



As the drive to improve the environmental friendliness, safety and comfort of new vehicles continues, test and measurement instruments are playing an increasingly fundamental role

Made to measure

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With experience in developing measurement systems that dates back over a century, Japanese company Yokogawa is focusing its automotive arm on the measurement challenges associated with energy conservation, efficiency and sustainability – in the belief that, sometime between 2030 and 2050, the use of pure internal combustion engines will dwindle or disappear, and electric and hybrid vehicles will take over.

Of the company's vast portfolio of products that help users to save and accurately measure energy, 2-, 4-, and 8-channel oscilloscopes play a central role in capturing, analyzing and troubleshooting data in both electrical and real-world physical signals. In recent months, new bus support has been added to Yokogawa's oscilloscopes, most recently to facilitate PSI5 – a product mainly used in airbag testing.

Adaptable technology

The company also offers the ScopeCorder product family – high-performance and flexible multi-channel test instruments that combine the benefits of a mixed-signal oscilloscope and a traditional data acquisition recorder. These offer more memory than an oscilloscope, the ability to have isolated inputs, and 16-bit high resolution. “They can be adapted according to the application and they can be changed, which means if users have a system that is complex, with a large variation of input types, the unit can accept these directly,” says Clive Davis, Yokogawa's European product manager. “In an automotive and transportation environment, where there are lots of physical and electrical inputs, there are buses in the vehicle. One of the challenges is to diagnose the interaction between the physical sensors, the ECUs, and anything else that is going on in the vehicle, so for those

sorts of application we also offer serial bus monitoring such as CAN, LIN, and SENT, and then users can categorize the whole system irrespective of what the actual inputs are that are coming in.”

A ScopeCorder can be used to decode CAN, LIN-Bus, or SENT signals and display information on physical data, such as engine temperature and vehicle speed, as analog waveforms. This can then be compared with data coming from real sensors.

While external packages can be supported, much analysis can be completed within the product itself, as well as outputting data in real time, so “if a user has data-sensitive applications, we can maintain redundancy on that data by simultaneously capturing both internally and externally”, adds Davis. With up to 2GB of acquisition memory in the instrument, the data can be searched and viewed with ease.

Yokogawa's ScopeCorder DL850E and ScopeCorder DL850EV are aimed at whole-system diagnostics and characterization, as Davis explains: "We have to continuously develop new features, new plug-in modules that enable the platform to address emerging application areas or satisfy our users who are currently utilizing the product but need to use it for different applications."

Practising precision

Yokogawa is also a market leader in precision power measurement. In the past few months, the successor to the company's WT1800 series has been introduced. "The WT1800E is our precision workhorse instrument," says Davis, "in that we have added new features including a more flexible data update interval setting with an automatic mode, for fluctuating input signal frequencies such as during motor startups. We have also reduced the influence of power factor on accuracy, increased the ability to handle large crest factors of up to 280 with specified accuracy, improved basic specified accuracy to 0.05% of reading and 0.05% of range, and enabled new interfacing to be performed." The instrument is available with up to six input channels at 2MS/s.

