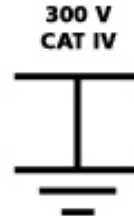


CAT IV Instrument rating

Why is the "CAT" or "Category" rating important?

The CAT (Category) rating of a test instrument defines where in the electrical supply chain the instrument can be safely used. This is usually printed on the instrument across the test connections

and appears as CAT II, CAT III or CAT IV. CAT I is generally no longer used, as it has no practical application.



What is a CAT rating?

The CAT rating defines the level of transient (spike or surge) the instrument has been designed to withstand. These transients vary in size and duration depending on the source of the transient. A transient may be several hundred or several thousand volts in amplitude but its duration is typically very short, maybe only 50 microseconds.

On its own the transient will cause little or no damage. However, when it occurs on top of the normal mains sinusoidal supply voltage it can create an arc, which the transformer will see as a short circuit. The fault current supplied by the transformer will only be limited by the resistance of the circuit between the transformer and the fault.

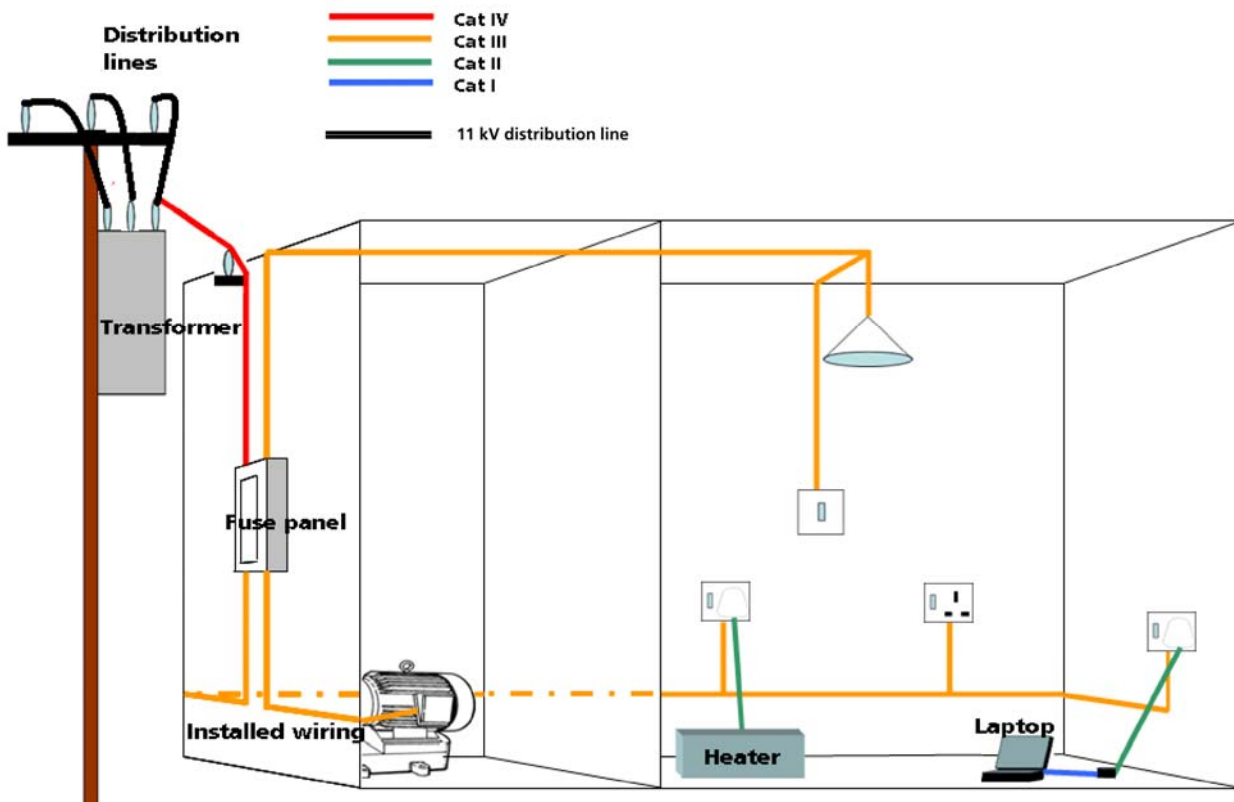
The transient riding on a high-energy supply is more dangerous than a transient on an isolated cable as it can deliver larger currents

when a fault occurs. In the case of a CAT IV system the available short circuit current can be several thousand amps on the CATIV part of the circuit. This generates hundreds of kilowatts of heat in a small space for a few milliseconds, creating an arc flash, possibly causing burns, fire or explosion and significant personal injury or death. Instruments designed with the correct category rating have sufficient clearance between critical parts to prevent an arc from forming and consequently no arc flash.

