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100 Years of Precision Making

Colophon

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Publisher:
Yokogawa Europe B.V.
Euroweg 2
3825 HD Amersfoort
The Netherlands
Tel: +31 88 464 1429
Fax: +31 88 464 1111
Email: tmi@nl.yokogawa.com
Web: tmi.yokogawa.com

Contributors:
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By: Hafeez Najumudeen, Product Marketing Manager, Power analysers and meters & Clive Davis, Marketing Manager

Making calibration meaningful for power measurements
By: Clive Davis, Marketing Manager & Erik Kroon, Manager European Standards Laboratory

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In 2015, Yokogawa celebrates 100 years of precision making and thus becomes one of 20,000 Japanese companies which are over 100 years old. This is in significant contrast to the average life of a company listed in the Fortune 500 index which has fallen to just 15 years. What's different today is that globalisation and the shift in power in the marketplace from buyer to seller is dramatically shortening the life expectancy of firms that are not focused on delivering value to customers.

Yokogawa is an example of a long lived company which is sensitive to its environment and has a cohesive innovative workforce with a strong sense of identity. These strengths enable Yokogawa T&M to provide enduring measuring solutions which continue to satisfy the demands of modern technology and a sustainable future.

The contents of this magazine are intended to provide a taste of some of the ways that our products help engineers and scientists bring their products to market and why this also results in a lasting partnership.

The first article in this edition explains why a versatile ScopeCorder should be considered for almost any measurement application particularly for those in electro mechanics or mechatronics. The ScopeCorder also appears alongside others in the second article which takes a broad view of the types of product which are available and suitable for the various stages in the development of power electronics. As the selection of an appropriate instrument for power measurement is also determined by the level of accuracy required, the third article explains the importance of ensuring that the instrument is calibrated according to the actual test conditions of the device-under-test.

In this way a product developer or test engineer can clearly demonstrate to their customers that their product meets the required accuracy in real world conditions.

We look forward to providing you with trusted measurement solutions now and in the future.

Clive Davis

Marketing Manager, Test and Measurement
Yokogawa Europe B.V.

10 reasons to choose a ScopeCorder

as your next measuring instrument

By: Kelvin Hagebeuk, Product Marketing Manager – ScopeCorders and high speed data acquisition

The ScopeCorder is a powerful portable data acquisition recorder that combines features of a multi-channel digital oscilloscope and a high-performance oscillographic recorder. As such, it can capture and analyse both short-term transient events and long-term trends for periods up to 200 days.

Using flexible modular inputs it combines measurements of electrical signals, physical (sensor) parameters and CAN/LIN serial bus signals, as well as being able to trigger on electrical power related events and carry out calculations in real time.

The ScopeCorder has several unique features that offer users of other types of measuring instruments an alternative measuring method to consider for their applications.

This article presents ten key features of the ScopeCorder, along with the reasons why users should consider choosing a ScopeCorder as the optimum instrument for their next measurement application.

1 Flexible and swappable input modules

The ScopeCorder's modular design allows users to choose from a range of 17 types of input modules, each with built-in signal conditioning, and install up to eight of these modules in the instrument at any time. This setup allows

Figure 1: Example of a 3 phase inverter output measurement. The signals shown on the display are: 3 phase voltage and current signals, real power-, and kWh trend and harmonic analysis shown in a bar graph overview.

time-synchronised measurements on up to 128 channels with a mixed selection of data-acquisition cards to measure electrical and physical parameters as well as logic signals and CAN/LIN bus signals. **See figure 1 above.**

2 Isolated and shielded measurement channels

Channel isolation allows measurements to be carried out on floating signals or to measure at different points of a circuit, where the grounds of those points are at different potentials, without having to use any special differential probes. The housing for the input modules includes both shielding for the single input channel and extra shielding for the housing of the input module. Using this double shielding method results in high noise rejection. Using internal high-speed optical fibre-based transmission, this module achieves high sample rates (up to 100 MS/s) and high resolution (up to 16 bits), and provides the performance needed for precise measurement of fast switching signals even in the harshest environments.

