YOKOGAWA

© Jörg Riethausen

Interview

SAXOGY: Safely Testing Power Electronics
Safety test bench for inverters - Page 3

Test&Measurement Magazine

tmi.yokogawa.com/eu

News

Data Centers: Validation of Energy Storage Systems and UPS Systems
New input modules for isolated oscilloscopes – Page 7

Context

SmartDAC+ Easy Predictive Detection for Heat Treatment Systems
AI-based continuous monitoring of system condition – Page 8

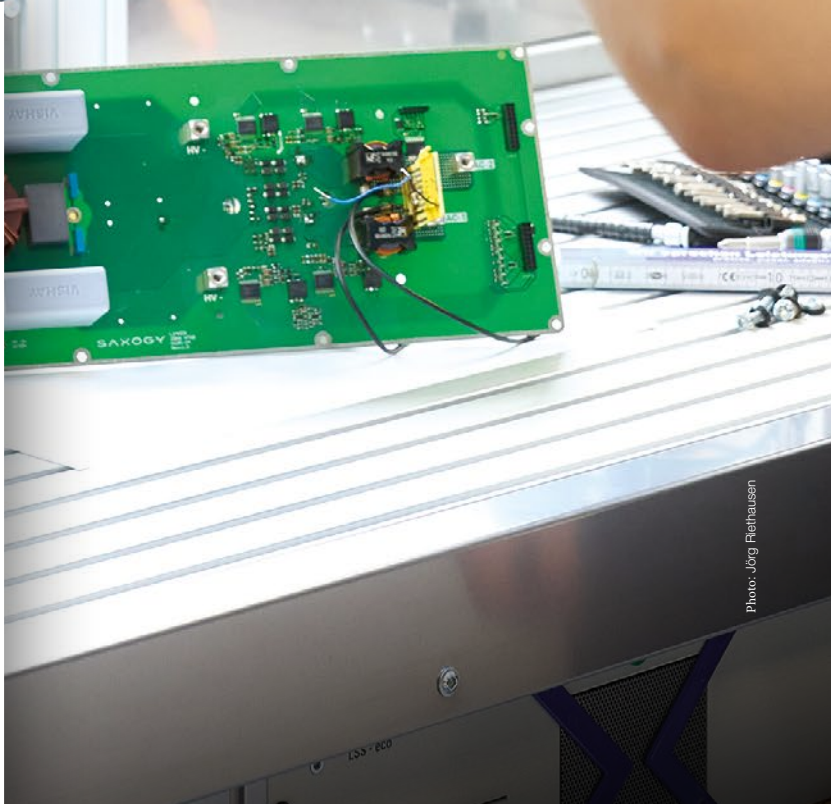


Photo: Jörg Riethausen

YOKOGAWA

Safely Testing Power Electronics

Safety test bench for inverters

When testing power electronics, it is not only the accuracy of the measuring instruments that matters, but also the safety of the operating personnel. After all, high voltages and currents are involved. SAXOGY has the right solutions for this.

The founding of SAXOGY happened more or less by chance. As a developer of analog circuit technology, company founder Konrad Domes came into contact with power electronics and HVDC technology (high-voltage direct current transmission), through transistor and IGBT modules. Because high voltages and currents are associated with considerable danger potential, he decided to develop and build safe test equipment for power measurements alongside his work, through his own engineering office.

Finally, in 2004, he founded the company SAXOGY POWER ELECTRONICS in Nuremberg, which now employs 40 people and is based in Chemnitz. In 2018, he moved fully into self-employment. Today, the company's main areas of focus include the development and manufacture of test equipment and safety technology for power electronics. The team includes specialists in electronics, mechanics, pneumatics, software, and safety technology, who develop complete solutions from concept through to support.

SAXOGY's customized solutions are used in development, commissioning, and production, primarily in the automotive, electronic components, energy, research, and education sectors.

