The NEW Fluke T+ and T+PRO Electrical Testers

Application Note

The first electrical tester had a simple solenoid that pulled an indicator attached to a spring across a special voltage scale. The higher the voltage applied to the solenoid, the further the indicator would be pulled against the spring.

High accuracy is not a big concern when installing lighting, switches, and other common electrical wiring and equipment. Often, you just need to differentiate common voltages from one another.

The problem is, these classic testers are no longer safe to use by NFPA electrical measurement standards. Many companies have outright barred them from the field and floor.

Since the basic measurement need was still there, Fluke developed two new testers that did what electricians needed them to do. The new T+ and T+PRO ac/dc electrical testers are rated to CAT IV 600 V and CAT III 1000 V and use light, sound, and vibration to indicate voltage. They also test for continuity and GFCI and are low impedance. Additionally, the T+PRO model has a LCD digital readout screen, a rotary phase indicator, and resistance.

Basic voltage applications

Before starting any test, touch the two leads of the T+PRO or T+ together. All of the LEDs should light up. That means the tester is working and has battery power.

These testers have nine LEDs, each of which indicates a specific voltage, that illuminate when the test leads contact voltage. At the same time, the testers beep and vibrate strongly enough that you can feel it when voltage is detected. For ac voltage, the ac LED lights up and the beeper makes a chirping sound. For dc voltage, the dc positive or negative LED lights up and the beeper makes a steady tone. And, on the T+PRO, a digital readout of either measurement will appear on the LCD. If the batteries fail, the LEDs will still light up, so that the user always has voltage detection capability.

Both testers measure ac and dc voltage from 12 to 600 volts (the T+PRO measures down to 10.2 V on the LCD). For the residential electrician, the T+ model covers all of the basic electrical measurements, from voltage entering the house at the power panel, to the output of the transformer powering the doorbell.

One typical use is checking a 240 V ac outlet for a dryer or range for correct wiring. Place the tester's probes between the two hot sockets of the outlet. The tester will automatically come on, illuminate the LEDs to indicate 240 V ac, beep, vibrate, and illuminate the hazardous voltage LED. Next, check for 120 V ac between each hot and neutral socket of the outlet.

For industrial techs, check voltage balance between phases—is it within 2 %—and for voltage drop across motor contactors or relays, where voltage drop should be negligible. Also check control circuit voltage. To eliminate measurement errors from ghost or stray voltages, these testers' low input impedance loads the circuit and absorbs any ghost voltage energy. That gives you a reliable indication that the circuit you are testing is truly dead.

Continuity

One common continuity application is checking switches or breakers for continuity when they are closed. With power removed from the switch, place the tester probes on the two switch contacts. If the switch is working properly, the tester will illuminate the continuity LED and sound the beeper continuously when the switch is closed. No need to power the tester on or select a function. As long as there is no voltage present, the tester automatically comes on and selects the continuity function.

GFCI testing

Both the T+ and the T+PRO have a GFCI test function. After installing a GFI protected circuit, say a kitchen outlet branch circuit for example, apply power to the circuit by closing the breaker at the power panel. Go to one of the kitchen outlets and place the tester's black lead into the ground (not neutral) socket and the red lead into the hot (small slot) socket. If the branch circuit is wired properly, the tester will immediately illuminate the LEDs to indicate normal voltage. Next, press the tester's GFCI button and leave tester connected for seven seconds. While testing, the dc (+) and dc (-) LEDs will blink to indicate the GFCI test is active. If the GFI circuit is operating normally, the GFCI should trip and remove power from the circuit. With no power, the tester's LEDs should extinguish. Reset the GFCI circuit and repeat the test from the next outlet.

Nice-to-haves

When working in dimly-lit locations, use the LED flashlight built in to the tester to illuminate the connections and guide your measurement. The light stays on for five seconds or as long as the flashlight button is pressed. With one probe locked into the built-in probe holder, the tester's light will illuminate the area where the probe is pointing.