3 Capture detailed waveforms from milliseconds up to months

The ScopeCorder is equipped with a large and fast acquisition memory of up to 2 GPoint capacity, which enables high sample rates (up to 100 MS/s) on multiple channels simultaneously. For testing over longer periods of time – for example, days or weeks – data is typically acquired at lower sample rates. The ScopeCorder's "dual capture" function can record at two different sampling rates. As an example, it is possible to set waveform triggers and capture 5000 high-speed transient events at 100 MS/s while at the same time continuously recording a trend measurement at 10 kS/s for 10 hours.

4 Powerful trigger functions

The ScopeCorder allows the user to set different types of triggers on multiple channels to help investigation into what causes a particular transient event. A feature called "action on trigger" allows the user to leave a ScopeCorder unattended and automatically save the waveform to a file or send an email for notification of a trigger event. >>>

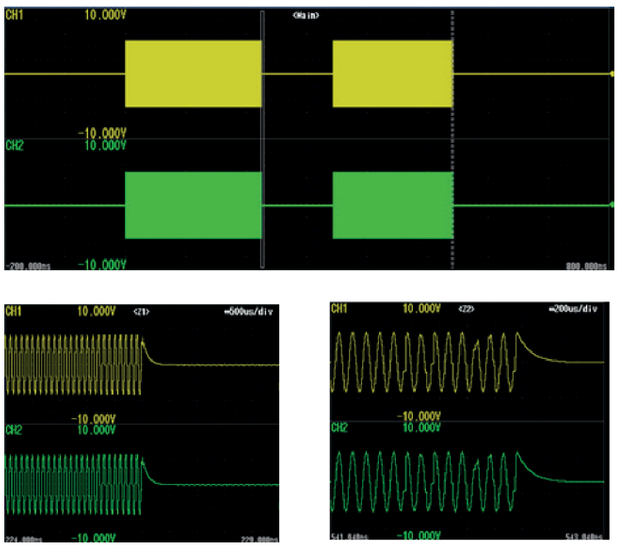

Figure 2: Giga Zoom Engine II

5 Giga Zoom Engine II

The ScopeCorder is equipped with Giga Zoom Engine II, a powerful processor designed for optimising access to data seamlessly. The user can activate two zoom windows while displaying the entire original signal, allowing long-term recordings to be observed while also examining every detail of the waveforms – for instance, to observe and analyse transient events. **See figure 2 above.**

6 Convenient analysis functions

Analysis after the measurement can be done on the instrument itself or with PC-based waveform analysis software. The ScopeCorder offers a range of built-in analysis functions including parameter measurements and cycle statistics.

7 Real-time mathematical computations and digital filtering

The ScopeCorder can perform mathematical calculations on acquired measurement data and display the results during waveform capture in real time. Steep digital filters can also be selected to isolate or trigger on the amplitude of certain frequency components. The user can also carry out trend calculations and can calculate and display up to 125 types of electrical power-related parameters in real time.

8 "Good to go" right out of the box

The ScopeCorder can be used immediately without any programming, and can also be easily taken from the laboratory environment into another location.
It can save most common measurement setups in its internal memory or can be loaded easily from a USB stick to start measurements at a convenient location without delays.

9 Supports integration with automated test systems

The ScopeCorder is equipped with Ethernet, USB and GPIB interfaces, allowing easy interfacing and integration within an automated test system.
Third-party software, including Visual C++/Visual Basic, MATLAB and LABVIEW, can be used to control the ScopeCorder and transfer measurement results.

10 Quality first

"Quality first" is an integral element in Yokogawa's development philosophy, and that is why the reliability of a ScopeCorder is supported by a standard 3-year warranty. Yokogawa's instruments are renowned for maintaining high levels of precision and for continuing to deliver value for far longer than other instruments.

Do you have questions about ScopeCorders?
Get in touch with a precision maker
at: **kelvin.hagebeuk@nl.yokogawa.com**
or visit **tmi.yokogawa.com/DL850E**

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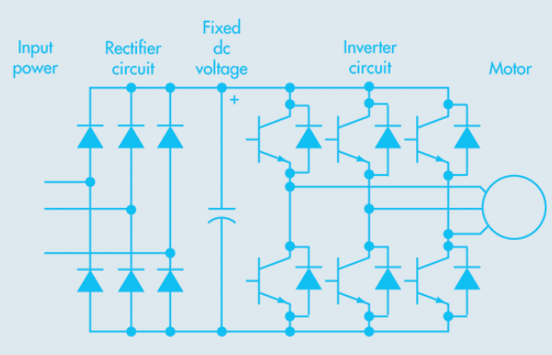
Testing Power Electronic Systems

By: Hafeez Najumudeen, Product Marketing Manager, Power analysers and meters & Clive Davis, Marketing Manager



With today's increased incorporation of power electronics and switching devices in overall system design, there is a growing need for accurate measurement of both the power behaviour of the applied power electronics and other inter-related electrical and physical parameters. >>>

>>> **To establish the types** of measuring equipment that are required for testing power electronics systems, it is useful to look at the various stages in the development of a power electronics product.