>>>

“Integral” Safety
SAXOGY’s measurement stations are based on a modular system concept and are specifically designed for testing power electronics. Depending on customer requirements, they can be equipped with current and voltage supplies, inductive loads, thermal management, and a wide variety of measuring instruments. Functional safety is not an add-on, but an integral part of the architecture. Thanks to extensive protective mechanisms and clearly defined operating levels, they are also suitable for users who are not specifically trained to work with hazardous voltages.

A central component of the safety measurement stations is an enclosed test chamber in which test objects are electrically contacted and, where necessary, connected to the required supply, hydraulic, and pneumatic connections. If voltage is present at the test object, access to the test chamber is securely locked to ensure maximum operational safety. This is achieved by a lowering hood or by doors, which allow a clear view into the test chamber while safely preventing contact with live parts.

Image 1: The SAXOGY SHL safety measurement station, or Safety Housing Lab, has a modular design and can be equipped with a wide range of measurement technology.

The safety concept is supplemented by a discharge system for high voltages, a voltage monitoring system, an insulation monitoring system, and overvoltage detection. The voltage monitors ensure that the locking mechanisms for the hood or doors only open below the safety extra-low voltage. If the voltage monitors detect a voltage higher than the safety extra-low voltage while unlocked, the system immediately enters emergency stop, the high-voltage supply switches off, and the error is signaled. Insulation faults or detected overvoltages can also trigger an emergency stop and switch off the high-voltage supply. Hazardous states are additionally indicated by a red signal tower.

In addition, the test system also has integrated smoke detectors and a leakage sensor, for example to detect leaks in the cooling or hydraulic system.
In an emergency, the system can be stopped immediately via the emergency-stop button. This switches off the supply for the high-voltage power supply and the temperature control, and discharges the DC link.

The hood, sliding door, and test cabinet door are only released for opening once the voltage monitoring system detects a voltage below the defined limit values. The current status of the safety system can be accessed at any time via the system’s user interface. The entire setup is designed to comply with relevant standards, such as DIN EN ISO 13849 and IEC 60204.

Example: Inverter Test
In the automotive sector, major efforts are currently being made to further optimize the efficiency of electric vehicles. This effectively solves two problems at once: with the same battery size, the range can be increased and operating costs reduced through lower consumption.

Increasing the efficiency of individual components in the drivetrain is usually only possible in the single-digit percentage range, since modern inverters and electric motors already achieve efficiencies of over 95%. Overall, however, there is still notable potential for

