

# Isolation Glossary



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## ***About This Isolation Glossary***

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This glossary lists and explains terms, acronyms, and definitions for isolation devices.

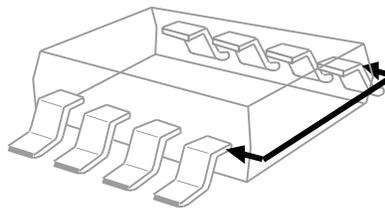
# Isolation Glossary

## 1 Isolation Glossary

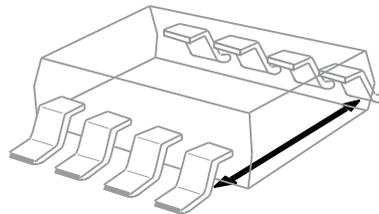
**Primary Circuit** — A circuit that is directly connected to an external mains supply for its power needs.

**Secondary Circuit** — A circuit that has no direct connection to a primary circuit and derives its power from a transformer, converter or equivalent isolation device, or from a battery.

**Creepage** — The shortest distance between two conductive parts measured along the surface of a solid insulation. The shortest path is typically found around the end of the package body.



**Clearance** — The shortest distance between two conductive parts measured through air.



**Isolation Capacitance ( $C_{i0}$ )** — The total capacitance between the terminals on a first side of the isolation barrier connected together and the terminals on a second side of the isolation barrier connected together forming a two-terminal device.

**Isolation Resistance ( $R_{i0}$ )** — The resistance between the terminals on a first side of the isolation barrier connected together and all the terminals on a second side of the isolation barrier connected together forming a two-terminal device.

**Rated Isolation Voltages** — The maximum voltage between all input terminals (connected together) and all output terminals (connected together) respectively.

*Maximum Rated Working Isolation Voltage ( $V_{IOWM}$ )* — An r.m.s or equivalent d.c. voltage assigned by the manufacturer, characterizing the specified long term withstand capability of its isolation.

*Maximum Rated Repetitive Peak Isolation Voltage ( $V_{IORM}$ )* — A peak voltage assigned by the manufacturer, characterizing the specified withstand capability of its isolation against repetitive peak voltages. It includes all repetitive transient voltages, but excludes all non-repetitive transient voltages.

*Maximum Rated Transient Isolation Voltage ( $V_{IOTM}$ )* — A peak impulse voltage assigned by the manufacturer, characterizing the specified withstand capability of its isolation against transient overvoltages.

*Withstand Isolation Voltage ( $V_{ISO}$ )* — Maximum AC r.m.s. isolation voltage for one minute.

*Surge Isolation Voltage ( $V_{IOSM}$ )* — The highest instantaneous value of an isolation voltage pulse with short time duration and of specified wave shape.

**Partial Discharge** — Localized electrical discharge which occurs in the insulation between all terminals of the first side and all terminals of the second side of the coupler.

**Comparative Tracking Index (CTI)** — CTI is an index used for electrical insulating materials that is defined as the numerical value of the voltage which causes failure by tracking during standard testing. Tracking is the process that produces a partially conducting path of localized deterioration on or through the surface of an insulating material as a result of the action of electric discharges on or close to an insulation surface -- the higher the CTI value of the insulating material, the smaller the minimum creepage distance required.

Generally, insulation breakdown occurs either through the material, over its surface, or both. Surface failure may arise from flashover or from the progressive degradation of the insulation surface by small localized sparks. Such sparks are the result of the breaking of a surface film of conducting contaminant on the insulation. The resulting break in the leakage current produces an overvoltage at the site of the discontinuity, and an electric spark is generated. These sparks often cause carbonization on insulation material and lead to a carbon track between points of different potential. This process is known as *tracking*.

**Material Groups** — Materials are classified into four groups according to their CTI values. These values are determined in accordance with IEC 60112. The groups are as follows:

- Material group I:  $600V \leq CTI$
- Material group II:  $400V \leq CTI < 600$
- Material group IIIa:  $175V \leq CTI < 400$
- Material group IIIb:  $100V \leq CTI < 175$

## 1.1 **Insulation:**

*Functional insulation* — Insulation needed for the correct operation of the equipment.

*Basic insulation* — Insulation that provides basic protection against electric shock.

*Supplementary insulation* — Independent insulation applied in addition to basic insulation in order to ensure protection against electric shock in the event of a failure of the basic insulation.

*Double insulation* — Insulation comprising both basic and supplementary insulation.

*Reinforced insulation* — A single insulation system which provides a degree of protection against electric shock equivalent to double insulation.

## 1.2 **Pollution Degree:**

Pollution is any addition of foreign matter, solid, liquid, or gaseous that can result in a reduction of electric strength or surface resistivity of the insulation. There are four categories of pollution:

*Pollution Degree 1* — No pollution or only dry, nonconductive pollution occurs. The pollution has no influence.

*Pollution Degree 2* — Only nonconductive pollution occurs. However, a temporary conductivity caused by condensation is to be expected.

*Pollution Degree 3* — Conductive pollution occurs or dry non-conductive pollution occurs which becomes conductive due to condensation which is to be expected.

*Pollution Degree 4* — Continuous conductivity occurs due to conductive dust, rain, or other wet conditions.

### 1.3 **Overvoltage Categories and Installation Classification:**

*Overvoltage Categories* define transient overvoltage conditions. There are four different levels as indicated in IEC 60664.

I: Signal level — Special protected equipment or parts of equipment, for example, circuit board inside a DVD player.

II: Local level — Portable equipment that is supplied from the wall outlet, for example, a DVD player

III: Distribution level — Equipment in fixed installation such as HVAC system, Washers / Dryers, and so forth.

IV: Primary supply level — Equipment for use at the origin of the installations such as overhead lines, cable systems, and so forth.

Lower level category is subject to smaller transients than the category above.

### Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

#### Changes from Original (October 2014) to A Revision

Page

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|--|---|
| • Changed <i>Maximum Rated Isolation Working Voltage</i> ( $V_{IOWM}$ ) To: <i>Maximum Rated Working Isolation Voltage</i> ( $V_{IOWM}$ )..... | 3 |
| • Changed material group label numbers in the <b>Material Groups</b> bullets.....  | 4 |

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