At the architecture and design stage, we are considering the development of individual parts and measurements includes characteristics such as fast inverter switching, high-frequency dynamic behaviour, overshoot on pulses, and the need to trigger on individual waveforms. Measurements of this type typically require a mixed-signal Oscilloscope with up to eight input channels to view input and output signals in three-phase systems. With a waveform-displaying product such as an oscilloscope it can seem easier to understand power measurement as even standard measuring features can be used to derive the value of active power.

The next stage is verification and prototyping at which the individual parts are combined and form the system under test.

To understand the dynamics of the application requires the measurement and analysis of a combination of electrical, mechanical and physical signals and, in automotive applications, signals from buses such as Can and Lin. For this type of measurement, ScopeCorders are used (Figure 1).

As a portable data acquisition recorder, it can capture and analyse both transient events and trends for long periods. Using flexible modular inputs they can combine measurements of electrical signals, physical parameters from sensors and Can and Lin serial buses, and can trigger on electrical power related and other calculations in real time.

In the efficiency validation stage, the key factors that need to be tested are power analysis, conversion efficiency, harmonics, and for instance the battery charge and discharge process. For tests of this type, the instrument of choice is the power analyser, offering high precision, high accuracy, high stability, and the ability to carry out calibrated measurements.

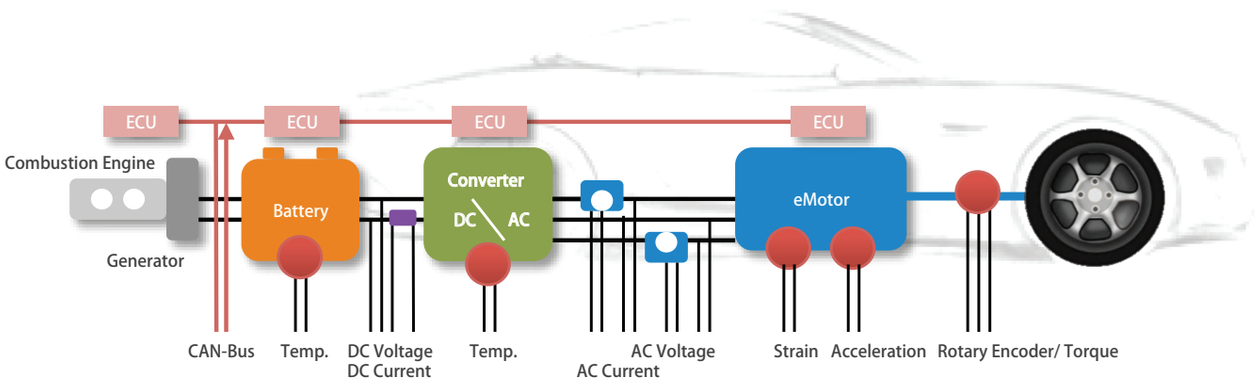


Figure 1: Schematic of electric car drive train.

