Electric utility plays it safe with Fluke T+ Electrical Tester

Application Note

Testing Functions **Case Study**

Measuring tools: Fluke T+PRO Electrical Tester

Operator: Electrical utility field service team

Tests conducted: Voltage, load, continuity, tampering

Quote: "Our safety department got involved," the supervisor said, "and they told us the solenoid-based tester was old technology and not reliable."

There's a lot at stake when electric utility field service representatives turn the electric power on or off. Their safety, and that of their customers, comes first.

So each time they remove or install an electric meter for one of 300,000 customers, field reps for this Electric Co. test the meter socket for voltage.

"My guys aren't electricians, they are strictly field service employees," said the supervisor of field service and collections. "They use a tester to determine if voltages are correct, and if there's load being drawn from inside the house when they restore service. They're also trying to determine if there's tampering."

The company won't activate service if a device in the home is drawing current. The load could be an appliance, such as a hair dryer, heater or power tool, that would cause a hazard or even start a fire if left on unattended. Another problem is tampering with electric service, which involves rewiring to bypass the meter and get power for free. Of course that's illegal, but a greater concern is the fire and shock hazard tampering with circuitry can cause for residents and utility workers.

In the past, the service representatives used a solenoid-based electrical tester or "Wiggy™" device to detect voltage and load (see sidebar). But recently, the supervisor had them try a new tool for the job, the safety-rated Fluke T+PRO Electrical Tester. It all started with an incident that could have had tragic consequences: A service rep tested a meter socket, but the solenoid tester in use did not detect that there was continuity present. Someone had tampered with the service. The continuity caused a short.

"Our safety department got involved," the supervisor said, "and they told us the solenoid-based tester was old technology and not reliable." As they looked for a replacement tool, the team determined that the digital multimeters used elsewhere in the company were too sensitive and had more features than the service reps needed. Then they heard about a new device, the safety-rated Fluke T+PRO Electrical Tester, that was specifically designed to do the job of the old solenoid-based testers, but more accurately and safely.

The Fluke T+PRO tester is safety rated for use in IEC CAT IV 600 V (including outside facilities, service entrance and electric meters) and CAT III 1000 V settings and complies with the National Fire Protection Association (NFPA) standard 70E when used properly per Article 110.9. It looked like it could meet the team's need for a safety-rated test tool of compact size, capable of testing meter sockets without picking up stray or "ghost" voltage.

When they tested the Fluke T+PRO on the job, the field service team liked its ease of use and multiple signaling methods (LCD, LED, sound and vibration) and its built-in flashlight, and felt the unit was built tough enough for daily industrial use. They also appreciated its added features for resistance, continuity and GFCI testing. One rep commented that the Fluke tool detected a small load—a transistor radio left on—that the solenoid tester did not pick up. Another group of employees, the meter electricians who actually test electric meter function, liked the tool's ability to test all three power phases and determine the phase rotation between any two phases.

The team also had suggestions for the Fluke design engineers, such as larger buttons for gloved hands and a battery life indicator. They noted that the unit was designed to measure voltage even if the batteries for the unit were depleted or missing. The T+PRO test leads took some getting used to, but the unit does come with velcro wraps and on-unit probe storage to help keep them under control.

The Fluke T+PRO passed the field tests, and the utility is adding the tool as a standard to replace all of the old solenoid-based testers. "These devices worked perfectly," the supervisor said. "They do what they are intended to do and they have very nice features. We're going to bring them in as a regular stock item in our warehouse," he said. And, in addition to the 25 field service representatives, and the meter electricians, they anticipate that the overhead and underground crews too will adopt the Fluke T+PRO.

Solenoid-based Testers: What's the Buzz?

Their compact size and ruggedness have made solenoid-based electrical testers a traditional favorite for electrical industry professionals, but advancing safety standards are leaving these devices behind. These classic testers are no longer safe to use by NFPA electrical measurement standards and not CAT rated by the International Electrotechnical Commission (IEC). Many companies have outright barred them from use.

A solenoid depends on the movement of a ferrite slug in response to the energization and de-energization of an electromagnetic coil. The indication function of these testers depends on a spring, which drives a mechanical pointer. The spring restrains the slug, which slides to one end of its chamber or the other, depending on whether the coil has enough energy to cause the slug to overcome the opposing force of the spring. Unfortunately, solenoid-based testers have several shortcomings:

- The amount of energy required restricts their sensitivity. In the US, a useful solenoid-based tester will measure voltages up to 480 V or more. But the poor dynamic range of the magnetics limits the ability of such a device to detect voltages below about 100 V.
- Solenoid-based testers have relatively low input impedance—10 kilohms at the upper end, but often as low as 1 kilohm. So solenoid-based testers can easily make their presence felt in a circuit as loads and interfere with the operation of that circuit. The relatively high current draw also creates enough heat that the testers can quickly overheat, even to the point of damaging the tester.
- These testers are generally unable to comply to IEC 61010 due to excessive current draw, poor dielectric withstand performance and impulse destruction due to transients originating from the mains. This is one reason many companies forbid the use of voltage testers on anything but 24 V control circuits, and some forbid them altogether.
- The high current flowing through solenoid-based testers has another downside. You can easily carry a lethal current through the tester. Wearing insulated gloves can reduce the shock hazard, but you'll also be risking an arc hazard with each use.

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