

## Fluke web

### Complete information

The most complete and in-depth resource for information on Fluke's products and services including:

- Product information
- Interactive selection guides
- Virtual product demonstrations
- Extended specifications
- Application notes
- Product manuals
- Service information
- What's new
- Promotions
- Prices
- Where to buy
- Distributor and sales office locations

### Find information fast

To quickly find more information on Fluke products, use the "Search by model" box in the top left corner of our web pages. All you have to do is type in the model number.

Europe: [www.fluke.eu](http://www.fluke.eu)

UK: [www.fluke.co.uk](http://www.fluke.co.uk)

IE: [www.fluke.ie](http://www.fluke.ie)

Worldwide: [www.fluke.com](http://www.fluke.com)



Fluke web sites are available in all countries around the world and in 18 different languages.



## Electronic Newsletter

**E-Test-it!** is Fluke's regular news publication for professional test tool users. It is electronically available 6 times per year. You will be the first to hear about:

- New Fluke products
- The latest actions and promotions from Fluke
- How to get more out of Fluke tools
- How to use Fluke tools better in your application
- Exclusive offers, promotions and discounts on Fluke Merchandizing
- Exclusive offers on Fluke ex-demo equipment

E-Test-it! is free of charge. If at any point in time you do not want to receive E-Test-it! anymore, you can unsubscribe with a simple mouse click. E-Test-it! is small in size (on average about 12 KB) and does not fill up your mailbox or take long to download.

**Try it now and sign-up for your FREE e-Test-it! subscription. Go to the Fluke web site and fill in the on-line subscription form.**

# New from Fluke



## Fluke 113 True RMS multimeter

The Fluke 113 is for basic electrical tests and repairing most electrical problems. Features include Fluke's VCHEK™, added measurement functions, backlight and conformance to the latest safety standards.

See page 15.

## Fluke 411D/416D Laser Distance Meters

These meters are fast, accurate, durable and easy to use – just point and shoot. Their straightforward design and easy, one-button operation means you spend less time measuring.

See page 30.



## Fluke 1650B Series Multifunction Installation Testers

Safer, easier installation testing. The new 1650B Series builds on the rugged reputation of the earlier 1650 Series and adds new features like the fast, high current loop test and a variable RCD trip current setting.

See page 40 and 41.

## Fluke 1523/1524 Reference Thermometers

Measure, graph and record three sensor types with one tool. The Fluke 1523/24 Reference Thermometer readouts deliver high accuracy, wide measurement range, logging, and trending, all in a handheld tool you can take anywhere.

See page 52.



## Fluke 225C/215C Color ScopeMeters

The new ScopeMeters give you all the functionality of the existing 190C Series and more. With a built-in bus health test they are the only tools that can validate signal integrity of multiple types of industrial network.

See page 66 and 67.

## Fluke 719 Pressure Calibrator

With the innovative, built-in electric pump, the Fluke 719 provides pressure calibration at your fingertips! Now you can calibrate and test pressure devices quickly and easily with one hand, saving you valuable time.

See page 90.



# Application/ background articles

As part of our commitment to supporting you in your work we do more than just design and manufacture rugged and versatile test tools: we also provide application notes which all can be downloaded from our web site. Furthermore check our three new dedicated web portals: Industrial Portal, Electrical Portal and Process Portal. In addition to inspection tips and helpful application information, the portals also offer advice on picking the right tool for the job.



# Fluke: Where safety is built in



As distribution systems and loads become more complex, the possibilities of transient overvoltages increase. Motors, capacitors and power conversion equipment such as variable speed drives can be prime generators of spikes. Lightning strikes on outdoor transmission lines also cause extremely hazardous high-energy transients. If you're taking measurements on electrical systems, these transients are "invisible" and largely unavoidable hazards. They occur regularly on low-voltage power circuits, and can reach peak values in the many thousands of volts. To protect you against transients, safety must be built into the test equipment.

