

C/A  
Apparatus

SUPERSEDED BY

AS 1829-1981

AS 1829 — 1980

UDC 621.3.019.3 : 614.83

Copy A

2-1980

# Australian Standard 1829 — 1980

---

**ELECTRICAL EQUIPMENT FOR  
EXPLOSIVE ATMOSPHERES  
INTRINSICALLY SAFE  
ELECTRICAL APPARATUS**

---



**STANDARDS ASSOCIATION OF AUSTRALIA**

*Incorporated by Royal Charter*



e

THE FOLLOWING SCIENTIFIC, INDUSTRIAL AND GOVERNMENTAL organizations and departments were officially represented on the committee entrusted with the preparation of this standard:

Australian Coal Association  
Australian Electrical and Electronics Manufacturers Association  
Confederation of Australian Industry  
Co-opted specialist interests  
Department of Productivity  
Departments of Explosives  
Departments of Labour and Industry  
Departments of Mines  
Electrical Contractors Associations of Australia  
Insurance Council of Australia  
Oil companies  
Statutory Electricity Authorities  
Sydney County Council (Testing Interest)

---

This standard, prepared by Committee EL/14, Electrical Equipment for Hazardous Locations, was approved on behalf of the Council of the Standards Association of Australia on 13 March 1980, and was published on 1 May 1980.

---

To keep abreast of progress in industry, Australian standards are subject to continuous 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 their standards are up-to-d. Full details of all SAA publications will be found in the Annual List of Australian Standards; these details are supplemented by listings in the SAA monthly journal 'The Australian Standard'. Information on the Annual List and 'The Australian Standard' may be obtained from any sales office of the Association, where details are also available of the current status of individual standards. Suggestions for improvements to published standards, addressed to the head office of the Association, are welcomed.

**AUSTRALIAN STANDARD**

**INTRINSICALLY SAFE  
ELECTRICAL APPARATUS  
FOR EXPLOSIVE ATMOSPHERES**

**AS 1829 — 1980**

First published (as AS C376) .....	1968
Revised and issued as AS 1829 .....	1976
New edition .....	1980



**PUBLISHED BY THE STANDARDS ASSOCIATION OF AUSTRALIA  
STANDARDS HOUSE, 80 ARTHUR STREET, NORTH SYDNEY, N.S.W.**

**ISBN 0 7262 1910 X**

## P R E F A C E

This standard was prepared by the Association's Committee on Electrical Equipment for Hazardous Locations, 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, viz:

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

SFA3012:1972 — BASEEFA Certification Standard for Intrinsic Safety

Acknowledgement is made of the assistance received from these sources.

In this edition the published amendments to the 1978 edition have been incorporated, and substantial changes have been made to the foreword and to Clause 3.1 (General) to permit interface with IEC 79-11 and the assessment of an intrinsically safe circuit where the electrical parameters are sufficiently well defined for its safety to be deduced from recognized gas ignition charts.

The standard may require reference to—

- |         |   |
|---------|---|
| AS 1147 | Plastics Insulating Materials of Mouldings for Cable Connecting Devices for Use in Coal Mines   |
| AS 1939 | Classification of Degrees of Protection Provided by Enclosures of Electrical Equipment  |
| AS 2010 | Installation and Application of Shunt Diode Safety Barriers   |
| AS 2011 | Shunt Diode Safety Barriers   |
| AS 3000 | Part 1—SAA Wiring Rules   |
| AS C98  | Flameproof Enclosure of Electrical Equipment for Explosive Atmospheres  |
| AS C100 | Definitions and General Requirements for Electrical Materials and Equipment   |
| BS 2050 | Electrical Resistance of Conductive and Antistatic Products made from Polymeric Material  |
| BS 5308 | Instrumentation Cables Intended for Intrinsically Safe Systems<br>Part 1—Polyethylene Insulated Cables<br>Part 2—PVC Insulated Cables |
| BS 9300 | Semiconductor Devices of Assessed Quality: Generic Data and Methods of Test   |
| ISO 54  | Cylindrical Gears for General Engineering and for Heavy Engineering — Modules and Diametral Pitches                                   |

