

The Global Need for Low-Cost DMMs

TEST ENGINEERS are looking for ways to maximize their time and instrumentation budgets as well as increase throughput in production testing applications. In today's ever-more competitive global electronics industry, test engineers need versatile, low-cost test instruments that can perform in a variety of capacities. For digital multimeters (DMMs), this includes being able to be used as a benchtop instrument for quick, single instance measurements, as well as the ability to be part of a system for more advanced measurement functions.

DMMs are among the most generally used pieces of test equipment. From the hundreds of thousands of handheld units to the tens of thousands of high-precision units sold each year, global sales for DMMs of all types exceed \$300 million U.S. annually.

Until fairly recently, there has been a notable lack of high-quality, high-performance, entry-level DMMs for test engineers who need more than a simple handheld DMM but who don't need to spend thousands of dollars on a more sophisticated instrument. This is especially true of test engineers in low-cost manufacturing regions performing manual and semi-automatic electrical functional test.

In response to these market conditions, Keithley Instruments has introduced its

Model 2100 6½-Digit USB DMM, a low-cost, high-quality 6½-digit DMM with high-precision 6½-digit accuracy and performance at a 5½-digit price. The Model 2100 is a precision, USB-based DMM for bench, portable, and small system measurement applications and can be used in a wide range of production test, burn-in, and manual and semi-automatic R&D applications. The Model 2100 continues in the tradition of Keithley's family of high-performance, precision DMMs, complementing its line of

premium DMMs with an entry-level, USB-based instrument.

Keithley's Model 2100 features high precision 10VDC accuracy of 38ppm and 6½-digit resolution at a fast measurement rate of 50 readings/second over a USB bus, a reading rate that is more than twice as fast as competitively priced offerings. At 4½-digits, the instrument reads more than 2000 readings/second, giving users much more performance and flexibility for the price.

Eleven measurement functions cover the most commonly measured parameters. These parameters include standard DMM functions such as Volts, Ohms, Amps, and RTD temperature measurement capability, as well as MX+B, dB, and dBm math modifiers for more specialized measurement applications.

Fully specified accuracies are valid for one year on all functions for ISO-compliant applications and facilities. The importance of fully specified accuracies is largely due to the increased need for more testing, better accuracies, and more consistent data collection through automatic testing. Driving this, in turn, is the increased pressure to test and archive design validation and production test and quality assurance measurements to meet ISO standards for manufacturing businesses. This ISO movement is largely driven by global quality improvement programs led by the Japanese and is also supported by companies like GE and Motorola with their Six-Sigma initiatives.



Keithley Model 2100 6½-Digit USB DMM

The Model 2100 also offers selectable front and rear two- and four-wire remote sense inputs, which enable it to be used either as a stand-alone benchtop DMM or in small rack mounted systems applications. The four-wire remote sense inputs provide test engineers the ability to conduct four-wire remote-sensed measurements for accurate low-level resistance applications.

Keithley's Model 2100 6½-Digit USB DMM is easy to set up and begin using right out of the box, needing no additional configuration or accessories. All units include power and USB cables, measurement probes, and free utility software to ensure quick startup and a lower total cost of ownership. The easy to setup and easy-to-use units mean quick start-up times and reliable operation, decreasing the likelihood of operator error.

Another ease-of-use feature is the built-in, low-cost USB interface. The USB interface supports the TMC (Test and Measurement Class) protocol, allowing SCPI (Standard Commands for Programmable Instrumentation) commands to be sent over the USB bus for added data transfer and basic control options, especially in test system applications. In addition, the TMC-compliant USB interface ensures preservation of existing SCPI test code, saving development time and cost.

A suite of built-in software eliminates the

need to purchase software, saving time and start-up costs. Among the included software is a graphing utility called KI-Tool, which allows basic trend plotting and data transfer to a PC. It also includes an add-in tool used for importing data directly into Microsoft® Excel and Word documents. USB and LabVIEW™ drivers are also provided with each Model 2100 DMM.

The Model 2100 DMM is well suited for a wide range of applications across a number of industries. For instance, test engineers performing manual and semi-automatic electrical function tests, as well as development and R&D engineers performing electrical validation in emerging electrical design and manufacturing regions will benefit from the Model 2100's low-cost and high-performance.

A typical use case might be an R&D engineer designing such products as personal electronic devices, Ethernet routers, mobile phones, kitchen appliances, and power supplies. In these cases, a DMM will be used as a benchtop or manual tool for checking the operation of electronic components, circuits, modules and end products during the design and design validation phases. Most often, the R&D engineer will use the DMM manually but may use the USB interface to conveniently transfer data to a PC for archival, analysis,

or transmittal purposes.

Another example may be a design validation or audit group. Here, test engineers will typically use the DMM under program control to rigorously test new designs before they are released to production.

On the production end, production technicians will use a DMM to test each PCB assembly as they are powered on for the first time, often using a test program to run a series of pre-check tests. Once the end product is assembled, a DMM may be used for final test and, on occasion, for a calibration step before the product is shipped.

Service and calibration technicians working in instrument repair and metrology may also use a DMM, as well as research scientists and engineering students in science and engineering laboratories.

Summary

Keithley's newest DMM, the Model 2100 6½-Digit USB DMM, is a high-precision, low-cost USB-based instrument suitable for benchtop, portable, or small-system test configurations. It fits the needs of engineers who need more than a simple handheld instrument but who don't need to spend thousands of dollars on more complex instruments.

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