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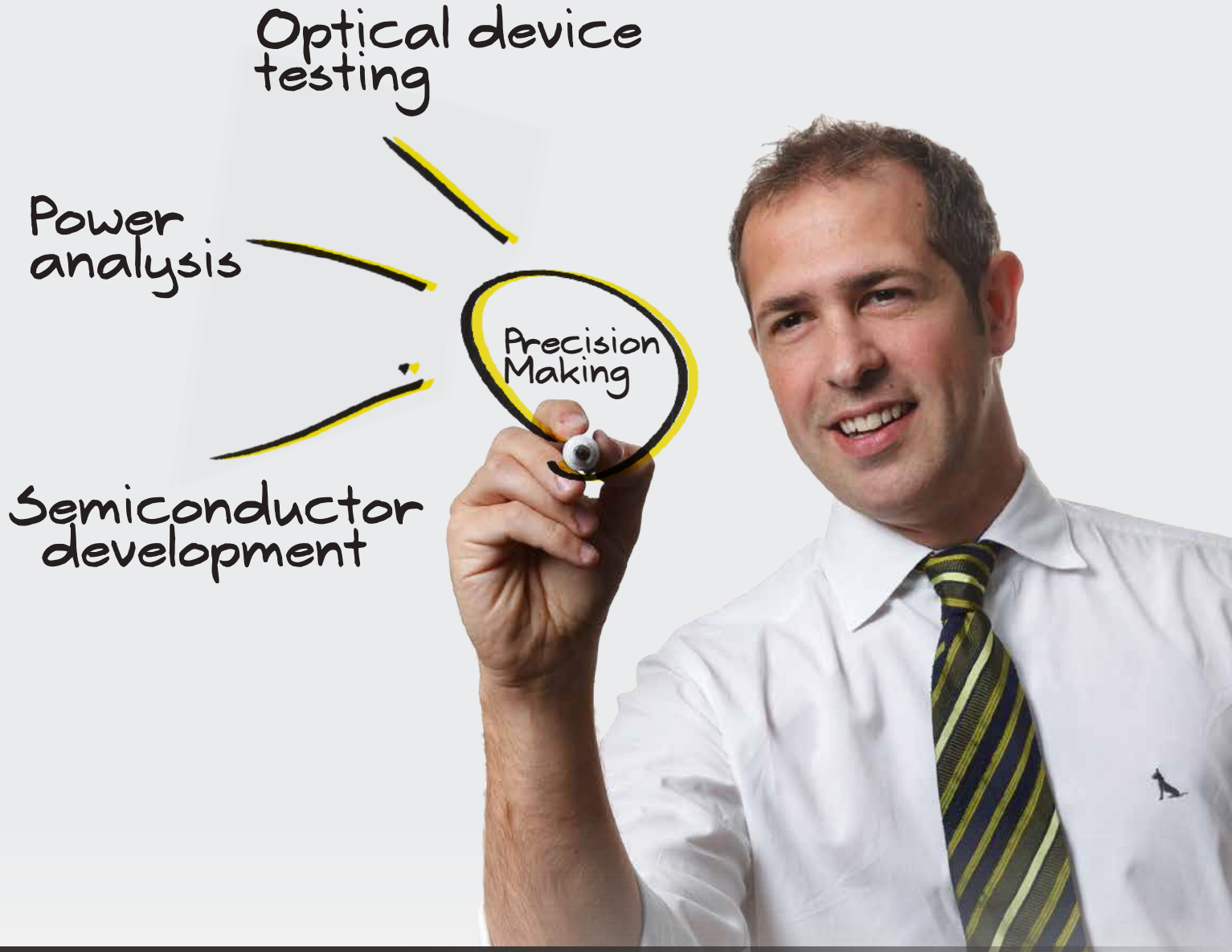

no.2

May 2014

Test&Measurement magazine

tmi.yokogawa.com

nbn Austria GmbH

Why Yokogawa Test & Measurement is the world's most trusted measurement partner

Colophon

Yokogawa Test & Measurement magazine is published twice a year.

Publisher:
Yokogawa Europe B.V.
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The Netherlands
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Where power meets precision
By: Hafeez Najumudeen, Yokogawa T&M Marketing

Yokogawa instruments form the heart
of Infineon's semiconductor
By: Infineon technologies AG

The AQ6377 optical spectrum analyser and
laser absorption spectroscopy
By: Paolo Magni, Yokogawa T&M Marketing

Plan B grafische dienstverleners – Assendelft,
graphic design and printing.

