



# Data Sheet

# Residual current circuit breakers with overcurrent protection (RCBO)

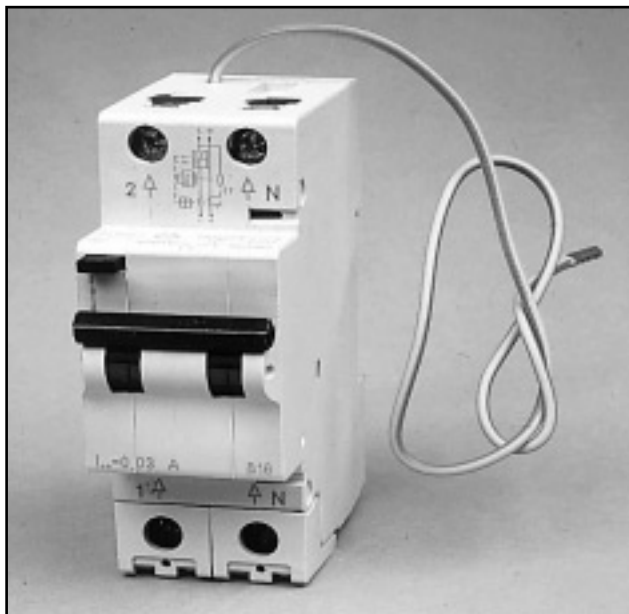
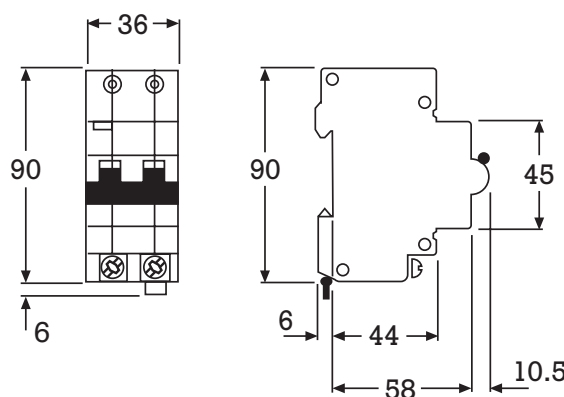


Figure 1 Dimensions



| RS stock no. | $I_n$ (A) | $I_{\Delta n}$ (A) |
|--------------|-----------|--------------------|
| 157-9866     | 6         | 0.3                |
| 157-9872     | 10        | 0.3                |
| 157-9888     | 16        | 0.3                |
| 295-4858     | 20        | 0.3                |
| 157-9894     | 25        | 0.3                |
| 157-9901     | 32        | 0.3                |

A range of 2 pole switching residual current circuit breakers with overcurrent protection (RCBO). The units have a sensing system which is capable of detecting both ac and pulsating dc fault currents.

The circuit breaker section performs the functions of switching and isolation, protection against overload currents and protection against short-circuit currents. These functions are accomplished by means of thermal and electro-magnetic protection devices.

The earth fault detection section energises the trip coil when an earth fault occurs, the circuit breaker is then opened.

## Features

- Double pole switching
- Protects against overcurrent, short-circuit and earth fault currents
- High shot circuit capacity (3kA)
- Sensitive to earth fault currents on ac and pulsating dc systems
- Circuit breaker has type 2 tripping characteristic
- Test circuit for earth fault detection section, operated via external test button
- On/Off toggle switch operates unit and gives clear indication of device status
- Two modules width to DIN 43 880 (35mm wide), the device may be snap-fitted to symmetrical DIN rail or fixed in a modular enclosure.

## How the RCBO works

The circuit breaker part of the RCBO protects the circuit against overload currents by automatically switching off the supply. When only a slight overload occurs, however, the opening action of the circuit breaker must be retarded. This is to guard against the effects of voltage surges and spikes, which can cause nuisance tripping of the device, as well as surges caused by switching on of motor, lighting and inductive circuits. In contrast, short circuit currents must be interrupted as quickly as possible.

In order to accomplish protection for both overload and short-circuit currents, the RCBO has a bi-metallic strip and an electromagnetic unit. The bi-metal strip provides the thermal part of the tripping characteristic. When an overload current occurs the bi-metal strip is heated, the degree of which is determined by the size and duration of the overload current. As a result, the strip bends until, after a certain time, the device is switched off.

