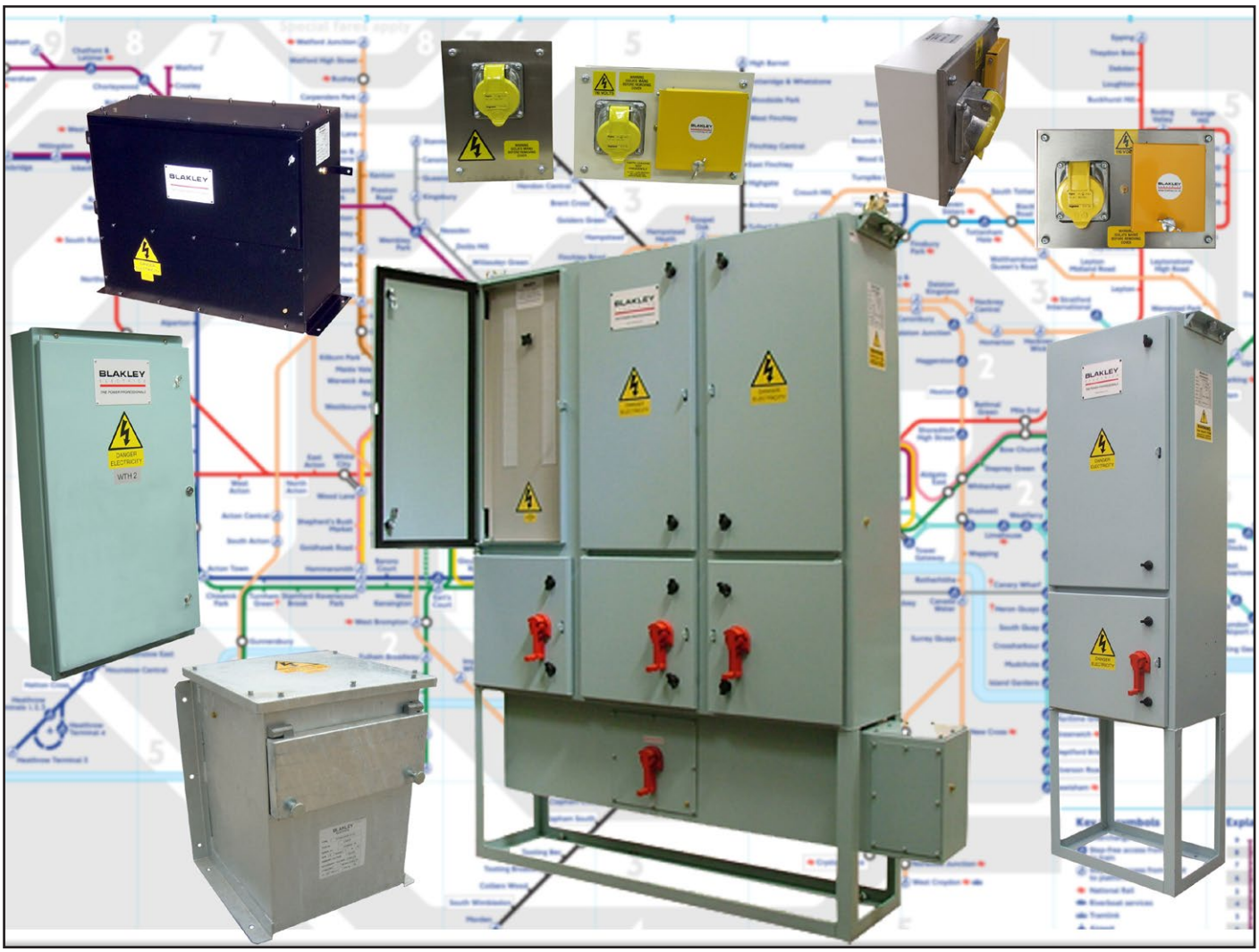
BLAKLEY ELECTRICS

TECHNICAL DATA SHEET

London Underground 110V Reduced Low Voltage (RLV) Transformer and Distribution Product Guide

Blakley Electrics has over 20 years experience in designing and manufacturing 110V Reduced Low Voltage (RLV) transformer and distribution products for installation in the London Underground Network. Our 110V products are installed across the LUL estate, including the entire tunnel system, most stations, many maintenance depots and a host of other locations. Through our involvement in numerous, diverse projects, we have built-up an unrivalled level of expertise in this specialist sector.



Blakley Electrics are able to offer a complete 110V RLV solution with our wide range of LUL approved, 110V RLV transformer, distribution and socket outlet products. Our 110V RLV products are designed to complement each other and, when installed together, in accordance with the guidelines overleaf, installations can be in complete compliance with BS7671:2008 (IET Wiring Regulations 17th Edition).

Experts in **high performance** power and lighting products

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BS7671:2008 110V RLV Circuit Requirements

Contrary to popular belief, 110V RLV circuits are no different from any other electrical circuit. In order to achieve compliance with BS7671:2008 the following requirements MUST be satisfied.