### Who Develops Safety Standards?

The IEC (International Electrotechnical Commission) develops international general standards for safety of electrical equipment for measurement, control and laboratory use. IEC61010-1 is used as the basis for the following national standards:

- US ANSI/ISA-S82.01-94
- Canada CAN C22.2 No.1010.1-92
- Europe EN61010-1:2001

### Overvoltage Installation Categories

IEC61010-1 specifies categories of overvoltage based on the distance the piece of equipment is from the power source (see Fig. 1 and Table 1) and the natural damping of transient energy that occurs in an electrical distribution system. Higher categories are closer to the power source and require more protection. Within each installation category there are voltage classifications. It is the combination of installation category and voltage classification which determines the maximum transient withstand capability of the instrument.

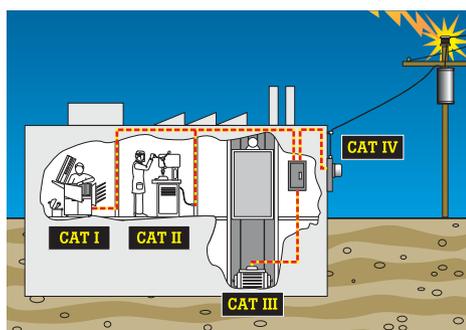


Figure 1. Understanding categories: location

IEC 61010 test procedures take into account three main criteria: steady-state voltage, peak impulse transient voltage and source impedance. These three criteria together will tell you a multimeter's true voltage withstand value.

Within a category, a higher working voltage" (steadystate voltage) is associated with a higher transient, as would be expected. For example, a CAT III 600 V meter is tested with 6000 V transients while a CAT III 1000 V meter is tested with 8000 V transients. So far, so good. What is not as obvious is the difference between the 6000 V transient for CAT III 600 V and the 6000 V transient for CAT II 1000 V. They are not the same. This is where the source impedance comes in. Ohm's Law (Amps = Volts/Ohms) tells us that the 2 Ω test source for CAT III has six times the current

of the 12 Ω test source for CAT II. The CAT III 600 V meter clearly offers superior transient protection compared to the CAT II 1000 V meter, even though its so-called "voltage rating" could be perceived as being lower. See Table 2.

### Independent testing is the key to safety compliance

How can you tell if you're getting a genuine CAT III or CAT II meter? Unfortunately it's not always that easy. It is possible for a manufacturer to self-certify that its meter is CAT II or CAT III without any independent verification. The IEC (International Electrotechnical Commission) develops and proposes standards, but it is not responsible for enforcing the standards. Look for the symbol and listing number of an independent testing lab such as UL, CSA, VDE, TÜV or other recognized approval agency.

These symbols can only be used if the product successfully completed testing to the agency's standard, which is based on national/



international standards. UL 3111, for example, is based on EN61010-1. In an imperfect world, this is the closest you can come to ensuring that the meter you choose was actually tested for safety.

Table 1

Overvoltage category	In brief	Examples
CAT IV	Three-phase at utility connection, any outdoor conductors	<ul style="list-style-type: none"> <li>• Refers to the "origin of installation"; i.e., where low-voltage connection is made to utility power.</li> <li>• Electricity meters, primary overcurrent protection equipment.</li> <li>• Outside and service entrance, service drop from pole to building, run between meter and panel.</li> <li>• Overhead line to detached building, underground line to well pump.</li> </ul>
CAT III	Three-phase distribution, including single-phase commercial lighting	<ul style="list-style-type: none"> <li>• Equipment in fixed installations, such as switchgear and polyphase motors.</li> <li>• Bus and feeder in industrial plants.</li> <li>• Feeders and short branch circuits, distribution panel devices.</li> <li>• Lighting systems in larger buildings.</li> <li>• Appliance outlets with short connections to service entrance.</li> </ul>
CAT II	Single-phase receptable connected loads	<ul style="list-style-type: none"> <li>• Appliance, portable tools, and other household and similar loads.</li> <li>• Outlet and long branch circuits.</li> <li>• Outlets at more than 10 meters (30 feet) from CAT III source.</li> <li>• Outlets at more than 20 meters (60 feet) from CAT IV source.</li> </ul>
CAT I	Electronic	<ul style="list-style-type: none"> <li>• Protected electronic equipment.</li> <li>• Equipment connected to (source) circuits in which measures are taken to limit transient overvoltages to an appropriately low level.</li> <li>• Any high-voltage, low-energy source derived from a high-winding resistance transformer, such as the high-voltage section of a copier.</li> </ul>

