

# Meeting the measurement challenge

A new generation of 8-channel mixed-signal oscilloscopes enables engineers to address many measurement challenges presented by the complex electrical and electronics signals found in today's industrial control and power systems, according to **Clive Davis of Yokogawa Europe**

**A**s intelligent control permeates more and more sectors of the industry, from industrial drives and controls to power systems, the signals that engineers need to look at for testing become faster and more complex. In the development of power devices and motor inverters, for example, high-speed measurement of the ungrounded voltage and current is necessary to improve the efficiency, the functionality and the reliability.

In such applications, it is necessary to capture the actual voltage and current waveforms for evaluating the switching loss inside the power devices. Checking the surge voltage and current and observing the timing of the gate signal are also necessary.

This process involves a multiplicity of measurement points. A three-phase inverter, for example, has six switching power devices, and there are three voltages and three currents in a three-phase motor. In many cases, it is also necessary to monitor additional parameters such as digital control and alarm signals or physical parameters such as position or speed from external sensors.

For many years, the tool of choice for such measurements has been the oscilloscope: originally an analogue tool but now almost universally based on digital storage and signal-processing technology. In recent years, the

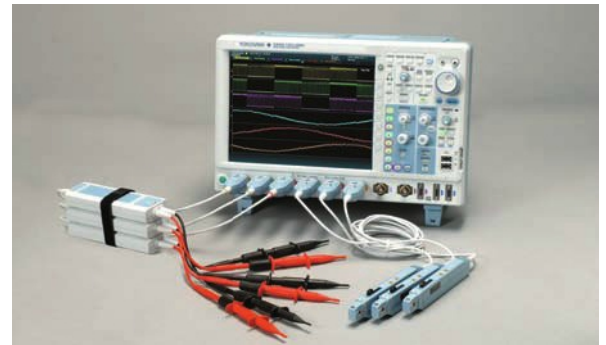
task of making complex measurements has been greatly eased by the advent of the mixed-signal oscilloscope (MSO), which captures and displays analogue waveforms alongside digital signals.

The MSO is typically used in combination with differential probes and current probes to measure signals from various points in an effort to evaluate and analyse the relationship between the different elements of the system under test. Up until now, however, it has been increasingly difficult to measure all the necessary points simultaneously, because the first generation of MSOs had only four analogue inputs, limiting users to measurements on only part of the whole system.

## Eight-channel measurements

Yokogawa has introduced the DLM4000 Series which comprises two models, with bandwidths of 350 and 500MHz and a sampling rate of 1.25 gigasamples per second (GS/s), expandable to 2.5 GS/s with interleaving. The channels can be allocated as eight analogue channels or seven analogue channels plus one 8-bit digital input. A future option will add 16 more channels of logic to allow seven channels of analogue plus a 24-bit digital input.

The new instruments feature long memory, allowing both long recordings and multiple waveforms to be



**Yokogawa's DLM4000 mixed signal oscilloscope is features eight channels**

acquired. A history memory function, which does not reduce the oscilloscope's high waveform acquisition rate, allows up to 20,000 previously captured waveforms to be saved in the acquisition memory, with any one or all of them displayed on screen for cursor measurements to be carried out. Waveforms can be displayed one at a time, in order, or automatically played back, paused, fast-forwarded or rewound. The history memory in combination with the advanced waveform search and automatic measurement features enable users to capture, see and analyse the details of anomalies on individual waveforms when their characteristics are still unknown.

Advanced measurement and analysis features include histogram and trending functions, digital filtering, zoom windows, user-defined mathematics and serial bus analysis.

The instruments incorporate a large high-resolution XGA display, and yet are housed in a compact body 18cm deep and weighing just 6.5kg. Other features include backlit buttons, additional knobs and jog shuttle, on-screen information in English, German, French, Italian and Spanish languages, two zoom windows with 80:20 or 50:50 zoom/main area split, and a choice of first-cycle or screen average mode for frequency measurement.

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## Injection moulders aim for zero defects



**T**he many injection moulding companies based in Ireland will be striving to meet the demand from end users for zero parts per million defects and avoid the significant costs incurred from just a few out of spec parts in a delivery.

A similar issue was addressed by Barkley Plastics in Birmingham, which produces 6.5 million injection moulded parts each month. Like many injection moulders, Barkley has been using cavity pressure monitoring for several years to try to identify out of spec parts before they get into the delivery system.

Barkley had been using a simple two-channel peak pressure monitoring system that was difficult to set-up and had become problematic. To protect its reputation and bottom line, two of the old systems have now been replaced with the latest four-channel CoMo Injection systems from Kistler Instruments. This new, state-of-the-art system cost about the same as the old system did 10 years ago making the much more sophisticated CoMo Injection system good value for money.

According to Barkley's business development manager, Matthew Powell, by monitoring all aspects of the cavity pressure curve during the moulding process, the CoMo system ensures that all out of spec parts are rejected quickly and reliably. "Because the CoMo system automatically provides perfect rejection of faulty parts, it is possible to run the moulding machines in the dark with little or no supervision."

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## Application benefits

The ability to measure eight channels of analogue input at 500MHz bandwidth means all the waveforms in a drive system can be captured simultaneously. It becomes efficient and convenient to check the total balance, timing and relation between each component.

## Conclusion

The combination of eight-channel acquisition and display with advanced mixed-signal technology has resulted in a range of instruments suited to test and debugging applications in the embedded systems, power electronics, mechatronics and automotive sectors.