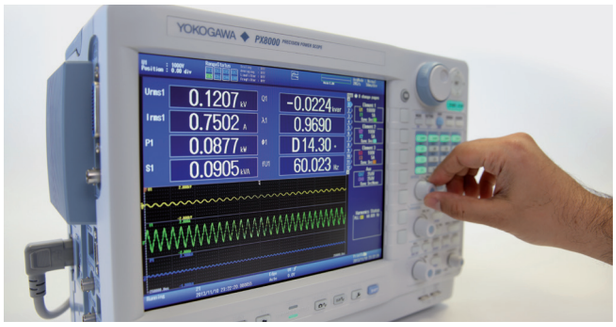


Figure 2: PX8000 Precision Power Scope

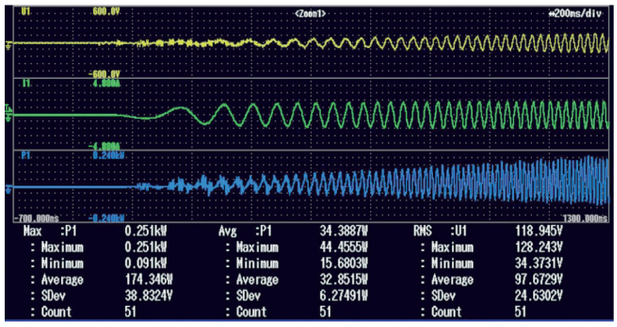


Figure 3: During the start-up phase of an inverter and motor in an electric or hybrid car, for example, current increases can be analysed in each cycle.

PX8000 Precision Power Scope

In addition to the dedicated instruments described above, engineers and R&D professionals are also looking for hybrid instruments that can be used at all stages of the development cycle. When the power consumed by the load varies – for example during the start-up of a motor – it may be necessary to measure power at much shorter intervals.

A specific requirement is to provide the time-based measurement functionality of an oscilloscope combined with the accuracy of a power analyser. Instruments such as precision power scopes (Figure 2) provide users with flexibility, accuracy and wide bandwidth, allowing them to draw together the range of power readings needed to optimise the efficiency of boost-circuits and inverters – two key elements in overall electric vehicle performance.

The PX8000 brings a new dimension to power analysis with the introduction of high-accuracy time-based measurement.

Like a power meter, a precision power scope is capable of accurately measuring steady-state power and related variables, since they share the same input techniques and measurement principles. However, as it also shares characteristics of oscilloscopes and ScopeCorders, it is capable of capturing and measuring the power arbitrarily over any part of the power waveform using start and stop cursors. This is particularly useful for examining transient phenomena and in the design of periodically controlled equipment. The trigger functionality helps to set various trigger conditions based on the analysis of the transient phenomena to understand the behaviour of the system under test. During the start-up phase of an inverter and motor in an electric or hybrid car, for example, current increases can be analysed in each cycle (Figure 3). And, when the load changes rapidly, the engineers can gain insights that will enable them to improve the control of the inverter.

For more information, visit **tmi.yokogawa.com**

Making calibration meaningful

for power measurements

By: Clive Davis, Marketing Manager & Erik Kroon, Manager European Standards Laboratory

The levels of precision in power measurement required in today's industry can only be achieved if the measuring instruments are properly calibrated with reference to national and international standards.

11 **Regular traceable calibration is** a method for gaining quantifiable confidence in a measurement system, and should enable instrument makers and their customers to have confidence in their test results.

However, with power measurements in particular, the situation is not so clear cut – to the extent that the accuracy figures quoted in manufacturers' specifications – and indeed some of the parameters listed in calibration certificates issued by well-established test houses – can be meaningless when taken out of context.

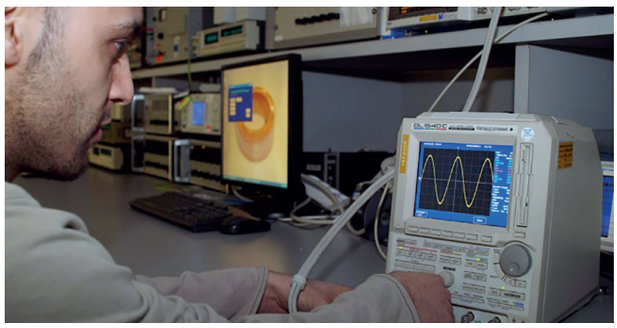
Consider, for example, power measurements at high frequencies. Traditionally, AC power meters are calibrated at frequencies from 50 to 440 Hz. Nowadays, however, there is a demand for power measurement at high frequencies on devices such as switch-mode power supplies, electronic lighting ballasts, soft starters in motor controls and frequency converters in traction applications.

Calibration of high-frequency power has lagged behind the development of power meters to address these applications, and few national laboratories can provide traceability up to 100 kHz. In fact, Yokogawa is the only industrial (i.e. non-government or national) organisation to offer this capability, and thus is the only power meter manufacturer which can directly prove the performance of its own instruments.

There are a number of other parameters involved in power measurements that determine the performance of an instrument in a particular application. It is no longer sufficient merely to list voltage and current specifications: today's power environment needs to address variables such as phase shift, power factor and the effects of distorted waveforms.

