

Australian/New Zealand Standard™

Explosive atmospheres

**Part 25: Intrinsically safe electrical
systems**



AS/NZS 60079.25:2011

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-014, Equipment for Explosive Atmospheres. It was approved on behalf of the Council of Standards Australia on 1 June 2011 and on behalf of the Council of Standards New Zealand on 16 May 2011.
This Standard was published on 20 June 2011.

The following are represented on Committee EL-014:

Auckland Regional Chamber of Commerce
Australian Chamber of Commerce and Industry
Australian Coal Association
Australian Industry Group
Australian Institute of Petroleum
Australian Institute of Refrigeration Air Conditioning and Heating
Australian Petroleum Production and Exploration Association
Australian Pipeline Industry Association
Bureau of Steel Manufacturers of Australia
Consult Australia
Department of Industry and Investment, NSW
Department of Mines and Energy, Qld
Electrical Compliance Testing Association
Electrical Contractors Association of New Zealand
Electrical Regulatory Authorities Council
Energy Networks Association
Engineers Australia
Environmental Protection Authority New Zealand
Institute of Electrical Inspectors
Institute of Instrumentation, Control and Automation Australia
Institution of Professional Engineers, New Zealand
Mining Electrical and Mining Mechanical Engineering Society
Ministry of Economic Development (New Zealand)
National Electrical and Communications Association
New Zealand Employers and Manufacturers Association (Central)
The Aviation and Marine Engineers Association
WorkCover, NSW

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Web Shop at www.saiglobal.com.au or Standards New Zealand web site at www.standards.co.nz and looking up the relevant Standard in the on-line catalogue.

For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia or Standards New Zealand at the address shown on the back cover.

This Standard was issued in draft form for comment as DR AS/NZS 60079.25.

Australian/New Zealand Standard™

Explosive atmospheres

Part 25: Intrinsically safe electrical systems

Originated as AS/NZS 60079.25:2004.
Second edition 2011.

COPYRIGHT

© Standards Australia Limited/Standards New Zealand

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Australia) or the Copyright Act 1994 (New Zealand).

Jointly published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001 and by Standards New Zealand, Private Bag 2439, Wellington 6140

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-014, Equipment for Explosive Atmospheres, to supersede AS/NZS 60079.25:2004.

The objective of this Standard is to establish the specific requirements for construction and assessment of intrinsically safe systems, type of protection ‘i’, for use where Group I, II and III apparatus is required. It modifies but should be read in conjunction with, AS/NZS 60079.0 and AS/NZS 60079.11, in particular.

The objective of the revision is to adopt the current edition of IEC 60079-25. A list of ‘significant changes’ in this revision is given in the Foreword.

This Standard is identical with, and has been reproduced from IEC 60079-25 Ed.2.0 (2010), *Explosive atmospheres—Part 25: Intrinsically safe electrical systems*

As this Standard is reproduced from an International Standard, the following applies:

- (a) Its number appears on the cover and title page while the International Standard number appears only on the cover.
- (b) In the source text ‘this part of IEC 60079’ should read ‘this part of AS/NZS 60079’.
- (c) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>		<i>Australian or Australian/New Zealand Standard</i>	
IEC		AS	
60060	High-voltage test techniques	1931	High-voltage test techniques
60060-1	Part 1: General definitions and test requirements	1931.1	Part 1: General definitions and test requirements
		AS/NZS	
60079	Explosive atmospheres	60079	Explosive atmospheres
60079-0	Part 0: General requirements	60079.0	Part 0: General requirements
60079-11	Part 11: Equipment protection by intrinsic safety ‘i’	60079.11	Part 11: Equipment protection by intrinsic safety ‘i’
60079-14	Part 14: Electrical installations design, selection and erection	60079.14	Part 14: Electrical installations design, selection and erection
60079-15	Part 15: Equipment protection by type of protection ‘n’	60079.15	Part 15: Equipment protection by type of protection ‘n’
60079-26	Part 27: Fieldbus intrinsically safe concept (FISCO)	60079.26	Part 27: Fieldbus intrinsically safe concept (FISCO)
61241	Electrical apparatus for use in presence of combustible dust	61241	Electrical apparatus for use in presence of combustible dust
61241-11	Protection by intrinsic safety ‘iD’	61241.11	Protection by intrinsic safety ‘iD’

Only international references that have been adopted as Australian or Australian/New Zealand Standards have been listed.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the annex to which they apply. A ‘normative’ annex is an integral part of a Standard, whereas an ‘informative’ annex is only for information and guidance.