Photo: Jörg Riethausen

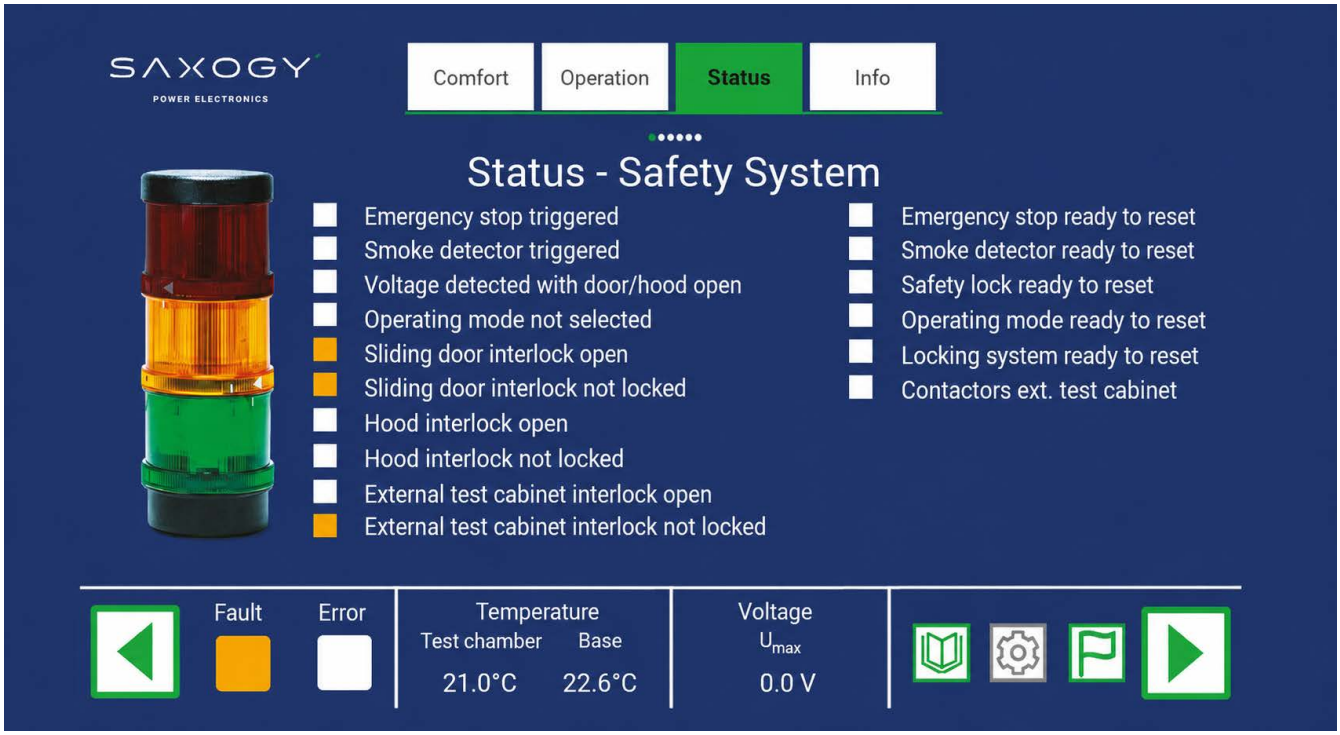


Image 2: The safety status of the system can be viewed at any time via the user interface.

efficiency improvements in the complete drivetrain system consisting of battery, inverter, gearbox, and electric motor. This is partly due to the wide operating range of an electric vehicle, in which not all components always operate within their optimum efficiency range. Fine-tuning between the individual components is still possible here. However, this requires complex test benches that can precisely simulate, monitor, and record the driving behavior and operating conditions of the vehicle. Only in this way can real driving tests on test tracks be greatly reduced.

The modular architecture of SAXOGY's safety measurement stations allows individual configuration for such drivetrain components, whether for series testing, development tests, or high-performance tests under real load conditions. In the lower section of the measurement stations and behind the hood, there are standardized 19-inch rack frames that allow the required supply and measurement technology to be installed according to customer requirements.

Depending on the application, power supplies, loads, power analyzers, and other devices can be housed here. This makes it easy to implement, for example, supply power up to 1,500 VDC / 30 kW, inductive or electronic load simulations up to 1,000 Arms / 2,000 Apeak, as well as integrated cooling-water management.

High-Precision Power Measurements

To achieve further efficiency improvements, measurement technology is required that supports highly accurate multi-channel measurements on the battery, inverter, and motor. What matters here is not only very high accuracy, but also the ability to measure high voltages, over 800 volts, and currents of several hundred amperes with high bandwidth simultaneously across multiple channels. Ideally, this is complemented by synchronous recording of temperatures, rotational speed, and torque. This enables a complete evaluation of the entire drivetrain from the battery to the drive axle. >>>

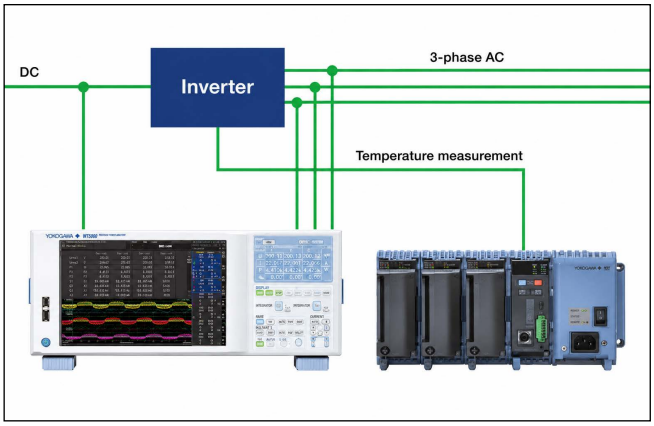


Image 3: Example configuration for an inverter test.

