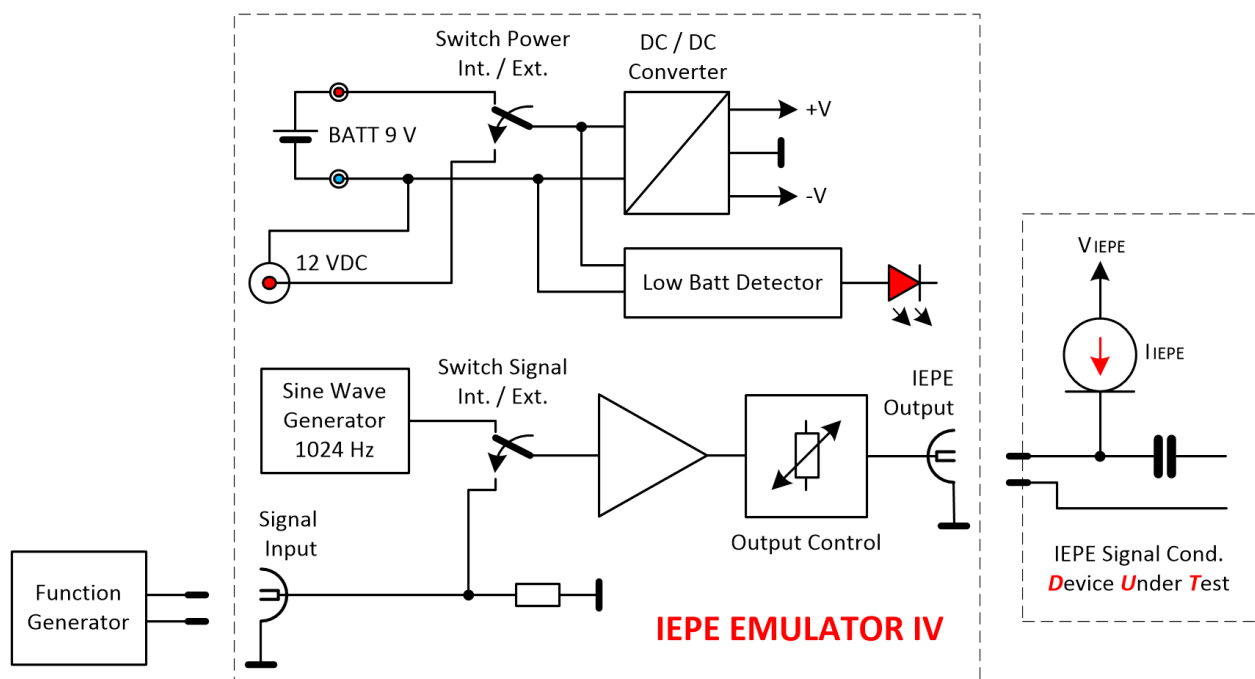
Because IEPE sensors are operated with a constant current of 2 to 20mA from a DC voltage source of nominally 24 VDC (18 to 30 VDC), a direct feed of test signals into the inputs of IEPE amplifiers (DUT) is not easily possible. The test signal "works" quasi against the IEPE current source and against the high IEPE supply voltage.

Therefore a circuit was developed which simulates the rest potential of the IEPE sensor. The rest potential is about half the IEPE supply voltage, i.e. about +12 VDC. The test signal is coupled to the output stage and superimposes this quiescent DC voltage with the test signal AC voltage. (See principle circuit diagram.)

Overview of function groups

- Internal power supply via wide input range DC/DC converter
- Supply selector switch - external supply or internal battery
- Battery undervoltage detector for supply voltages (external or battery) flashes at < 6.5 V
- Internal sine wave generator internal: 1024 Hz / ± 4 VAC (= 2.828 VRMS)
- Test signal selector switch - internal sine wave generator or external signal source
- IEPE output stage for IEPE currents 2 to 20 mA (int. lim. to 30 mA) with DC bias approx. +10 to +12 VDC

Principle circuit diagram



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Connectors and Switches

Connectors and switches on the front:

- DC connector for external power supply 12 VDC (7 to 18 VDC)
- BNC socket "SIGN IN" for external test signal 0 to ± 5 VAC

Please note:

Danger of signal overload of IEPE output stage at input level > 10 V_{peak-peak}!
 Check signal output with oscilloscope.

