

Don't risk CAT IV areas without the right leads

Application Note

Test leads do more than connect a tester to a circuit, they also protect you from potential hazards of which you may not even be aware. This article will explain the various characteristics that affect a test lead's ability to protect you from the dangers inherent in making an electrical measurement.

The test system

You've probably heard the phrase, "The system is only as good as its weakest link!" This phrase is very appropriate when referring to the safe use of your test equipment. A tester such as a digital multimeter (DMM) is designed as a complete system, meaning the tester, its replaceable parts and accessories have been designed to work together as a complete unit. This applies not only to a test system's functional capabilities but, more importantly, to its safety features as well.

When you pick up a tester that has a specific safety rating and take it to measure a 600 V bus, how well are you protected for the hazards that exist in that environment? The tester may indicate it has the proper rating for the environment in which you are working, but what about the test leads? If you are using test leads that did NOT come with the product, you could easily be compromising your safety. Even if the leads did come with the product, are they up to today's standards?



What's the difference in test leads?

Not all test leads are created equal. It's very common to accumulate test leads over the years and mix them up with the newer, more robust leads available today. Test leads, just like the testers themselves, have been upgraded to meet the new safety standards established for today's electrical environments.

These standards require that the insulation between the test lead conductor and your fingers have the minimum distance to stand off the hazards that exist in the environment in which you are working. There should also be a finger guard on the outside of the probe that establishes the proper distance between your fingers and the exposed metal parts of the probe. These distances and insulating ratings have been predetermined for each installation category and voltage rating¹.

Choosing the correct test leads

Once you identify the installation category and the voltage you will be working with, it's a simple task of choosing the appropriate tester for that environment. However, make sure the test leads you will be using with the tester equal or exceed the tester's rating.

For instance, if you are planning to measure a 600 V circuit, you could choose a Fluke 170 or 180 Series Digital Multimeter (DMM) for this measurement. All the products in these series are dual rated 1000 V CAT III (the environment in our example) and 600 V CAT IV. Even



though the DMM is clearly marked with this safety rating, are the test leads equally rated? If the DMM's test leads do not equal or exceed the rating of the tester, then you are putting the tester, and more importantly, yourself at risk.

Test leads you have accumulated from years ago may not be designed with the insulation thickness needed for today's electrical environments. In addition, test leads suffer from wear and abuse that could easily damage the insulation. For instance, test leads that have been pinched in a panel door or kinked due to sharp bends have reduced insulating capability at those stress points. Test leads that are cracked, pinched or excessively dirty should be thrown away and new ones, with the same rating as the tester, purchased from your local Fluke distributor.

¹ See ABCs of Multimeter Safety for more information on Installation Category and Voltage ratings.

Another characteristic to watch for is the amount of current test leads can safely handle. In the previous example, the Fluke 170 and 180 Series products are fused to a maximum current of 10 A. When measuring current using test leads with a current rating less than 10 A could cause the test leads to become overheated. This in turn could cause the insulation to melt and compromise the safety rating of the leads. Again, discard all leads that have discoloration or appear to have melted insulation and replace them with new ones.

Category IV ratings

Recently the International Electrotechnical Commission (IEC), an organization that develops safety standards, defined the standards for Category IV environments. This environment includes overhead power lines, underground power lines, and service entrance power. These are environments where electricians make measurements every day.

In order for you to make measurements in these environments safely, Fluke has upgraded most of its test lead products to meet the new CAT IV standards. If you find yourself making measurements in these areas and have an older set of leads, you might want to consider replacing them with leads that are clearly marked as rated for CAT IV.

Other safety features

In addition to having the measurement category ratings and current handling capability, Fluke test leads have other safety features worth considering. Shrouded connectors and silicone insulation provide an additional level of safety while using your test equipment.

Most of Fluke's test leads have shrouded connectors. This feature protects the user from coming in contact with the connector if it should become disconnected while still attached to the circuit. This shroud is incorporated into the removable test probes and extension leads as well as the general purpose test leads.

Silicone insulation not only provides better insulation, but stands up to the normal wear and tear better than standard lead insulation. You will also find these leads to be more flexible and easier to handle. Fluke's TL222 and TL224 Silicone Insulated Test Leads work with a variety of removable test probes.

So when you pick up that tester to make a measurement, you not only want to inspect the tester itself for damage as well as proper safety ratings, but the test leads and other accessories as well. To be safe, make sure the tester's leads have the same measurement category rating and current carrying capability that are marked on the tester. Even better, use Fluke's test leads to get that added safety with the shrouded connectors.

Contact your local Fluke distributor or check out the accessories at www.fluke.com to find the best and safest set of leads for your application. Fluke leads the way in providing safe, rugged products for your testing needs.

Fluke. *Keeping your world up and running.*

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