Australian/New Zealand Standard™

Electrical equipment for coal and shale mines—Electrical protection devices

Part 5: Earth-fault current limiters

Standards Australia

STANDARDS NEW ZEALAND
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This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-023, Electrical Equipment in Coal Mines. It was approved on behalf of the Council of Standards Australia on 16 July 2002 and on behalf of the Council of Standards New Zealand on 27 June 2002. It was published on 12 August 2002.

The following are represented on Committee EL-023:

Australian Chamber of Commerce and Industry
Australian Coal Association
Australian Electrical and Electronic Manufacturers Association
Australian Industry Group
Department of Mineral Resources N.S.W.
Department of Natural Resources and Mines (QLD)
Electrical Apparatus Service Association
Mining Electrical and Mining Mechanical Engineering Society
New Zealand Hazardous Areas Electrical Coordinating Committee
Regulatory authorities (electrical)
Regulatory interests, New Zealand
University of Newcastle
WorkCover New South Wales

This Standard was issued in draft form for comment as DR 99413.

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Originated as part of AS C318—1958.
Previous edition AS 2081.5—1988.
Jointly revised and designated AS/NZS 2081.5:2002.

Jointly published by Standards Australia International Ltd, GPO Box 5420, Sydney, NSW 2001 and Standards New Zealand, Private Bag 2439, Wellington 6020

ISBN 0 7337 4751 5

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-023, Electrical Equipment in Coal Mines, to supersede AS 2081.5—1988, *Electrical equipment for coal and shale mines—Electrical protection devices,* Part 5: *Earth-fault current limiters.*

The AS/NZS 2081 series comprises the following parts:

Part 1: General requirements
Part 2: Earth-continuity monitoring devices
Part 3: Earth-leakage protection systems for use on earth-fault current limited systems (IT systems)
Part 4: Lockout earth-fault protection devices
Part 5: Earth-fault current limiters (this Part)

The key objectives of the AS/NZS 2081 series are as follows:

(a) To ensure touch and step time/voltage levels are within acceptable limits.

(b) To minimize the risk of explosion due to arcing.

(c) To ensure earth return path(s).

(d) To ensure reliable operation under operating conditions.

(e) To ensure performance criteria are maintained under operating conditions.

(f) To minimize the risk of fires by electrical arcing.

(g) To minimize exposure to electrical contact with live parts.

In the AS/NZS 2081 series, levels were established using data provided in AS 3007.2 *Electrical installations—Surface mines and associated processing plants,* Part 2: *General protection requirements*, with respect to the physiological effects of electricity on the human body. The preservation of the integrity of other equipment was an important consideration in the preparation of this series.

This Standard differs from the previous edition in the following significant ways:

(a) The provision of separate and clear requirements for the various types of earth-fault current limitation employed in practice specifically:

  (i) Neutral connected (zero sequence) impedance connected between the star point of a transformer and earth.

  (ii) Series connected (zero sequence) impedance when a 3 phase zero phase sequence reactor is connected in series with the supply. This is normally the method used where it is not possible to install an impedance as detailed in (i) above, such as where the substation is not under the control of the client.

  (iii) Zig-zag or open delta connected earthing transformers are used to limit earth-fault current. This is frequently the method employed where on-site generation is used.

(b) Allowance for less than continuously rated earth-fault current limiting devices to be used.

(c) This Standard has been published as a Joint Australian/New Zealand Standard.

The use of these ‘short time’ rated devices is only permitted where at least two completely separate earth-leakage protection and tripping systems are used in conjunction with the ‘short time rated’ earth-fault current limiting device. Each earth-leakage protection and tripping system shall consist of a separate toroid, earth-leakage relay, tripping circuit and circuit isolation device (the tripping of a common circuit isolation device by two separate earth-leakage protection relays is not permitted).

The term ‘informative’ has been used in this Standard to define the application of the appendix to which it applies. An ‘informative’ appendix is only for information and guidance.

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FOREWORD

The interrelationship of the ‘techniques’ described in the five Parts of this series strives to create as safe a working environment as possible. In this environment of surface and underground mines electrically powered equipment is often mobile and supplied by trailing or reeling cables.

These ‘techniques’ are as follows:

(a) The continuous checking that the equipment is earthed, by monitoring the pilot loop earth in the supply cable, its connection to the machine it is supplying and its termination at the substation supplying the machine (see AS/NZS 2081.2.).

NOTE: This system may incorporate remote start/stop features.

(b) The measurement of leakage current to earth in a circuit and the initiation of isolation of that circuit, when the value reaches or exceeds a predetermined safe value (see AS/NZS 2081.3).

(c) The pre-energization testing of a circuit, to determine that the phase-to-earth insulation value of each and every phase conductor is above a present value, before the circuit can be energized (see AS/NZS 2081.4).

(d) The use of earth current limiting devices, to minimize the risk of touch and step potential reaching a level which would cause risk to personnel (see this Standard).

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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out minimum performance requirements for earth-fault current limiter devices intended for use on a.c. power supply systems, having an earth-fault current limitation system (IT system).

NOTES:

1 Whereas this Standard is based upon 50 Hz supply systems it is envisaged that equipment may be installed upon higher or low frequency supply systems.

Consideration of the effects of these installations upon current limitation and effects upon the human body need to be considered. IEC 60479-1 and IEC 60479-2 should be referenced for the effects upon the human body of other supply frequencies.

2 Installation guidelines are provided in Appendix A.

1.2 OBJECTIVE

The objective of this Standard is to establish requirements for earth-fault current limiters in order to ensure that the earth-fault current is limited to a predetermined value that will—

(a) minimize the touch and step voltages to acceptable limits;

(b) minimize the risk of explosion due to arcing;

(c) ensure reliable operation under normal operating conditions;

(d) ensure performance criteria are maintained under normal operating conditions;

(e) minimize the risk of fires caused by electrical arcing; and

(f) minimize exposure to electrical contact with live parts.

1.3 RELATIONSHIP TO REGULATIONS

The requirements of this Standard may be read in conjunction with, but do not take precedence over, regulations of a regulatory authority that may apply in a specific area.

1.4 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

1028 Power reactors and earthing transformers

1824 Insulation co-ordination

1824.1 Part 1: Definitions, principles and rules

2374 Power transformers