

Description of Protective Switches Operation

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Two articles in two last year's numbers of the magazine Er have presented a survey of operation of overcurrent protective devices, based on the use of traditional safety fuses. A similar survey can be presented also for the protective devices, manufactured as various protective switches. These devices are in the first place:

- circuit breakers complying with the standard SIST EN 60898 – circuit breakers for overcurrent protection for household and similar installations;
- residual current circuit breakers without overcurrent protection built-in, complying with the standard SIST EN 61008;
- residual current circuit breakers without overcurrent protection built-in, for the use in household and similar applications (RCCB);
- residual current circuit breakers with overcurrent protection, complying with the standard SIST EN 61009 - residual current circuit breakers for the use in household and similar applications (RCCO).

Basic representation of a protective switch state is the position of the on-off button on the protective switch that can be down below, in the middle or above. As a rule, the operation of protective switches doesn't depend on their location, and can usually be mounted in any position, therefore the manufacturer must very clearly indicate which position of the on-off button or switch handle corresponds to the position "switched-on" or "switched-off". This is also one of requirements of all standards for such products. The manufacturers usually fulfil the requirement by printing this information on the product. One of possibilities is shown in Figure 1.



Figure 1: Indication "O – I" on the residual current circuit breaker

For better overview and better reliability the manufacturers usually place the indication 0/I or ON/OFF directly on ON-OFF buttons, which is shown in Figure 2.

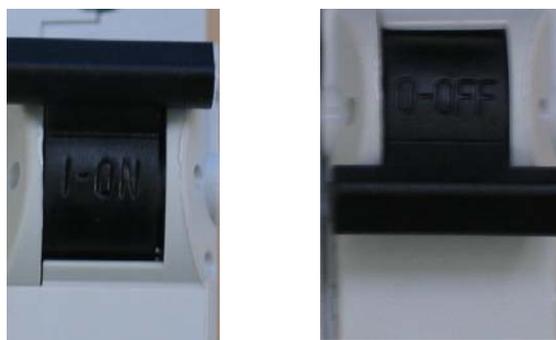


Figure 2: ON-OFF button with indication "O – I" added on the circuit breaker

But the possibility of an error still remains on the protective device itself. The position of the ON-OFF button can be changed, but not the state of contacts inside the device (because the contacts are e.g. welded). Therefore more and more protective devices represent actual situation of contacts within the protective device: red flag – contacts of the switch are still closed; green flag – the contacts are open. This example is shown in Figure 3.



Figure 3: The flag "red / green" in residual current circuit breakers and in circuit breaker

Such contact condition indication must ensure that the "green condition" isn't shown if the contacts are still closed, regardless of the position of switching mechanism and ON-OFF button.

It is often important to find out switched-off condition of the protective switch in the shortest possible time, because an urgent process may have been interrupted by switching off. And the protective switch might be installed in a relatively remote and badly visible place. In such cases the so-called auxiliary and signal switches are used. The difference between them is as follows: An auxiliary switch always changes the state of its contacts when the protective switch is switched; a signal switch (also named alarm switch), however, only changes the state of its contacts when the protective device is switched off due to a failure (manual switching-off doesn't change the contacts' condition).

So the task of these switches is to send information – remote signalling – to a remote location, about the changed condition of protective device. Consequently, they report a power supply interruption. This remote signalling is carried out through the contacts of an auxiliary switch that can switch on or off an acoustic or other type of signalization.

As for the mounting method of auxiliary switches, the following two situations can be distinguished:

- built-in auxiliary switches (they are incorporated into protective devices by the manufacturer);
- built-on auxiliary switches (a mechanical building-on in the field is possible).

For practical reasons the second variant is, of course, more appreciated.

With regard to the principle of operation the switches can be mechanical or electronic. For protective switches primarily mechanical versions are used. There is also a standard with which such products must comply, that is SIST EN 62019 – Electrical Committee – Circuit breakers and similar devices to be used in household area – Auxiliary contacts' unit.

In practice there can be found primarily auxiliary switches that by their external shape correspond to a basic protective switch, while their width equals one half of the standard module (9 mm). It is important to read the operating instruction, enclosed to the auxiliary switches before their installation. Namely, some of them have to be mounted when the main device is switched on, whereas for the others it must be switched off. The least, what can be caused by an incorrect installation is the malfunction of the auxiliary switch. Moreover, it can cause its damage, or even a damage of the main protective switch. A mechanical building-on can be usually carried out by means of clamps that can be metallic or plastic. With the older types adhesive tapes were still used, but they used to slacken due to aging or dirt, thus causing malfunctions.



Figure 4: Building an auxiliary switch onto the circuit breaker

An example of building-on an auxiliary switch to the circuit breaker is shown in Figure 4. The auxiliary switch is built on to the left-hand side, and the circuit breaker must be switched-off during the installation.

An example of technical specification for an auxiliary switch:

- rated voltage: 230 V a.c. or 110 V d.c.
- rated current: 6 A a.c. or 1 A d.c.
- conditional short-circuit capacity: 1 kA (with a preceding safety fuse cartridge of 20 A);
- contacts: 1 x a (closing), 1 x b (opening); the most often used combination;
- connecting terminals: 1 – 4 mm².

Some important data are also printed on the side surface of the product (permissible screw torque for connecting terminals, marking of connecting terminals, and the like – Figure 5).

For timely reporting switch-off conditions of protective switches, the auxiliary switches have been already now very often used in industry and electrical distribution. Improvement in the quality of electrical installation, and the use of so-called intelligent installations will certainly increase their use in house installations as well.

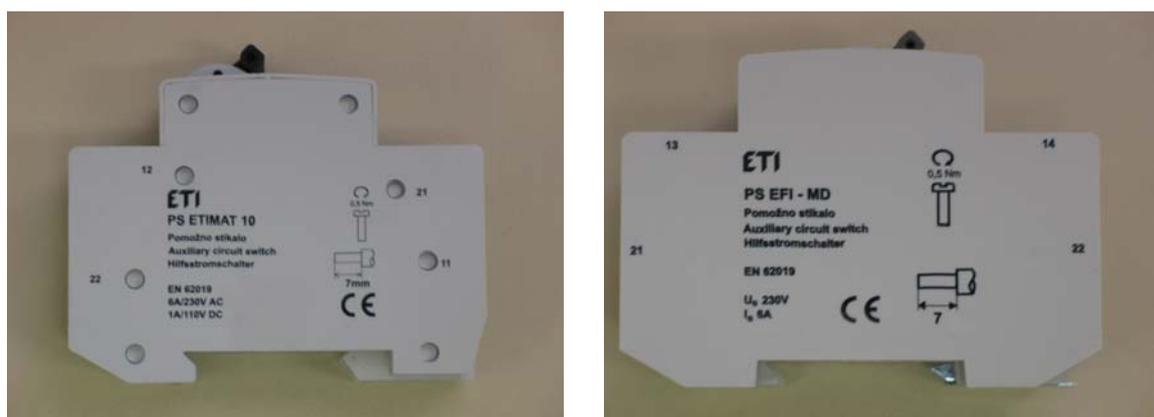


Figure 5: Important data, printed on an auxiliary switch

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