

Australian Standard[®]

**Electrical equipment for explosive
atmospheres—Explosion-
protection techniques**

Part 7: Intrinsic safety i

This Australian standard was prepared by Committee EL/14, Electrical Equipment in Hazardous Locations. It was approved on behalf of the Council of the Standards Association of Australia on 12 January 1987 and published on 2 March 1987.

The following interests are represented on Committee EL/14:

Australian Coal Association
Australian Electrical and Electronic Manufacturers Association
Australian Institute of Petroleum
Confederation of Australian Industry
Department of Defence
Department of Industrial Relations and Employment, N.S.W.
Department of Labour, Vic.
Department of Mines, Qld
Electrical Contractors Associations of Australia
Electricity Supply Association of Australia
Independent testing interests
Insurance Council of Australia
State electricity regulatory authorities

Representatives of the following interests also participated in the drafting of this standard:

Australian Gas Association
Institute of Instrumentation and Control Australia

Review of Australian Standards. To keep abreast of progress in industry, Australian Standards are subject to periodic review and are kept up to date by the issue of amendments or new editions as necessary. It is important therefore that Standards users ensure that they are in possession of the latest edition, and any amendments thereto.

Full details of all Australian Standards and related publications will be found in the Standards Australia Catalogue of Publications; this information is supplemented each month by the magazine 'The Australian Standard', which subscribing members receive, and which gives details of new publications, new editions and amendments, and of withdrawn Standards.

Suggestions for improvements to Australian Standards, addressed to the head office of Standards Australia, are welcomed. Notification of any inaccuracy or ambiguity found in an Australian Standard should be made without delay in order that the matter may be investigated and appropriate action taken.

This standard was issued in draft form for comment as DR 80042.

Australian Standard[®]

**Electrical equipment for explosive
atmospheres—Explosion-
protection techniques**

Part 7: INTRINSIC SAFETY i

First published as C376	1968
Redesignated AS 1829	1976
Second edition	1980
Third edition	1981
AS 1829 revised and amalgamated with AS 2011—1977 and redesignated AS 2380.7	1987

PREFACE

This standard was prepared by the Association's Committee on Electrical Equipment in Hazardous Areas, to supersede AS 2011—1977* and AS 1829—1981†. This standard is intended for the guidance of manufacturers, users, statutory authorities and associated interests. It is Part 7 of a standard dealing with the explosion-protection of electrical equipment intended for use in potentially explosive atmospheres.

In its terminology, definitions and general treatment of the subject, this standard is similar to the following standards and draft standards issued by the International Electrotechnical Commission and the European Committee for Electrotechnical Standardization:

IEC 79-11	Electrical apparatus for explosive gas atmospheres Construction and test of intrinsically-safe and associated apparatus
EN 50 020	Electrical apparatus for potentially explosive atmospheres Part 7: Intrinsic safety i
IEC 31G(Sect)24	Draft revision of IEC 79-11

Acknowledgement is made of the assistance received from these sources.

Acknowledgement is also made to the Safety in Mines Research Establishment, Ministry of Power, United Kingdom, for the graphs reproduced in Appendix A which have been extracted from SMRE Research Report No. 256.

Intrinsic safety is an explosion-protection technique for electrical circuits in hazardous areas, where ignition of explosive mixtures is prevented from occurring by limiting the energy of any potential spark occurring under fault conditions and by limiting surface temperatures.

This is generally achieved by a combination of electrical and mechanical measures, which also have to ensure that the protection is maintained in service.

Historically, intrinsic safety has been used as a protection technique for electrical equipment intended to be used in explosive gas atmospheres. Hence, the use of (gas) groups I and II throughout the standard. However, this technique has now been recognized in AS 3000 as suitable for combustible dust areas (Class II) under certain specified conditions.