# Fluke: Where safety is built in

**Safety is everyone's responsibility but ultimately it is in your hands. No tool by itself can guarantee your safety when working with electricity. It's the combination of the right tools and safe work practices that gives you maximum protection. Here are a few tips to help you in your work:**

**Make sure you always comply with (local) regulations.**

**Work on de-energized circuits whenever possible.**

Use proper lock-out/tag-out procedures. If these procedures are not in place or enforced, assume that the circuit is live.

**Use protective gear when working on live circuits:**

- Use insulated tools
- Wear safety glasses or a face shield
- Wear insulated gloves, remove watches or jewelry
- Stand on an insulated mat
- Wear flame resistant clothing, not ordinary work clothes



Use protective equipment such as safety glasses and insulated gloves

**Select the right test tool:**

- Choose a test tool rated to the highest category and voltage for which it could possibly be used (most often 600 or 1000 volt CAT III and/or 600 volt CAT IV).
- Look for the category and voltage marking near the recessed input connectors of your test tool and a "double insulated" symbol on the back.
- Verify your test tool has been tested and certified by two or more independent testing laboratories, such as UL in the United States and VDE or TÜV in Europe by looking for the symbols of these agencies on (the back of) your test tool.
- Make sure that the test tool is made of a high-quality, durable non-conductive material.
- Check the manual to verify that the ohms, continuity and capacitance circuits are protected to the same level as the voltage test circuit, to reduce hazards when the test tool is used incorrectly in ohms, continuity or capacitance mode (if applicable).
- Verify that the test tool has internal protection to prevent instrument damage when voltage is incorrectly applied to an amperage measurement function (if applicable).
- Make sure that the amperage and voltage of your test tool's fuses meets specifications. Fuse voltage must be as high or higher than the test tool's voltage rating.
- Be sure to use test leads that have:
  - Shrouded connectors
  - Finger guards and a non-slip surface
  - Category ratings that equal or exceed those of the test tool
  - Double insulation (look for the symbol)
  - A minimum of exposed metal on the probe tips

**Inspect and test your test tool:**

- Check for a broken case, worn test leads or a faded display.
- Make sure the batteries still deliver sufficient power to get reliable readings. Many test tools have a low battery indicator on the display.
- Check the test leads resistance for internal breaks while moving the leads around (good leads measure 0.1-0.3 Ohm).
- Use the meter's own test capability to ensure that the fuses are in place and working right (see manual for details).

**Apply the appropriate working practices when measuring on live circuits:**

- Hook on the ground clip first, then make contact with the hot lead. Remove the hot lead first, the ground lead last.
- Use the three-point test method, especially when checking to see if a circuit is dead. First test a known live circuit. Second, test the target circuit. Third, test the live circuit again. This verifies that your test tool worked properly before and after the measurement.
- Hang or rest the test tool if possible. Try to avoid holding it in your hands, to minimize personal exposure to the effects of transients.
- Use the old electrician's trick of keeping one hand in your pocket. This lessens the change of a closed circuit across your chest and through your heart.

**For more information or to request the Electrical Safety DVD go to:**

United Kingdom: [www.fluke.co.uk/safety](http://www.fluke.co.uk/safety)

Ireland: [www.fluke.ie/safety](http://www.fluke.ie/safety)

E-Europe/Middle-East/Africa: [www.fluke.nl/safety\\_ex](http://www.fluke.nl/safety_ex)

**Table 2**

Overvoltage Installation Category	Working Voltage (DC or AC RMS to ground)	Peak Impulse Transient (20 repetitions)	Test Source (Ω = V/A)
CAT I	600 V	2500 V	30 Ohm source
CAT I	1000 V	4000 V	30 Ohm source
CAT II	600 V	4000 V	12 Ohm source
CAT II	1000 V	6000 V	12 Ohm source
CAT III	600 V	6000 V	2 Ohm source
CAT III	1000 V	8000 V	2 Ohm source
CAT IV	600 V	8000 V	2 Ohm source

