SLOVENSKI STANDARD
oSIST prEN IEC 60079-25:2019

01-maj-2019

Eksplozivne atmosfere - 25. del: Lastnovarni električni sistemi

Explosive atmospheres - Part 25: Intrinsically safe electrical systems

Explosionsfähige Atmosphäre - Teil 25: Eigensichere Systeme

Atmosphères explosives - Partie 25: Systèmes électriques de sécurité intrinsèque

Ta slovenski standard je istoveten z: **prEN IEC 60079-25:2019**

ICS:

29.260.20	Električni aparati za eksplozivna ozračja	Electrical apparatus for explosive atmospheres

oSIST prEN IEC 60079-25:2019 **en,fr,de**

31G/294/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 60079-25 ED3**	
DATE OF CIRCULATION: **2019-03-22**	CLOSING DATE FOR VOTING: **2019-06-14**
SUPERSEDES DOCUMENTS: **31G/279/CD,31G/284A/CC**	

IEC SC 31G : INTRINSICALLY-SAFE APPARATUS

SECRETARIAT: United Kingdom	SECRETARY: Mr Nicholas Ludlam
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 18	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Explosive atmospheres - Part 25: Intrinsically safe electrical systems

PROPOSED STABILITY DATE: 2025

NOTE FROM TC/SC OFFICERS:

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –

Part 25: Intrinsically safe electrical systems

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60079-25 has been prepared by subcommittee 31G: Intrinsically safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

This third edition cancels and replaces the second edition published in 2010 and constitutes a technical revision.

The significance of the changes between IEC Standard, IEC 60079-25, Edition 2 (2010) and IEC 60079-25, Edition 3 (2019) are as listed below:

		Type		
Changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
References to “electrical systems” changed to “systems”, and note added that installation requirement for Group I are being considered	1	X		
Normative references updated to remove references that were outdated or not mentioned in the body of the standard	2	X		
Reference to IEC Electropedia and ISO Online Browsing platform added, abbreviations dropped from title. Definition of “system designer” deleted, definitions of certified intrinsically safe electrical system, and uncertified intrinsically safe electrical system dropped	3	X		
“Intrinsically safe electrical system” changed to “intrinsically safe system”	3.1	X		
Definition for “multi-circuit cable” added	3.2	X		
“Maximum” changed to “total” on definitions of cable capacitance and cable inductance	3.4, 3.5	X		
“Maximum” deleted on definition of cable inductance to resistance ratio	3.6	X		
FISCO changed to definition from abbreviation	3.9	X		
The requirement for the system designer to sign and date the document dropped, editorial changes for clarity made, and a reference to Annex E made to show typical descriptive system documents	4	X		
Title of clause changed to “Grouping and temperature classification”, ambient temperature range added to things to be included in the system document, and reworded for clarity	5		X	
Notes moved and reworded among the clauses.	6.1, 6.2, 6.3, 6.4	X		
Changed from “Ambient temperature rating” which was moved to Clause 5, and new section renamed “Non-intrinsically safe circuits” added	7		X	
Clause reorganized into sections and some rewording done for clarity	8	X		
Title changed to “Requirements of single and multi-circuit cables”	9	X		
Requirement for insulation thickness moved into this clause, and it now applies to all cables	9.1		X	
Title changed to “Dielectric strength” and consolidates requirements for single circuit and multi-circuit cables. Requirement for dielectric testing changed to twice circuit voltage with a minimum of 500VAC	9.2		X	
Dielectric strength requirements for single circuit cables consolidated here	9.2.1	X		
Dielectric strength requirements for multi- circuit cables consolidated here	9.2.2	X		

