



Digital Multimeter Safety Tips

Most engineers perform measurements with a digital multimeter (DMM) as part of their job. Before you grab the nearest handheld DMM next time, make sure you select the right DMM for your task.

Different multimeters are designed for different electrical environments and the risks involved. Some multimeters are designed for testing circuits in an electrical environment that is protected with limited transient overvoltage. There are also some multimeters that are designed to be able to measure and handle higher voltage ratings and higher energy transient environments.

For your own safety and the safety of those around you, choosing the right multimeter can help protect against the electrical hazards you might encounter. Consider the following advice before you start making measurements with a DMM.

Select the Right Digital Multimeter for the Job

Know what you are measuring

You should know the maximum voltage of the circuit you want to measure. There are many different power voltage ratings for the operation of household and light-commercial electrical appliances and lighting. However, the circuit voltage rating alone does not reveal the whole story. Make sure you take transient voltages into consideration before you select a handheld DMM to make a measurement.

Do you need special training to make this measurement?

Electrical safety compliance training can help you understand the safety regulations that apply to your industry and develop processes to put those safety regulations into practice. An electrical safety course will help ensure your own safety and the safety of those around you.



Robust design for real-world conditions

Keysight's handheld Digital Multimeters U1240, U1250, U1270 and U1280 series have CAT III 1000 V and CAT IV 600 V over-voltage protection.

Learn more about Keysight's Digital Multimeters at www.keysight.com/find/DMM.



Your company may offer on-site electrical safety compliance training. If not, some private and public institutions offer electrical safety compliance training.

Do you need any certification to approach the circuit you want to test?

Certification requirements vary by region, country, province, state and local government, so check to make sure you have the appropriate certification before you make any electrical measurements.

Are there standard operating procedures that you must follow?

Many international organizations, such as the International Organization for Standardization (ISO), require specific operating and safety procedures to protect you from electrical and electronic hazards.

Choosing a Digital Multimeter

When you select a DMM to use around hazardous circuits, it should have these three features:

- *Clear and unambiguous display* -- a difficult to read display on a DMM poses a danger, especially when you are working in and around hazardous circuits
- *Ease of use* -- a DMM should be simple to operate in order to minimize the time spent around hazardous circuits
- *Reliable function* -- a good quality, reliable DMM is essential when working around hazardous circuits

Pay Attention to the Voltage Rating of the Measurement Circuit and the Measurement Limit of your Digital Multimeter

When you make measurements with a DMM, keep the following factors in mind:

1. Make sure you have the appropriate training before you make any measurements in the environment you are in.
2. Never perform any Category III, or Category IV measurements, based on International Electrotechnical Commission (IEC) definitions, unless you have appropriate training and certification for the region, country, province, state and locality in which you are working.
3. Observe all signs and warnings associated with Arc Flash prohibited and restricted boundaries. These regulations may differ from country to country.
4. Use the standard operating procedures (SOP) required under local work place regulations.
5. Wear appropriate personal protective equipment (PPE).
6. Use the right DMM and accessories for the job. Check the voltage rating of the circuit or the load under test. This includes the transient rating as well as the circuit voltage rating. The transient rating of the DMM must exceed the expected transients on the circuit under test. Consult the user instructions for more detail.
7. Always read the instructions that come with the DMM.
8. Always make sure the DMM is set correctly before making any measurement.
9. Make sure your DMM has the appropriate measurement category for the circuit under test.



Figure 1. Digital multimeter with IEC measurement category highlighted within the red box.

Take Precautions when Performing Live Measurements

Here are a few safety precautions you should take when making live measurements with a DMM:

1. Always use personal protection equipment (PPE) when making any electrical measurements: safety glasses, insulated mats, and insulated gloves. Your PPE needs appropriate certification to provide an adequate level of protection.



Figure 2. Using insulated gloves to make live measurements.

2. Additional personal protection is required when working in Category III and CAT IV areas according to local Health and safety regulations. For example, use a full-face protective visor and protective suits.
3. Always test the digital multimeter before and after each measurement according to its standard operating procedures.
4. Do not change the settings or functions of a DMM during a test. If you are performing several sequential tests, do not change the functions of the DMM between tests.
5. Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. If you have damaged test leads, replace them before you use the DMM.
6. When you make measurements, always connect the common test lead before you connect the live test lead. When you disconnect the leads, disconnect the live test lead first. Avoid holding the test leads in your hands.

Understand your Digital Multimeter's Safety Certification Markings

Before you start a measurement, always select a DMM and accessories that display their safety certifications. The safety certifications ensure your DMM is compliant with relevant safety standards. DMMs with a safety certification from an accredited certification body, such as the Canadian Standard Association (CSA), should perform accurately to the relevant safety standard.

Certified products should always carry the relevant agency marking. The certified mark can be on the front, or the side, or under a flap of the device. The same certification mark should appear on DMM accessories, such as probes too.



Figure 3: Examples of certification body markings.

What is the CE Marking?

The “CE” marking is an abbreviation for “European Conformity” (from the French phrase “Conformité Européene”). The CE mark demonstrates that a product complies with all of the relevant European Union (EU) directives, such as the Low Voltage, EMC, and Machinery Directives.

Generally, DMMs fall under the scope of the Low Voltage, RoHS, and EMC Directives. CE-approved products also come with a manufacturer’s Declaration of Conformity (DoC). The manufacturer’s DoC is a declaration that the product meets all of the requirements of the applicable EU directives. The DoC comes from the product manufacturer, or from the person or company that sells the product within the EU.

DMMs available for sale in the European Union carry the CE mark and have a manufacturer’s DoC. The DoC provides information on the standards applied to demonstrate how the DMM conforms with applicable European Union directives.

Often a multimeter with a CE marking will also carry the certification mark of another standards body, like CSA, which demonstrates an independent assessment of conformity.



Conclusion

Whenever you make a measurement, safety is paramount. Always follow the standard operating procedures that correspond with your training. Wear appropriate personal protective equipment and pay attention to the signage in the environment where you are performing the measurements.

When you are working with a DMM, make sure it, and all of the other accessories you intend to use, are rated for the measurement you are about to make. Compliance markings, certification body markings, and declarations of conformity assure that the DMM's you use meet rigorous performance and safety standards.

Learn more about Keysight digital multimeters at: <https://www.keysight.com/find/DMM>.



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