* AS 2011, Shunt Diode Safety Barriers for Explosive Atmospheres

† AS 1829, Electrical Equipment for Explosive Atmospheres—Intrinsically Safe Apparatus—Type of Protection i

© Copyright — STANDARDS AUSTRALIA

Users of Standards are reminded that copyright subsists in all Standards Australia publications and software. Except where the Copyright Act allows and except where provided for below no publications or software produced by Standards Australia may be reproduced, stored in a retrieval system in any form or transmitted by any means without prior permission in writing from Standards Australia. Permission may be conditional on an appropriate royalty payment. Requests for permission and information on commercial software royalties should be directed to the head office of Standards Australia.

Standards Australia will permit up to 10 percent of the technical content pages of a Standard to be copied for use exclusively in-house by purchasers of the Standard without payment of a royalty or advice to Standards Australia.

Standards Australia will also permit the inclusion of its copyright material in computer software programs for no royalty payment provided such programs are used exclusively in-house by the creators of the programs.

Care should be taken to ensure that material used is from the current edition of the Standard and that it is updated whenever the Standard is amended or revised. The number and date of the Standard should therefore be clearly identified.

The use of material in print form or in computer software programs to be used commercially, with or without payment, or in commercial contracts is subject to the payment of a royalty. This policy may be varied by Standards Australia at any time.

CONTENTS

	<i>Page</i>
SECTION 1. SCOPE AND GENERAL	
1.1 SCOPE	5
1.2 REFERENCED DOCUMENTS	5
1.3 DEFINITIONS	5
1.4 GROUPING AND CLASSIFICATION	6
1.5 TEMPERATURES	6
1.6 CATEGORIES	6
1.7 SAFETY FACTORS	6
1.8 CERTIFICATION	6
SECTION 2. CONSTRUCTIONAL REQUIREMENTS	
2.1 GENERAL REQUIREMENTS	7
2.2 WIRING	8
2.3 MOUNTING OF COMPONENTS	8
2.4 OUTER ENCLOSURES	8
2.5 FACILITIES FOR CONNECTION OF EXTERNAL CIRCUITS	8
2.6 CLEARANCES, CREEPAGE DISTANCES, AND DISTANCES THROUGH CASTING COMPOUND AND INSULATIONS	10
2.7 EARTHING	10
2.8 INSULATION	11
2.9 INTRINSICALLY SAFE ELECTRICAL SYSTEMS	11
2.10 PIEZO-ELECTRIC DEVICES	13
SECTION 3. REQUIREMENTS FOR COMPONENTS	
3.1 COMPONENTS ON WHICH INTRINSIC SAFETY DEPENDS	14
3.2 INFALLIBLE COMPONENTS AND INFALLIBLE ASSEMBLIES OF COMPONENTS	14
SECTION 4. REQUIREMENTS FOR SAFETY BARRIERS	
4.1 GENERAL	17
4.2 PROVISION OF DIODES	17
4.3 EARTHING	17
4.4 PROTECTIVE MEASURES	17
4.5 RATING OF BARRIER COMPONENTS	17
4.6 CONSTRUCTION	17
4.7 ROUTINE TESTS	17
SECTION 5. TYPE TESTS FOR ELECTRICAL EQUIPMENT	
5.1 GENERAL	18
5.2 SPARK TEST APPARATUS	18
5.3 TEST MIXTURES	18
5.4 CALIBRATION OF THE SPARK TEST APPARATUS	18
5.5 TESTS WITH THE SPARK TEST APPARATUS	18
5.6 VOLTAGE TEST	19
5.7 IMPACT TEST	19
SECTION 6. MARKING	
6.1 MARKING OF ELECTRICAL EQUIPMENT	20
6.2 MARKING OF DIODE SAFETY BARRIERS	20
6.3 MARKING OF CONNECTION FACILITIES	20
6.4 MARKING OF INTEGRATED INTRINSICALLY SAFE SYSTEMS	20
6.5 EXAMPLES OF MARKING	20

	<i>Page</i>
APPENDICES	
A GUIDANCE ON DESIGN AND ASSESSMENT OF INTRINSICALLY SAFE CIRCUITS	21
B GUIDANCE ON DESIGN AND ASSESSMENT OF SHUNT DIODE SAFETY BARRIERS	35
C DETERMINATION OF EXTERNAL PARAMETERS	42

Currently in preview, click buy full version

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

for

**ELECTRICAL EQUIPMENT FOR EXPLOSIVE ATMOSPHERES—
EXPLOSION-PROTECTION TECHNIQUES**

PART 7—INTRINSIC SAFETY 'i'

SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. This standard specifies requirements for intrinsically safe electrical equipment and systems, type of protection 'i', intended for use in explosive atmospheres.

