People protection against electrocution

Your customers' safety is your business



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Life Is On | Schneider Electric



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Electrical risks and safety

Each year, **400 000** electrical incidents happen and **3000** people suffer from electrical accidents*

Research worldwide shows that the **intensity and duration** of current flowing through the body determines the extent and severity of the electrical shock and its consequences. Even at a very low value of intensity, the current can be harmful when it flows through the human body

As an electrician, the **safety** of your customers and their families is your primary and constant concern. Your day-to-day-action contributes to reducing electricity-related hazards and the tragedies they can cause



*Source: French National Observatory for Electrical Safety

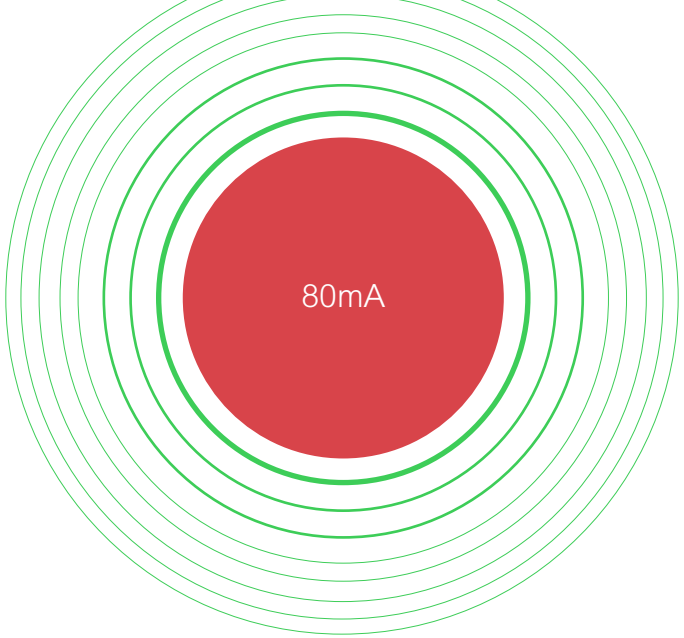
Effects on the human body

Up to 0.5mA

10mA

Up to 5mA

40mA



High risk of ventricular fibrillation (>50%) – internal burns

300mA



Shock-free electrical installation

Shock-free electrical installation

Electrical safety – a joint venture between electrical contractors and Schneider Electric

Thanks to its worldwide leadership in electrical distribution and a century of experience in protection technologies, Schneider Electric is the best provider of:

- Information on evolving techniques and regulations
- Training in state-of-the-art practices and compliance with standards
- Top quality products that are reliable, easy to use, and widely available
- Comprehensive solutions tailored for each kind of building

Schneider Electric supplies you with tools that enable you to exchange with your customers:

- Safe behavior in daily use of electrical goods
- Key points for keeping electrical equipment safe
- Recommendations for upgrades to ageing electrical equipment

Electrical safety – a joint venture between electrical contractors and Schneider Electric

Insulation of live parts

Ensure insulation quality of equipment within reach of end users. Use quality switches and outlets as these items are vital for your safety:

- Outlets equipped with automatic shutters to prevent children from inserting fingers or objects into the holes
- All plastic parts must be strong enough to withstand blows
- All lighting and power grids are screwed securely to the mounting brackets

Odace Range



Grounding of all metallic and conducting parts

Metallic or conducting parts can be at risk of becoming under voltage if the insulation inside the part fails

To prevent this issue, it is mandatory to ensure correct grounding of all metallic and conduction parts. In TT earthing systems, a residual current device (RCD) protection is needed to prevent these parts from reaching a harmful voltage. The sensitivity of the RCD has to be calculated according to the earth resistance

In case of doubts concerning the earth resistance value, a 30mA RCD should be installed





Residual Current Devices

Residual current devices

The residual current device is the ultimate means to protect people from the risk of the electrocution

Residual Current Devices (RCD) measure the difference of intensity of the current between the phase and neutral conductors. If there is some leakage current that may flow through the human body, the RCD trips within a few milliseconds, preventing injuries