		Type		
Changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
Title changed to “Intrinsic safety parameters of cables”	9.3	X		
Title changed to “Enclosures”	10	X		
Most the old Clause 12 moved to 60079-14.	11			C1
This clause was Clause 13 in the previous edition, and the entire clause has been re-arranged for clarity and easier reading	12	X		
This General clause has been re-written in list format to make it easier to understand, and analysis of single and multiple power supplies moved to 12.4 and 12.5 respectively	12.1		X	
This clause added to clarify fault applications in assemblies of certified equipment	12.2		X	
This clause added to provide guidance on how to handle non-certified items in larger assemblies.	12.3		X	
Analysis of single power source information collected here and amplified	12.4		X	
Analysis of multiple power sources information collected in this clause, information added for clarity	12.5		X	
The circuit analysis example dropped in text for simple apparatus, new Annex F added with more information	12.6	X		
This section added to provide more information on determining capacitance, inductance and L/R that was moved in from Annex A	12.7		X	
Requirements for Type A, B, and C cables reworded for clarity	12.8	X		
Information on evaluation of capacitance and inductance moved to 12.7	Annex A	X		
Changed from normative to informative	Annex B			
Reordered and rewritten for greater clarity	Annex C	X		
Annex updated for clarity	Annex E	X		
The former Annex F on surge protection has been removed .	Annex F			C2
Annex G in the previous edition was on testing of cable parameters and has been removed from this edition. Annex G is now FISCO systems.	Annex G	X		

NOTE: The technical changes referred to include the significance of technical changes in the revised IEC Standard, but they do not form an exhaustive list of all modifications from the previous version. More guidance may be found by referring to the Redline Version of the standard.

Explanations:

A) Definitions

Minor and editorial changes clarification
decrease of technical requirements

	minor technical change
	editorial corrections

These are changes which modify requirements in an editorial or a minor technical way. They include changes of the wording to clarify technical requirements without any technical change, or a reduction in level of existing requirement.

Extension	addition of technical options

These are changes which add new or modify existing technical requirements, in a way that new options are given, but without increasing requirements for equipment that was fully compliant with the previous standard. Therefore, these will not have to be considered for products in conformity with the preceding edition.

Major technical changes	addition of technical requirements
	increase of technical requirements

These are changes to technical requirements (addition, increase of the level or removal) made in a way that a product in conformity with the preceding edition will not always be able to fulfil the requirements given in the later edition. These changes have to be considered for products in conformity with the preceding edition. For these changes additional information is provided in clause B) below.

Note: These changes represent current technological knowledge. However, these changes should not normally have an influence on equipment already placed on the market.

B) Information about the background of 'Major Technical Changes'

C1 – Most of the earthing and bonding requirements have been moved to IEC 60079-14, and the surge protection requirements that were in the old Clause 12 were added here in Clause 11. The rest of the old Clause 12 was also removed and moved to IEC 60079-14

C2 – The former Annex F on surge protection has been removed and will be covered in IEC 60079-14, Annex F is now Simple Apparatus, which was Annex H in the previous edition

The text of this standard is based on the following documents:

FDIS	Report on voting
31G/ /FDIS	31G/ /RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 60079 series, under the general title *Explosive atmospheres*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

EXPLOSIVE ATMOSPHERES –

Part 25: Intrinsically safe electrical systems

1 Scope

This part of IEC 60079 contains the specific requirements for design, construction and assessment of intrinsically safe 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 Ex Equipment 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 document 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 document supplements IEC 60079-11, the requirements of which apply to apparatus used in intrinsically safe 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. Installation requirements for Group I are being considered.

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

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

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

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions, specific to intrinsically safe systems, apply. They supplement the terms and definitions which are given in IEC 60079-0 and IEC 60079-11.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
intrinsically safe system
assembly of interconnected items of apparatus, described in a descriptive system document, in which the circuits or parts of circuits, intended to be used in an explosive atmosphere, are intrinsically safe circuits

3.2
multi-circuit cable
multi-core cable containing more than one intrinsically safe circuit

3.3
descriptive system document
document in which the items of apparatus, their intrinsic safety parameters and those of the interconnecting wiring are specified

3.4
total cable capacitance
C_c
total capacitance of the interconnecting cable that can be connected into an intrinsically safe circuit

3.5
total cable inductance
L_c
total inductance of the interconnecting cable that can be connected into an intrinsically safe circuit