This standard supplements AS 2380, Part 1, except for the following requirements which do not apply:

(a) For intrinsically safe equipment and associated equipment:

- Clause 2.1.4(b) Access to uninsulated live parts
- Clause 2.4.2 Special fasteners
- Clause 2.5 Interlocking devices
- Clause 2.6 Bushings and terminal studs
- Clause 2.7 Materials used for cementing and sealing
- Clause 2.8 Connections
- Clause 2.12 Cable and conduit entries
- Section 3 Supplementary requirements for certain electrical equipment

- Clause 5.2.1 Impact test
- Clause 5.2.3 Rubbing of moving parts
- Clause 5.4 Torque test for bushings

(b) For associated electrical equipment:

- Clause 2.2 Plastics enclosures
- Clause 2.3 Light alloy enclosures
- Clause 5.5 Temperature rise test
- Clause 5.6 Thermal shock test
- Clause 5.7 Insulation resistance test of parts of enclosures of plastics material

Where associated electrical equipment is protected by a type of explosion-protection other than intrinsic safety, the requirements of the applicable standard for that type of protection shall apply.

This standard applies also to electrical equipment or parts of electrical equipment located outside the explosive atmosphere or protected by another type of explosion-protection, where the intrinsic safety of the electrical circuits in the explosive atmosphere may depend upon the design and construction of such electrical equipment or parts of such electrical equipment.

NOTE: The permitted methods of interconnection of intrinsically safe electrical equipment and associated electrical equipment are specified in AS 1076, Part 4.

1.2 REFERENCED DOCUMENTS. The following standards are referred to in this standard:

- | | |
|---------|---|
| AS 1076 | Electrical Equipment for Explosive Atmospheres—Selection, Installation and Maintenance
Part 4—Intrinsic Safety 'i' |
|---------|---|

AS 1939	Classification of Degrees of Protection Provided by Enclosures for Electrical Equipment
---------	---

AS 2380	Electrical Equipment for Explosive Atmospheres—Explosion-Protection Techniques Part 1—General Requirements
---------	---

AS 2420	Fire Test Methods for Solid Insulating Materials and Non-metallic Enclosures used in Electrical Equipment
---------	---

AS 2430	Classification of Hazardous Areas Part 1—Explosive Gas Atmospheres Part 2—Combustible Dusts
---------	---

AS 2480	Electrical Equipment for Explosive Atmospheres—Flameproof Enclosure—Type of Protection 'd'
---------	--

AS 2768	Electrical Insulating Materials—Evaluation and Classification Based on Thermal Endurance
---------	--

AS 3000	SAA Wiring Rules
---------	------------------

IEC 79-11	Electrical Apparatus for Explosive Gas Atmospheres—Construction and Test of Intrinsically-safe and Associated Apparatus
-----------	---

BS 50 000	Harmonized System of Quality Assessment for Electronic Components—General Specification: Discrete Semiconductor Devices.
-----------	--

1.3 DEFINITIONS. The following definitions specific to type of protection intrinsic safety 'i' are applicable in this standard and are supplementary to the definitions given in AS 2380, Part 1.

1.3.1 Associated electrical equipment—electrical equipment in which the circuits are not all intrinsically safe but which contains circuits that can affect the safety of intrinsically safe circuits connected to it.

NOTE: Associated electrical equipment may be either of the following:

(a) Electrical equipment which has an alternative type of explosion-protection for use in the explosive atmosphere.

Example: A safety barrier housed inside a flameproof enclosure.

(b) Electrical equipment not so protected and which is therefore not to be used within an explosive atmosphere, i.e. must be located in a safe area.

Example: A recorder which is located in a safe area where only the recorder input circuit is intrinsically safe.