
Technical Information Service

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Circular No. T403

Content:

T403 Earth Fault Loop Impedance Testing and Recording

Earth fault loop impedance testing is carried out on a completed electrical installation to check compliance with BS 7671 (IET Wiring Regulations) with regard to fault protection and is normally carried out as follows:

- 1) With a test current of approximately 23A where circuits are protected by overcurrent devices such as fuses or circuit breakers only; or
- 2) With a test current of approximately 15mA, to prevent unwanted tripping where circuits are protected by 30mA or other RCDs.

The testing of circuits protected by RCDs has presented instrument manufacturers' with difficulties in providing test results similar to that of the testing of non-RCD protected circuits, without tripping the RCDs during the tests. Typically test results for high current (23A) tests in the range 0.1Ω to 1.0Ω are largely stable with a resolution of 0.01Ω . For low current (15mA) tests the resolution was 0.1Ω , but attempts to decrease this to 0.01Ω have been largely unsuccessful in providing the same stable results for readings of less than 1.0Ω .

A recent study by one of the UK leading instrument manufacturers using instruments from seven different manufacturers under controlled conditions found significant discrepancies in the instrument readings.

Further investigation revealed that the problem appeared to be mainly with the low test currents, caused by variations in power supply quality created by voltage magnitude, transients, harmonics etc. Similar tests carried out using a stabilised power supply with a clean 50Hz waveform produced more consistent results.

It should however, be noted that these discrepancies, usually in the order of 1.0Ω or less, are not significant in terms of the correct operation of an RCD. The maximum earth fault loop impedance values for RCDs are given in Table 41.5 of BS 7671. For a 30mA RCD the tabulated value is 1667Ω . The need for accurate test results of less than 1.0Ω is therefore irrelevant in these situations.

As some electrical contractors have however experienced, the main problem with the test results obtained from these low current tests, is in the completion of certification

and the tendency of designers, and in some instances customers, to expect the maximum measured earth fault loop impedance (Z_s) values recorded to be compatible with the $Z_e + R_1 + R_2$ value of each circuit, irrespective of the requirements of the respective protective device(s).

SELECT therefore recommend that test results measured using low current tests are not recorded on schedules of test results, it is preferable to record the Z_s values calculated from individual test results i.e. $Z_s = Z_e + R_1 + R_2$ where Z_e is derived from a high current test as shown in 1) above and $R_1 + R_2$ obtained during continuity testing of the circuits.

The type of test results recorded and the test method used should be indicated in the appropriate remarks column of the test results schedule.