BRITISH STANDARD

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Specification for open path apparatus for the detection of combustible or toxic gases and vapours —

Part 2: Performance requirements for apparatus for the detection of combustible gases

The European Standard EN 50241-2:1999 has the status of a British Standard

ICS 13.320; 29.260.20

National foreword

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The UK participation in its preparation was entrusted by Technical Committee GEL/31, Electrical apparatus for use in explosive atmospheres, to Subcommittee GEL/31/19, Gas detectors, which has the responsibility to:

— aid enquirers to understand the text;

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Summary of pages

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English version

Specification for open path apparatus for the detection of combustible or toxic gases and vapours — Part 2: Performance requirements for apparatus for the detection of combustible gases

Spécifications pour les détecteurs à chemin optique ouvert de gaz et vapeurs toxiques — Partie 2: Règles de fonctionnement pour les détecteurs de gaz combustible

Anforderungen an Geräte mit offener Meßstrecke für Detektion brennbarer oder toxischer Gase und Dämpfe — Teil 2: Anforderungen an das Betriebsverhalten von Geräten für die Detektion brennbarer Gase

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

This European Standard was prepared by SC 31-9, Electrical apparatus for the detection and measurement of combustible gases to be used in industrial and commercial potentially explosive atmospheres, of Technical Committee CENELEC TC 31, Electrical apparatus for explosive atmospheres.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50241-2 on 1998-10-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1999-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn: (dow) 1999-10-01

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and covers essential requirements of EC Directive 94/9/EC.

Contents

1 Scope

This European Standard specifies performance requirements for Group II[1)] portable, transportable and fixed apparatus for the detection and measurement of integral concentrations of combustible gas or vapour in air over a defined open path. The apparatus, or parts thereof, may be installed or transported for use in potentially explosive atmospheres. The general requirements and test methods applicable to the apparatus covered by this European Standard are specified in part 1.

This European Standard concerns apparatus intended to provide measurement or warning of specific combustible gases in air which constitute a potential hazard by virtue of their flammability.

Open path detection apparatus as covered by this European Standard measures the path integral concentration. It is not capable of resolving the spatial variation of concentration along the optical path.

2 Normative references

This European Standard incorporates by dated or undated references, provisions from other publications. These normative references are cited at the appropriate place in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 50270:1999, *Electromagnetic compatibility — Electrical apparatus for the detection and measurement of combustible gases, toxic gases and oxygen.*

EN 50241-1:1999, *Specification for open-path apparatus for the deception of gases and vapours — Part 1: General requirements and test methods.*

3 Definitions

For the purpose of this European Standard, the definitions given in EN 50241-1 apply.

4 General requirements

It shall be verified by inspection of the apparatus and the documentation provided by the manufacturer that the general requirements as specified in clause **4** of EN 50241-1 are fulfilled.

5 Performance requirements

5.1 Requirements for tests

5.1.1 *Gas cells*

Gas cells, as described in **5.2.4.1** of EN 50241-1, used for tests with combustible gases, shall be constructed such that errors in measurement arising from variations of attenuation with wavelength in the windows of the cells shall be less than 2 % of measuring range or 5 % of the measured value, whichever is the greater.

5.1.2 *Compliance*

Compliance with the performance requirements described in **5.2** to **5.15** and clause **6** shall be determined by application of the test methods specified in **5.4** of EN 50241-1.

5.2 Unpowered storage

After being subjected to the conditions specified in **5.4.2** of EN 50241-1, the apparatus shall meet the requirements specified in **5.3** to **5.15**.

5.3 Calibration curve (not applicable to alarm-only apparatus)

In the calibration test, as described in **5.4.3** of EN 50241-1, none of the measured values of the integral concentration for each gas shall differ from the nominal values by more than $\pm$10 % of the measuring range or $\pm$20 % of the measured value, whichever is the greater.