The Yokogawa Group's corporate philosophy has at its core, the goal, - 'to contribute to society through broad-ranging activities in the areas of measurement, control and information'.

Yokogawa Electric Corporation was established in 1915 by Dr. Tamisuke Yokogawa to manufacture the first electric meters in Japan. Measurement was the foundation for the original business and remains a strong and important driver for our business. Ever since those early days, Yokogawa has been providing products and solutions that continue to satisfy the ever changing demands of modern technology. Keeping ahead of technology measurement needs has involved dedicated focus, strong attention to detail, specialist and highly experienced engineers and above all the belief that no product or solution leaves the Yokogawa manufacturing line without being of the highest quality.

Measurement is important to us all. It is the ability to quantitively express certain physical values that provide indications to the quality, performance and function of the item being measured. To ensure the quality and performance, the measured value must be reliable. It is not sufficient for a measuring instrument to measure only on given days. It must obtain the same value over intervals of time, regardless of the environmental conditions it must endure. That is why the spirit of 'quality first' is an integral element in meeting our corporate philosophy goal.

With almost 100 years of experience, we have built our reputation on understanding the needs of scientists and engineers that require both the accuracy of a measurement system and its precision where stability and reproducibility ensure that repeated measurements under unchanged conditions show the same results.

A measurement system can be accurate but not precise, precise but not accurate, neither, or both. A measurement system is considered valid if it is both accurate and precise. In Yokogawa T&M, we are in the business of accuracy and precision. 'Precision' is what we make and 'Precision Making' is what we do. We are the 'Precision Makers'.

That is why scientists and engineers see Yokogawa T&M as the world's most trusted measurement partner.

Yo Kaneko
President
Yokogawa Meters & Instruments Corporation

The world's first Precision Power Scope:

Where power meets precision

By: Hafeez Najumudeen, Product Marketing Manager - Power Meters & Analysers

Yokogawa has combined its world-leading expertise in power measurement and its long heritage in oscilloscope design to create the world's first Precision Power Scope: the PX8000.

The PX8000 brings oscilloscope-style time-based measurement to the world of power measurement. It can capture voltage and current waveforms precisely, opening up applications and solutions for a huge variety of emerging power measurement problems.
As more and more innovation focuses on energy efficiency and the integration of electronics into power-based systems, more and more engineers are demanding accuracy and precision from their power measurements. With the launch of the PX8000, engineers need no longer compromise on their need for high-accuracy time-based power measurement: a need that conventional power analysers and oscilloscopes were never designed to meet.

The PX8000's power measurement capabilities are supported by Yokogawa's reputation for measurement accuracy, stability and repeatability. The instrument also offers ease of use and a short learning curve thanks to features familiar to users of Yokogawa's existing families of power analysers and oscilloscopes.

The new instrument has 12-bit resolution with 100 MS/s sampling and 20 MHz bandwidth. This means that the PX8000 can be used for accurate measurement of inverter pulse shapes, which can then be used to fine-tune inverter efficiency. A choice of input modules covers voltage, current and sensor measurements at voltages up to 1000 V RMS and currents up to 5 A RMS (higher values are possible with external current sensors), with basic accuracy down to ±0.1%.

To evaluate three-phase electrical systems, at least three power measurement inputs are required. The PX8000 goes one better by not only having four inputs but also enabling the simultaneous capture and display of voltage and current across all three phases.

In addition to delivering precision power measurement to give true insight into energy consumption and performance, the PX8000 incorporates a number of innovative features that support the crucial measurement and analysis of transient power profiles. It provides simultaneous voltage and current multiplication to give real-time power sampling, supporting both transient measurement (as standard) and numerical values averaged across the sample period. Up to 16 different waveforms – including voltage, current and power – can be displayed side-by-side, giving engineers instant “snapshots” of performance.

The PX8000 is powered by Yokogawa’s isoPRO™ technology, which offers industry-leading isolation performance at the highest speeds. isoPRO core technology, designed with energy-saving applications in mind, delivers the performance needed to evaluate high-efficiency inverters that operate at high voltages, large currents and high frequency.

The PX8000 has built-in functions for the direct calculation of derived parameters, such as root mean square (RMS) and mean power values, to enable the identification of cycle-by-cycle trends. The PX8000 provides graphical displays of voltage, current and power readings which can be inspected for specific numerical values at any point or for calculating average values over a specific period.