3.6
cable inductance to resistance ratio
L_c/R_c
value of the ratio inductance (L_c) to resistance (R_c) of the interconnecting cable connected into an intrinsically safe circuit

3.7
linear power source
power source from which the available output current is determined by a resistor; the output voltage decreases linearly as the output current increases

3.8
non-linear power source
power source where the output voltage and output current have a non-linear relationship

Note 1 to entry: For example, a supply with a constant voltage output that can reach a constant current limit controlled by semiconductors

3.9
FISCO
Fieldbus Intrinsically Safe Concept
intrinsically safe system architecture which is bus-powered and designed in accordance with IEC 61558-2, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

4 Descriptive system document

A descriptive system document shall be created for all intrinsically safe systems. The descriptive system document shall include the technical justification for the combination of the apparatus and shall include at a minimum the following:

a) a block diagram of the system listing all the items of apparatus within the system including simple apparatus and the interconnecting wiring;

b) a statement of the Group subdivision (for Groups II and III), the Level of Protection and the Equipment Protection Level (EPL) for each part of the system, the temperature classification, and the ambient temperature rating in accordance with Clauses 5 and 6;

c) the requirements and permitted parameters of the interconnecting wiring in accordance with Clause 8;

d) details of the earthing and bonding points on which intrinsic safety depends;

e) where applicable, the confirmation of apparatus as simple apparatus in accordance with IEC 60079-11;

f) the result of the assessment of intrinsically safe systems in accordance with Clause 12; and

g) a unique document identification.

The requirements found in Clauses 5 through 12 shall be used to determine the content of the descriptive system document.

NOTE The descriptive system document is not the same as the Control Drawing referred to in IEC 60079-11.

Annex E shows an example of a typical diagram, illustrating the requirements of the descriptive system document.

5 Grouping and temperature classification

Parts of intrinsically safe systems that are intended for use in an explosive atmosphere shall be grouped in accordance with the equipment grouping requirements of IEC 60079-0. They shall be assigned a temperature class or a maximum surface temperature in accordance with the temperature requirements of IEC 60079-0 and IEC 60079-11.

Associated apparatus not intended for use in an explosive atmosphere shall only be grouped in accordance with the equipment grouping requirements of IEC 60079-0.

Where the intrinsically safe system or parts of the intrinsically safe system are specified as being suitable for operation outside the normal operating temperature range of -20 °C and +40 °C, then this shall be specified in the descriptive system document.

NOTE Different parts of the same intrinsically safe system may have different subdivisions A, B or C. The apparatus used may have different temperature classes and different ambient temperature ratings.

6 Levels of Protection

6.1 General

Each part of an intrinsically safe system intended for use in an explosive atmosphere shall have a Level of Protection “ia”, “ib” or “ic” in accordance with IEC 60079-11 and an Equipment Protection Level (EPL) in accordance with IEC 60079-0. Separate parts of the system may have a different Level of Protection or EPL.

NOTE For Group I applications, an intrinsically safe system can be “ib” in normal operation with external power, but when power is removed under defined safety circumstances (e.g. ventilation failure) then the system could become “ia” under back up battery power. The Level of Protection will be clearly defined for intended circumstances.

6.2 Level of Protection “ia”

Where the requirements applicable to apparatus of Level of Protection “ia” (see IEC 60079-11) are satisfied by an intrinsically safe system or part of a system considered as an entity, then that system or part of a system shall be assigned a Level of Protection “ia”.

6.3 Level of Protection “ib”

Where the requirements applicable to apparatus of Level of Protection “ib” (see IEC 60079-11) are satisfied by an intrinsically safe system or part of a system considered as an entity, then that system or part of a system shall be assigned a Level of Protection “ib”.

NOTE For example, a Level of Protection “ia” field instrument powered via a Level of Protection “ib” associated apparatus would be considered as a Level of Protection “ib” system or a Level of Protection “ib” field instrument powered via a Level of Protection “ia” associated apparatus would also be considered as a Level of Protection “ib” system.

