

# Australian Standard 1829—1981

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## ELECTRICAL EQUIPMENT FOR EXPLOSIVE ATMOSPHERES INTRINSICALLY SAFE APPARATUS—TYPE OF PROTECTION i



**STANDARDS ASSOCIATION OF AUSTRALIA**  
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Represented on the committee which was responsible for the preparation of this standard were the following:

Australian Coal Association  
Australian Electrical and Electronics Manufacturers Association  
Australian Institute of Petroleum  
Confederation of Australian Industry  
Department of Industrial Relations, N.S.W.  
Department of Industry and Commerce  
Department of Mineral Resources, N.S.W.  
Department of Minerals and Energy, 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

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**AUSTRALIAN STANDARD**

**ELECTRICAL EQUIPMENT FOR  
EXPLOSIVE ATMOSPHERES  
INTRINSICALLY SAFE  
APPARATUS—TYPE OF  
PROTECTION i**

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## PREFACE

This edition of this standard was prepared by the Association's Committee on Electrical Equipment for Hazardous Locations, to supersede the 1980 edition. This standard is intended for the guidance of manufacturers, users, statutory authorities and associated interests and for use with the SAA Wiring Rules and Relevant Mining Regulations. It prescribes requirements in respect of design, construction and marking of intrinsically safe and associated apparatus and includes a section on testing.

In its terminology, definitions and general treatment of the subject this standard is similar to corresponding recommendations issued by the International Electrotechnical Commission (IEC) and the certification standard issued by the British Approvals Service for Electrical Equipment in Flammable Atmospheres.

The major changes in this edition are as follows:

- (a) Reference is made to AS 2380, Part 1 for grouping of apparatus, temperature classification and marking.
- (b) The requirement that each core of a multicore cable be insulated for 250 V has been deleted and new requirements introduced.
- (c) The minimum conductor size for internal wiring has been deleted.
- (d) The Appendix which provides guidance on the design and testing of intrinsically safe circuits has been modified and extended.

This standard may require reference to the following standards:

AS 1076	Code of Practice for Selection, Installation and Maintenance of Electrical Apparatus and Associated Equipment for Use in Explosive Atmospheres (Other Than Mining Applications) Part 1—Basic Requirements Part 4—Apparatus with Type of Protection 'i'—Intrinsically Safe Apparatus and Systems
AS 1939	Classification of Degrees of Protection Provided by Enclosures for Electrical Equipment
AS 2010	Code of Practice for Installation and Application of Shunt Diode Safety Barriers
AS 2011	Shunt Diode Safety Barriers for Explosive Atmospheres
AS 2380	Electrical Equipment for Explosive Gas Atmospheres—Explosion Protection Techniques Part 1—General Requirements
AS 2430	Classification of Hazardous Areas Part 1—Explosive Gas Atmospheres Part 2—Dusts (Including Inherently Explosive Dusts)
AS 3000	SAA Wiring Rules
AS 3191	Approval and Test Specification for Electric Flexible Cords
AS C100	Approval and Test Specification for Definitions and General Requirements for Electrical Materials and Equipment
ISO 54	Cylindrical Gears for General Engineering and for Heavy Engineering—Modules and Diametral Pitches
BS 2050	Electrical Resistance of Conducting and Antistatic Products Made from Polymeric Material
BS 9300	Semiconductor Devices of Assessed Quality: Generic Data and Methods of Test

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## STANDARDS ASSOCIATION OF AUSTRALIA

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**Australian Standard****for****ELECTRICAL EQUIPMENT FOR EXPLOSIVE ATMOSPHERES—INTRINSICALLY  
SAFE APPARATUS—TYPE OF PROTECTION I**

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**FOREWORD**

The purpose of this standard is to establish requirements to ensure that the thermal energy available at any arcing or sparking points under any condition of operation is not capable of causing ignition of prescribed flammable atmospheres.

Apparatus complying with these requirements will be suitable for use in flammable or explosive atmospheres in which gases or vapours may be present, as required by the SAA Wiring Rules or by the mining regulations or defined hazardous areas.

The classification of hazardous areas is dealt with in AS 2430, Parts 1 and 2. Part 1 applies to explosive gas atmospheres and recognizes the following zones:

**Zone 0** - an area in which an explosive gas atmosphere is present continuously, or is expected to be present for long periods, or for short periods which occur with high frequency.

**Zone 1** - an area in which an explosive gas atmosphere can be expected to occur periodically or occasionally during normal operation.

**Zone 2** - an area in which an explosive gas atmosphere is not expected to occur in normal operation and if it occurs is likely to be present only infrequently and for short duration.

This standard recognizes two categories of intrinsically safe apparatus—Category ia and Category ib. Apparatus complying with the requirements for Category ia may be used in Zone 0, Zone 1 or Zone 2. Apparatus complying with the requirements for Category ib may be used in Zone 1 or Zone 2.

Further information on the use of intrinsically safe apparatus is given in AS 1076, Part 4.