1. Short Circuit and Overcurrent Protection (BS7671:2008, Chapter 43)
110V RLV circuits MUST be fed from suitably rated double pole protective devices offering overcurrent protection in both poles.
2. Automatic Disconnection (BS7671:2008, Chapter 41)
110V RLV circuits MUST be protected by a device that will automatically disconnect the supply within 5 seconds of an earth fault occurring (regulation 411.8.3 refers).
3. Current Carrying Capacity (BS7671:2008, Chapter 52, Appendix 4)
Circuit conductors / cables must be suitably sized to ensure co-ordination with the protective device.
4. Voltage Drop (BS7671:2008, Chapter 52, Appendix 4)
Circuit conductors / cables must be sized to ensure permitted voltage drop figures are not exceeded.

The major limiting factor for 110V RLV circuits is generally believed to be voltage drop. However, in practice, ensuring the earth fault loop impedance (Zs) of the 110V RLV circuit is within the maximum permitted level usually represents the greatest challenge to installation designers. As stated above, BS7671:2008 requires that 110V RLV circuits are protected by a 5 second disconnection time. To achieve this, the maximum permitted earth fault loop impedance (Zs) for the circuit's protective device must not be exceeded. Failure to comply with this requirement may result in the protective device not operating correctly in the event of an earth fault, which could result in DEATH or FIRE.

110V RLV Circuit Design Guidance

To ensure compliance with the above four points, it is essential that the following factors are carefully co-ordinated: the impedance of the mains supply; the impedance of the 110V transformer; the size and type of the cables; the performance of the protective devices; the characteristics of the load to be supplied. As a quick guide, the following table details the maximum cable lengths for typical 110V RLV circuits protected by MCBs.

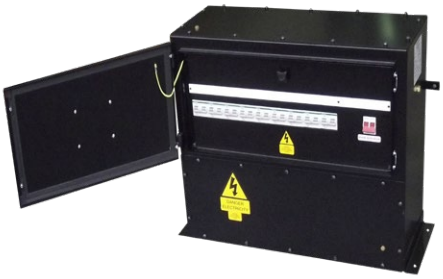
Maximum Cable Lengths for MCB Protected 110V RLV Circuits

Transformer Rating (kVA)	Secondary MCB Type "C" (amps)	Max Secondary 110V Cable Length (metres)				
		2.5mm² Cable, Radial / Ring	4.0mm² Cable, Radial / Ring	6.0mm² Cable, Radial / Ring	10.0mm² Cable, Radial / Ring	16.0mm² Cable, Radial / Ring
2	16A	6 / 12	10 / 20	15 / 30	25 / 50	39
6	16A	13 / 26	21 / 43	32 / 65	54 / 109	85
6	32A	- / 8	- / 14	10 / 21	17 / 35	27

As can be seen, despite the large cable capacity of Blakley equipment, when circuits are protected by Type "C" MCBs, which is a minimum requirement for supplying inductive loads such as small power tools or cleaning equipment, the circuit lengths are very limited. For this reason, RCDs are often used on 110V RLV circuits with high Zs figures, in order to satisfy the automatic disconnection requirements of BS7671:2008 (point 1 above). The 30mA or 300mA sensitivity of these devices reduces the need to install costly and excessively large cables to meet disconnection times on relatively small circuits. Across our range of transformers and distribution equipment, high quality double pole MCBs, RCCBs and RCBOs are incorporated. 'R' versions of all standard products are available, which incorporate integral RCBO and RCCB devices. Our RCBOs and RCCBs are designed to ensure correct operation on 110V RLV supplies and offer complete discrimination when multiple devices are used in series on the same distribution circuit. It is worth noting that many "standard" RCBOs and RCCBs are unsuitable for use on 110V RLV circuits, because the test button, used for periodic testing, is designed to operate on a 230V supply and not a 110V RLV supply. In addition, many standard RCBOs only offer single pole thermal and magnetic protection, which does not meet the short circuit and overload requirements of BS7671:2008 (point 4 above).

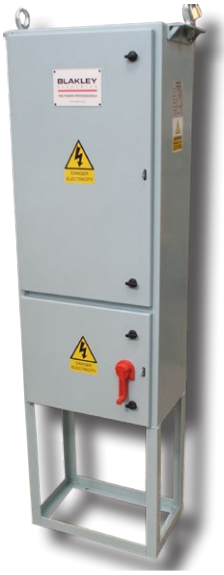
Important Notes & Assumptions:
The above figures are based on all of the 110V RLV equipment being from the Blakley Electrics range of LUL products.
The above is intended for guidance only, compliance to BS7671:2008 must be confirmed by the appointed design authority.
Primary impedance is based on the maximum figures permitted by Table 41.3 of BS7671:2008, 2kVA transformer fed from a 10A type 'C MCB with a maximum earth fault loop impedance (Zs) of 2.3Ω and 6kVA transformer fed from a 32A type 'C MCB with a maximum earth loop impedance (Zs) of 0.72Ω.
The Blakley Calculator's transformer fault current calculation sheet can be used to calculate fault currents using actual Zs figures, please visit www.blakley.co.uk/blakley-electrics-calculator or contact the Blakley Technical Department.
All cable figures based on single core 70°C cable and taken from Table 4D1A column 2 and Table 4D1B BS7671:2008.
Earth loop impedance (Zs) figures are based on furthest LV9 or hardwired device.
The use of an RCD does not protect a circuit against line to line fault currents, which must be protected in accordance with BS7671:2008, section 434.5.