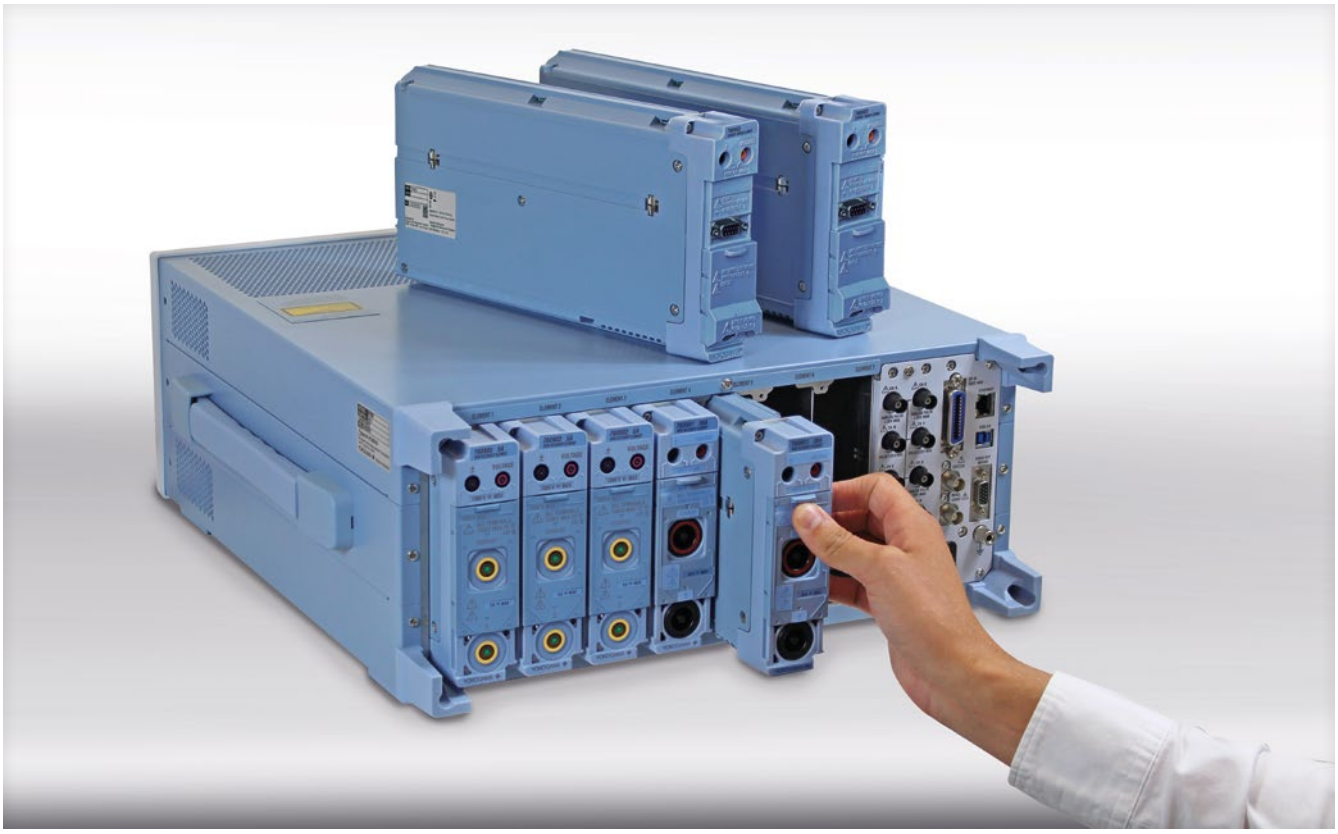


Image 4: The WT5000 precision power analyzer can accommodate up to seven user-replaceable input modules.

