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This topic explains the different types of residual current device (RCD) normally used.

2. General

An RCD monitors the algebraic sum of the currents in the line and neutral conductors (the residual current) at the point at which it is installed in a circuit, and mechanically interrupts the circuit when this sum attains a predetermined value (the rated residual operating current $I_{\Delta n}$).

The following definition is given in Part 2 of *BS 7671*:

'Residual current device (RCD). *A mechanical switching device or association of devices intended to cause the opening of the contacts when the residual current attains a given value under specified conditions.'*

'Residual current device' (RCD) is the generic name for a range of devices including:

- RCCB (residual current operated circuit-breaker without integral overcurrent protection)
- RCBO (residual current operated circuit-breaker with integral overcurrent protection)
- SRCD (socket-outlet incorporating an RCD)
- Portable RCD
- An RCD formed of a suitable association of devices including current transformers, a residual current sensor, a test button and a circuit-breaker.

Requirements on selection and erection of RCDs is given in Regulation Group 531.2.

Information on discrimination of RCDs in series is given in Topic **R101-5**.

Further information on the requirements of RCDs is given in Topic **R101-29**.

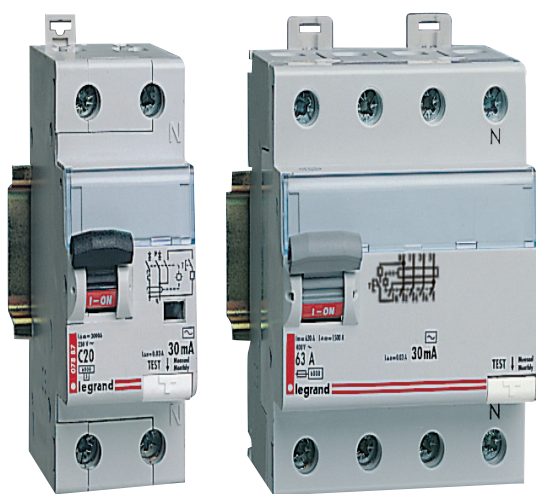
3. RCCB (residual current operated circuit-breaker without integral overcurrent protection)

A residual current operated circuit-breaker without integral overcurrent protection (RCCB) is **not** designed to perform the function of protection against overcurrent (overload current or fault current).

A circuit, or circuits, controlled by an RCCB must therefore be provided with devices for protection against overcurrent, such as suitable circuit-breakers or fuses.

Residual current operated circuit-breakers without integral overcurrent protection should comply with *BS EN 61008 Specification for residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs)*.

Examples of RCDs for DIN rail mounting for use in an enclosure such as a distribution board or consumer unit. From left to right, a two-pole device and a four-pole device



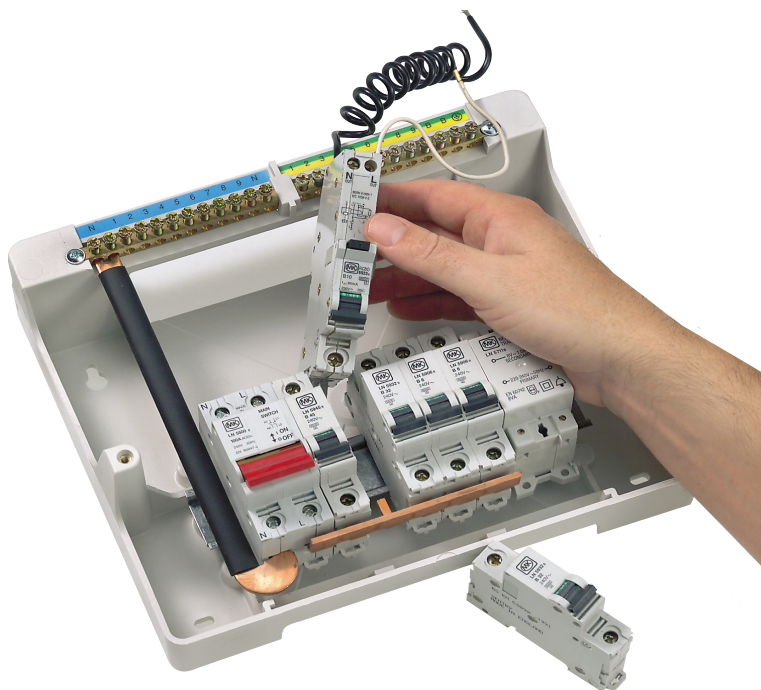
Photograph courtesy of Legrand Electric Limited

4. RCBO (residual current operated circuit-breaker with integral overcurrent protection)

A residual current operated circuit-breaker with integral overcurrent protection (RCBO) is designed to perform the function of protection against overcurrent, as well as that of a residual current device.

RCBOs are often used as circuit protective devices in consumer units and distribution boards.

RCBO being installed into a consumer unit



Photograph courtesy of MK Electric Limited

Residual current operated circuit-breakers with integral overcurrent protection should comply with *BS EN 61009 Specification for residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs)*.

Further information on RCBOs is given in Topic **R93-1**.

5. SRCD (socket-outlet incorporating an RCD)

A socket-outlet incorporating a residual current device (SRCD) provides an alternative to protecting a circuit supplying a socket-outlet by an RCD. The advantage of using an SRCD is that only the circuit that is plugged into the SRCD socket-outlet is disconnected when the SRCD detects an earth fault. The circuit supplying the SRCD should be unaffected and continues to supply any other socket-outlets or SRCDs that it serves.