The international safety standard for electrical measurement instruments, IEC61010, defines the design requirements for instruments that declare a specific category rating. Recently companies, especially electrical utilities, have stipulated all electrical test instrumentation to be rated CAT IV. This is a result of injuries sustained by engineers using inappropriately rated instruments on the supply and an increasing trend for live working.

Where are CAT IV applications found?

The electrical supply can be broken down into categories from CAT I to CAT IV as shown. In fact CAT I is no longer used.



The picture shows the transmission lines (overhead or underground) as Category IV because the energy available from the supply and size of a transient is much higher near to the transformer. Test equipment suitable for use in this environment needs to be rated to CAT IV.

By the time the transient has passed through the fuse panel into the premises, the circuit impedance is higher and transients are damped (or even suppressed by surge protection devices), reducing the available energy in the transient and the available fault current if an arc does occur.

The ability of the test instrument to withstand this surge is less stringent, hence a Category III rating. Refer to IEC 60364 or BS7671 section 44. for further details on over voltage protection.

The further down the supply you progress the lower the protection a test instrument has to provide. At the socket or lighting outlet the circuit is rated CAT II and items such as photocopiers, televisions etc can be considered as CAT I environments. Most electricians' testers will be rated to CAT II, or the better ones to CAT III. These instruments **are not designed to be used** on the higher energy CAT IV circuits.

However in reality this does occur.

Who wants CAT IV?

Electrical Utilities: -

As already mentioned, the electrical utilities are now specifying CAT IV instruments in an attempt to reduce risk to their operators and consequent liability, where instruments get used both inside and outside the building. This applies to insulation testers as well as LIVE testers, as the capability to measure supply voltage exists on a voltage measurement range, as well as accidental connection to live circuits whilst in other test modes.

Any engineer: -

Working outside the premise, either on overhead or underground LV supplies, will be working in a CAT IV environment, and should be working with suitably rated instruments.

Important safety reminder:

CAT IV systems are capable of delivering very high currents under short circuit of fault conditions that could cause significant injury or death. A risk assessment should be performed on all installations to establish whether a fused test lead set should be used.

Some basic statistics:

Small transients (a few hundred volts)

Occur on supply systems most days of the year.

Large transients (5 to 10 kV)

Do not occur very often however, they are unpredictable. Using a correctly rated instrument the chances of a dangerous breakdown are something like one in a million for every hour connected to the supply. Using a tester rated one category less increases the chances of an accident by a factor of about 30. This means that if 100 engineers are using instruments with wrong category ratings and they connect to live systems for one hour every day, 200 days a year, a dangerous situation is likely to occur once every 18 months!

The range of Megger instruments that is now suitable for connection to CAT IV systems has increased significantly. They include:

| | | |
|-----------------|--|--------------|
| MIT300 series | Insulation testers | CAT IV 300 V |
| MIT400 series | Insulation testers | CAT IV 600 V |
| LT300 | High current earth loop tester | CAT IV 300 V |
| LTW300 series | Non- trip, 2-wire earth loop tester | CAT IV 300 V |
| LWT425 | High resolution 2-wire earth loop tester | CAT IV 300 V |
| MFT1700 series | Multifunction testers | CAT IV 300 V |
| MFT1800 series | Multifunction testers | CAT IV 300 V |
| DCM330 | Open jaw current clamp | CAT IV 600 V |
| DET3T series | Contractors earth electrode tester | CAT IV 100 V |
| DET4T series | 4 pole earth resistivity tester | CAT IV 100 V |
| MIT5_0/2 series | 5 kV insulation resistance tester | CAT IV 600 V |
| MIT5_5 series | 5 kV insulation resistance tester | CAT IV 600 V |
| MIT1020/2 | 10 kV insulation resistance tester | CAT IV 600 V |
| MIT1025 | 10 kV insulation resistance tester | CAT IV 600 V |
| S1-55_ series | 5 kV insulation resistance tester | CAT IV 600 V |
| S1-105_ series | 10 kV insulation resistance tester | CAT IV 600 V |

These CAT ratings apply to all test ranges on Megger instruments, not just the easy ones!