The instrument also supports the capture of power waveforms over specific periods of time through the definition of start and stop “cursors”. This is particularly useful for examining transient phenomena and in the design of periodically controlled equipment. To ensure that such equipment complies with energy standards, it is vital to measure power consumption across a range of different modes from “sleep” to full activity – and all the transient states in between.
The PX8000 offers X/Y display capabilities which can be used, for example, to show the speed/torque characteristics of motors. It can also display Lissajous waveforms of input and output for phase analysis.
Like other members of Yokogawa’s digital oscilloscope family, the PX8000 incorporates a history memory function that automatically records up to 1000 historical waveforms which can be recalled and redisplayed at any time. Recorded waveforms can also be used to redefine

>>>

>>> trigger conditions. Historical waveforms are explored via condition-based searches to locate specific hard-to-isolate abnormal phenomena during repeated high-frequency measurements.

A variety of functions including arithmetical calculations, time shifting and Fast Fourier Transforms enable users to display waveforms with offsets and skew corrections. An automatic de-skewing function eliminates offsets between current and voltage signals that may be caused by sensor or input characteristics. Users can also define their own computations via equations that combine differentials, integrals, digital filters and a wealth of other functions.

‘Compromise is no longer needed when making time-based power measurements’

The PX8000 makes it possible to simultaneously measure the harmonic components of voltage and current waveforms as well as the harmonic distortion factor. The high precision harmonic measurements take place in parallel with conventional voltage and current measurements. Harmonics up to the 500th order of the fundamental can be measured.

Applications for the PX8000 cover everything from sustainable power to advanced robotics. Typical application sectors include inverter and motor testing, reactor loss measurement of inverter boost circuits, transient responses of industrial robots, wireless charger efficiency measurement, and voltage and power measurements in electricity distribution systems. Any situation where power consumption is at a premium – which means almost anywhere power is consumed – can benefit from the introduction of the PX8000’s precision measurement and analysis capabilities.

Yokogawa instruments form the heart of Infineon's semiconductor

By: Infineon Technologies AG, Neubiberg bei München, Deutschland, www.infineon.com

Test instruments supplied by Yokogawa form the heart of an automated test rig developed by semiconductor manufacturer Infineon for evaluating the company's latest generation of power management chips. >>>

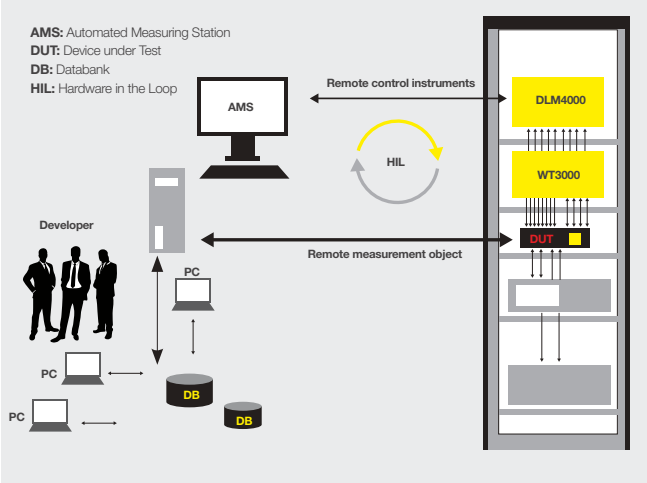
<< Johannes Loibl checks the settings of the DLM4000 8-channel oscilloscope

>>> **To ease the development** of end products using these devices, Infineon offers standardized evaluation boards which can be used with a number of standard applications. These not only demonstrate the capabilities of a semiconductor device: they also will serve as a basis for customers developing their own applications. Infineon also uses these boards as an aid to the design and evaluation of the semiconductors: in particular, the various tests that are needed to specify the hardware and software functions of the controller ICs.

Because of the increasing complexity of the controller and the ever shorter development cycles, these tests have to be specified during the actual development of the semiconductor device. In the further phases of the development process, the tests have to be repeated as the hardware or firmware changes in order to verify the correct functioning of the chip.
Infineon needed to develop tests that could be carried out as automatically as possible – while also creating individual test procedures that could be used over and over again for a variety of projects, applications and components. Depending on the end requirements, these individual tests could then be combined in different configurations.
“As part of a pilot project, we are developing a set of universal individual tests, a multi-purpose test and a higher-level framework with software tools, workflows, and a repository. Later we want to transfer this concept to other applications”, says Sergei Kunz, Project Manager for the automated test framework at Infineon’s plant at Neubiberg, Germany.