Alternative:

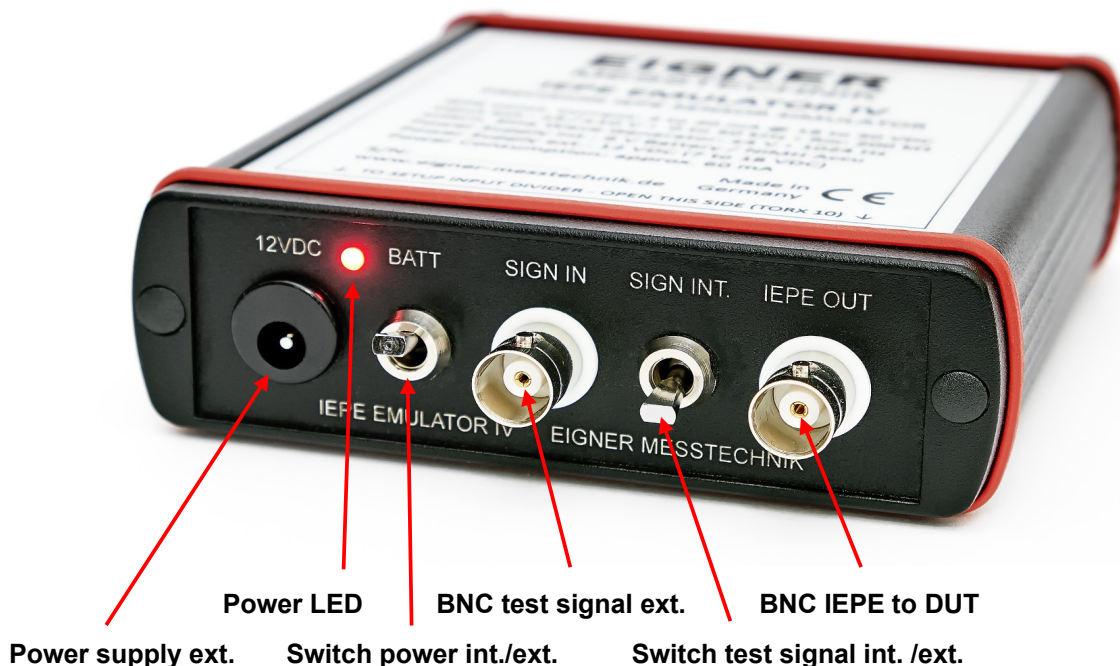
Internal frequency and amplitude stable sine wave generator with 1024 Hz / ± 4 VAC (= 2,828 VRMS)

- BNC socket "IEPE OUT" for connection of the test object (Device Under Test - IEPE signal conditioning)
 Inner contact - positive IEPE connection, outer contact negative IEPE connection (GND).

The negative output connection (BNC ground) is identical with the input ground but not with the negative pole of the device power supply.

Note: Do not use a device under test (DUT) without IEPE current limitation!

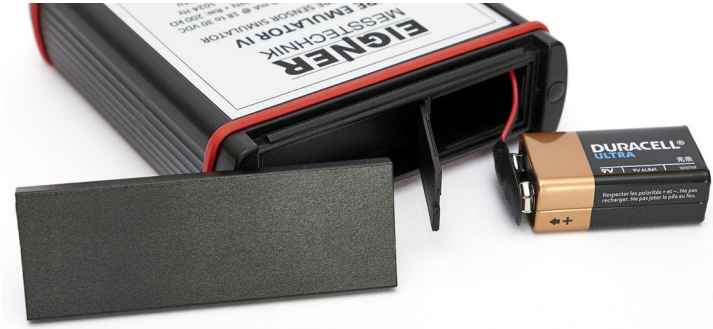
- Switch "BATT" for selection of power supply -
 external 12 VDC or internal battery (AlMn battery or NiMH accumulator) 9 V
 - Lever down - battery OFF, external supply ON
 - Lever up - battery ON, external supply OFF
 Current consumption approx. 60 mA - resulting in battery life approx. 8 h for Alkali-Manganese with 500 mAh or approx. 3 h for NiMH battery with 170 mAh.
- Power Indicator
 - LED permanently on - supply voltage in normal range
 - LED flashes - supply voltage below approx. 6.5 VDC.
 Remove battery and dispose of properly.
- Switch "SIGN INT" for selection of test signals -
 external via BNC "SIGN IN" or internal sine wave generator (1024Hz / ± 4 VAC)
 - Lever down - external signal is used
 - Lever up - internal sine generator is used