The Fluke T+ and T+PRO come with special, extra-heavy-duty test leads that hold up longer against the wear and tear of normal use than standard leads. Both test leads also have removable probe tips for easy tip replacement and to allow alternate probe tip styles. The test leads themselves can also be replaced without having to replace the entire tester.

Additional features of the T+PRO

The T+PRO Electrical Tester has additional features tailored to the electrician working in commercial and industrial installations. These features include a digital display with a resolution up to 0.1 volts for readings between 10 V and 50 V, a resistance function, and a Rotary Field Direction function.

When measuring ac voltage between phases of a three-phase circuit, the T+PRO tester indicates the phase relationship between the two test leads as well as the voltage. A typical application is connecting a three-phase motor and testing for proper rotation direction. Connect the tester's leads between two of the phase conductors. The tester's display will indicate a clockwise rotation (↷) when the red test lead voltage is 120° ahead of the black lead. You'll see a counter-clockwise indicator (↶) when the phase between the leads is reversed. Next, move the red test lead to the third phase conductor to see its phase relationship to the other two conductors. Now you can connect the conductors to the motor for the desired rotation.

Press the ohms Ω button to switch the tester to resistance mode. Now, you can check resistors in motors, fuses, switches, relays, or other general resistance applications on dead circuits, up to 9.99 kΩ.

Last but not least, because the T+PRO can measure down to 10 V with three digits of accuracy, it's a far more accurate tool for low-voltage lighting applications. Most standard electrical testers (solenoid and solid-state) only measure down to 12 V and may not be able to see that a step-down lighting transformer is only putting out 10.8 volts. (That's a 10 % variance from what the voltage should be.) Depending upon the set up, the bulbs may not function properly (or at all). The farther down the line you go from the transformer, the greater the possible voltage drop—but a standard voltage tester may still read 12 V, leading you to believe that everything is fine.

For more information on industrial and HVAC applications, read the Fluke application note "HVAC applications for the Fluke T+ and T+PRO Electrical Testers."

FLUKE®

Five reasons to give up your old solenoid tester

1. In the US, a useful solenoid tester can measure up to 480 V or more. Having the ability to measure higher voltages limits the tool's ability to detect voltages below 100 V, due to the poor dynamic range of its magnetics. Try using one on 24 V or 48 V control circuits, and you may as well be using a stick of wood.
2. Solenoid-based testers can appear on the circuit under test as a load and interfere with its operation. The T+ and T+PRO testers have higher input impedance than traditional solenoid-type testers, but not so high that they have problems with ghost voltages.
3. The relatively high current draw of solenoid-based testers means significantly more heat—enough that the testers can quickly overheat and even become damaged if you measure voltage too long. If you use a solenoid-based tester, allow for half-minute cool-downs. The T+ and T+PRO testers can measure voltage under 240 V indefinitely.
4. Solenoid-based testers generally don't comply with the IEC 61010 electrical safety standard due to excessive current draw, poor dielectric withstand performance, and impulse destruction from transients. When they fail, it can be catastrophic. Without IEC 61010 compliance, these testers also miss compliance with NFPA 70E (article 110.9) and other standards that require environmental ratings.
5. Applying Ohm's Law to the low-impedance solenoid-based tester shows that 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 each time. Solid-state testers, on the other hand, provide additional protection against this type of occurance.

Fluke. *Keeping your world up and running.®*

Fluke Corporation
PO Box 9090, Everett, WA USA 98206

Fluke Europe B.V.
PO Box 1186, 5602 BD
Eindhoven, The Netherlands

For more information call:
In the U.S.A. (800) 443-5853 or
Fax (425) 446-5116
In Europe/M-East/Africa +31 (0) 40 2675 200 or
Fax +31 (0) 40 2675 222
In Canada (800)-36-FLUKE or
Fax (905) 890-6866
From other countries +1 (425) 446-5500 or
Fax +1 (425) 446-5116
Web access: http://www.fluke.com

Printed in U.S.A. 4/2007 2825353 A-EN-N Rev A