

## **IS 12640 (Part 2) : 2016/ IEC 61009-1 : 2012 Residual Current Operated Circuit-Breakers with Integral Overcurrent Protection for Household and Similar Uses (RCBOs) Part 2: General Rules**

In a properly functioning electrical installation, the current flowing through the live (phase) wire should be equal to the current returning through the neutral wire unless there is any leakage of current e.g., through a person's body or due to a fault in an appliance or wiring, when the current will no longer be balanced between the live and neutral wires.

Flow of electricity through the human body due to direct or indirect contact with electricity leads to **electric shock** with a range of injuries - from mild tingling sensations to severe burns, cardiac arrest, or even death, depending on factors like the voltage, current, duration of contact, and the individual's health condition. Therefore, it is important to detect this imbalance (residual current) and automatically disconnect power supply when this imbalance is above a threshold (**typically 30 mA**, which is well below the limit of danger for humans), to prevent electric shock hazard.

Persistent earth faults and short circuits due to fault in an appliance or wiring could lead to unsafe conditions and **fire hazard** which can be prevented by disconnecting the electricity supply.

A residual current device in the electrical installations at appropriate locations in the network **detects the imbalance of current in the live and neutral conductors and automatically disconnects the electricity supply before the occurrence of hazards such as electric shock and fire hazards.**

Residual Current Operated Circuit-Breakers (RCBOs) provide comprehensive protection for both - electrical faults (such as **leakage or earth faults**) as well as overcurrent conditions (such as **overloads or short circuits**).

**IS 12640 (Part 2) : 2016/ IEC 61009-1 : 2012** applies to **residual current operated circuit breakers with integral overcurrent protection (RCBOs)** functionally independent of, or functionally dependent on, line voltage for household and similar uses, for rated voltages not exceeding 440 V a.c. with rated frequencies of 50 Hz, 60 Hz or 50/60 Hz and rated currents not exceeding 125 A and rated short circuit capacities not exceeding 25 000 A for operation at 50 Hz or 60 Hz.

Tests prescribed in the standard are for verifying that RCBOs will not only trip (disconnect) under fault conditions, at specified sensitivity and trip time but also perform the function of making, carrying, and breaking overcurrents under specified conditions. Compliance of RCBOs to mechanical and electrical endurance tests in the standard demonstrates its ability to withstand normal operational stresses and continue to function reliably over time in the electrical installation. Tests specified also verify their performance under various environmental conditions (e.g., temperature, humidity) to ensure consistent operation regardless of the installation environment.

The standard specifies test sequence and number of samples to be submitted for full test procedure as well as simplified test procedure for the purpose of certification.

Considering the significance of such devices in the safety of electrical systems, the use of a residual current device as per the relevant standard has been **mandated under Regulation 44 of Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023.**

**SP 30 : 2023 National Electrical Code of India**, provides details on their use, selection, evaluation of suitability and preferred locations for placement in electrical installation as a means of safety.

To ensure their quality, DPIIT has notified the **Electrical Wires, Cables, Appliances and Protection Devices and Accessories (Quality Control) Order, 2003** which mandates compliance to IS 12640 (Part 2) : 2016/ IEC 61009-1 : 2012 and that all the RCBOs sold, manufactured or imported shall bear the Standard Mark under a Licence from BIS.