

How robust is your handheld multimeter?

Application Note

In the world of handheld digital multimeters, maintenance professionals are being deluged with new models, new manufacturers, new functionality, claims about lowest cost, claims about features such as ruggedness, and water- and dust-resistance—the list goes on and on. To help put it all in perspective, consider some of the things that are most important to multimeter users.



Is it “CAT rated”?

Safety is, of course, the most important consideration. Make sure that any meter you consider has an International Electrotechnical Commission (IEC) category and voltage rating (often called a “CAT rating”) that is appropriate for the electrical environment in which you will use it. For instance, if you need to make measurements in an electrical panel with 480 V, you’ll need a meter that is rated “Category III 600 V” or “Category III 1000 V.” This means that the meter’s input circuitry has been designed to withstand voltage transients commonly found in this environment without harming the user. (The test leads you use with the meter should have an equal or greater CAT rating.)

A multimeter’s CAT rating is usually displayed near its input jacks. Multimeters that are not CAT rated should never be used in high energy, three-phase electrical work environments.

Is it certified for safety?

Instead of going to the “expense” and trouble of getting independent certification that their products meet tough standards for safety, ruggedness, and durability, some manufacturers and vendors state only that their products are “designed to meet” those standards. This can leave the buyer wondering if the product is as safe as the manufacturer claims it is. The easiest way to ensure that a multimeter

is safe is to look for the certification mark of independent safety and standards agencies stamped on the meter body and included in the meter’s brochures and catalogs. If a product carries the mark of a certifying agency, it has been independently tested and certified to meet the agency’s certification requirements.

As a rule, always make sure that the meter you are considering has at least one of the following certifications. More is better.

	Tested and certified as meeting Underwrites Laboratories’ safety requirements
	Tested and certified to meet Canadian Standards Association International’s standards for safety
	Tested and certified for electrical safety by TÜV Rheinland
	Tested and certified by the VDE Institute

Certification marks of four independent testing and certification entities.



Failed digital multimeter and probes that were not certified by an independent rating agency.

Choosing a meter with the appropriate CAT rating that also has a UL, CSA, TÜV, or VDE certification means the meter has not only been designed to IEC standards, it has been independently tested to verify that it meets those standards.

Is it water- and dust-resistant?

If your work takes you into wet or dusty environments, you may be considering a multimeter that is water- and dust-resistant. Water and dust resistance standards are defined in IEC 60529, which specifies levels of “ingress protection” (IP) from solids and water.

An IP rating has of two digits. The first digit specifies the size of excluded objects.

For example, the Fluke 28 II digital multimeter has a rating of “IP67.” It is designed and tested to be dustproof and to withstand immersion in water to a depth of one meter for 30 minutes. Again, a manufacturer’s claim that a tool is “designed to meet” a water and dust resistance standard is no guarantee. Look for independent certification.