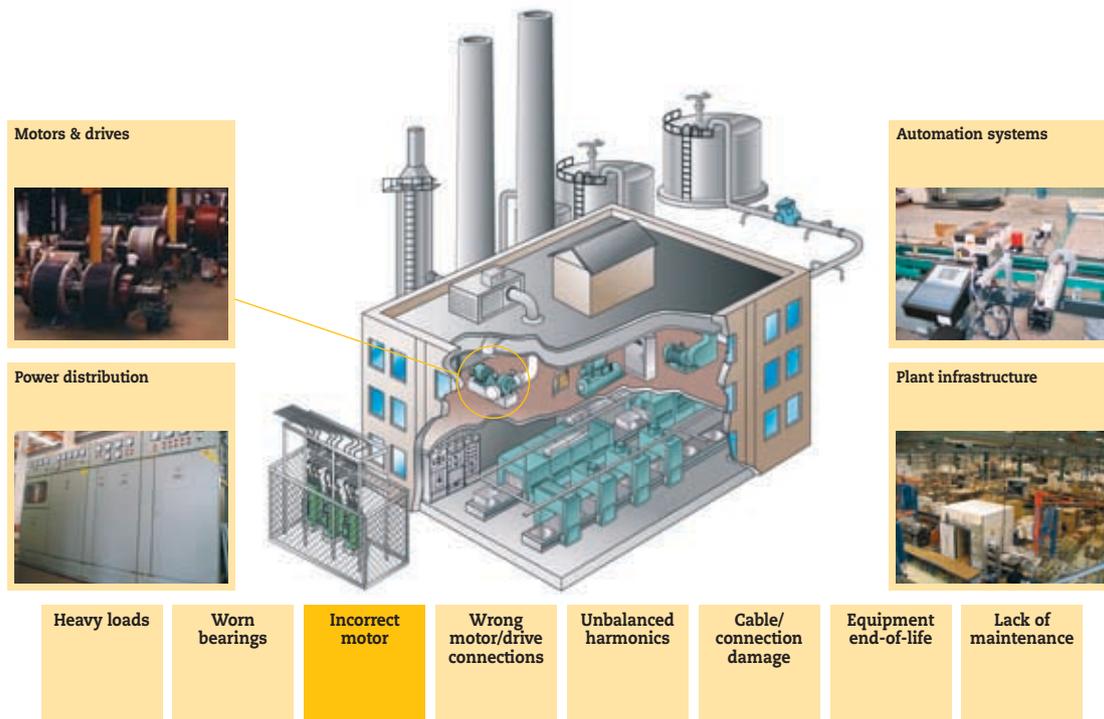
Transient test values for overvoltage installation categories. (50 V/150 V/300 V values not included)



Use meters with these markings: 1000 V CAT III or 600 V CAT IV

# Fluke Industrial Web Portal

## Reduce downtime and unnecessary repairs



### Incorrect motor

Overloading and mechanical strain could be signs that the motor is underperforming or inadequate for the job. Use an infrared thermometer to quickly locate hot spots, and see areas of excessive heat with a thermal imager to determine severity. A digital multimeter will determine if the current draw is too high, which is also a sign that the motor is inadequate for the demands placed on it. With a clamp meter measure the inrush current and high load currents.

### Fluke 568 Thermometer

- High accuracy
- Easy interface
- Infrared and contact bead probe
- Trending and reporting via PC



### Fluke Ti25 Thermal Imager

- IR-Fusion® blended thermal images
- Rugged, withstands 2 m drop
- High resolution and thermal sensitivity
- Full analysis and reporting software included



### Fluke 87V True RMS Multimeter

- Accurate frequency and voltage measurements on motor drives and electrically noisy environments.
- Built-in thermometer



### Fluke 337 True RMS Clamp Meter

- In-rush current function for motor starting, inductive lighting, etc.
- AC/DC voltage and frequency measurements
- Jaw opening 42 mm