According to the international wiring regulation standard IEC60364, a RCD with a residual operating current less than 30mA shall be provided for:

- Socket outlets with a rated current less than 32A in all locations
- All circuits in wet locations, bathroom, laundry room, and swimming pools
- Mobile equipment for use outdoor with a rated current less than 32A
- Final circuit supplying lighting for individual homes in TT and TN systems
- Supply circuits to work sites, caravans, pleasure boats, and travelling fairs





Choose the right RCD

There are five different types of RCDs. Depending on the loads that are on the circuit, different waveforms of earth leakage current can be generated

Different types of residual current devices have been defined by the standards to fully protect the customer in all situations

AC type	
A type	
F type	
A-*SI* type	
B-SI type	3P speed drive, lift, 3P HVAC, and cranes



Additional tips for efficient shock-free electrical installation

- Limit the number of electronic loads under the same RCD
- Dedicate residual current device for outdoor circuit
- Dedicate RCBO for protection of critical loads

Every electronic device induces small natural leakage current. While not necessarily dangerous for the human body, the accumulation can cause the RCD to trip

Indeed, these leakage current are mainly generated by the filtering capacitors in the power supply of electronic devices. Depending on the number of devices protected by the same earth leakage protection device, these leakage currents may increase the risk of tripping in the event of high-frequency interference, and can cause frequent tripping

To guarantee satisfactory operation, these continuous leakage currents must not exceed **25% of the sensitivity** of the protection device. The recommendation is thus to limit the electronic loads under a same RCD by using an RCBO or several RCCBs

Types of Residual current devices

Type AC

Type AC is intended to **detect pure sinusoidal residual currents**

In most cases, the expected fault current is of the same frequency and waveshape as the supply (i.e. sinusoidal 50 Hz), either because the fault may occur only on the supply conductors themselves (for example, if the appliance itself is of class 2), or because the load is resistive

Application:

- Incandescent lighting, electrical heating, and water heater
- Household devices: microwave, and small electro-domestic loads

Incandescent lighting



Types of Residual current devices

Type A

Type A is intended for protection against sinusoidal and pulsating direct current that can be superimposed by smooth direct current up to 6 mA.

In some cases, the expected fault current could contain pulsating DC waveshape because the fault current would flow through a rectifier. Residual current devices able to detect such waveshapes are known as Type A RCDs. Example of loads to be protected with Type A RCDs are:

- Computer and socket circuits on which power/ several electronic devices can be plugged
- Induction cooking, washing machine, dryer
- Machines with non-linear elements (diode, capacitors, rectifiers): Motors, manufacturing machines, and photovoltaic 1P