# CONTENTS

	<i>Page</i>
<b>FOREWORD</b> .....	5
 <b>SECTION 1. SCOPE AND GENERAL</b>	
1.1 Scope .....	6
1.2 Definitions .....	6
1.3 Grouping of Intrinsically Safe and Associated Safe Area Apparatus .....	8
1.4 Application of Intrinsically Safe and Associated Safe Area Apparatus .....	8
1.5 Surface Temperature Classification .....	8
1.6 Categories of Intrinsically Safe and Associated Safe Area Apparatus .....	8
 <b>SECTION 2. CONSTRUCTIONAL REQUIREMENTS</b>	
2.1 Compliance with Standards .....	10
2.2 Infallible Components and Subassemblies .....	10
2.3 General Requirements for Components .....	15
2.4 Creepage Distances and Clearances .....	16
2.5 Plug-in Connectors, Boards and Components .....	17
2.6 Cells and Batteries .....	18
2.7 Earthing .....	18
2.8 Insulation .....	18
2.9 Internal Wiring .....	18
2.10 Layout of Apparatus and External Wiring .....	19
2.11 Minimum Wire Size .....	19
2.12 Connections for External Wiring .....	20
2.13 Protective Cases .....	20
2.14 Conductor Size .....	21
2.15 Layout of Apparatus and Wiring .....	21
2.16 Mounting of Components .....	21
2.17 Restriction on Use of Copper and Silver in Acetylene Atmospheres .....	21
 <b>SECTION 3. TESTS</b>	
3.1 General .....	22
3.2 Spark Test Apparatus .....	22
3.3 Test Gases .....	22
3.4 Calibration of Spark Test Apparatus .....	22
3.5 Type Tests for Intrinsic Safety .....	23
3.6 Temperature Classification .....	24
3.7 Voltage Test .....	24
3.8 Compliance with AS C100 .....	25

## SECTION 4. MARKING

	<i>Page</i>
4.1 General .....	26
4.2 Additional Marking of Intrinsically Safe Apparatus .....	26
4.3 Marking of Associated Apparatus .....	27
4.4 Marking of Terminals .....	27
4.5 Installation and Use Requirements .....	27

## APPENDICES

A Apparatus Groups .....	28
B Description of Break-flash Apparatus .....	32
C Notes on the Design of Intrinsically Safe Circuits .....	40

© Copyright — STANDARDS ASSOCIATION OF AUSTRALIA 1980  
Users of standards are reminded that copyright subsists in all SAA publications. No part of this publication may be reproduced, stored in a retrieval system in any form or transmitted by any means without prior permission in writing of the Standards Association of Australia.

# STANDARDS ASSOCIATION OF AUSTRALIA

---

## Australian Standard for INTRINSICALLY SAFE ELECTRICAL APPARATUS FOR EXPLOSIVE ATMOSPHERES

---

### FOREWORD

The purpose of this standard is to establish design criteria such as 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 may be certified Category 'ia' or 'ib' according to the zonal classification of the hazardous area and the number of faults that are taken into account by the testing authority. Category ia has a larger safety factor than ib, and intrinsically safe apparatus certified 'ia' may therefore be used in areas of greater risk. Apparatus of Category ia and apparatus of Category ib are suitable for Zone 0 and Zone 1 areas of hazard respectively.

The following sequence is recommended in the marking of intrinsically safe explosion protected electrical apparatus:

Zone — Type of protection — Group — Sub-group — Temperature classification.

Typical marking for intrinsically safe apparatus might be—

Z0 Exia IIC T5

This marking indicates certification to Zone 0 area of hazard, Category ia. The apparatus group IIC indicates compliance with the requirements of that group and by implication with less onerous requirements of groups IIA and IIB. The apparatus may be safely used with all compounds allocated to these groups subject to consideration of temperature, classification and chemical compatibility.

The precautions which must be taken to ensure that safe interconnection of items of intrinsically safe apparatus and associated safe area intrinsically safe systems must be such that the number of faults will not be lessened for the degree of hazard concerned.

## SECTION 1. SCOPE AND GENERAL

**1.1 SCOPE.** This standard applies to 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 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.

**1.2.2 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.

**1.2.3 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.

**1.2.4 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 a hazardous area.
2. Appropriate protection which would enable associated safe area apparatus to be mounted in a hazardous area would be a flameproof enclosure.

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