IEC 60079-27

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Explosive atmospheres –
Part 27: Fieldbus intrinsically safe concept (FISCO)

Atmosphères explosives –
Partie 27: Concept de réseau de terrain de sécurité intrinsèque (FISCO)

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FOREWORD

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International Standard IEC 60079-27 has been prepared by subcommittee 31G: Intrinsically-safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

This second edition cancels and replaces the first edition issued in 2005. It constitutes a technical revision.

The significant change with respect to the first edition is that this standard replaces the FNICO requirements with the requirements of an "ic" FISCO system.

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

CDV	Report on voting
31G/169/CDV	31G/176A/RVC

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 the IEC 60079 series, under the general title: *Explosives atmospheres* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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- withdrawn;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 27: Fieldbus intrinsically safe concept (FISCO)

1 Scope

This part of IEC 60079 contains the details of apparatus, systems and installation practice for use with the Fieldbus Intrinsically Safe Concept (FISCO). It is based on the concepts of Manchester encoded, bus powered systems designed in accordance with IEC 61158-2 which is the physical layer standard for Fieldbus installations.

The constructional and installation requirements of FISCO apparatus and systems are determined by IEC 60079-11, IEC 60079-14, and IEC 60079-25, except as modified by this standard. Part of a Fieldbus device may be protected by any of the methods of explosion protection listed in IEC 60079-0, appropriate to the zone of intended use. In these circumstances, the requirements of this standard apply only to that part of the apparatus directly connected to the intrinsically safe trunk or spurs.

NOTE 1 Certification to the FISCO requirements does not prevent apparatus also being certified and marked to IEC 60079-11 in the conventional manner so that they may be used in other systems. Some apparatus certified before this standard was published but not necessarily complying with the electrical parameters of this standard may be marked "Suitable for FISCO systems". This apparatus may be accepted in a FISCO system, if the comparison of the electrical parameters U_o, I_o, P_o, with U_i, I_i, P_i, demonstrate compatibility with the remainder of the system, and all the other requirements of this standard are met.

NOTE 2 A typical system is illustrated in Annex A.

NOTE 3 Generally, "ic" FISCO systems are intended for use in zone 2 locations. FISCO systems are predominantly intended for use in zone 1 and 2 locations, but may enter zone 0 locations if specifically permitted to do so by the documentation.

NOTE 4 Edition 1 of this standard introduced the FNICO concept to cover the use of Fieldbus concepts in zone 2 utilizing the energy-limited [nL] concept. This standard substitutes the "ic" concept for the energy-limited concept, but permits the continued use of FNICO and nL apparatus.

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, *Electrical apparatus for explosive gas atmospheres – Part 14: Electrical installations in hazardous areas (other than mines)*

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

IEC 60079-25, *Electrical apparatus for explosive gas atmospheres – Part 25: Intrinsically safe systems*

IEC 61158-2, *Digital data communications for measurement and control – Fieldbus for use in industrial control systems – Part 2: Physical layer specification and service definition*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60079-0, IEC 60079-11 and IEC 60079-15 as well as the following apply.

NOTE Additional definitions applicable to explosive atmospheres can be found in IEV 60050-426.

3.2 Abbreviations

FISCO Fieldbus Intrinsically Safe Concept

FNICO Fieldbus Non-Incendive Concept

4 Apparatus requirements

4.1 General

Apparatus shall be constructed in accordance with IEC 60079-11 except as modified by this standard.

The apparatus documentation shall confirm that each apparatus is suitable for use in a FISCO system in accordance with this standard.

4.2 FISCO power supplies

4.2.1 General

The power supply shall either be resistive limited or have a trapezoidal or rectangular output characteristic. The maximum output voltage, U_o, shall be not greater than 17,5 V nor less than 14 V under the conditions specified in IEC 60079-11 for the respective level of protection.

The maximum unprotected internal capacitance C_i and inductance L_i shall be not greater than 5 nF and 10 µH, respectively.

The output from the power supply may be connected to earth.

No specification of the internal parameters L_i and C_i or the maximum external parameters L_o and C_o is required on the certificate or label.

The determination of power supply output parameters shall take into account the possible opening, shorting and earthing of field wiring connected to the field terminals of the apparatus.

4.2.2 Additional requirements of “ia” and “ib” FISCO power supplies

The maximum output current I_o for any “ia” or “ib” FISCO power supply shall be determined in accordance with IEC 60079-11 but shall not exceed 380 mA. For rectangular supplies, Table 1 may be used for assessment.

Table 1 – Assessment of maximum output current for use with "ia" and "ib" FISCO rectangular supplies

U_o V	Permissible current, for IIC (includes 1,5 safety factor) mA	Permissible current, for IIB (includes 1,5 safety factor) mA
14	183	380
15	133	354
16	103	288
17	81	240
17,5	75	213
NOTE The two largest current values for IIB are derived from 5,32 W.		

The maximum output power P_o shall not exceed 5,32 W.

4.2.3 Additional requirements of "ic" FISCO power supplies

The maximum output current I_o for an "ic" FISCO power supply shall be determined in accordance with IEC 60079-11. For "ic" FISCO rectangular supplies, Table 2 may be used for assessment.

