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Australian Standard 3190—1983

APPROVAL AND TEST SPECIFICATION FOR CURRENT-OPERATED (CORE BALANCE) EARTH-LEAKAGE DEVICES

PUBLISHED BY THE STANDARDS ASSOCIATION OF AUSTRALIA
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Incorporated by Royal Charter

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Department of Defence Support
Department of Transport and Construction
Department of Public Works, N.S.W.
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Electricity Supply Association of Australia
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AMENDMENT No 1
to
AS 3190—1983
Approval and Test Specification for
CURRENT-OPERATED (CORE BALANCE) EARTH-LEAKAGE DEVICES

REVISED TEXT

The 1983 edition of AS 3190 is amended as follows; the amendments should be inserted in the appropriate place.

SUMMARY: The following sections of this standard are covered by this amendment: Clauses 2.3, 3, 4.2, and Appendix C.

Published on 4 April 1985.

AMDT No 1 APRIL 1985

Page 5. Clause 2.3.

Delete 'Type A' in 5th line of 1st paragraph and *insert* 'Type I or Type II'.

This amendment forms part of the specification on publication.

AMDT No 1 APRIL 1985

Page 5. Clause 3.

Delete the existing text and *insert* the following:

Protection devices and relays shall be classified as follows:

Type I — protection devices having a rated tripping current not exceeding 10 mA.

Type II — protection devices and relays having a rated tripping current in excess of 10 mA but not exceeding 30 mA.

Type III — protection devices and relays having a rated tripping current in excess of 30 mA but not exceeding 300 mA.

This amendment forms part of the specification on publication

AMDT No 1 APRIL 1985

Page 5. Clause 4.2.

Delete the existing text and *insert* the following:

A protection device or relay shall be deemed to comply with this specification only if:

(a) *Of Types II and III*, it complies with all the appropriate requirements of this specification and passes the relevant tests specified herein; and

(b) *Of Type I*, it complies with all the appropriate requirements of this specification and passes the relevant tests specified herein, except as varied by Appendix C.

This amendment forms part of the specification on publication.

New page 19. **Appendix C.**
Add a new appendix C as follows:

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1985

APPENDIX C

REQUIREMENTS FOR TYPE I PROTECTION DEVICES

(See Clauses 3 and 4.2)

C1 APPLICATION. Type I protection devices shall comply with the appropriate requirements of this specification except as varied by this Appendix.

C2 SENSITIVITY. The protection device shall be designed so that—

(a) an imbalance of current in excess of the rated tripping current, but in no case greater than 10 mA between the live conductors, shall cause the supply to be interrupted within 40 ms.

(b) an imbalance of current of less than 50 percent of the rated tripping current, or less than 5 mA for 10 mA rated devices, between live conductors, shall not cause the supply to be interrupted.

NOTE: The sensitivity and the operating times of Type I devices, are different from those specified in Clause 8, for Types II and III.

C3 TESTING.

C3.1 Modifications to testing conditions of AS 3190. Type I protection devices shall be tested in accordance with the requirements of AS 3190 except as modified below:

(a) *Tests at high tripping (leakage) currents.* During the tests of Clause 8.6, the maximum tripping time shall not exceed 40 ms.

(b) *Test for tripping time without prior energization or load.* During the tests of Clause 8.8.1, the test current (simulated earth fault) shall be the rated tripping current and the maximum tripping time, i.e. the time interval between the instant at which current starts to flow and the instant at which the protection device contacts start to separate, shall not exceed 40 ms.

(c) *Endurance test.* The sensitivity test of Clause 8.9.3 shall be conducted at the rated tripping current.

(d) *Inspection of protection device.* For the purpose of the tests of Clause 8.12, the device shall operate satisfactorily, at not more than the rated tripping current.

(e) *Mechanical strength test for portable devices.* For the purpose of the tests of Clause 8.13, the leakage current of item (b), shall be equal to the rated tripping current.

C3.2 Additional test to determine full-wave sensing.

C3.2.1 *Test connections.* The protection device shall be connected as in Fig. C1 and the fault impedances introduced, one at a time, at points A, B and C.

C3.2.2 *Procedure for testing with prior energization.* The protection device shall be energized at rated voltage for a period of 1 min.

With the device still energized, a fault impedance shall then be introduced at point A.

The above sequence shall be repeated twice more, except that the fault impedance shall be introduced at point B and then C.

C3.2.3 *Procedure for testing without prior energization.* The protection device shall be connected as in Fig. C1 but not energized.

