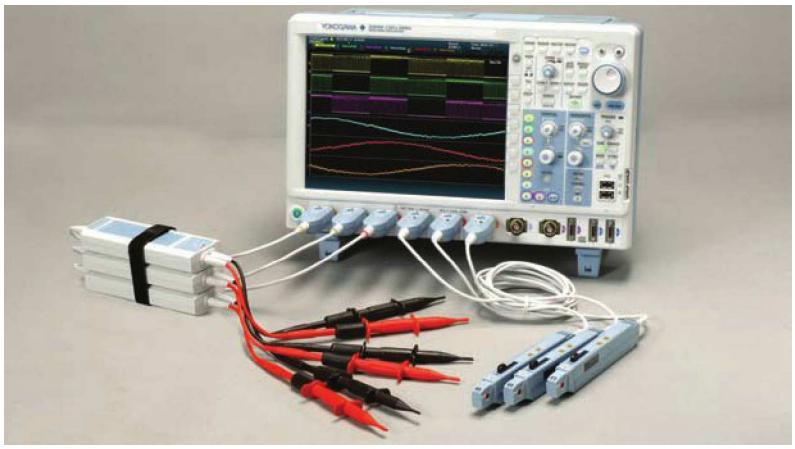
Getting mixed signals

With the signals engineers need to examine for testing becoming faster and more complex, a new generation of 8-channel oscilloscopes has been developed to address demands. **Clive Davis** from Yokogawa Europe explains

As 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 efficiency, functionality and 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.



The Yokogawa DLM4000 Series of 8-channel mixed-signal oscilloscopes

This process involves a multiplicity of measurement points. A 3-phase inverter, for example, has six switching power devices, and there are three voltages and three currents in a 3-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.

Similar challenges occur in the power-supply area. Many problems in electric devices are related to the power supply, where effects such as fluctuations, noise and ripple can affect the stability of the whole system. The design and troubleshooting processes for power management and start and shutdown sequences are becoming more complicated, and the signal timing between many points must be checked and adjusted precisely.

Traditionally, the measurement tool selected to carry out these tests has been the digital oscilloscope. Engineers, however, are increasingly finding that the standard four channels provided on many oscilloscopes are insufficient to handle the numbers of waveforms that need monitoring in today's power applications.

A new generation

To address these challenges, a new generation of 8-channel mixed-signal oscilloscopes has been developed to offer comprehensive measurement capabilities for embedded, automotive, power and mechatronics applications.

The two models in the range offer bandwidths of 350 and 500 MHz and a sampling rate of 1.25 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, allowing seven channels of analogue plus a 24-bit digital input.

Not only do these oscilloscopes provide enough channels for analogue applications such as 3-phase voltage and current measurements, but they also enable users to view the actual waveform shape of digital signals. This helps the digital debug process as glitches are often caused by such things as noise and crosstalk which are invisible when viewing just '1's and '0's.

Another key feature is the long memory of up to 62.5M points per channel and 125M points in interleave mode. This allows both long recordings and multiple waveforms to be 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 feature enables users to capture and see 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 benefits

With the new 8-channel MSOs, the ability to measure eight channels of analogue input at 500 MHz bandwidth means that all the waveforms in a drive system can be captured simultaneously. It becomes not only efficient but also convenient to check the total balance, timing and relation between each component.

Moreover, by using the optional power analysis function, a device's switching loss can be measured easily. De-skew and device correction functions will also contribute to improvements in accuracy. Surge voltages and currents and abnormal noise signals can be measured over the whole system simultaneously, and filter and maths functions can be used for analysing PWM waveforms. By using the waveform parameter cycle statistic analysis, fluctuations can be visualised – unusual movement of the motor can be found easily, for example.

Waveform measurements on eight channels enable total analysis from the input to the load/output devices, helping to contribute to reliable power supply design under various load conditions.

These MSOs will also capture noise and surge effects at the I/O stages of the converters and fast I/O signals from the controller along with the serial bus signal, at the sampling speed of 1.25 GS/s. Up to 62.5 M points per channel of memory makes it possible to capture long-term fluctuations of the power supply.

Additional benefits include 'unmanned' capturing of intermittent power-supply problems thanks to the trigger functions; while the history function and the cycle statistics parameter measurement function make the analysis of fluctuations and jitter easy, even for more than thousands of repeated measurements or cycles.

Yokogawa Europe
T: +31 (0) 88 464 1429 **Enter 678**
www.tmi.yokogawa.com