

Product

PW4001 Power Analyzer

Headline

4-channel Power Analyzer

Short Description

Portable 4-channel power analyzer with $\pm 0.04\%$ basic accuracy, DC to 600 kHz frequency bandwidth, CAT II 1500 V DC, 1 ms data update rate, waveform & D/A output, motor analysis, external DC power input, IEC harmonic and flicker measurement option

Banner Specs

- Basic accuracy: $\pm 0.04\%$
- Frequency bandwidth: DC, 0.1 Hz to 600 kHz
- CAN / CAN FD output and input
- Safety rating: CAT II 1500 V DC
- Operating temperature range: $-20\text{ }^{\circ}\text{C}$ to $50\text{ }^{\circ}\text{C}$

USPs

- Power calculation using CAN values

Applications

- WLTP (Worldwide harmonized Light vehicles Test Procedure) testing
- DC-DC converter efficiency measurements
- Inverter efficiency measurements
- Motor efficiency measurements
- Grid interconnection testing of photovoltaic (PV) inverters and battery energy storage systems (BESS)
- IEC harmonic and flicker compliance testing of EV chargers and industrial power converters

Product Description

The HIOKI PW4001 is a portable 4-channel power analyzer that combines compact design with laboratory-grade precision. With a basic accuracy of $\pm 0.04\%$ across a frequency range from DC to 600 kHz, and benchmark accuracy of $\pm 0.03\%$ rdg. $\pm 0.01\%$ f.s. at DC and 50/60 Hz, it provides the precision required for applications like WLTP (Worldwide harmonized Light vehicles Test Procedure) testing, DC-DC converter efficiency evaluation, and other demanding measurement tasks in R&D, production, and field environments.

The power analyzer supports direct voltage input up to 1500 V DC (CAT II) and 1000 V DC (CAT III), enabling measurements in high-voltage environments such as photovoltaic inverters and other modern power conversion systems. Furthermore, its CAN input function allows the PW4001 to obtain battery voltage values via CAN communication, so that power can be calculated without direct voltage probing. This is particularly important in environments where safety considerations make direct access to terminals difficult, for example when testing fully assembled electric vehicles.

The combination of a fixed four-channel design, high accuracy, and wide frequency bandwidth makes the PW4001 ideally suited for efficiency testing of single-stage converters. Typical applications include energy storage system (ESS) converters and the inverter stages used in heat pumps, compressor drives, and basic industrial motor drives, where DC input and AC output can be measured simultaneously.

Sensor Communication and Phase Correction

For current measurement, HIOKI provides a wide range of dedicated sensors, from compact clamps for low currents to high bandwidth probes capable of several kiloamps. As both the analyzer and the sensors come from a single source, they communicate directly, automatically exchanging calibration and correction data. The HIOKI PW4001 Power Analyzer applies phase shift corrections with 0.001° resolution, minimizing error and ensuring that each sensor performs to its full potential. HIOKI's high-precision current clamps are particularly valued for their ability to capture currents quickly and safely on complete systems without the need for direct wiring.

DC operation and long-term recording

With the optional DC power input, the analyzer can operate directly from a DC supply such as a car or truck battery or a portable battery pack within a voltage range of 10.5 to 28 VDC. This makes it ideal for field tests where AC power is not available. Its 16 GB internal memory enables long-term recording without external USB devices, reducing the risk of interrupted measurements. Designed for harsh conditions, the PW4001 operates from -20 °C to +50 °C and is specified for vibration resistance up to 4.6 G. It also meets the requirements of WLTP and SAE J1634 testing at -7 °C, ensuring stable performance in certified cold chamber evaluations as well as in real driving tests.

System Integration and Automation

The PW4001 Power Analyzer is ideally suited for integration into test benches and automated test environments. With LAN interfaces supporting SCPI, Modbus/TCP, and XCP-on-Ethernet, it can be controlled directly from existing systems. An integrated HTTP server allows browser-based operation without additional software, while FTP client and server functions make internal storage accessible like a remote file drive. For extended monitoring, an optional 16-channel analog output function is also available, allowing waveforms and key parameters to be output in real time.