Additional switching arrangements shall be made to simultaneously—

(a) supply rated voltage to the protection device;

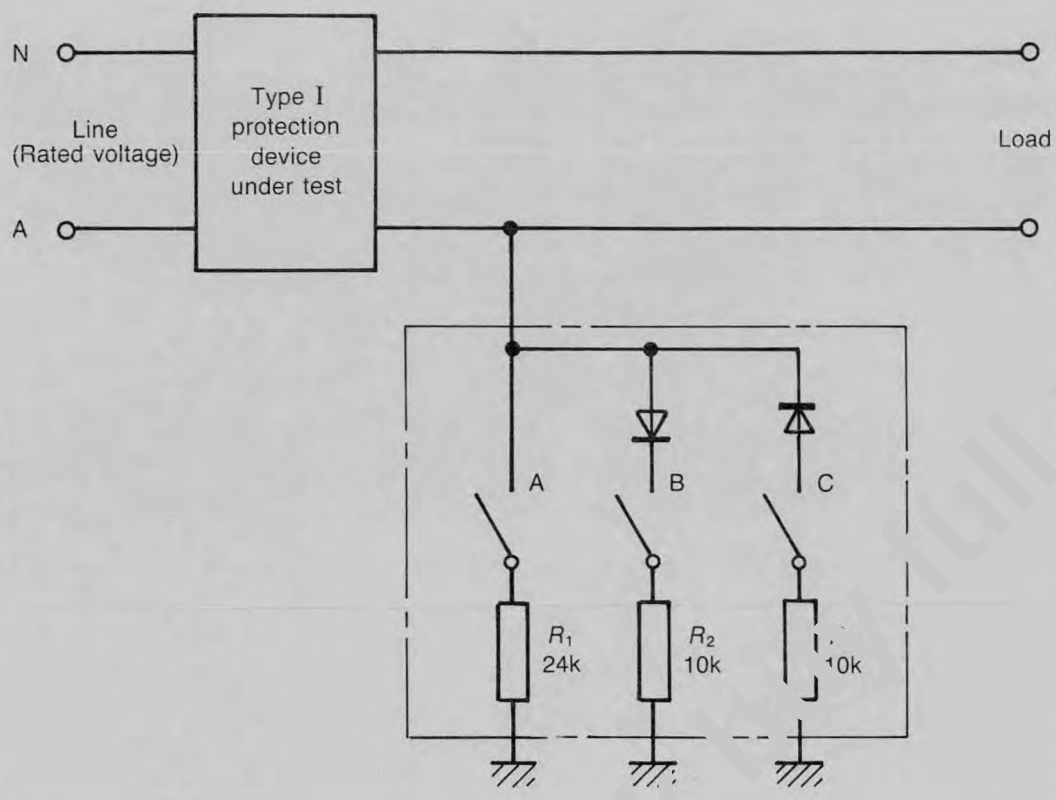
(b) connect a load between the 'load' terminals that will cause the protection device to deliver its rated current; and

(c) introduce the fault impedance at point A.

The above sequence shall be repeated twice more except that the fault impedance shall be introduced at point B and then C.

C3.2.4 *Tripping times.* The maximum tripping time after the fault impedances have been introduced, i.e. the time interval between the instant at which current starts to flow and the instant at which the protection device contacts start to separate, shall not exceed 40 ms.

NOTE: Tripping times and fault impedance values for this test, are under review.



NOTE: The impedance values for R_1, R_2 and R_3 stated above are applicable for devices with a rated voltage of 240 V and a rated tripping current of 15 mA.
For devices with other ratings, the impedance values for R_1, R_2 and R_3 can be calculated as follows:

$$R_1 = \frac{\text{Rated voltage} \times 1\,000}{\text{Rated tripping current in mA}} \text{ ohms}$$

$$R_2 \text{ \& } R_3 = \frac{\text{Rated voltage} \times 1000}{2.4 \times \text{Rated tripping current in mA}} \text{ ohms}$$

Fig. C1. TEST CIRCUIT FOR FULL WAVE SENSING
(See Paragraph C3.2)

This amendment forms part of the specification on publication.

PREFACE

This edition of this standard was prepared by the Association's Committee EL/4, Electrical Accessories.

It is one of a series of approval and test specifications issued by the Association. These specifications are accompanied by a general specification AS 3100, containing definitions and general requirements for electrical materials and equipment. The purpose of these specifications is to outline conditions which must be met to secure approval for the sale and use of electrical equipment in Australia. Only safety matters and related conditions are covered.

This edition is technically identical with the 1980 edition except that it incorporates Amendment No 1 to that edition which was issued in April 1981, and includes changes to the following clauses:

*Clause 5.7—additional requirements for insulating materials
†Clause 5.8—additional requirements for spacing between terminals intended for field wiring
Clause 6—reference to extra tests being under consideration deleted
Clause 6.2—introduces new requirements for the test facility
†Table 1, Tests 3, 4 and 5—additional tests
*Table 1, Test 19—additional test
†Clause 8.10.2—new second paragraph
*Clause 8.14—adds fire test
†Clause 8.15—adds impulse withstand test
†Clause 8.16—adds high-frequency disturbance test
†Fig. 4—adds guidance for new requirements of Clause 5.8
†Appendix A—adds procedure for impulse withstand test
†Appendix B—adds procedure for high-frequency disturbance test.

