

The following information was kindly provided and compiled by

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The Low Voltage Directive – Key points

All electrical equipment supplied in the European Economic Area must comply with the Low Voltage Directive (LVD). In UK law this is implemented through the Electrical Equipment (Safety) Regulations 1994 and it is a CE Marking requirement. It is not essential that testing for the LVD is carried out by a third party test house if the manufacturers are sufficiently confident of doing it themselves.

The safety standard covers equipment in normal use or in foreseeable misuse conditions and also applies to equipment built for own use by the manufacturer. It also covers prevention of access to hazards without the use of special tools or a key. The regulations do not apply to explosive atmospheres, medical equipment, aircraft, ships, railways, lifts, electricity meters, domestic plugs and sockets or components. However, there are other Directives or Regulations that apply to these items

Voltages covered by the LVD are 50 – 1000 Vac (rms) and 75 – 1500 Vdc. However, there is some discussion at the moment about reducing the minimum to zero volts.

General requirements

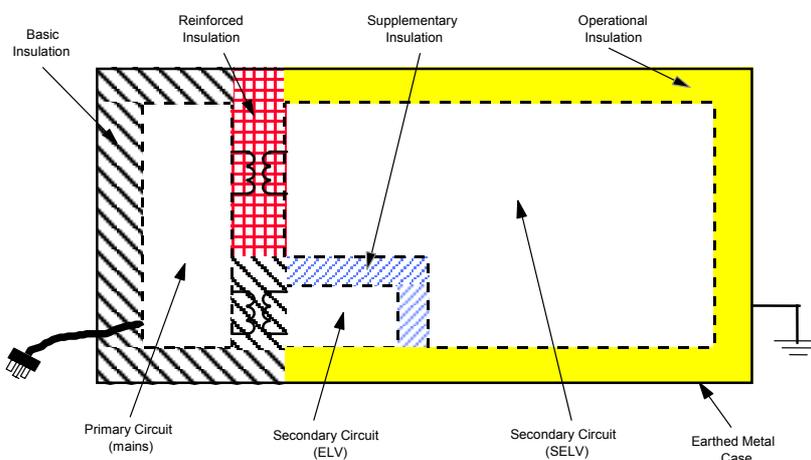
Additionally the following should be considered

- ❑ Voltages greater than 30 Vac or 60 Vdc are normally considered to be hazardous
- ❑ Voltages greater than 2V with available power greater than 240VA are considered to be hazardous energy levels.
- ❑ It must not be possible, under normal or single fault conditions, to make contact with hazardous voltages or hazardous energy levels.

Accessibility to Electrical Hazards

- ❑ There must be two levels of protection between hazardous voltages and “safe” voltages. This can be made up of one layer of insulation plus earth or two layers of insulation.
- ❑ The first layer of insulation is known as **Basic Insulation**. There will be *Basic Insulation* between hazardous voltages and earth or earthed parts.
- ❑ If there is not an earth a second layer of insulation is required and this is known as **Supplementary Insulation**.
- ❑ A combination of *Basic Insulation* and *Supplementary Insulation* is known as **Double Insulation**.
- ❑ Often there is a single layer of insulation between hazardous and “safe” voltages which has the same insulation properties as *Double Insulation*, this is known as **Reinforced Insulation**.

Types of Insulation



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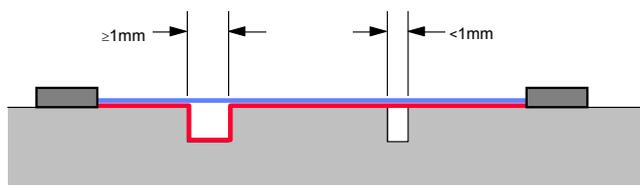
Insulation Distances

- Insulation distance through air is known as the **Clearance Distance**.
- Insulation distance along a surface is known as the **Creepage Distance**.
- Assuming the hazardous voltage is 230V single phase mains, the following table shows the normal insulation distances:

	Clearance	Creepage	Distance through insulation	Stress Voltage
Basic Insulation	2.0 mm	2.5 mm	Not Specified	1.5 kVac (2.1 kVdc)
Double or reinforced insulation	4.0 mm	5.0 mm	0.4 mm	3.0 kVac (4.2 kVdc)

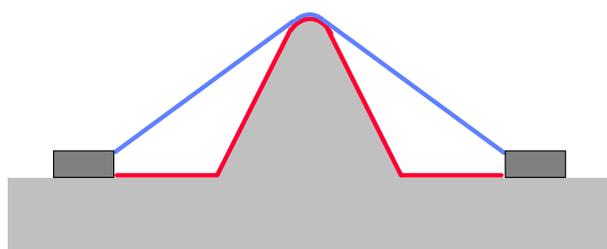
Examples of Creepage Distances and Clearances