The electromagnetic section comprises a coil and a moving latch. When a short circuit current flows through the coil, a magnetic field is created that causes the latch to be attracted to the coil. This occurs as soon as the short circuit current starts to flow, as a result of which the circuit breaker is tripped.

The RCD part of the RCBO protects against earth fault currents. The main function of the unit is to detect any difference between the currents that flow in the live and the neutral. If a discrepancy is detected the live and neutral contacts are opened by an electro-mechanical device.

The tripping system used in the device is a drop out system that is qualified as fail safe. This system comprises a magnetic circuit that is linked to an adjacent coil core when an earth fault has been detected. When not in operation, the system is kept on standby by a permanent magnet, that ensures that the striker pin is held in position.

If an earth fault occurs it is detected by the electronic section of the device. The capacitor is then discharged and a pulse is given to the coil of the tripping system. As a result of the coil being energised, the coil core becomes part of the magnetic circuit. In this situation magnetic flux no longer

exists in the striker pin, which is subsequently released, and, by discharging a spring, provides the energy to operate the tripping mechanism.

The test circuit consists of an orange test button marked 'T' under which a contact spring and resistor are located. This resistor is connected to the phase voltage and, when the test button is pressed, is also connected to the neutral conductor situated outside the core.

The value of the resistor is such that the current passing through it is equal to approximately 2 x I<sub>Δn</sub>. By pressing the test button an earth fault is simulated and the RCBO drops.

### Time/Current table in accordance with BS3871 (test temperature 40°C)

| RS stock no. | Rated current (I <sub>n</sub> ) | Tripping characteristics | Circuit breaker | Thermal protection         |                          | Magnetic protection |               |
|--------------|---------------------------------|--------------------------|-----------------|----------------------------|--------------------------|---------------------|---------------|
|              |                                 |                          |                 | Test current               | Tripping time            | Test current        | Tripping time |
| 157-9866     | 6A                              | Type 2                   | Does not trip   | 6A<br>5.4A ①               | >2h<br>>2h               | 24A                 | >0.1s         |
|              |                                 |                          | Trips           | 9A<br>15A<br>10.5A ②       | <1h<br>1s <t <60s<br><1h |                     |               |
| 157-9872     | 10A                             | Type 2                   | Does not trip   | 10A<br>9A ①                | >2h<br>>2h               | 40A                 | >0.1s         |
|              |                                 |                          | Trips           | 15A<br>25A<br>17.5A ②      | <1h<br>1s <t <60s<br><1h |                     |               |
| 157-9888     | 16A                             | Type 2                   | Does not trip   | 16A<br>14.4A ①             | >2h<br>>2h               | 64A                 | >0.1s         |
|              |                                 |                          | Trips           | 21.6A<br>40A<br>24A ②      | <1h<br>1s <t <60s<br><1h |                     |               |
| 295-4858     | 20A                             | Type 2                   | Does not trip   | 20A<br>18A ①               | >2h<br>>2h               | 80A                 | >0.1s         |
|              |                                 |                          | Trips           | 27A<br>50A<br>30A ②        | <1h<br>1s <t <60s<br><1h |                     |               |
| 157-9894     | 25A                             | Type 2                   | Does not trip   | 22A<br>22.5A ①             | >2h<br>>2h               | 100A                | >0.1s         |
|              |                                 |                          | Trips           | 33.75A<br>62.5A<br>37.5A ② | <1h<br>1s <t <60s<br><1h |                     |               |
| 157-9901     | 32A                             | Type 2                   | Does not trip   | 32A<br>28.8A ①             | >2h<br>>2h               | 128A                | >0.1s         |
|              |                                 |                          | Trips           | 43.2A<br>80A<br>48A ②      | <1h<br>1s <t <60s<br><1h |                     |               |

① Test temperature 55°C    ② Test temperature 20°C

### Technical data

Rated voltage (Un) \_\_\_\_\_ 220/240Vac

Rated frequency \_\_\_\_\_ 50Hz

Rated current (In) \_\_\_\_\_ See above table

Rated short circuit capacity \_\_\_\_\_ 3kA

Operating temperature (in enclosure) \_\_\_\_\_ -25°C to +40°C

Storage temperature \_\_\_\_\_ -25°C to +85°C

RS Components shall not be liable for any liability or loss of any nature (howsoever caused and whether or not due to RS Components' negligence) which may result from the use of any information provided in RS technical literature