This standard supersedes AS 3190—1980 from date of publication.

The Association desires to call attention to the fact that this standard does not purport to include all the necessary provisions of a contract.

This standard requires reference to the following Australian standard approval and test specifications:

AS 3100	Definitions and General Requirements for Electrical Materials and Equipment
AS 3111	Miniature Overcurrent Circuit-breakers
AS 3112	Plugs and Plug Sockets
AS 3191	Electric Flexible Cords
AS 3300	General Requirements for Household and Similar Electrical Appliances

and to the following Australian standards:

AS 1931	High Voltage Testing Techniques
AS 2081	Earth Fault Protection, Monitoring and Current Limitation Equipment for Use in Coal Mines and Shale Mines
AS 2481	All-or-nothing Electrical Relays (Instantaneous) and Timing Relays

*Forms part of the standard on 1 January 1984.
†Forms part of the standard on 1 June 1984.

CONTENTS

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
APPROVAL AND TEST SPECIFICATION
FOR
CURRENT-OPERATED (CORE BALANCE) EARTH-LEAKAGE DEVICES

This specification shall be read in conjunction with AS 3100. (See also Clause 4, below.)

1 SCOPE. This specification applies to earth-leakage devices and relays of the current-operated (core balance) type, designed for operation at low or medium voltage, having an alternating current rating not exceeding 100 A, and intended to isolate supply or initiate a tripping signal in the event of a current flow to earth in the protected circuit, in excess of a predetermined level.

It is not intended that this specification apply to earth-leakage devices for the protection of distribution systems, or high voltage equipment, or specialized industrial installations, nor for protection of equipment in mines covered by AS 2081.

2 DEFINITIONS. For the purpose of this specification the following definitions apply:

2.1 Current-operated (core balance) earth-leakage device (hereinafter referred to as a 'protection device')—an arrangement consisting of a current-operated (core balance) earth-leakage relay and a means of isolating the controlled circuit.

2.2 Current-operated (core balance) earth-leakage relay (hereinafter referred to as a 'relay')—a component incorporating a magnetic core through which all active and neutral conductors of a circuit pass, capable of sensing a current imbalance as a result of earth leakage from this circuit, and designed to produce a sudden change in its output circuit when the imbalance exceeds a predetermined level.

2.3 Portable protection device (hereinafter referred to as a 'portable device')—a portable self-contained unit arranged for connection to a plug socket either directly or by means of a flexible cord and plug and consisting of a Type A protection device (see Clause 3) and one or more outlets, constructed so that it can be carried by hand.

Unless a specific requirement is stated for a portable device, it shall be understood that any requirement given herein for a protection device applies to a portable device.

2.4 Rated voltage—the voltage assigned by the manufacturer to indicate the nominal voltage of the circuit which the protection device is designed to protect.

2.5 Rated load current—the maximum continuous load current assigned by the manufacturer.

2.6 Rated tripping current—the value of nominal leakage current specified by the manufacturer at which positive operation of the device or relay is ensured when subjected to all applicable conditions of Clause 8.5.

2.7 Rated frequency—the frequency assigned by the manufacturer to indicate the nominal frequency of a circuit which the device is designed to protect.

2.8 Test facility—a means of enabling the correct functioning of the device to be checked.

2.9 Trip-free operation—the automatic release of the circuit switching device can function independently of the mechanism to close the device and cannot be held closed against a condition where tripping should occur.

3 TYPES. Protection devices and relays shall be classified as follows:

Type A—having a rated tripping current not exceeding 30 mA.

Type B—having a rated tripping current in excess of 30 mA but not exceeding 300 mA.

4 COMPLIANCE WITH SPECIFICATIONS.

4.1 General Requirements of AS 3100. This specification shall be read in conjunction with AS 3100, and the appropriate provisions of AS 3100 shall apply to the construction of the protection device and the insulation and/or safeguarding of parts that normally carry current.

4.2 Specific Requirements of this Specification. A protection device shall be deemed to comply with this specification only if it complies with all the appropriate requirements of this specification and passes the relevant tests specified herein.

4.3 Requirements of Other Specifications. Equipment and components, the function of which is likely to give rise to a hazard, incorporated in a protection device or relay shall comply with the appropriate requirements of any relevant approval and test specification.

4.4 Protection Devices Incorporating Overcurrent Protection. A protection device within the scope of this specification, which also provides overcurrent protection, shall comply with the appropriate requirements of this specification and with all the requirements of AS 3111.

5 DESIGN AND CONSTRUCTION.

5.1 Enclosures.

5.1.1 *Relay enclosure.* The relay components shall be housed in one or more enclosures of non-hygroscopic, non-flammable material. The enclosure(s) shall be effectively sealed by the manufacturer so that access to relay components and to adjustments is not possible without breaking seals.