CONTENTS

1	Scope.....	6
2	Normative references	6
3	Terms, definitions and abbreviations	7
	3.1 Terms and definitions	7
	3.2 Abbreviations	8
4	Descriptive system document	8
5	Grouping and classification.....	9
6	Levels of protection	9
	6.1 General	9
	6.2 Level of protection “ia”	9
	6.3 Level of protection “ib”	9
	6.4 Level of protection “ic”	9
7	Ambient temperature rating	10
8	Interconnecting wiring / cables used in an intrinsically safe electrical system	10
9	Requirements of cables and multi-core cables	10
	9.1 General	10
	9.2 Multi-core cables	10
	9.3 Electrical parameters of cables.....	11
	9.4 Conducting screens.....	11
	9.5 Types of multi-core cables.....	11
	9.5.1 General	11
	9.5.2 Type A cable	11
	9.5.3 Type B cable	11
	9.5.4 Type C cable	11
10	Termination of intrinsically safe circuits	11
11	Earthing and bonding of intrinsically safe systems.....	12
12	Protection against lightning and other electrical surges	12
13	Assessment of an intrinsically safe system	13
	13.1 General	13
	13.2 Simple apparatus	14
	13.3 Analysis of inductive circuits.....	15
	13.4 Faults in multi-core cables.....	15
	13.4.1 Type of multi-core cables.....	15
	13.4.2 Type A cable	15
	13.4.3 Type B cable	15
	13.4.4 Type C cable	16
	13.5 Type verifications and type tests	16
14	Marking	16
15	Predefined systems	16
	Annex A (informative) Assessment of a simple intrinsically safe system.....	17
	Annex B (normative) Assessment of circuits with more than one source of power	20
	Annex C (informative) Interconnection of non-linear and linear intrinsically safe circuits	23
	Annex D (normative) Verification of inductive parameters	59

Annex E (informative) A possible format for descriptive systems drawings and installation drawings	61
Annex F (informative) Surge protection of an intrinsically safe circuit	64
Annex G (normative) Testing of cable electrical parameters	67
Annex H (informative) Use of simple apparatus in systems	69
Annex I (normative) FISCO systems	71
Bibliography.....	74
Figure 1 – Systems analysis	14
Figure 2 – Typical system using simple apparatus	15
Figure B.1 – Sources of power connected in series.....	21
Figure B.2 – Sources of power connected in parallel.....	22
Figure B.3 – Sources of power not deliberately connected	22
Figure C.1 – Equivalent circuit and output characteristic of resistive circuits	24
Figure C.2 – Current and/or voltage addition for interconnections	26
Figure C.3 – Output characteristic and equivalent circuit of a source with trapezoidal characteristic	29
Figure C.4 – Example of an interconnection.....	33
Figure C.5 – Sum characteristics for the circuit as given in Figure C.4.....	35
Figure C.6 – Current and/or voltage addition for the example given in Figure C.4	36
Figure C.7 – Limit curve diagram for universal source characteristic – Group IIC	47
Figure C.8 – Limit curve diagram for universal source characteristic – Group IIB	57
Figure C.9 – Copy pattern for universal source diagrams	58
Figure D.1 – Typical inductive circuit	60
Figure E.1 – Typical block diagram for IS system descriptive system document.....	62
Figure E.2 – Typical installation drawing for IS system	63
Figure F.1 – Surge protection requirements of an instrument loop	66
Figure I.1 – Typical system	73
Table A.1 – Simple system analysis.....	19
Table C.1 – Parameters necessary to describe the output characteristic.....	28
Table C.2 – Assignment of diagrams to equipment groups and inductances.....	31

FOREWORD

The significant changes with respect to the previous edition are listed below:

- extension of the scope from Group II to Groups I, II and III;
- introduction of level of protection “ic”;
- addition of requirements for cables and multi-core cables;
- reference to IEC 60079-11 regarding the termination of intrinsically safe circuits
- requirements for the assessment of an expanded and clarified intrinsically safe system regarding level of protection “ic”, simple apparatus and faults in multi-core cables;
- introduction of predefined systems and merging of the system requirements for FISCO from IEC 60079-27;
- addition of requirements for simple intrinsically safe systems containing both lumped inductance and lumped capacitance;
- addition of a method for testing the electrical parameters of cables;
- additional information for the use of simple apparatus in systems.

AUSTRALIAN/NEW ZEALAND STANDARD

Explosive atmospheres

Part 25: Intrinsically safe electrical systems

1 Scope

This part of IEC 60079 contains the specific requirements for construction and assessment of intrinsically safe electrical systems, type of protection “i”, intended for use, as a whole or in part, in locations in which the use of Group I, II or III apparatus is required.

NOTE 1 This standard is intended for use by the designer of the system who may be a manufacturer, a specialist consultant or a member of the end-user's staff.

This standard supplements and modifies the general requirements of IEC 60079-0 and the intrinsic safety standard IEC 60079-11. Where a requirement of this standard conflicts with a requirement of IEC 60079-0 or IEC 60079-11, the requirement of this standard takes precedence.

This standard supplements IEC 60079-11, the requirements of which apply to electrical apparatus used in intrinsically safe electrical systems.

The installation requirements of Group II or Group III systems designed in accordance with this standard are specified in IEC 60079-14.

NOTE 2 Group I installation requirements are presently not provided in IEC 60079-14.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-11:2006, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety “i”*

IEC 60079-14:2007, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

IEC 60079-15, *Electrical apparatus for explosive gas atmospheres – Part 15: Construction, test and marking of type of protection “n” electrical apparatus*

IEC 60079-27:2008, *Explosive atmospheres – Part 27: Fieldbus intrinsically safe concept (FISCO)*

IEC 61158-2, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*