The individual tests are currently created in LabView, with each section checking a function or performing specific measurements. The test cases are designed to be as generic as possible, so that the developer only has to specify the parameters for the test. The tests are usually structured to produce only “pass” or “fail” results. For a voltage measurement, for example, the user has to ensure that there is only one test point, and then specify a date and an upper and lower voltage value as a parameter. How and what this

Sergei Kunz from Infineon (2nd left) and Johannes Loibl from the University of Deggendorf (3rd left) explain the test setup to Klaus Thalheimer and Johann Mathä from Yokogawa



Automated Testing Framework: the developers from Infineon can use the Framework with a Test station. The DUT (Device Under Test) is usually a specific semiconductor chip on an evaluation board, shown in red.

measurement consists of is defined in the test case. This not only leads to ease of use: it also means that there is a high degree of reusability of the various test modules involved.

The actual tests are carried out on a “universal” test rig using largely standardized test procedures. Since the test objects are usually relatively simple, the test set-up consists of only a few components. This includes a Yokogawa DLM4000 8-channel oscilloscope, a Yokogawa WT3000 power analyser, an AC source and a load. The devices are connected via a USB bus, GPIB interface or Ethernet to a Lab PC which is a part of automated test framework.

The DLM4000 oscilloscope features eight analogue channels in addition to over 24 digital channels, allowing the input and output voltages to be detected and displayed alongside the output current and some digital signals. As a result, the various signals can be checked for faults and parameters can be measured in the time domain.

“Yokogawa has a long history of producing oscilloscopes with features that lead to rapid results, such as cursor measurements with pulse width modulation”, says Sergei Kunz. “With the WT3000 power analyser, the input and output power, harmonics and flicker are measured and a pre-compliance test is performed. This gives the developer a first insight into whether the circuit complies with standards and regulations in areas such as noise emission.”

‘Yokogawa has a long history of producing oscilloscopes with features that lead to rapid results.’

The AQ6375 optical spectrum analyser and laser absorption spectroscopy

By: Paolo Magni, Product Marketing Manager – Optical T&M Instruments

Initiatives to reduce greenhouse gases have led to the development of techniques for detecting small concentrations of gas molecules with high sensitivity.

One of these techniques is laser absorption spectroscopy, which measures the concentration by slightly modulating the oscillation wavelength of a laser around the absorption wavelength specific to the gas molecule being detected and then measuring the change in light intensity due to molecular absorption (Fig.1). Most greenhouse gases have relatively strong absorption lines in the short-wave infrared (SWIR) region around 2 μm.
The lasers used in absorption spectroscopy require excellent single-mode operation performance, which directly determines the limits of detection. They also have to produce a stable oscillation in the absorption region in order to achieve sensitive detection of the gas of interest.
Existing lasers that support a single vertical mode oscillation in the SWIR region include DFB-LD (distributed feedback laser diode) and VCSEL (vertical-cavity surface emitting laser).

The Yokogawa AQ6375 optical spectrum analyser is suitable for testing the laser sources used in absorption spectroscopy, and is capable of achieving high optical performance for measurements in the SWIR region. Operating over the broad wavelength measurement range from 1200 nm to 2400 nm, it can measure the optical spectra of the semiconductor lasers described above.

‘Yokogawa OSAs are also invaluable for environmental sensing applications’