The disadvantage of using an SRCD is that it does not protect users against earth faults in the SRCD supply circuit. Therefore, if an earth fault occurs in the SRCD supply circuit, a fault voltage may be present on any exposed-conductive-parts of the SRCD and the equipment plugged in to it, until the fault is cleared by an upstream protective device.

SRCDs should comply with *BS 7288 Specification for socket-outlets incorporating residual current devices (SRCDs)*.

Examples of SRCDs (socket-outlets with RCDs)



Photograph courtesy of Legrand Electric Limited

6. Portable RCD

Portable RCDs incorporate a plug-pin portion and may have either a socket-outlet portion or may include terminals for external flexible cords, where appropriate. It should be noted that such RCDs do **not** form part of the fixed electrical installation.

Such RCDs have a rated voltage not exceeding 250 V a.c. single-phase, a rated current not exceeding 16 A and a rated residual operating current not exceeding 30 mA.

Portable RCDs should comply with *BS 7071 Specification for portable residual current devices*.

A rewireable portable RCD, as in Fig 1, is constructed so a cable or flexible cord can be fitted or replaced using general purpose hand tools (such as a screwdriver).

Non-rewireable portable RCDs are constructed as a unit including a flexible cord which cannot be removed by any means without making the unit permanently useless.

Portable RCDs may be provided with overload current and/or short-circuit current protection.

Example of a rewireable portable RCD

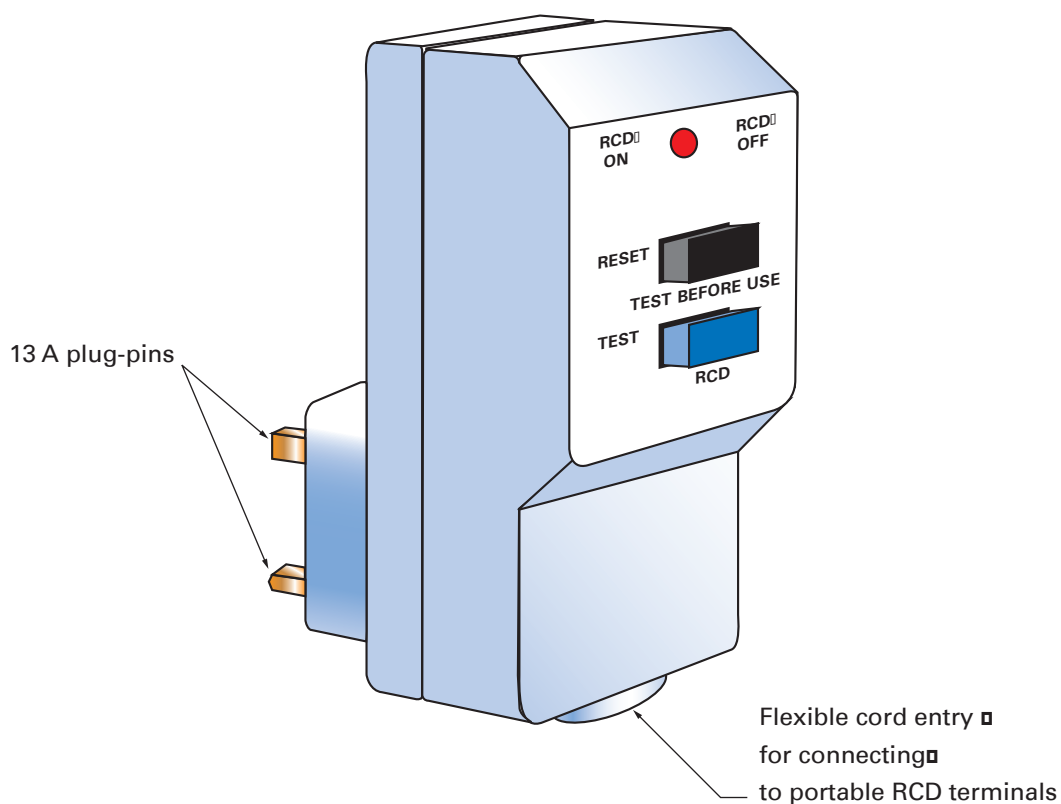


Fig 1

7. RCD formed by an association of devices

The principles of operation for an RCD formed by a suitable association of devices, are similar to those previously described for other RCDs. Such an association of devices might include current transformers, a residual current sensor, a test button and a circuit-breaker. An arrangement of a residual current device formed by an association of devices may be required for a circuit having a load current greater than that catered for by a conventional RCD (residual current device), which usually only has a current rating of between 13 A and 100 A.



Topics referred to in this text:

R93-1	RESIDUAL CURRENT BREAKER WITH OVERCURRENT DEVICE (RCBO): General
R101-5	RESIDUAL CURRENT DEVICE: Discrimination of, in series
R101-29	RESIDUAL CURRENT DEVICE (RCD): Regulatory requirements for



Topics not referred to in this text, which are related and may be of interest:

A11-17	ADDITIONAL PROTECTION: By RCD
E65	ELECTRIC SHOCK
F18-13	FAULT PROTECTION: Protective devices for
F18-17	FAULT PROTECTION: RCD protection
R101-17	RESIDUAL CURRENT DEVICE (RCD): In split-load consumer units
R101-19	RESIDUAL CURRENT DEVICE (RCD): In a TT system
R101-23	RESIDUAL CURRENT DEVICE (RCD): Other considerations in selecting
R101-25	RESIDUAL CURRENT DEVICE (RCD): Principles of operation



BS 7671 (Requirements for electrical installations)

Some of the most important requirements are found in:

Additional protection, residual current devices (RCDs)	415.1
Fault protection by protective equipotential bonding and automatic disconnection	411.3 to 411.6
RCDs	531.2