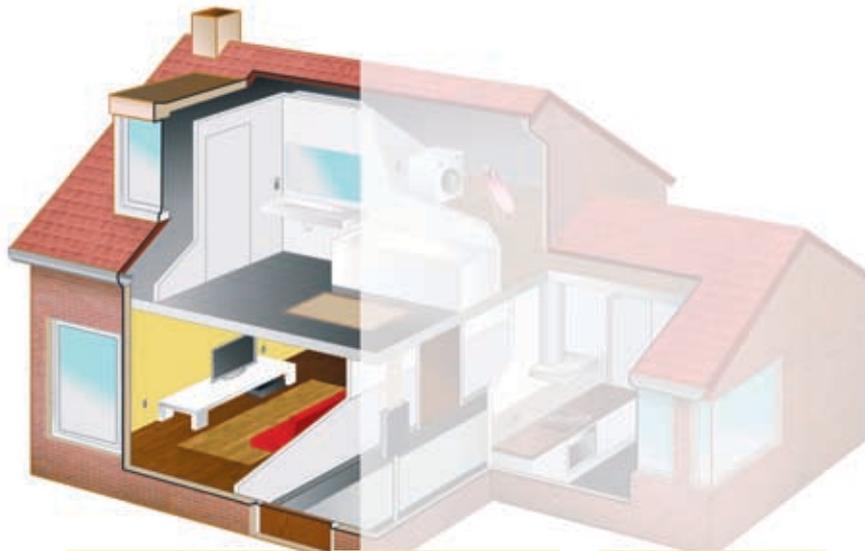


### [www.fluke.eu/industrial](http://www.fluke.eu/industrial)

Visit the full portal with practical information about troubleshooting potential problems throughout the plant. See how to find the right test tool for the job.

# Fluke Electrical Web Portal

A solution for every application



Electrical installation testing



Power consumption



Service/repair

## Electrical Installation Testing

Setting up new installations, extending an existing installation or trouble shooting around safety is always crucial. To avoid any safety issues, with a multifunctional installation tester all safety measurement are combined in one single tester, testing a RCD or measuring the loop etc.

A voltage tester is the every day tester when working in an electrical installation, quickly check voltage or continuity. The T5 with its OpenJaw™ technology allows current measurement on tight spaces such as for example on a distribution board.

## Fluke 1650B Series Installation Testers

- Insulation test, continuity test, high current loop test, RCD test, earth ground test
- Slim probe with test button



## Fluke T5-1000 Electrical Tester

- Voltage and continuity measurement
- OpenJaw™ technology for current checks up to 100 A



## Fluke T120 Voltage and Continuity Tester

- Voltage, continuity and resistance measurements
- Three-phase rotation detection system



[www.fluke.eu/electrical](http://www.fluke.eu/electrical)

Visit the full portal with practical information for the electrical installer. See how to find the right test tool for the job.

# Fluke Process Web Portal

## Identifying potential problems

**Testing in Ex. Classified areas**

**Maintenance and calibration of process instruments**

**Automation Systems**

**Instrument commissioning and service**

**Measuring, troubleshooting 4-20mA loop signals**

**Temperature calibrations**

**Pressure calibrations**

**Switch testing**

**Custody transfer**

**Troubleshooting process signals**

### Measuring troubleshooting 4-20 mA loop signals

Keeping manufacturing and processing plants running at maximum efficiency 24-hours a day requires regular inspection and troubleshooting of vital systems and equipment. 4-20mA control loops are the most common control signals used in process industries today. Troubleshooting the mA loop instruments, connections, and cables are an essential part of locating and repairing process control.

#### Fluke 707Ex Loop Calibrator

- Simultaneous mA and %
- mA accuracy of 0.02%
- Measure, source and simulate mA



#### Fluke 725Ex Multifunction Process Calibrator

- Measure, source and view process signals simultaneously
- Measure volts, mA, RTDs, thermocouples, frequency, and resistance to test sensors and transmitters.



#### Fluke 87VEx True RMS Multimeter

- Accurate frequency and voltage measurements on motor drives and electrically noisy environments.
- Built-in thermometer



### [www.fluke.eu/process](http://www.fluke.eu/process)

Visit the full portal with practical information about troubleshooting potential problems in the process control environment. See how to find the right test tool for the job.