Advanced Analysis and Test Functions of the PW4001 Power Analyzer

Beyond delivering numerical results, the PW4001 provides oscilloscope-like visibility. With four voltage and four current channels, engineers can view eight signals at once and capture them at high sampling rates. Zoom, trigger, and cursor functions make it possible to analyze switching events and transients in detail, while integrated memory supports long-term recording of measurement parameters.

For more advanced evaluation, the optional motor analysis package supports up to two motors, calculating motor power from torque and RPM while also providing vector displays and harmonic analysis up to the 500th order. Up to 20 custom formulas can be defined, allowing engineers to adapt the analyzer to specific test requirements.

Automatic Mode Detection for ESS and Regeneration

In applications such as energy storage systems (ESS) or drive systems with regenerative braking, the efficiency calculation depends on the operating mode. During charging or generator operation, the relationship between input and output power is reversed compared to discharging or motoring. The PW4001 automatically detects these modes and adjusts the efficiency calculation accordingly. This prevents incorrect results such as apparent efficiencies greater than 100% during regenerative operation.

When larger systems must be evaluated, up to eight PW4001 units can be synchronized via BNC, enabling time-aligned measurement across 32 channels and supporting complete system-level analysis of PV or EV powertrains.

From xEV energy consumption testing to converter, inverter, motor, and PV efficiency measurements, the PW4001 provides the versatility and reliability required for modern power analysis.

IEC Harmonic and Flicker Measurement with PW9006

The optional **PW9006 IEC Harmonic/Flicker Function** extends the PW4001 with IEC-compliant measurement according to **IEC 61000-4-7** (harmonics and interharmonics) and **IEC 61000-4-15** (voltage fluctuations and flicker). By simply selecting the IEC measurement mode, the analyzer is automatically configured to perform standard-compliant measurements. Harmonic measurement supports up to the 200th order, while flicker evaluation includes the key parameters Pst, Plt, dc, dmax, and Tmax, making the PW4001 suitable for EMC testing, harmonic evaluation, and grid interconnection assessment. The PW9006 function can be ordered together with the PW4001 or activated later using a license code.

Overview of PW4001 Models

Model	D/A Output	Motor Analysis	DC power supply
PW4001-01	☐	☐	☐
PW4001-02	☒	☐	☐
PW4001-03	☐	☒	☐
PW4001-04	☐	☐	☒
PW4001-05	☒	☒	☒

What's in the box

- PW4001 Power Analyzer
- Startup Guide ×1
- Power Cord ×1
- USB Cable ×1

- D-sub 25-pin Connector ×1 (PW4001-02, PW4001-05)
- DC Power Connector ×1 (PW4001-04, PW4001-05)

Related Products

- CT6834 (500 A) AC/DC Current Clamp
- CT6833 (200 A) AC/DC Current Clamp
- CT6831 (20 A) AC/DC Current Clamp
- CT6830 (2 A) AC/DC Current Clamp
- CT6841A (20 A) AC/DC Current Clamp
- CT6843A (200 A) AC/DC Current Clamp
- CT6844A (500 A) AC/DC Current Clamp
- CT6845A (500 A) AC/DC Current Clamp
- CT6846A (1000 A) AC/DC Current Clamp
- CT6877A (2000 A) AC/DC Current Sensor
- CT6876A (1000 A) AC/DC Current Sensor
- CT6875A (500 A) AC/DC Current Sensor
- CT6873 (200 A) AC/DC Current Sensor
- CT6872 (50 A) AC/DC Current Sensor
- CT6862-05 (50 A) AC/DC Current Sensor
- L1000 Voltage Cord
- PW9006-01 Activation Code Card
- VT1005 AC/DC High Voltage Divider
- SP7001-95 Non-Contact Can Sensor
- Z5302 Rackmount Fittings
- C4001 Carrying Case

Version	Date	Author	Approved	Document changes
1.0	04.10.2025	RN, RH	KS	First release
1.1	08.07.2026	VL	VL/RH	Added PW9006 in the description and related products