Computer and electronics



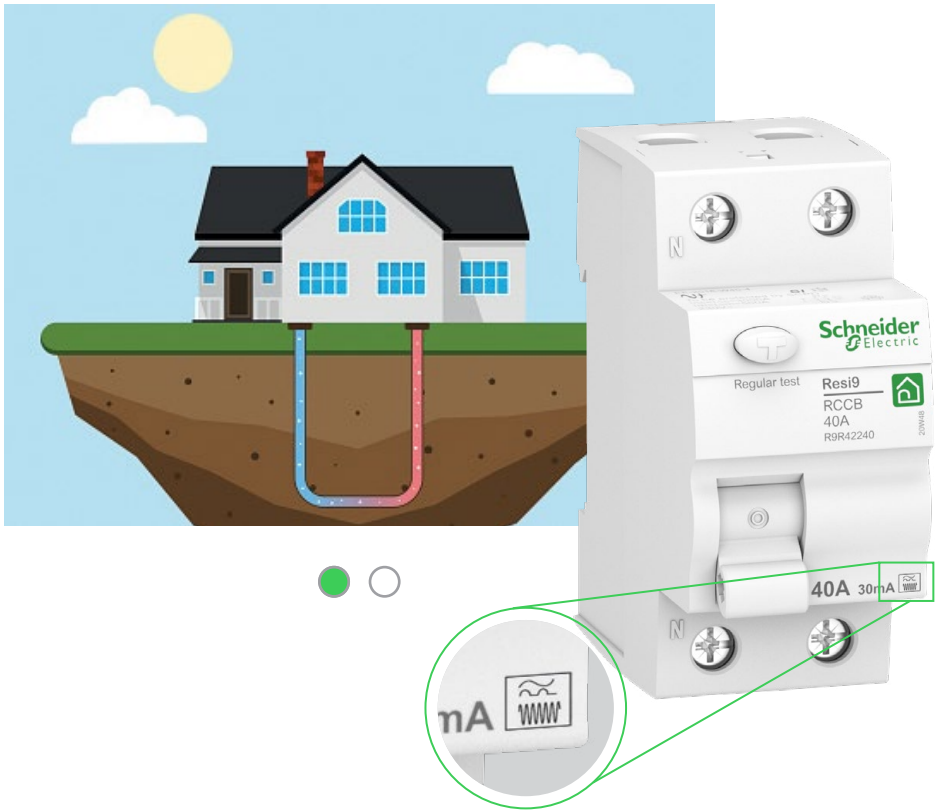
Types of Residual current devices

Type F

Type F: Protection at different frequencies.
In a few applications, the expected fault current may contain composite residual currents, with frequencies from a few hertz up to 1000 Hz. Residual current devices able to detect such waveshapes are known as Type F RCD

For example, loads to be protected with Type F are single phase Class 1 devices containing a motor controlled by a variable speed drive like a heat pump, air conditioner or a washing machine with speed drives

Heating pump



Types of Residual current devices

Typa A-SI

The operation of the RCD can be affected by some electrical and electromagnetic interferences (e.g. lightning). This can lead to ‘nuisance tripping’ which is tripping in a non-dangerous situation. Such tripping is often repetitive and is detrimental to satisfying user’s energy requirements

The nuisance tripping can be caused by different factors linked to the external environment and to the loads.
That’s why **Schneider Electric has developed the SI type**

SI type is recommended for the following applications:

- **For loads generating high frequencies disturbance:** fluorescent or variable lighting, powerful IT equipment, pump or motors with variable speed drive
- For loads where continuity of service is strongly requested: IT room, hospitals, cold room, etc
- In severe electromagnetic environment: frequent risk of lightning, backed-up network or risk of operating transient current

Industry application





Types of Residual current devices

Type B

Type B: Protection for a mix of frequencies and DC components.

In some applications, the waveshape of the residual current can contain various other components such as: frequencies higher than 50 Hz, non-sinusoidal waveshape, waveshapes resulting from rectifying circuits with a six pulse bridge, or even smooth DC

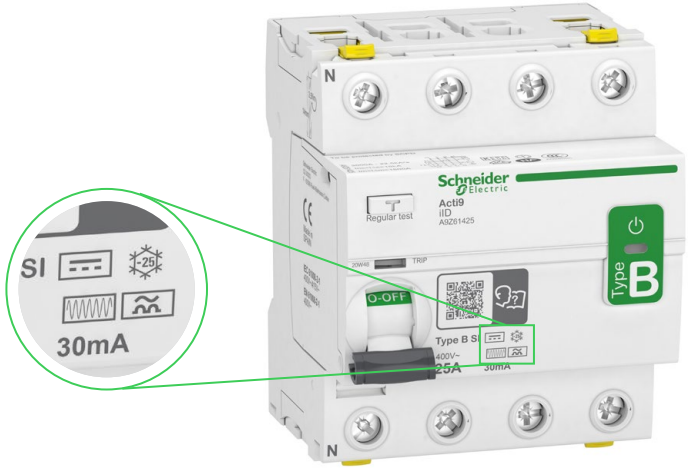
Residual current devices able to detect such waveshapes are known as Type B RCD

Applications:

1. Devices containing a motor controlled by a three-phase variable speed drive like: three phase HVAC, lifts, cranes
2. Three-phase solar panels
3. Electrical vehicles

Lift





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