6.4 Level of Protection “ic”

Where the requirements applicable to apparatus of Level of Protection “ic” (see IEC 60079-11) are satisfied by an intrinsically safe system or part of a system considered as an entity, then that system or part of a system shall be assigned a Level of Protection “ic”.

NOTE For example, a Level of Protection “ia” field instrument powered via a Level of Protection “ic” associated apparatus would be considered as Level of Protection “ic” system or a Level of Protection “ic” field instrument powered via a Level of Protection “ia” associated apparatus would also be considered as a Level of Protection “ic” system.

7 Non-intrinsically safe circuits

The descriptive system document shall define the limitations for connection of circuits to the non-intrinsically safe terminals of associated apparatus, such as the U_m value(s).

8 Interconnecting wiring / cables used in an intrinsically safe system

8.1 General

The intrinsic safety parameters of the interconnecting wiring upon which intrinsic safety depends and the derivation shall be specified in the descriptive system document. If a specific type of wiring is specified, then the justification for its use shall be included in the documentation.

Cables for the interconnecting wiring shall comply with the applicable requirements of Clause 9.

Cable faults shall be assessed in accordance with the requirements of Clause 12.8.

8.2 Cables containing a single intrinsically safe circuit

Cables containing a single intrinsically safe circuit shall comply with the requirements of 9.1, 9.2, 9.3 and where applicable, 9.4.

8.3 Cables containing more than one intrinsically safe circuit

The descriptive system document shall specify the permissible types of multi-circuit cables according to Clause 9, if used for particular circuits. In the particular case where faults between separate circuits have not been taken into account, a note shall be included on the block diagram of the descriptive system document stating the following: “Where the interconnecting cable utilizes part of a multi-circuit cable containing other intrinsically safe circuits, the multi-circuit cable shall be in accordance with the requirements of a multi-circuit cable Type A or Type B, as specified in Clause 9.

A multi-circuit cable containing circuits classified as Level of Protection “ia”, “ib” or “ic” shall not contain non-intrinsically safe circuits.

Where Level of Protection “ia”, “ib” or “ic” circuits are run together in a cable of Type A or Type B as specified in 9.5.2 and 9.5.3, each circuit retains its Level of Protection and equipment grouping.

Where Level of Protection “ia”, “ib” or “ic” circuits are run together in a cable of Type C as specified in 9.5.4, the combination of circuits shall be assessed according to 12.8 to determine the Level of Protection, EPL and applicable equipment grouping.

NOTE: Assessment according to 12.8 might determine that the combination is no longer intrinsically safe.

9 Requirements of single and multi-circuit cables

9.1 General

If the cable is specified as part of the system, then:

- individual conductors or strands of multi-stranded conductors within the hazardous area shall have a diameter of at least 0,1 mm; and

- the radial thickness of the insulation of each core of multi circuit cable shall be appropriate to the conductor diameter and the nature of the insulation with a minimum of 0,2 mm.

NOTE This clause is not intended to prevent the use of bare conductors that are intended to be bridged out in a signalling system. Such conductors are considered as simple apparatus and not interconnecting wiring.

9.2 Dielectric strength

9.2.1 Cables containing a single intrinsically safe circuit

The insulation of cables used for intrinsically safe circuits shall be capable of withstanding a dielectric strength test with twice the voltage of the intrinsically safe circuit or 500 V RMS (or 700 V DC) whichever is the greater.

9.2.2 Cables containing more than one intrinsically safe circuit

Multi-circuit cables shall not be used for intrinsically safe circuits with voltages exceeding 90 V.

Multi-circuit cables shall be capable of withstanding a dielectric strength test of at least:

a) 500 V RMS or 700 V DC applied between any armouring and/or screen(s) joined together and all the cores joined together; and

b) 1 000 V RMS or 1 400 V DC applied between a bundle comprising one half of the cable cores joined together and a bundle comprising the other half of the cores joined together. This test is not applicable to multi-circuit cables with conducting screens for individual circuits.

If information from the cable manufacturer is not available, then the dielectric strength test shall be carried out in accordance with an appropriate cable standard or dielectric strength tests of IEC 60079-11.

