

FAQ – Safe Supply units

Q. Why should I install a Safe Supply Unit (SSU) in a school science laboratory?

A. School science laboratories are a high risk area regarding electrical shock risk. There is a potentially dangerous combination of mains voltage, water and school children. Traditional protection methods, such as the creation of earth free areas, are impractical to maintain given the transitory nature of electrical experiments in school laboratories. Furthermore, the physiological effects of electrical current on school children are more severe than on healthy adults and the comparatively coarse protection provided by a 30mA RCD is not considered by many to be adequate. See below for the typical effects of electricity on human beings.

| Current Flow | Symptom |
|--------------|---------------------------------------|
| 1 to 4 mA | Tingling sensation / perception |
| 3 to 4 mA | Let-go current - children |
| 6 to 8 mA | Let-go current - women |
| 7 to 9 mA | Let-go current men |
| 16 to 20 mA | Skeletal muscle contraction - adults |
| 20 to 50 mA | Respiratory muscle paralysis - adults |
| 50 to 120 mA | Ventricular fibrillation - adults |

Q. What is the output configuration of an SSU and what protection is provided?

A. The unit contains an isolating transformer, typically with a one-to-one transformation ratio of 230:230V. The secondary winding is centre tapped to earth resulting in 115V on L1 and 115V on L2. The centre tap is referenced to earth via a 12kΩ current-limiting resistor. The output is protected by a high sensitivity earth leakage relay, either set at 1.25mA or 5mA.

Q. What are the benefits of this arrangement?

A. The shock risk is reduced from 230V to 115V by the centre-tapped configuration. The maximum fault current that can flow is limited to less than 10mA by the resistor at all times. Earth faults will be quickly removed by the tripping of the earth leakage device. This is the safest arrangement for the protection of school children who may come into contact with electricity in a laboratory environment. It should be noted that even this tight protection arrangement does not protect against line-to-line faults or shocks.

Q. Where does this arrangement come from?

A. The arrangement has been in use since the 1960s but was first formalised by the HSE in their publication GS23, "Electrical Safety in Schools", originally issued in 1983. Although no longer published, the HSE have made it clear that they still regard its advice as valid.

Q. Are standard BS1363 13A sockets used with this arrangement?

A. Yes, since the publication of the CLEAPSS handbook in 1990, conventional 13A sockets have generally been used with Safe Supply Units with a centre-tapped winding, a current limiting resistor and a high sensitivity RCD (CLEAPSS is the Consortium of Local Education Authorities for the Provision of Science Services). When switched 13A sockets are required, because the centre-tapped supply arrangement creates a voltage on what is usually the neutral connection, double pole switched sockets should be used.

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