FLUKE®

Plant News 1587 intro

Application Note

Bill Weindorf using the Fluke 1587 Insulation Multimeter.

Imagine running three printing plants for a flagship newspaper, managing 25 electricians, and maintaining and troubleshooting printing presses, conveyers, bundling equipment and distribution 24 hours a day.

Welcome to the world of high pressure industrial maintenance, where a motor failure is always an emergency, and technicians need to have the right tools to make diagnoses fast.

This spring, Bill Weindorf, electrical general foreman for the San Francisco Chronicle, and Buzzell Electric Works, his trusted motor repair shop, tested the new Fluke 1587 Insulation Multimeter to see whether it had the right stuff.

Buzzell's foreman, Mark Toland, had been saying for years that "someone ought to combine an insulation resistance tester with a DMM."

Now that they have one, says shop owner Matt Buzzell, "We use it for everything. All types of tests for motors and controls, any troubleshooting."

On the plant floor, Weindorf expects testing to become both more efficient and more thorough. Before using the 1587, he says, the insulation tester was usually 100 yards away in a locker and not used all the time. Going back for it cost any troubleshooting an extra five or ten minutes.

Now that Weindorf has the insulation tester built-in, his troubleshooting and maintenance is more accurate and faster than with two tools. "Whoever thought this up—this was a very innovative idea," he says.

Mark Toland tests stator resistance.

Feature rich

The right technology has finally come along. Fluke engineers have become adept at making complex tools easy to use and easy to carry in the palm of your hand. The new 1587 and 1577 Insulation Multimeters combine all the functions of an advanced multimeter with the most frequently used features of an insulation tester—for less cost than some insulation testers alone and half the size and weight.

Their small size is made possible by higher circuit densities and advances in safety design. For example, both meters are 600 V CAT IV and 1000 V CAT III overvoltage rated. They're designed for use on service entrances up to 600 V, and on PWM inverter dc buses up to 1000 V. They automatically disable insulation testing if connected to a live circuit with more than 30 volts. And following insulation resistance testing, the meters discharge all capacitive voltage from the equipment user test to help prevent accidental shocks.

Other advances include a remote activation probe that enables one-handed insulation testing via a voltage trigger on the probe handle.

The 1587 provides insulation resistance testing up to 2 GΩ, with five output voltages ranging from 50 V to 1000 V, while the 1577 tests up to 600 MΩ of resistance with 500 or 1000 V. Both meters also offer a low-ohms function for continuity and ground connection testing.

This new category of test tool is ideal for electricians who work on motors, switchgear and cabling and for HVAC/R technicians who work with compressors. To make the advanced model even more flexible, Fluke engineers added a low-pass filter for accurately measuring variable frequency drives, Min/Max, temperature, diode test, frequency, and capacitance.

As Weindorf says, "it has tons of functionality all wrapped up in one package."

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The goal is to help plant technicians do more **thorough** testing, **prevent** more problems, **diagnose** failures faster—and carry **less tools.**

What the Fluke 1587 Insulation Multimeter can do

Measurement Troubleshooting	Applications
Volts ac	• Line voltage level • Phase voltage unbalance
Volts ac, with low-pass	• "Envelope" voltage measurement on PWM motor drive output
Volts dc	• Battery voltage • Voltage on dc power supplies used in electronic equipment • DC buses on motor drives and uninterruptible power supplies
Amps with current clamp	• Running current • Current unbalance
Amps, in-line	• Low current control circuits such as 4 to 20 mA or alarm systems
Ohms	• Coil resistance in contactors, relays • Contact resistance in switches, circuit breakers • Use to check Resistance Temperature Detectors (RTD's) or thermistors • Check strain gauges
Continuity	• Verify conductor integrity • Connection integrity • Check fuses
Insulation resistance testing	• Check for conductor insulation degradation to bonded conduit • Check for insulation degradation between conductors sharing a conduit or raceway • Check for motor winding insulation degradation to bonded frame • Check for insulation degradation in transformers
Temperature*	• Check air temperature in HVAC systems • Check surface temperature of motor frames • Check surface temperature of switchgear and transformer enclosures • Corroborate other thermometers, thermostats or temperature transmitters
Hertz	• Check generator output • Check pulse output flow sensors • Check pulse output of optical encoders • Check "six step" motor drive output frequency
Hertz, with low-pass	• Check PWM motor drive output frequency
Capacitance	• Verify the proper capacitance of ○ Filter capacitors on dc power supplies ○ Motor start and run capacitors
Diode	• Check rectifier diodes for shorts and opens in power supplies, motor drives and UPS's/LED's
Min/Max/Avg recording	• Check for ac line voltage sags and swells • Use on current setting to track Max load • Track temperature excursions
Other	• Pressure, with appropriate accessory like PV350

*with k-type thermocouple adapter and temperature probe

Why test insulation?

Electrical insulation includes the entire complex system of cable insulation, bushings, and spacers within conduit, motors and general equipment. Low insulation resistance indicates that current is leaking through the insulation. That can cause heat build up, which in turn causes the insulation to degrade even faster and eventually fail. Leaking current can cause over-current protection devices to trip and motors and transformers to overheat, and is just plain unsafe and inefficient.

Insulation problems are usually caused by improper installation, environmental contamination, mechanical stress or age. Insulation testing can easily be combined in with regular maintenance, to identify degradation before failure, and during installation procedures to verify system safety and performance. When troubleshooting, insulation resistance testing can be the missing link that enables you to get a unit back into operation the easy way, by simply replacing a cable.

Insulation testers apply a dc voltage across an insulation system and measure the resulting current. This allows them to calculate and display the resistance of the insulation. Typically, the test verifies high insulation resistance between a conductor and ground or high insulation resistance between adjacent conductors. Two common examples include testing motor windings for insulation from the motor frame and checking phase conductors for resistance from bonded conduit and enclosures.

80 pound tool boxes

Buzzell Electric Works does motor repair, rewinding and service with on and off-site inspections, testing and consulting in the industrial market. Their work includes printing presses, elevators, fire pumps, hospitals, hotels and parking garages. They use DMM and insulation resistance tests for just about every troubleshooting call, says Matt Buzzell. That troubleshooting includes first checking the power supply; then, if that is good, checking the motor. They then check insulation to ground, balanced phase to phase resistance and the motor to service panel connections.

The cause of a specific motor failure isn't always obvious and insulation resistance testing is crucial in this situation. After talking to the client about the problem, they begin taking DMM measurements including voltage, fuse checks and ground connections. Moving on to insulation test, foreman Mark Toland verifies lock out and tag-out of the disconnect to the starter. They then engage the starter manually and measure the resistance across each contact and the resistance of line and load circuits to ground. If the load side resistance values are reasonable, he proceeds to the next test. Every test is inconclusive by itself, Buzzell comments—you need to complete them all.

To accomplish all this, Toland carries a tool box that weighs between 75 and 80 pounds. Since the company works with motors, the electricians need tools that will allow them to remove a 100 horsepower motor, change the contacts, and work on the reversal relays, alignment and balancing, to name a few of their common tasks.

For toolboxes like that, they don't want to carry even one more tool than necessary. "Any way you can lighten the load becomes a convenience," Buzzell says. "We do a lot of outside troubleshooting," and with each call, they use the insulation tester and DMM. "Now we're not going to have to pack the two tools," he says.

Fluke. *Keeping your world up and running.*

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