NOTE It is not a requirement of this standard that the conformity of the manufacturer’s specification of the cable needs to be verified.

9.3 Intrinsic safety parameters of cables

The intrinsic safety parameters (C_c and L_c, or C_c and L_c/R_c) for all cables used within an intrinsically safe system shall be determined according to a), b) or c):

a) the most onerous intrinsic safety parameters provided by the cable manufacturer;

b) intrinsic safety parameters determined by measurement of a sample, with the method of testing intrinsic safety parameters of cables given in Annex A; or

c) where the interconnection comprises two or three cores of a conventionally constructed cable (with or without screen) the following values may be used: 200 pF/m and either 1 μH/m or an inductance to resistance ratio (L_c/R_c) calculated by dividing 1 μH by the manufacturers specified loop resistance per meter. Alternatively, for currents up to I_o = 3 A an L/R ratio of 30 μH/Ω may be used.

Where a FISCO system is used, the requirements for the cable parameters shall comply with Annex G.

9.4 Conducting screens

Where conducting screens provide protection for separate intrinsically safe circuits in order to prevent such circuits becoming connected to one another, the screen shall provide a minimum 60% coverage along the entire length of the cable.

9.5 Types of multi-circuit cables

9.5.1 General

Multi-circuit cables shall be identified as Type A, Type B or Type C for the purposes of applying faults and assessing the safety of the cabling within an intrinsically safe system. The cable types are specified in 9.5.2, 9.5.3, and 9.5.4.

9.5.2 Type A cable

A multi-circuit cable that has conducting screens providing individual protection for each intrinsically safe circuit according to 9.4.

9.5.3 Type B cable

A multi-circuit cable that is fixed, is protected against damage by installation and does not contain any circuit with a maximum voltage U_o exceeding 60 V.

9.5.4 Type C cable

A multi-circuit cable that is not Type A or B.

10 Enclosures

Enclosures used for connection of separate intrinsically safe circuits, such as terminal boxes, shall provide separations for external connection facilities and meet the applicable enclosure requirements in IEC 60079-11.

11 Earthing and bonding of intrinsically safe systems

The descriptive system document should clearly indicate which point or points of the system are intended to be earthed and any special requirements of such a bond.

The use of surge protection devices which interconnect the circuit and the structure via nonlinear devices such as gas discharge tubes and semiconductors is not considered to adversely affect the intrinsic safety of a circuit, provided that in normal operation the current through the device is less than 10 µA.

NOTE If insulation testing at 500 V is carried out then it might be necessary to disconnect the surge suppression devices to prevent them invalidating the measurement.

Intrinsically safe systems utilizing surge suppression techniques shall be supported by an adequately documented analysis of the effect of indirect multiple earthing, taking into account the criteria set out above. The capacitance and inductance of the surge suppression devices shall be considered in the assessment of the intrinsically safe system.

12 Assessment of an intrinsically safe system

12.1 General

The compliance of an intrinsically safe system shall be demonstrated by the consideration of the following:

a) suitability of the individual apparatus for the hazardous area according to the applicable installation requirements e.g. IEC 60079-14;

b) suitability of the individual apparatus for the ambient temperature range;

c) comparison of input and output characteristics and parameters of the separately evaluated apparatus;

NOTE 1 Occasionally the safety of the field device is completely specified by only one of these parameters. In these circumstances the unspecified parameters are not relevant.

d) cable parameters of the interconnecting wiring;

e) faults within cables;

f) suitability and influence of simple apparatus;

g) separation of termination, and connection facilities; and

h) earthing and bonding.

Where all the necessary information is available, it is permissible to apply the fault count to the system as a whole even when apparatus conforming to IEC 60079-11 is being used. This is an alternative solution to the more usual straightforward comparison of input and output characteristics of the separately certified apparatus.

For Level of Protection “ic” field wiring faults are only considered when Type C cables are specified.

NOTE 2 It is recognized that applying faults to the system as a whole is less stringent than applying faults to each piece of apparatus; nevertheless, this is considered to achieve an acceptable level of safety.