5.4 Drift (continuous duty apparatus only)

Continuous duty apparatus submitted to the tests defined in **5.4.4** of EN 50241-1, shall comply with the following requirements.

a) *Short term drift.* Short term variations shall not exceed $\pm$5 % of the measuring range or $\pm$10 % of the measured value, whichever is the greater.

b) *Long term drift.* Long term variations shall not exceed $\pm$10 % of the measuring range or $\pm$20 % of the measured value, whichever is the greater.

5.5 Alarm

The alarm shall operate during every cycle of the test defined in **5.4.5** of EN 50241-1. If a latching alarm is provided, the operation and manual reset action shall be checked during every cycle.

[1)] Group II apparatus is suitable for places with potentially explosive atmospheres, other than mines susceptible to firedamp.

5.6 Temperature variation

The following conditions and performance requirements shall apply to apparatus or items of apparatus submitted to the temperature tests defined in **5.4.6** of EN 50241-1.

i) All parts of the apparatus excluding the reflector (and indicator/control unit if iii) applies), shall be subjected simultaneously to variations of temperature over the range −25 °C to +55 °C. Variations of the measured value over this temperature range shall not exceed ±5 % of the measuring range or ±10 % of the measured value at 20 °C, whichever is the greater.

ii) Where the transmitter and receiver are normally located separately the following additional temperature exposure shall be successively applied.

a) The temperature of the transmitter shall be varied over the range 0 °C to 40 °C while the receiver is maintained at 20 °C.

b) The temperature of the receiver shall be varied over the range 0 °C to 40 °C while the transmitter is maintained at 20 °C.

The variation of measured value throughout tests a) and b) shall not exceed ±5 % of the measuring range or ±10 % of the measured value at 20 °C, whichever is the greater.

iii) If the indicator or control unit is normally mounted separately from the transmitter and receiver, for example in a control room, the temperature of the indicator or control unit shall be varied over the range 5 °C to 55 °C while the transmitter and receiver are maintained at 20 °C. Any variation of the measured value during this test shall not exceed ±5 % of the measuring range or ±10 % of the measured value at 20 °C, whichever is the greater.

5.7 Pressure variation

In the tests described in **5.4.7** of EN 50241-1, the difference in measurements between clean air and test gas, when corrected according to the manufacturer's instructions as in **4.4**f)vi) shall not differ from the integral concentration of the test gas in each case by more than ±5 % of the measuring range or ±10 % of the measured value whichever is the greater.

5.8 Water vapour interference

In the test described in **5.4.8** of EN 50241-1 the difference in measured value between the tests with dry air and water vapour shall not exceed ±5 % of the measurement range or ±10 % of the measured value.

5.9 Vibration

As a result of being subjected to the vibration test, as defined in **5.4.9** of EN 50241-1, the apparatus shall not suffer any loss of function and the deviation of the measured value from that at the commencement of the test shall not exceed ±5 % of the measuring range or ±10 % of the measured value, whichever is the greater.

5.10 Alignment

The test procedure defined in **5.4.10** of EN 50241-1 shall not generate any false alarms and any variation in measurements of the integral concentration of gas compared with the initial measurement noted in **5.4.10** of EN 50241-1 shall not exceed ±10 % of the measuring range or ±20 % of the measured value, whichever is the greater.

5.11 Time of response

The performance requirements for the tests defined in **5.4.11** of EN 50241-1 are as follows.

5.11.1 *Response to positive step-change (not applicable to alarm-only apparatus)*

A measured value of 90 % of the final value shall be achieved in a time not exceeding 10 s.

5.11.2 *Response to negative step-change (not applicable to alarm-only apparatus)*

The measured value shall indicate 10 % of the previous final value in a time not exceeding 10 s.

5.11.3 *Time to alarm (alarm-only apparatus)*

Following the positive step-change in integral concentration, the time taken to alarm shall not exceed 10 s.

5.12 Power supply variations

For each of the tests **5.12.1**, **5.12.2** and **5.12.3** the apparatus shall operate throughout in accordance with Performance Criterion A as defined in EN 50270:1999.