For such measurements, Yokogawa's WT5000 precision power analyzer is well suited. It can be equipped with up to seven user-replaceable and easily configurable input elements plus four motor channels. This makes the WT5000 an ideal instrument for measuring both electrical and mechanical power and efficiency.

The WT5000 supports direct current measurements up to 33 A and direct voltage measurements up to 1500 VDC, or 1130 VAC, with a sampling rate of 10 MS/s and a resolution of 18 bits. Higher currents can be measured using additional external current sensors. The active power bandwidth is 1 MHz, which is important for harmonic analysis of inverter signals at different rotational speeds.

The guaranteed active power accuracy at 50/60 Hz is ±0.03%, made up of 0.01% of reading plus 0.02% of RMS range, and applies for a measurement range utilization between 1% and 130%. Since inverters in electric vehicles already operate with very high efficiencies, high accuracy over a wide measurement range and high bandwidth are crucial so that engineers can efficiently validate and optimize drivetrain efficiency.

To additionally record temperatures and other parameters, such as status information at various points of the test object, Yokogawa's modular GM10 data acquisition system can be used, for example. It is equipped as standard with up to 10 measurement modules and can optionally be expanded to up to 420 measurement channels. Thirteen different measurement modules are available.

The recorded data can be synchronized with the measurement data from the WT5000. In addition, the optionally available WTViewerE software allows up to four Yokogawa power analyzers to be connected, making synchronized long-term measurements possible on multi-phase test objects with up to 28 power measurement channels. This should cover almost all requirements.

Data Centers: Validation of Energy Storage Systems and UPS Systems

New input modules for isolated oscilloscopes

In times of the AI boom and the advancing electrification of industrial processes, uninterruptible power supplies, or UPS systems, and energy storage systems form the basis for supply security and system stability.

At the same time, requirements are continuously increasing: higher power densities, faster load changes, and ever more complex power electronics require new approaches in measurement technology.

Especially with highly dynamic load changes, for example caused by AI servers, electric drives, or fast switching operations between grid operation and battery operation — complex electrical processes occur that must be analyzed precisely.

The challenge is no longer merely the acquisition of classic voltage and current waveforms. Rather, the decisive capability is to make the smallest signal changes on superimposed DC voltages visible without influencing the device under test itself.

At the same time, the analysis of voltage, current, and other physical quantities is required in order to fully evaluate the behavior of the overall system.

This results in clear advantages in the development and validation process. Root causes of faults in transient processes can be identified faster, critical signal components become visible, and the significance of the measurements increases substantially.

Yokogawa addresses these requirements with the ScopeCorder family, which combines oscilloscope and data recorder in one modular measurement system. With the new 720252 and 720301 input modules, Yokogawa is expanding the series specifically for applications in energy storage systems, power electronics, and modern energy infrastructures.

DC Offset Adjustment with the ScopeCorder

The 720252 module is particularly suitable for high-resolution analysis of the smallest voltage and current changes on signals with superimposed DC components. Thanks to the extended offset adjustment and high input impedance, sensitive battery cells and low-impedance energy storage systems can be analyzed in detail and with minimal measurement influence.

Power Calculation with the ScopeCorder

At the same time, the 720301 module acts as a bridge between classic power analysis and highly dynamic data acquisition. It has been specifically equipped with higher measurement accuracy and supports power calculation. During a load step or grid failure, voltage and current waveforms can be acquired synchronously and analyzed in real time. At the same time, power values can be calculated on a cycle-by-cycle basis, and dynamic processes in UPS systems, electric drives, or energy storage systems can be determined.

With more than 20 available input modules, the ScopeCorder series provides a flexible platform for demanding measurement tasks in research, development, quality assurance, and industrial validation.

