

Stress Testing

Dropped, shocked, short-circuited, injected with thousands of volts of electricity and forced to endure extreme temperatures...

Fluke Corporation's test tools go through all that and more before a new Fluke product arrives in your toolbox. Once a new product survives Fluke's equipment test labs, you know it has what it takes to survive in the wilds of your world.



A meter, straight out of the test chamber at -20 °C, measuring 1,000 Volts AC1KHz while covered with ice.

“Our charter is to make sure that no Fluke product will ever fail in a customer’s hands,” says Bruce Maier, a Fluke safety engineer who has spent more than two decades working on electrical test instruments. Maier is one of five test engineers on the Fluke product evaluation team that performs a withering list of safety, environmental, and reliability tests, all designed to make sure your Fluke test equipment works safely, efficiently and reliably.

You likely already know that many Fluke digital multimeters (DMMs) come with a lifetime warranty, an exclusive quality guarantee that no other vendor offers. The ultimate objective of Fluke's abusive testing is to have our customers using Fluke products that will survive anything they can dish out, and then some.

Serious intent behind all stress testing

There's a serious intent behind all the stress testing. The potential for injuries or deaths when using test instruments is very real. Electrical workers are killed or injured by shocks and burns each year. Even in less serious incidents, workplace accidents result in a median of three days off work.

As the tragedies behind those figures show, improper use of test equipment can have dangerous –and sometimes fatal – results. Because of Fluke's commitment to safety, all of its equipment is designed to give a bit of extra cushion in case of operator error and provide as much protection as possible from the inherent dangers of working in the unsettled sea of electricity.

Laboratory fireworks

Fluke product evaluation teams spare no meter the full force of a comprehensive battery of tests. Fluke engineers test more than 20 products a month for robustness and safety under the worst possible conditions.

One test, called an impulse test, simulates a lightning strike. A meter is placed in a chamber and injected with thousands of volts of electricity. Maier and his colleagues take the meter through significantly more than your meter is designed to measure to protect you against the effects of a dangerous electrical spike or transient.

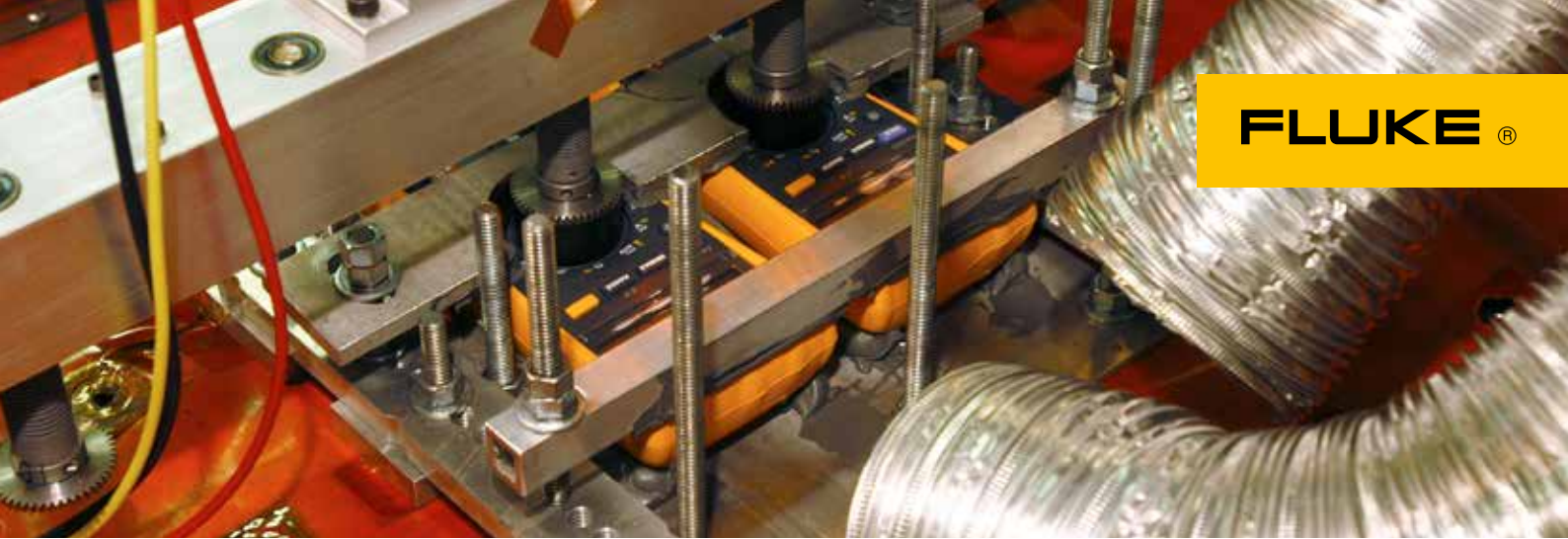
“We set the notch just a bit higher,” he says. “We design our products to exceed the conventional standards for impulse testing.”