5.12.1 *A.C. powered apparatus*

In the test described in **5.4.12.2** of EN 50241-1, any variation of the measured value shall not exceed ±5 % of the measuring range or ±10 % of the measured value, whichever is the greater.

5.12.2 *External d.c. powered apparatus*

In the tests described in **5.4.12.3** of EN 50241-1, any variation of the measured value shall not exceed ±5 % of the measuring range or ±10 % of the measured value, whichever is the greater.

5.12.3 *Apparatus with other power supplies*

In the tests described in **5.4.12.4** of EN 50241-1, any variation of the measured value shall not exceed ±5 % of the measuring range or ±10 % of the measured value, whichever is the greater. In the case of battery powered apparatus, these limits shall apply when the apparatus is subject to a change from the maximum terminal voltage of a new or fully charged battery to the minimum recommended operating voltage of that battery as determined by the built-in battery condition indicator.

5.13 Power supply interruptions and transients

During the tests specified in **5.4.13** of EN 50241-1, the apparatus shall not generate spurious inhibition, fault or alarm signals. On completion of the tests specified in **5.4.13.2** and **5.4.13.3** of EN 50241-1, the indicated reading shall return to the value at the beginning within ±2 % of the measuring range. In the test specified in **5.4.13** of EN 50241-1, the apparatus shall operate throughout in accordance with performance criterion B as defined in EN 50270:1999.

5.14 Recovery from power supply interruption

In the test described in **5.4.14** of EN 50241-1 the measured integral concentration after restoration of the power shall be within ±5 % of the nominal value of integral concentration contained in the test cell. Alternatively, the apparatus must indicate a latched inhibit condition.

5.15 Electromagnetic compatibility

During the tests specified in **5.4.15** of EN 50241-1, the apparatus shall not generate spurious inhibition, fault or alarm signals. Any variation of the indicated reading shall not exceed ±5 % of the measuring range or ±10 % of the indicated reading whichever is the greater. The apparatus shall operate throughout the tests in accordance with performance criterion A as defined in EN 50270:1999.

5.16 Attenuation of radiation

After attenuation of the beam by insertion of the grid as in **5.4.16** of EN 50241-1, the instrument shall continue to operate and shall not generate inhibition or fault signals.

Whilst attenuation may produce a more noisy reading any change in the mean measured value of the integral gas concentration on inserting the grid shall not exceed ±5 % of the initial value.

5.17 Beam blockage

5.17.1 ***Spurious alarms***

On applying the tests described in **5.4.17** of EN 50241-1, the instrument shall continue to operate without generating spurious alarm signals until a beam blocked or inhibition signal is produced. On withdrawal of the shutter from the position of "beam blocked" or "inhibition" to complete removal, the instrument shall again operate without generating spurious alarm signals.

5.17.2 ***Recovery***

On applying the test described in **5.4.17.2** of EN 50241-1, the indication or output attained within 20 s of the removal of the shutter shall not differ from the value of integral concentration in the test cell by more than ±10 %.

5.18 Long range operation

After attenuation of the beam by insertion of the grid, as in **5.4.18** of EN 50241-1, the instrument shall continue to operate and shall not generate inhibition or fault signals.

Whilst attenuation may produce a more noisy reading, any change in the mean measured value of the integral concentration on inserting the grid shall not exceed ±5 % of the measuring range.

5.19 Direct solar radiation (applicable for apparatus intended for outdoor use)

Throughout the test described in **5.4.19** of EN 50241-1, the apparatus shall continue to operate and shall not generate inhibition, fault or alarm signals. The measured signal after stabilization at each of the angles of inclination shall not exceed ±10 % of the measuring range or ±20 % of the measured value, whichever is the greater.

6 Field verification equipment

The measured value or output signal observed during the use of the field verification equipment in a manner corresponding to the manufacturer's instruction, shall not differ from the expected response as detailed by the manufacturer by more than ±15 % of the measuring range.

7 Instructions for use

The requirements of clause **7** of EN 50241-1 apply.

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