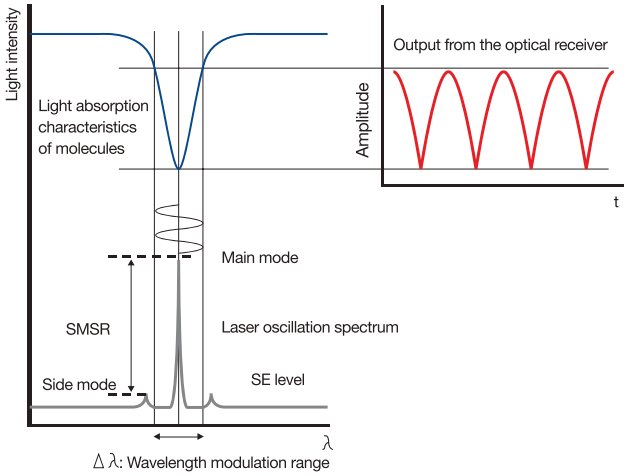


Fig.1 – Laser absorption spectroscopy technique

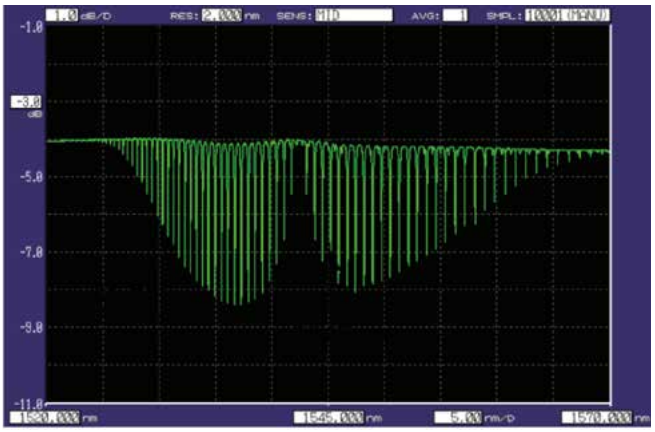


Fig.2 – Hydrogen Cyanide $H_{13}C_{14}N$ absorption spectrum measurement

Important parameters for evaluating the performance of these lasers are the side-mode suppression ratio (the amplitude difference between the main mode and the side mode), and the spontaneous emission level (the amount of background noise light). Both parameters can be accurately and quickly measured by the AQ6375 thanks to its high wavelength resolution (0.05 nm) its high close-in dynamic range (55 dB), its high sensitivity (-70 dBm) and its short sweep time (0.5 sec for any 100 nm span in 'auto' mode).

The AQ6375 can also be used to measure the absorption spectrum of a mixture of gases with different absorption wavelengths, using a tunable laser or a broadband light source like a super-luminescent diode or a super-continuum source to illuminate the gas mixture.
When used with a tunable laser, the AQ6375 can perform a sweep of the wavelength span of interest synchronised with the light source using its 'TLS sync sweep' function, which produces an absorption spectrum similar to that shown in Fig.2. With a broadband light source, the absorption spectrum of the gas mixture will be the result of the filtering action that is performed on the incident light by the high-precision Czerny-Turner monochromator which lies at the core of the AQ6375. The result will be similar to Fig.2, but because the broadband light source has a lower power density (mW/nm) than a laser, the spectrum will be much more attenuated.
In either case, The AQ6375 can clearly measure the low-power absorption spectra of gas mixtures illuminated by broadband light sources thanks to its high sensitivity (-70 dBm) and its special free-space optical input. This input will also accept multi-mode fibres (both GI50 and GI62.5, which can collect and carry more light than a single-mode fibre) without being affected by the high coupling losses characteristic of the common optical input structure adopted by other optical spectrum analysers.

The world's most accurate power analyser for the transformer industry.

'How can we reduce losses? Precisely.'

"The accuracy of the power measurements is currently one of the most important factors in minimising the no-load losses in transformers. The manufacturers of power turbines frequently have a penalty clause in their contracts regarding the level of these losses, and they risk paying heavy fines if the no-load losses are too high. The level of these fines can be judged by the fact that it can cost about 11,500 euros per kilowatt lost, making it vital to be able to measure the losses with great precision. My experience in this sector reinforces my belief that it is important to maintain power measurement accuracy thorough the transformer life cycle from R&D, though production and installation, to service and maintenance, and the Yokogawa WT3000T has certainly enabled us to rise to this challenge."

Claes Hugoson
CEO of Elektrisk Drivteknik AB, Sweden

For more information visit the product page:
tmi.yokogawa.com/WT3000T

Upcoming events

Vermogenselektronika
24 juni 2014
Delft, the Netherlands

LED & RF
September 9 2014
Manchester, UK

ECOC 2014
22-25 September 2014
Cannes, France

Power & Sensor Technologies
28 October 2014
Oxford, UK

News corner

New firmware for the DLM2000

Firmware version 2.37 for these 2 and 4 channel mixed signal oscilloscopes also adds automated power parameter measurements to the /G4 option and increases the maximum number of serial buses which can be simultaneously analysed.

For more information: scan this QR-code.

New DL850E ScopeCorder adds real-time power measurement.

The increased incorporation of power electronics and switching devices found in industrial and transport systems poses new requirements for data acquisition recorders. This article explains why real-time power measurements enable faster development cycles and fault finding tasks.

For more information: scan this QR-code.

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