Forget suits and ties for the product evaluation team. They forego business attire for clothing that withstands a war zone. “It can be a little dangerous if you're not careful around here,” Maier admits. “Things have been known to blow up or spew flames.”

Allowing for operator error is another factor that goes into such rigorous safety tests. For example, the multi-functional overload test involves injecting very high-energy voltage into non-voltage functions. Maier adjusts the meter inside a small chamber to every conceivable position while sending powerful voltage surges into the instrument.



Anechoic chamber where EMC testing is conducted. The antenna in the foreground radiates radio waves at the meter shown on the back wall of the chamber.



View inside of the HALT chamber. Notice that the meters under test are bolted down to the shaker table so that the energy of the shaker table is transferred to the meter and that the airducts, in the foreground, are directed at the meters for more rapid heating and cooling.

Again, as in all these procedures, products are tested to destruction.

“People’s lives are literally on the line, and that thought is always first on our minds,” Maier says. “If a meter goes bad, it could be deadly.”

There may be occasions when a user will be testing electrical equipment while conducting other tests and not want to have radio frequency waves disrupt meter circuitry. So the test engineers place meters in an anechoic chamber and transmit doses of radio frequency waves into the meter.

“A user may be using his walkie-talkie while measuring equipment, and he doesn’t want the test tool to malfunction. Or an auto mechanic could experience noisy readings when working around the ignition wires. This test helps prevent these things from happening,” Maier explains.

Fluke uses HALT (highly accelerated lifetime testing) to wring out new designs. This combines 3-axis vibration at more than 150Gs with extremely fast temperature swings to simulate a lifetime of wear and tear. The chamber has the capability of going from -100 °C (-148 °F) to 200 °C (+392 °F) in minutes.

“The saying with this test is, ‘shake and bake it till you break it’ ” Maier says with a smile. “Then make design improvements to whatever broke and re-test.”

Unlikely as it seems when you take a new Fluke meter out of its box and vow to keep it like new forever, electricians have been known to drop instruments onto hard surfaces. So test engineers repeatedly drop meters on all six sides several feet to



The drop test. A meter specified to -10 to 50 °C, such as the Fluke 179, will be dropped from 1 meter on all six sides at -10 and again at 50 °C.

a concrete floor and then inspect them for the slightest damage. This test is done at the operating extremes of the meter, at -10 °C (-14 °F) and +55 °C (+131 °F).

Another test simulates meters being transported under rugged conditions, such as in off-road vehicles. Engineers place the meter on a vibration table where it is shaken at 5Gs for as much as 30 minutes per axis. Once is not enough. Meters are repeatedly tested in several positions to account for all conceivable circumstances.

“Once a piece of equipment has at last passed muster, the entire team experiences a sense of satisfaction that lasts long after the product begins shipping”, Maier says.

“Once we’ve signed off on a product, it feels like you’ve given birth,” he says. “It’s like your kid is out there now and it’s on its way to the customer. It’s a good feeling.”