Table 2 – Assessment of maximum output current for use with "ic" FISCO rectangular supplies

U_o V	Permissible current, for IIC mA	Permissible current, for IIB mA
14	274	570
15	199	531
16	154	432
17	121	360
17,5	112	319

NOTE The maximum output power P_o from "ic" FISCO power supplies is not restricted to 5,32 W.

4.3 FISCO field devices

4.3.1 General

These requirements apply to apparatus other than the power supply terminators and simple apparatus connected to the intrinsically safe bus whether installed inside or outside the hazardous area.

In addition to the relevant sections of IEC 60079-11, hand held terminals shall comply with the requirements for field terminals.

The requirements are as follows:

a) field devices shall have a minimum input voltage parameter of U_i = 17,5 V;

b) the maximum unprotected internal capacitance C_i of each field device shall be not greater than 5 nF;

c) the bus terminals shall be isolated from earth in accordance with IEC 60079-11;

d) the bus terminals of separately powered field devices shall be galvanically isolated from other sources of power in accordance with IEC 60079-11, so as to ensure that these terminals remain passive and multiple earthing of the bus is avoided;

e) under normal or fault conditions as specified in IEC 60079-11 the bus terminals shall remain passive, that is the terminals shall not be a source of energy to the system except for a leakage current not greater than 50 µA;

f) field devices shall be allocated a level of protection and be suitable for apparatus group IIC in accordance with IEC 60079-11;

g) field devices intended to be installed within the hazardous area shall be temperature classified in accordance with IEC 60079-11.

4.3.2 Additional requirements of "ia" and "ib" FISCO field devices

The additional requirements of "ia" and "ib" FISCO field devices are as follows:

a) field devices shall have minimum input parameters of I_i = 380 mA and P_i = 5,32 W;

b) field devices shall have an internal inductance L_i not greater than 10 µH.

4.3.3 Additional requirement of "ic" FISCO field devices

The additional requirement of "ic" FISCO field devices is that they shall have an internal inductance L_i not greater than 20 µH.

4.4 Terminator

The line terminators required by the system shall comprise a resistor-capacitor combination, which presents at its terminals a circuit equivalent to a resistor of minimum value 90 Ω in series with a capacitor of maximum value 2,2 µF (including tolerances).

NOTE 1 IEC 61158-2 specifies the component values necessary for operational reasons.

The terminator shall

a) be allocated a level of protection and be suitable for apparatus group IIC;

b) have an input voltage parameter U_i not less than 17,5 V;

NOTE 2 If the capacitive component(s) are considered to be able to fail to create a short circuit then the required power rating of the resistor(s) is 5,1 W and the temperature class should be determined with a power dissipation of 3,4 W.

c) be isolated from earth in accordance with IEC 60079-11;

d) have a maximum unprotected internal inductance L_i not greater than 10 µH;

e) terminators intended to be installed within the hazardous area shall be temperature classified in accordance with IEC 60079-11.

The terminators may be incorporated within field devices or power supplies.

NOTE 3 For safety assessment purposes, the effective capacitance (C_i) of the terminator is considered not to affect the intrinsic safety of the system.

4.5 Simple apparatus

The requirement of simple apparatus used in an intrinsically safe system is that it shall comply with IEC 60079-11. The capacitance and inductance of the simple apparatus shall be known so that the system requirement in 5.1 can be assessed. The total inductance and capacitance of each simple apparatus connected to a FISCO system shall be not greater than 10 µH and 5 nF, respectively.

NOTE Care should be taken in temperature classifying simple apparatus within an "ia" or "ib" system since the maximum power available may be as high as 5,32 W. Temperature classification of an "ic" system is done in normal operation.

4.6 Marking

Each piece of apparatus, with the exception of simple apparatus, shall be marked with the word “FISCO” followed by an indication of its function, i.e. power supply, field device or terminator. In addition, each piece of apparatus shall be marked in accordance with IEC 60079-11, except where modified by this standard. For example, the manufacturer’s name and address shall still be marked.

Where apparatus is dual marked so that it can be used in both a FISCO system and a conventional intrinsically safe system, care shall be taken to differentiate between the FISCO marking and the marking for the conventional intrinsically safe system.

For FISCO power supplies, output parameters U_o, I_o, C_o, L_o, P_o and L_o/R_o need not be marked. For FISCO field devices or terminators, input and internal parameters U_i, I_i, C_i, L_i, P_i and L_i/R_i need not be marked.

4.7 Examples of marking

a) Power supply

FISCO power supply

U_m = 250 V

[Ex ia] IIC

John Jones Ltd

SW99 2AJ UK

Type: DRG OOI

–20 °C ≤ Ta ≤ +50 °C

PTB Nr 01A 2341

Serial No: 014321

b) Field device

FISCO field device

Ex ia IIC T4

Paul McGregor plc

GL99 1JA UK

Type: RWS 001

–20 °C ≤ Ta ≤ +60 °C

c) Terminator

FISCO terminator

Ex ia IIC T4

James Bond plc

MK45 6BY UK

Type MI5 007

BAS 01 A 4321

Serial No: 012345

d) Dual marked field device

A McTavish plc

GL 98 1BA UK

Type RWS 002