SmartDAC+ Easy Predictive Detection for Heat Treatment Systems

AI-based continuous monitoring of system condition

Many operators of heat treatment systems face similar challenges: unexpected quality deviations, unplanned system downtime, rising maintenance costs, and a growing volume of data that is hardly used in day-to-day operations. At the same time, a shortage of skilled workers and increasing pressure for efficiency make stable and economical process management more difficult.

With the Equipment/Quality Easy Predictive Detection function, SmartDAC+ expands classic data recording with AI-supported analysis that uses existing measurement data to detect deviations early, without requiring special AI expertise.

Continuous Monitoring with the Health Score

In the continuous heat treatment process, SmartDAC+ continuously monitors the system condition based on a so-called Health Score. This key figure describes the stability of the process and reacts sensitively to changes in system behavior.

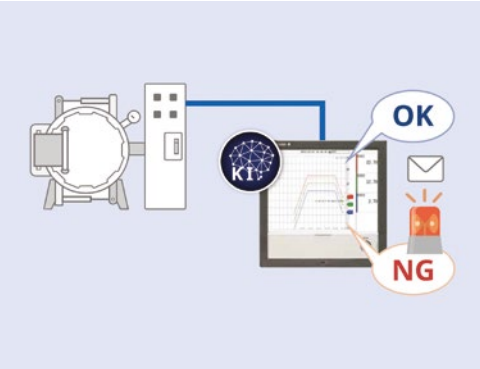
Typical signs of emerging problems include, for example:

- increasing temperature fluctuations, known as “hunting”
- unusual control movements of regulating valves
- unstable control loops

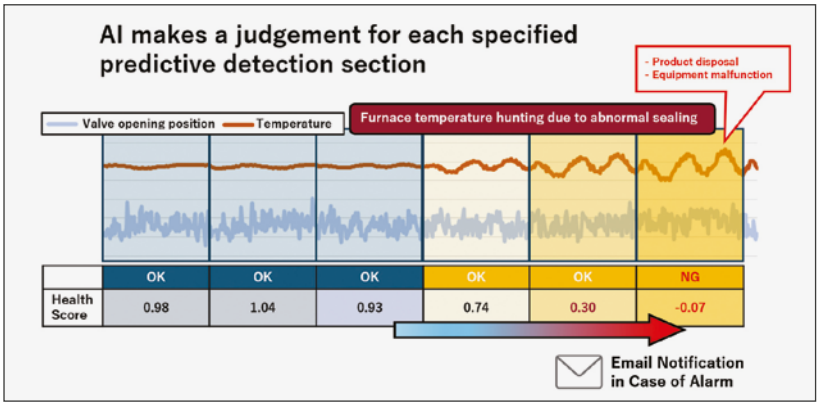
Even before classic limit alarms are triggered, the Health Score drops measurably. If it falls below a defined threshold, an alarm message is automatically sent, for example by email.

In this way, it is possible to:

- detect quality deviations at an early stage
- plan maintenance measures in a targeted way, as predictive maintenance
- reduce unplanned downtime
- narrow down causes such as leaks, burner problems, or contamination more quickly



SmartDAC+ AI alerts you to wear in items such as sensors or heating elements and to the resulting reduction in quality.



The Health Score decreases as system utilization increases and enables early detection of anomalies. As soon as it falls below the defined threshold, an email is sent.

Detecting Deviations Before They Become Critical
A key advantage is that not only limit violations are detected, but also changes in process behavior. For example, a slightly unstable temperature curve can be identified over a longer period of time, even if all measured values are still within permissible limits. In practice, this means that maintenance measures such as cleaning, readjustment, or component replacement can be carried out in a planned manner, before the deviation affects product quality or system availability.

Keeping Batch and Continuous Processes in View
Predictive Detection supports both continuous and batch-based processes:

- **Continuous Furnaces:**
  Continuous evaluation of system condition via the Health Score and early detection of anomalies in the process sequence.
- **Batch Furnaces:**
  Monitoring of individual batches based on defined temperature and process profiles.

