Nuisance tripping and te

In the last issue *Bill Allan* considered RCDs in general, this time he examines how they are installed and why they sometimes operate when they shouldn't



RCDs are usually installed in consumer units and the common arrangement is shown in Fig. 1. The main switch has an RCD incorporated with a rated residual operating current of 100 mA and this is referred to as the upstream device. It should be pointed out however, that the current rating of the main switch is commonly 100 amps. An RCD may also be installed in consumer units in a similar way to mcbs. The 30 mA RCD shown in Fig. 1 is referred to as a downstream device. It protects only the two circuits shown on its right. This is called a split-board.

Socket-outlets and plug tops are also manufactured with RCDs incorporated for downstream operation. These are referred to as SRCDs and PRCDs respectively.

Types of RCD

In addition to having differing operating currents, RCDs are manufactured with different characteristics. Further information can be obtained by reference to Section 11 of the IEE On-Site Guide. Some protective devices combine the overcurrent protective functions of mbcs and the residual current protection of RCDs. They are called RCBOs.

Inadvertent operation

Sometimes RCDs operate when they shouldn't – often called nuisance tripping. The most common reasons for this are:

- incorrect selection the use of a high sensitivity RCD (30 mA for example) as an upstream device to protect a complete installation can lead to inadvertent operation
- lack of discrimination between two RCDs in the same installation. When two or more RCDs are used in succession, it is necessary to use a timedelayed upstream device to achieve discrimination. For example, let us consider the consumer unit shown in Fig. 1. Let us assume that the 30 mA RCD is protecting the downstairs' ring final circuit. If an earth fault were to occur on an electrical appliance plugged into a socket-outlet in the downstairs' ring circuit, both devices would

see the fault. It does not follow that the 30 mA RCD would operate and the 100 mA RCD would not. If the 100 mA RCD were to operate, it would cut off the electricity supply to the whole house. Steps must be taken to ensure that this does not happen and that only the 30 mA RCD operates – this is called discrimination. This is commonly achieved by selecting an upstream RCD which has a time delay built into its operation, so that only the downstream device operates. These are known as type S devices and are identified by the symbol S marked on the device.

- loose connections loose connections downstream of an RCD can result in inadvertent operation
- crossed neutral on split load consumer units consider how a circuit to be protected by the 30 mA RCD in Fig. 1 would be connected. If the neutral was connected into the wrong neutral bar, the 30 mA RCD would operate because it would see an imbalance.
- ageing equipment over a period of time, insulation degrades in electrical equipment, causing the leakage current to increase.

Testing RCDs

BS 7671 contains a requirement for the effectiveness of RCDs to be verified "by a test simulating an appropriate fault condition and independent of any test facility incorporated in the device" (Regulation 713-13-01). Therefore this requirement is in addition to proving that the test button is operational. This means that an RCD tester must be used – there are a number on the market.

Tests are made on the load side of the RCD, as near as practicable to the RCD. Tests are made between the phase conductor and the circuit protective conductor of the protected circuit. The load supplied by the RCD should be disconnected for the duration of the test.

- RCD tests are carried out as follows:
- the no trip test with a test current flowing equivalent to 50 per cent of the rated tripping current (I Δn), the RCD should not trip

sting requirements



• the trip test – with a test current flowing equivalent to 100 per cent of the rated tripping current (I Δ n), the RCD should trip. RCDs to BS 4293 and RCD protected socket-outlets to BS 7288 should trip within 200 ms. General purpose RCCBs to BS EN 61008 or RCBOs to BS EN 61009 should trip within 300 ms. Type S devices should trip within a time range from 130 ms to 500 ms.

The following is an additional requirement where an RCD or RCBO, not exceeding 30mA, is used to provide supplementary protection against direct contact.

the fast trip test – a test current of 5 ∆n (that is 150 mA for RCDs up to and including 30mA) is

applied. In this case, the device should trip within 40 ms.

Note

The second and third test results must be recorded on the NAPIT Electrical Test Sheet.

Conclusion

No doubt there is more that could be said about RCDs. They are of such importance that it is likely that they'll be discussed again in The Competent Person before too long.

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See overleaf for Student Activities

