TECH DATA

BLAKLEY ELECTRICS

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.

PTO

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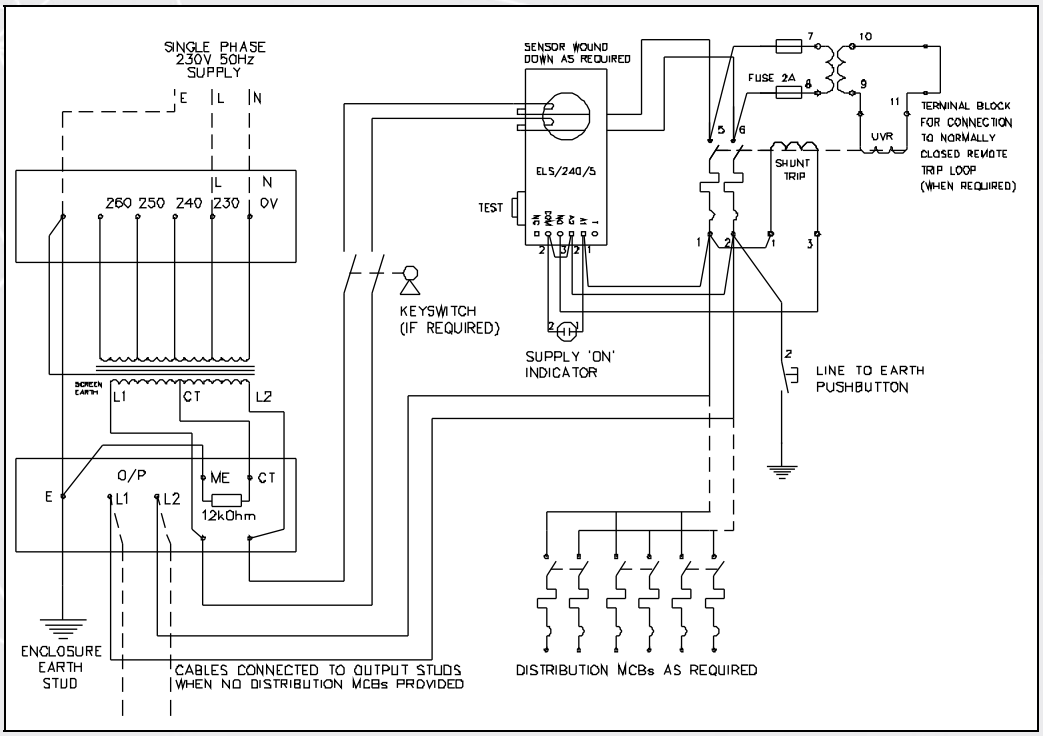
Cert. No. 902091
TDS9 - 05/10

Q. Can SSUs incorporate an emergency stop facility for the laboratory?
A. SSUs can incorporate a facility to be connected to a normally closed emergency stop system within the laboratory, in accordance with BS7671 clause 537.4.2.3. Key operated switches can also be incorporated to prevent unauthorised use.

Q. Does the arrangement cause any complications for installers of testers of Safe Supply Units?
A1. Like all transformers, an inrush current may be experienced when the transformer winding is energised. Type 'D' MCBs of appropriate ratings must be used to supply SSUs.
A2. Transformers generate heat when energised and used, so SSUs should be installed in well ventilated positions to prevent excessive heat build-up. They should not be installed in small cupboards which limit the airflow around them.
A3. No special earthing arrangements are required when connecting the output circuits. The outgoing earth connections can be taken to the earth stud within the unit in the normal way.
A4. The transformer is provided with multiple primary taps at 230V, 240V, 250V and 260V. The tapping that most closely reflects the typical supply voltage should be selected.
A5. Transformers all exhibit regulation, whereby the output voltage will be higher when the transformer is lightly loaded. The output voltage can rise above 230V by up to 5% if there is very little applied load. This overvoltage could be made worse by use of the incorrect primary tap.
A6. The test button on the front of the unit tests both the function of the RCD and also the earthing arrangement of the transformer. If the resistor fails or becomes disconnected, the test button will not trip the unit. One function of the resistor is to limit the current that flows through the test button. Resistors should not be removed under any circumstances, even for testing purposes.
A7. Standard plug-in socket testers may show problems such as neutral / polarity faults or earth faults. This is normal and cannot be avoided.
A8. Many RCD test sets may not work when connected to the output of an SSU, because the voltage to earth is lower than the test set is expecting. Blakley Electrics Ltd can provide fully compatible test sets if required.

Q. Does the arrangement cause any complications for end users?
A1. Nuisance tripping can be experienced if equipment is used that has circuitry connected to earth. For example, some computers have filters connected down to earth and these will have a small standing leakage. It might be necessary to limit the number of computers connected to any one unit.
A2. Turning off an item of equipment by means of a single pole switch built into a 13A socket or appliance will not result in removal of all power from the equipment. Therefore "Mains On" indicators may not truly represent the power feed to the equipment.

Typical wiring diagram



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