Creepage Distances and Clearances (1)



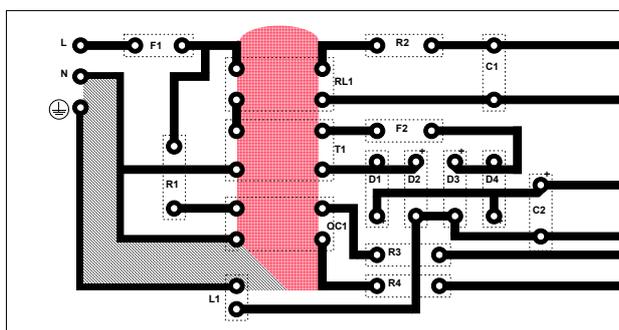
— Clearance
— Creepage Distance

Creepage Distances and Clearances (2)



— Clearance
— Creepage Distance

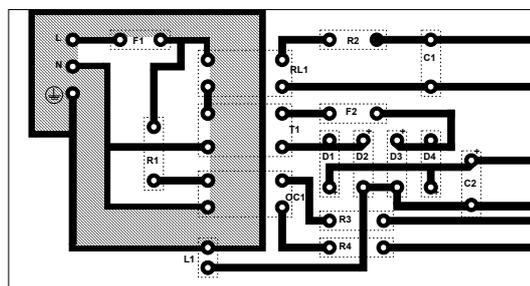
Creepage Distance (1)



Basic insulation - creepage distance at least 2.5mm between protective earth and hazardous circuitry.

Reinforced insulation - creepage distance at least 5mm between hazardous circuitry and self circuitry.

Creepage Distance (2)



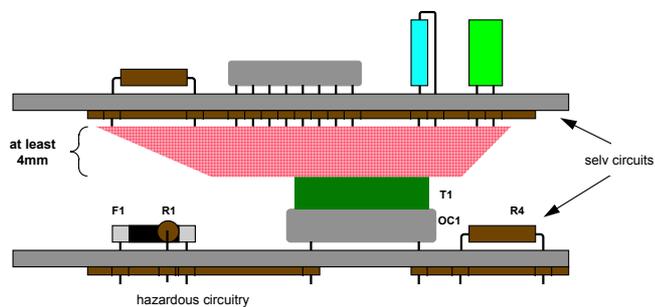
Basic insulation - creepage distance at least 2.5mm between protective earth and hazardous circuitry.

Note: There must still be a creepage distance of at least 5mm to maintain reinforced insulation between hazardous circuitry and self circuitry even though the earth track separates the two circuits.



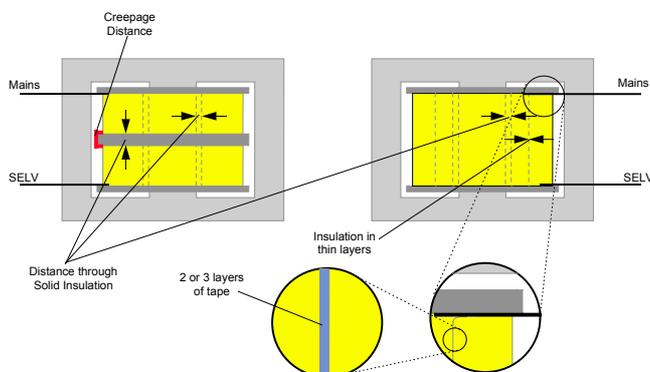
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Clearance Distance



Reinforced insulation - clearance distance at least 4mm between selv circuitry and hazardous circuitry.

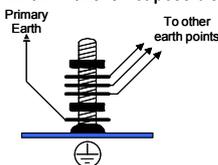
Distance through Insulation



Other important considerations

Earthing

- Earth wiring must be green/yellow (bare or transparent covering is allowed for earth braiding).
- The resistance between any point that requires to be earthed for safety reasons and the earth terminal must be less than 0.1Ω .
- The primary earth connection must be marked \oplus , subsequent earths should be marked \perp .
- The primary earth should preferably be connected to a separate terminal, subsequent earths being taken from another terminal. If this is not possible the primary earth should be connected first and held in place with a nut, subsequent earths can then be added and held in place with a second nut. The reason for this is to prevent the main earth from being disturbed during servicing.



Rating Plate

A rating plate must be affixed to the equipment in a visible position