Profile Function for Typical Process Curves
In addition to the Health Score, SmartDAC+ uses a profile function. Based on historical measurement data, typical curves of a stable process are determined and stored as reference profiles.

From this, upper and lower limit curves are generated automatically. Deviations from these curves are reliably detected, for example:

- delayed temperature rises, such as in the case of heater problems
- atypical temperature curves, such as those caused by leaks
- deviations in critical process phases

As soon as a process signal leaves the defined profile, an alarm is triggered, often much earlier than with classic limit values.

Easy Implementation Without AI Specialist Knowledge
Setup takes place in two steps:

1. Model creation:
Historical recording data, for example from SmartDAC+ or other recorders, is analyzed using a cloud-based or locally installed tool. This creates predictive models and reference profiles.

2. Integration into the recorder:
The models are transferred to SmartDAC+ and are then immediately available there for online monitoring. The entire process requires no in-depth knowledge of data analysis or artificial intelligence and can be integrated into existing systems.

Conclusion
SmartDAC+ Easy Predictive Detection expands classic process monitoring with a predictive component. By using existing measurement data, changes in system behavior can be detected early and evaluated in a targeted way. For operators of heat treatment systems, this results in concrete advantages:

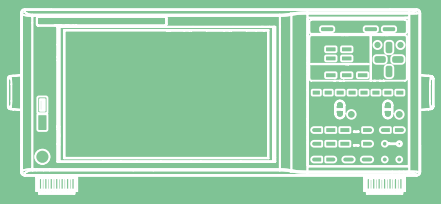
higher system availability, reduced maintenance costs, less scrap, and better use of existing process data, especially in environments with limited personnel resources.

Test&Measurement

YOKOGAWA

Events 2026

tmi.yokogawa.com/eu/news/events



Power-Workshops

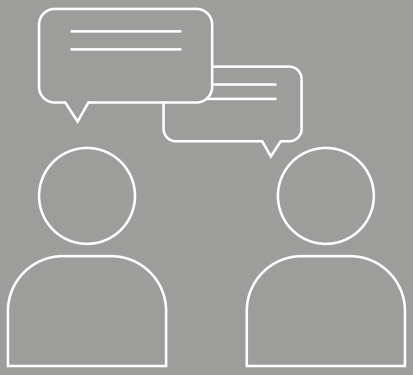
Fundamentals of Electrical Power Measurement

Power Workshop WT1800E/R*
20 - 22 October 2026, Herrsching am Ammersee

Power Workshop WT5000*
1 - 3 December 2026, Herrsching am Ammersee

Power Workshop 2027
Dates are announced and can be booked here

*Held in German



Events

Meet the Precision Makers

CIGRE
World's Leading Power System Event
23 - 29 August 2026, Palais des Congrès, Paris, France | B232

ECOC
European Conference on Optical Communication
21 - 23 September 2026, Málaga, Spain | Booth 2157

Coiltech Italy
Trade fair for coil winding, electric motor and transformers
23 - 24 September 2026, Pordenone Fiere, Italy | Booth 7-C08

Engineering Design Show
7 - 8 October 2026, Coventry Building Society Arena, UK

Electronica
World's leading trade fair for electronic technology
10 - 13 November 2026, Messe Munich, Germany | Booth 117

New

DL950 LITE ScopeCorder

The “smart deal” for individual high-speed measurement tasks

Benefit from proven DL950 technology with a compelling cost-benefit ratio, with support for up to four input modules or 16 channels when using the 4-channel modules. Ideal for demanding applications where flexibility, efficiency, and future-proofing are the focus.

Test&Measurement

Imprint

Issue: June 2026

Publisher:
Yokogawa Europe B.V.
Euroweg 2
3825 HD Amersfoort, The Netherlands
Phone +31 (0)88 464 1000
PrecisionMaking.EU@yokogawa.com
tmi.yokogawa.com/eu

Cover image: © Jörg Riethausen

Precision Making