It is also important to calibrate the instrument under the right conditions. Many test houses still use pure sine waves to calibrate power meters, which renders the results virtually useless for users carrying out tests under "real world" conditions.

It is therefore important for users of power measuring instruments to look at the actual "calibrated" performance of different manufacturers' products rather than just comparing specifications. This is the key thinking behind Yokogawa's policy of having the Yokogawa European Standards Laboratory with minimal uncertainties and capabilities which are almost second to none. It is also reflected in the attention paid to the design of the input circuits in the company's precision power analysers, with an emphasis on wideband, high-linearity characteristics.



The Yokogawa European Standards Laboratory includes wideband and high-accuracy calibration systems as well as systems for calibrating other classes of test instruments.

'Low uncertainties and high-frequency power calibration'

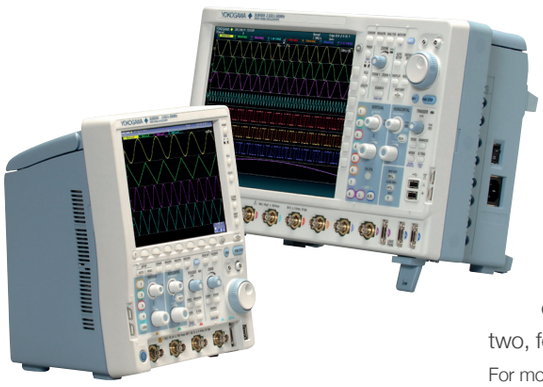
An indication of the high standards established by the laboratory is provided by a recent official Interlaboratory Comparison on low frequency (LF) power in which different accredited laboratories measured an object (a power meter) and the results were compared to reference values. This showed that the Yokogawa WT3000 power analyser proved to have the required accuracy, stability and ruggedness to enable it to be used as the measurement object in this interlaboratory comparison. The Yokogawa European Standards Laboratory also had the best stated uncertainties.

For more information, visit **tmi.yokogawa.com/calibration**

New /M3 option adds 250MPoints memory

to Yokogawa DLM2000 and DLM4000 MSOs

Yokogawa's DLM2000 and DLM4000 mixed-signal oscilloscopes have been enhanced with longer memory options.



Fundamentally, larger memories offer two advantages. The first obvious point is that more memory allows a longer acquisition time. The second is that, for the same acquisition time, using a larger memory can result in a higher sample rate – which actually means that the effective bandwidth of the measurement is increased.

There is yet a third benefit of a larger memory, which comes into play if the whole memory is not required for a particular measurement. For example, if the oscilloscope is equipped with a one megapoint memory and the instrument is set to use 100k points, theoretically it could capture ten acquisitions before the memory needs to be overwritten. This is the basis of the "history memory" used in Yokogawa oscilloscopes. If the history memory capability is combined with a fast waveform acquisition rate, it becomes possible to capture occasional anomalies and analyse them without having to rearm and retrigger the DSO. The search features can be used to isolate individual waveform acquisitions, which means that not only can the anomaly be analysed on its own channel waveform but the other input channels can also be analysed to help identify the cause of the anomaly. Using this approach, Yokogawa is able to offer MSOs with two, four and eight channels.

For more information, visit **tmi.yokogawa.com/scopes**

Upcoming events

LED & Lighting / RF & Wireless
24 March & 26 March
Cambridge & Oxford – UK

PCIM 2015
19-21 May, Nuremberg – Germany

Laser World of Photonics
22-25 June, Munich – Germany

Vermogens Elektronica
23 June, Den Bosch – The Netherlands

EPE 2015
8-10 September, Geneva – Switzerland

ECOC 2015
28-30 September, Valencia – Spain

News corner

Portable OTDR

The Yokogawa AQ7280 portable OTDR delivers the ideal combination of measurement automation, user-friendly operation and reliable performance to enable fast, precise optical fibre characterisation.

It features a multi-touch display and a 15-hour battery capacity.

For more information: scan this QR-code.

-40˚C to +85˚C oscilloscope probes

The Yokogawa 702902 and 702906 are 10:1 passive oscilloscope probes that operate over a temperature range from -40˚C to +85˚C, and are ideally suited to use in tests where temperature cycling is part of the test procedure.

For more information: scan this QR-code.