## SECTION 1. SCOPE AND GENERAL

**1.1 SCOPE.** This standard specifies requirements for electrical apparatus for use in intrinsically safe systems, all or parts of which, by design, cannot constitute a source of ignition for a hazardous gas or vapour.

The standard prescribes the design and constructional requirements and test procedures for apparatus and parts of apparatus intended for use in a hazardous area and also for associated apparatus and parts of associated apparatus intended for use in a safe area.

Relevant requirements of this standard also apply to components or subassemblies or apparatus submitted to a certifying authority for approval.

**NOTE:** A certificate of intrinsic safety should specify the complete electrical system together with any special installation requirements for safe operation of the system.

**1.2 DEFINITIONS.** For the purpose of this standard, the following definitions apply:

**1.2.1 Assessment**—subjective judgement of factors which cannot be rigorously demonstrated, enabling a decision to be made regarding suitability for use in an explosive or potentially explosive gas atmosphere.

**1.2.2 Associated safe area apparatus**—apparatus designed to form part of an intrinsically safe system, in which not all the circuits are intrinsically safe circuits, but which affects the safety of the intrinsically safe system of which it forms a part. Such apparatus may not be installed in a hazardous area unless provided with appropriate protection.

**NOTES:**

1. Examples of associated safe area apparatus are a power unit fed from a mains supply supplying power to intrinsically safe apparatus in a hazardous area, and a recorder in a safe area actuated by a transducer situated in hazardous area.
2. Appropriate protection which would enable associated safe area apparatus to be mounted in a hazardous area would be a flameproof enclosure.

**1.2.3 Fault**—a defect or electrical breakdown of any component, or of any connection between components, upon which the intrinsic safety of the circuit depends.

**NOTES:**

1. If a defect or breakdown leads to other defects or breakdowns in other components upon which the intrinsic safety of the circuit depends, the primary and the subsequent defects or breakdowns or other components are to be considered as a single fault.
2. The use of a break-flash apparatus in the circuit to produce circuit interruptions, or short-circuits, is not considered as one of the faults.

**1.2.4 Infallible component (or subassembly)**—a component or subassembly that, in service or in storage, is not liable to become defective in such a manner as to lower the intrinsic safety of any system or apparatus of which it may form part.

**NOTE:** An infallible component or subassembly is considered as not to be subject to fault when tests of intrinsic safety are made on apparatus.

**1.2.5 Intrinsically safe apparatus**—apparatus in which all the circuits are intrinsically safe, or which is designed to form part of an intrinsically safe system. Intrinsically safe apparatus may be installed in a hazardous area.

**1.2.6 Intrinsically safe circuit**—a circuit in which any spark or thermal effect produced either normally or in specified fault conditions is incapable under prescribed test conditions of causing ignition of a given gas or vapour.

**1.2.7 Intrinsically safe system**—a system comprising apparatus and interconnecting wiring in which any spark or thermal effect in any part of the system intended for use in the hazardous area is incapable under prescribed conditions of causing ignition of a given gas or vapour.

**1.2.8 Non-self-revealing fault**—a fault which would not be evident to the user in the normal operation of the equipment.

**1.2.9 Normal operation**—an intrinsically safe system is in normal operation when it conforms electrically and mechanically with its design specification.

**1.2.10 Routine tests**—checks and tests which are carried out by the manufacturer.

**1.2.11 Self-isolating fault**—a fault that results in the removal of power from the faulty circuit.

**1.2.12 Self-revealing fault**—a fault which would cause some malfunction necessitating correction before proceeding with further operation of the equipment, and which may be indicated, for example, by an audible or visible signal.

**1.2.13 Type tests**—checks and tests carried out to ensure that the apparatus under test complies with the requirements of this standard. The apparatus tested is a production or prototype sample submitted for the purpose by the manufacturer.

**1.3 GROUPING OF APPARATUS.** Intrinsically safe and associated safe area apparatus shall be grouped in accordance with Clause 1.5 of AS 2380, Part 1.

**1.4 TEMPERATURE CLASSIFICATION.** Apparatus shall be classified in accordance with Clause 1.6 of AS 2380, Part 1.

**NOTE:** The temperature of small components (such as transistors, diodes, resistors, etc) may, however, exceed the limiting temperature of the class, provided the heated areas are small enough as not to constitute either a direct or an indirect ignition risk and the temperature causes no deformation or degradation of the insulation which may adversely affect the intrinsic safety of the circuit or system.

**1.5 CATEGORIES OF APPARATUS.**

**1.5.1 General.** Intrinsically safe and associated safe area apparatus shall be placed in one of two categories, viz ia or ib. The requirements of this standard shall apply to both categories, unless otherwise specified.

**1.5.2 Category ia.** Apparatus of Category ia shall be incapable of causing ignition in normal operation or with any combination of up to two faults applied, and with the following safety factors:

- (a) In normal operation ..... 1.5.
- (b) With any one fault ..... 1.5.
- (c) With any two faults ..... 1.0.