110V RLV Distribution Solutions



Transformer Distribution Cubicle

TH series Transformer



Transformer
Distribution Rack

Distribution Board

Tunnel Transformer

REPAIR DEPOT

TUBE MAINTENANCE

LUL TICKET MACHINES AND GATES

PLATFORM SOCKET

London Underground Equipment

Blakley Electrics designs and manufactures a wide range of products for London Underground (LUL) installations, many of which are already listed on the LUL Approved Product Register (APR). A number of these products have unrestricted approval and can be installed in all Section 12 locations, whilst other products have approval for installation indefined Section 12 locations.'

APR Approved TDC Series – APR 2071

Transformer Distribution Cubicles (TDC) combine a step-down, double-wound transformer with a 6W, 9W or 12W double-pole MCB distribution arrangement. The assembly provides a 110V Reduced Low Voltage Supply (RLV) to BS 7671, with dual 55V secondary windings, to LUL requirements.

TDCR versions are also available, which are as above but with each set of 3 x MCBs protected by a 300mA RCCB with time delay.

For further details please refer to our product data sheet TRPDS11

APR Approved TH Series – APR 2072

TH series transformers provide a 110 volt Reduced Low Voltage Supply (RLV) to BS 7671 and employ a transformer with dual 55V secondary windings to LUL specification. A number of standard transformer ratings and distribution arrangements are available incorporating MCBs and socket outlets.

THR versions are also available, which are as above but with the addition of RCD protection.

For further details please refer to our product data sheet TRPDS11

APR Approved MCB Distribution Boards – APR 1932

A wide range of IP55 MCB Distribution Boards for 400V TP&N, 230V SP&N, 110V DP or 110V TP applications. Boards incorporate MCB pan assemblies from 4 way to 24 way, with incoming isolators rated from 63A to 250A.

For further details please refer to our product data sheet PPDS12

Transformer Distribution Racks (TDR)

TDRs typically comprise one to three vertical sections with each combining an incoming main isolator, step-down double-wound transformer and a 12 way double Pole MCB pan assembly. The assembly provides multiple 110 volt Reduced Low Voltage Supplies (RLV) to BS 7671, utilising transformers with dual 55V secondary windings to LUL.

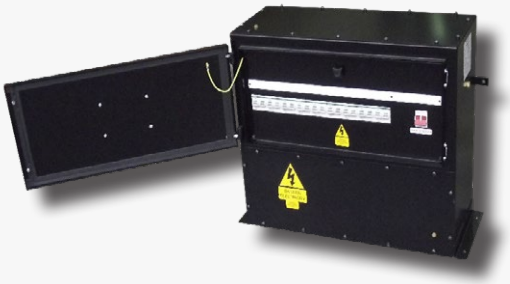
For further details please refer to our product data sheet PPDS14

APR Approved LV9 Socket Outlet Assemblies– APR 1935

A wide range of sockets is available, in surface or flush enclosures, with brushed stainless steel or white powder coated lids. LV9 sockets incorporate 16A 2P+E 110V metal clad sockets protected by a 16A DP MCB. 32A versions are also available.

LV9R series versions are also available, which are as above but with integral DP RCBO protection.

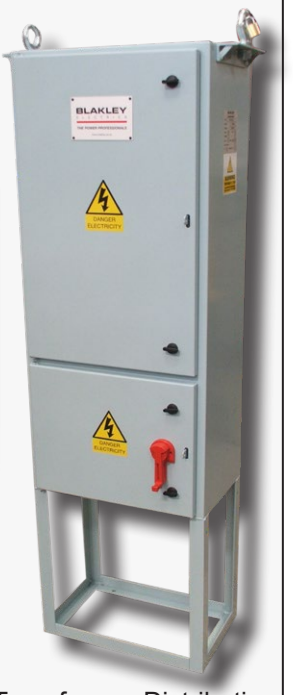
For further details please refer to our product data sheet PPDS11



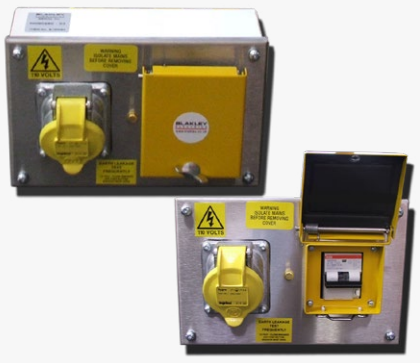
Transformer Distribution Cubicle

TH Series Transformer

MCB Distribution Boards



Transformer Distribution Racks



LV9 Socket Outlet Assemblies