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Elements on the back:

- Battery holder for 9 V battery block
- Cover cap for water and dust protection



Rear: Battery compartment open



Rear: Battery compartment cover for IP 54

Housing protection

The IP 54 protection class only applies to battery operation with the sealing cap on the back properly closed. The connection of the external power supply via the DC plug does not meet the requirements of IP 54. Optionally available is an IP 54-compliant power connector for self-assembly of the connection cable of the external power supply.

Operation

- Power:** Connect supplied (optional) or own power supply (plug-in or desktop power supply) 230 VAC / 12 VDC to the power socket and / or insert battery 9 V into battery compartment. Select the desired power supply type with the "BATT" switch.
- Signal:** Select signal source (switch "SIGN INT.") - use internal sine wave generator or feed external AC signal to BNC "SIGN IN".
 Signal control (use BNC T-connector if necessary)
- Shape with scope connected to BNC "IEPE OUT" with DUT connected and ready for operation
 - Level with AC multimeter at BNC "IEPE OUT" (Sinusoidal signal: measured RMS = $V_{\text{peak}} / 1.414$).
 - Signal bandwidth external signal: 0 Hz to 50 kHz (min.).

Test procedure

- The IEPE EMULATOR IV is powered either by means of an external power supply (optionally available 12 VDC plug-in power supply) or by means of the inserted battery 9 V.
- The IEPE signal conditioning to be tested is connected to the BNC socket "IEPE OUT" and operated with its power supply.
- As test signal either an external signal via the BNC socket "SIGN IN" with switch "SIGN INT" set to OFF or the internal sinus generator (switch "SIGN INT" to ON) is used.
- The effective input signal of the DUT can be measured at the BNC socket "IEPE OUT" by means of a scope (via a BNC T-piece).
- The output swing of IEPE EMULATOR IV is ± 5 VAC symmetrically around the bias voltage of approx. +10 to +12 VDC.

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- IEPE OUT cabling variants:



IEPE cabling: BNC T-piece



IEPE cabling: BNC to banana

Technical data

Power supply:	7 to 18 VDC (power supply not included in delivery - suitable type "PWR1.0")
Low Batt Indic.:	Power LED flashes at supply voltage < 6.5 VDC
Current consumpt.:	approx. 60 mA at 9 VDC
Battery life:	Battery / accum. capacity [mAh] / 60 [mA]. Example AIMn battery 500 mAh / 60 mA = 8 h (Accum. not included in delivery.)
Signal input external:	0 bis $\pm 5\text{VAC} = 3,536\text{VRMS}$ (for sine wave) @ $R_{IN} = 100\text{k}\Omega$
Signal generator internal:	Sinusoidal signal $\pm 4\text{ VAC} = 2,282\text{VRMS}$ at 1024 Hz
IEPE current:	2 to 20 mA from IEPE voltage 18 to 30 VDC (internally limited to 30 mA max.)
Bandwidth:	0 to 50 kHz, 0 to 100 kHz with reduced linearity
Amplification:	Ratio input signal (external) to output signal = 1 : 1 ($\pm 0,1\%$ at 0 to 50 kHz)
Signal output:	0 to $\pm 5\text{ VAC}$
Output bias:	Approx. +10 to +12 VDC
Dimensions:	109 x 35 x 129 [mm ³] (over all, incl. BNC und switches)
Weight:	Approx. 300 g (incl. 9 V battery)
Environment:	Storage temperature -40 to +100 °C, operating temperature -10 to +85 °C Protection class IP 54 (Battery operation with back cap in place)
Attention: This device and the battery must not be disposed of with household waste or thrown into a fire. Disposal must be carried out via designated collection points.	