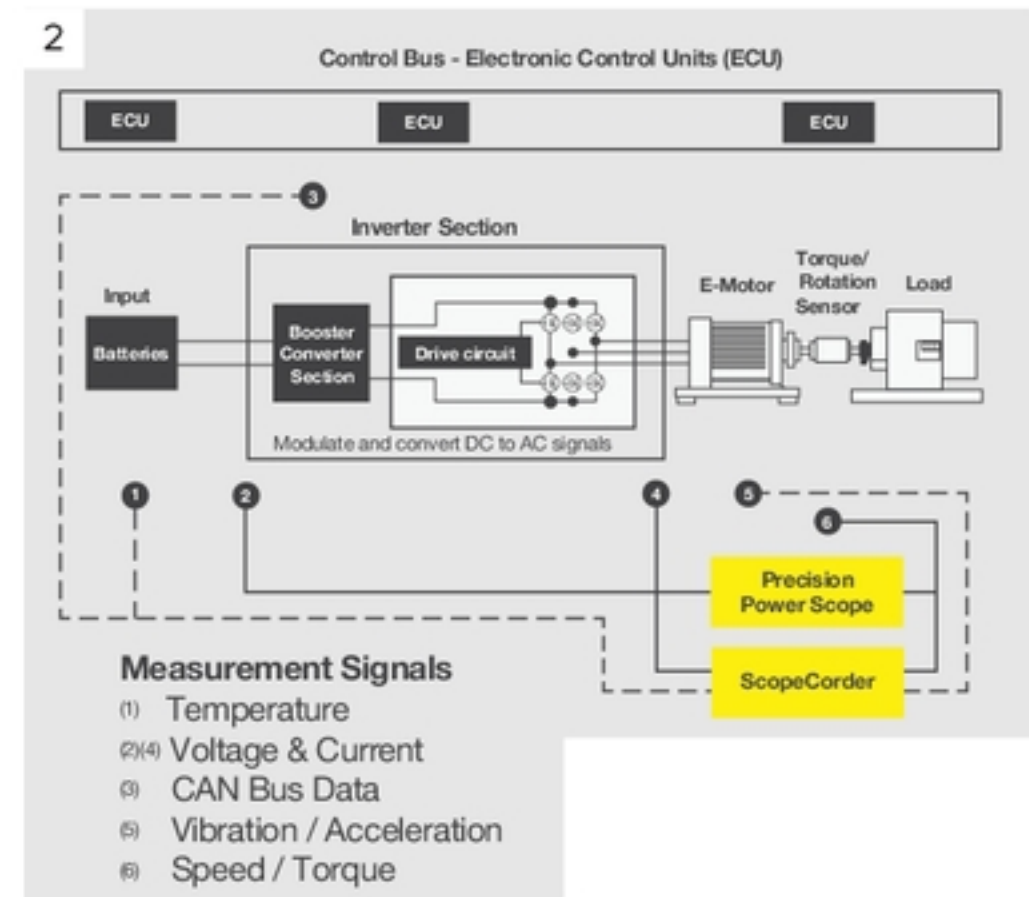
"What we find with our instrumentation," Davis continues, "is there's high usage in test benches. We see more and more automation of the testing process, so in those sorts of environments we install many power meters and data acquisition tools. We support a wide range of interfacing and language requirements, and offer native support for external analysis

tools such as MATLAB, and we are now introducing Modbus/TCP and Ethercat support on our products as well."

One of the most important requirements for Yokogawa's customers, Davis states, is validation. This is in part due to their need to satisfy the requirements of the EU's climate and energy framework, and other regions' alternatives. "To fulfill this, you have to be able to measure very accurate energy usage and energy saving," he explains, "so we regard the ability to make the most accurate measurements in this area, for all products, to be of vital importance."

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Clive Davis, European product manager, Yokogawa



1: Test and measurement instruments are increasingly important to EV development

2: Test setup for powertrain drive system with a number of additional parameters and measurement points

3: Yokogawa's mixed-signal oscilloscopes now support PSII5

Measuring up

To this end, Yokogawa has developed its own ISO 17025-accredited laboratory at its European HQ in Amersfoort, Netherlands, where engineers can calibrate power up to 100kHz. "This is important because as we are looking at different ways to transmit energy – in the automotive industry, for example, as part of which there is discussion about potentially large uses of wireless charging – accurate measurements at higher frequencies are required," Davis explains. "So with our range of products that are able to cover this, and also offer the highest accuracy and validated measurements for this, it is an area where we will continue to invest in R&D. We can calibrate at 100kHz today, but as industry requirements change, and as the frequency requirements and transmission frequencies of power applications change, the level we can calibrate will, by necessity, have to increase."

When asked about the industry's current trends and how they might influence other future developments, Davis sees interest in increasing the level of power for electric vehicles. As this grows, he explains, energy demands will increase, as will the need to conserve energy. "Therefore, a product that is able to follow that energy and power usage, regardless of the frequency the device is using, will be important."