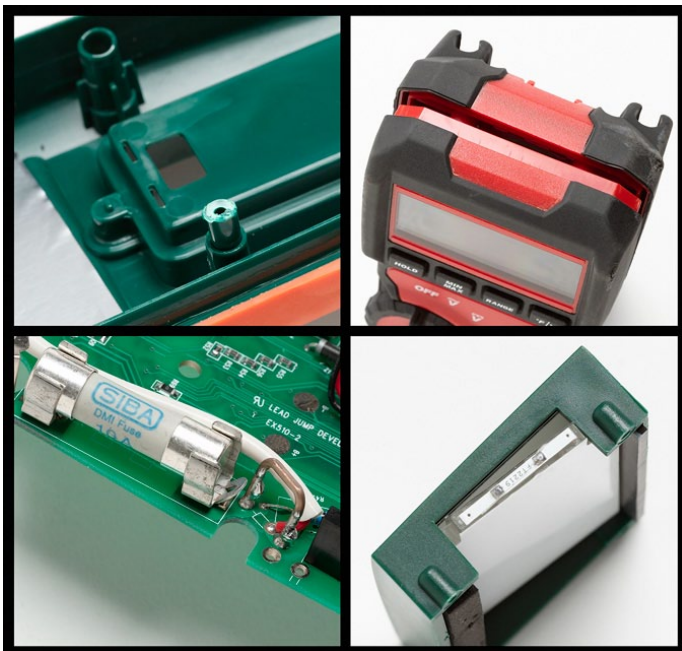
Ingress Protection Levels for Solids

Level	Object Size	Effective against
0		No protection
1	> 50 mm	Any large surface of the body
2	> 12.5 mm	Fingers or similar objects
3	> 2.5 mm	Tools, thick wires
4	> 1 mm	Granular objects. Most wires, screws etc
5	Dust protected	Not entirely prevented but must not interfere with satisfactory operation
6	Dust tight	No ingress of dust. Dustproof

The second digit of an IP rating specifies the level of protection against water.

Ingress Protection Levels for Water

Level	Protected against	Detail
0	Not protected	
1	Dripping Water	Vertically falling water. No harmful effect.
2	Dripping water, 15° tilt	Vertically falling water. No harmful effect when unit tilted up to 15° from its normal position.
3	Spraying water	Water falling as a spray at up to 60°. No harmful effect.
4	Splashing water	Water splashing from any direction. No harmful effect.
5	Water jets	Water projected by a nozzle from any direction. No harmful effect.
6	Powerful water jets	Water projected in powerful jets by a nozzle from any direction. No harmful effect.
7	Immersion up to 1 m	Immersion in water up to 1 m for 30 minutes. Waterproof to 1 m for 30 minutes.
8	Immersion beyond 1 m	Continuous immersion.



Damage to multimeters subjected to a six-foot drop onto concrete. Clockwise from top left: Broken screw boss, case separation, dislodged display, bent fuse clip with loose fuse.

Is it rugged and durable?

One safety standard for electrical equipment (IEC 61010) specifies that a product must survive a one-meter drop at both its highest and lowest specified operating temperatures.

The image above shows examples of products whose ruggedness and durability fell short when subjected to a more demanding test that simulated the effects of a fall from a six-foot ladder onto a concrete floor.

An Australian video blogger who loves to “exercise” electronic test equipment took this kind of testing to an extreme when he subjected a Fluke 28 II digital multimeter (which is tested by the manufacturer to withstand a three-meter drop) to a river canyon torture test. <http://www.eevblog.com/2010/03/07/eevblog-66-death-destruction-of-a-fluke-multimeter>

Can you trust the manufacturer?

Another method of determining product ruggedness and durability is to look at the manufacturer’s reputation for quality and reliability, how long the manufacturer has been providing products to the industry, and the number of older products from that manufacturer that are still in use. (How long the manufacturer itself has been around is another good indication of product quality). New manufacturers and suppliers entering the market can make claims about safety, quality, durability, and ruggedness, but have only a short track record to support their claims.

For more information about digital multimeter features and functions, see **ABCs of DMMs**.

To learn more about test lead safety, see **Don’t risk CAT IV areas without the right leads**.

How do you choose?

Faced with many choices and many competing claims, how do you choose? Here are some things to consider:

- Start by making sure that any meter you are considering has an IEC category and voltage rating (a “CAT rating”) appropriate for the environment in which you will be working.
- Make sure the meter has one or more safety certification marks from an independent rating agency. If in doubt, ask the vendor or manufacturer for proof of compliance with established safety standards.
- Look for a solid, well-built instrument that is free of obvious defects (rattles, poor workmanship, cheap materials) and that is built to withstand years of use.
- If you work outdoors, in harsh environments, or just want a multimeter that is dust and water resistant, look for an “IP code” (for example, “IP67”). Safety certification testing for IEC 61010 doesn’t test for compliance with the IEC 60529 “ingress protection” standard, so check with the manufacturer or vendor for proof of compliance.
- Look for a brand with a reputation for quality made by an established manufacturer.

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