SLOVENSKI STANDARD

SIST EN 50241-1:2000

prva izdaja
april 2000

Specifikacije naprav z odprto merilno potjo za odkrivanje vnetljivih ali strupenih plinov in hlapov - 1. del: Splošne zahteve in preskusne metode

Specification for open path apparatus for the detection of combustible or toxic gases and vapours - Part 1: General requirements and test methods

ICS 13.320; 19.080

Referenčna številka
SIST EN 50241-1:2000(en)

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50241-1

April 1999

ICS 13.320; 19.080

English version

Specification for open path apparatus for the detection of combustible or toxic gases and vapours Part 1: General requirements and test methods

Spécifications pour les détecteurs à chemin optique ouvert de gaz et vapeurs toxiques
Partie 1: Règles générales et méthodes d'essai

Anforderungen an Geräte mit offener Meßtrecke für die Detektion brennbarer oder toxischer Gase und Dämpfe
Teil 1: Allgemeine Anforderungen und Prüfverfahren

This European Standard was approved by CENELEC on 1998-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 50241-1:1999 E

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 50241-1 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.

1 Scope

This European Standard specifies general requirements for the construction and testing of apparatus for the detection and measuring of combustible or toxic[1] gases or vapours in ambient air by measuring the spectral absorption by the gases or vapours over extended optical paths, ranging typically from one metre to a few kilometres.

Such apparatus measures the integral concentration of the absorbing gas over the optical path in units such as LEL metre for combustible gases and ppm metre for toxic gases.

NOTE 1: Actual values of concentration can only be deduced where it can be established that the concentration is uniform over the optical path, as for example in very short optical paths (<100 mm). In such cases, the apparatus is within the scope of EN 50054 - EN 50058 and prEN 45544-1 to prEN 45544-4.

Apparatus falling within the scope of this European Standard is classified as follows by the following types.

Type 1: an optical transmitter and receiver, located at either end of a path through the atmosphere to be monitored.

Type 2: an optical transceiver (i.e. combined transmitter and receiver) and a suitable reflector, which may be a topographic feature or a retroreflector, located at either end of a path through the atmosphere to be monitored.

This European Standard does not apply to any of the following:

1. Apparatus intended to provide range resolution of gas concentration (e.g. LIDAR),
2. Apparatus consisting of a passive optical receiver without a dedicated optical source,
3. Apparatus intended to measure the local volumetric concentration of gas (point sensors),
4. Apparatus intended for the detection of dusts or mists in air,
5. Apparatus for cross stack monitoring,
6. Apparatus intended for the detection of explosives and vapours, and
7. Apparatus intended for quantitative and simultaneous multicomponent analysis, e.g. FTIR.

This European Standard covering general requirements and test methods is supplemented by the following European Standard concerning specific requirements of performance:

EN 50241-2 : Performance requirements for apparatus for the detection of combustible gases.

This European Standard is applicable to apparatus which is intended for use in both hazardous and non hazardous areas. Apparatus for use in hazardous areas which may contain potentially combustible atmospheres is required to be designed for safe operation, see 4.1.2.

This European Standard applies to transportable, and fixed apparatus intended for commercial and industrial applications.

NOTE 2: This European Standard and EN 50241-2 as referenced above are intended to provide for the supply of apparatus giving a level of performance suitable for general purpose applications. However, for specific applications a prospective purchaser or an appropriate authority may additionally require apparatus to be submitted to particular tests or approval. Such tests or approval are to be regarded as additional to and separate from the provisions from the European Standards referred to above.

---

[1] The word 'Toxic' is used in accordance with its dictionary definition and includes 'harmful', 'toxic' and 'very toxic' meanings.

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
EN 60068-2-6	1995	Environmental testing - Part 2-6: Test Fc and guidance: Vibration (sinusoidal)
EN 60825-1	1994	Safety of laser products - Part 1: Equipment classification, requirements and user's guide

3 Definitions

The following definitions are applicable for all parts of this European Standard.

3.1 Apparatus

3.1.1
alarm only apparatus
Apparatus which generates an alarm signal but does not have a meter or output giving a measure of the integral concentration.

3.1.2
fixed apparatus
An apparatus which is intended to have all its parts permanently installed.

3.1.3
transportable apparatus
Apparatus which is not intended to be portable, but which can be moved from one place to another and used after alignment.

3.2 Alarms

3.2.1
alarm set point
A fixed or adjustable setting of the apparatus that is intended to pre-set the value of integral concentration at which the apparatus will automatically initiate an indication, alarm, or other output function.

3.2.2
alarm signal
An audible, visual, electronic or other signal generated by the apparatus when an integral concentration of gas in excess of a pre-set value is detected.

3.2.3
latching alarm
An alarm which, once activated, requires a deliberate action to deactivate it.

3.3 Signals and indications

3.3.1
fault signal
An audible, visual, or other type of output which provides, directly or indirectly, a warning or indication that the apparatus is defective.

3.3.2
beam blocked signal
An audible, visual or other type of output which provides, directly or indirectly, a warning or indication that the optical path is obscured or that the signal detected is too weak to enable the apparatus to function normally.

3.3.3
inhibition signal
An audible, visual, or other type of output which provides, directly or indirectly, a warning or indication that normal operation has been suspended.

3.3.4
indicating devices
Means for displaying values or states in analogue or digital form.

3.4 Gaseous atmospheres

3.4.1
ambient air
The atmosphere in the area being monitored by the apparatus.

3.4.2
clean air
Air which is free from gases or vapours (combustible, toxic or environmentally harmful gases) to which the apparatus is sensitive or which influence the performance of the apparatus.

3.4.3
combustible atmosphere
A mixture with air, under normal atmospheric conditions, of combustible materials in the form of gas, vapour or mist, in which, after ignition, combustion spreads throughout the unconsumed mixture.

NOTE 1: This definition specifically excludes dusts and fibres in suspension in air. Mists, though included in the definition are not covered by this European Standard.

NOTE 2: Although a mixture which has a concentration above the upper explosive limit is not a combustible atmosphere, there is a risk of creating a combustible atmosphere by dilution.

NOTE 3: Normal atmospheric conditions include variations above and below reference levels of 101,3 kPa (1013 mbar) and 20 °C provided the variations have negligible effect on the explosion properties of the combustible materials.

NOTE 4: For the purposes of this European Standard 'explosive', 'combustible' and 'flammable' are regarded as synonymous.

3.4.4
combustible gas
A gas, which, when mixed with air in certain volumetric ratios, forms a combustible atmosphere.

3.4.5
integral concentration
The mathematical integral of the gas concentration along the optical path. It is expressed in units of concentration multiplied by distance, e.g., LEL metre for combustible gases or ppm metre for toxic gases.

NOTE: 100 % LEL × 1 metre = 1 LEL metre
10 % LEL × 10 metre = 1 LEL metre

3.4.6
lower explosive limit (LEL)
The volume ratio of combustible gas or vapour in air below which a combustible gas atmosphere will not be formed.

3.4.7
upper explosive limit (UEL)
The volume ratio of combustible gas or vapour in air above which a combustible gas atmosphere will not be formed.

3.4.8
explosion protection
The measures applied in the construction of electrical apparatus to prevent ignition of a surrounding combustible atmosphere by the apparatus.

3.4.9
toxic gas
A gas that may be harmful to human health and/or the performance of persons due to its physical or physico-chemical properties.

3.5 Optical apparatus

3.5.1
open path
An optical path which traverses the area (or part of the area) in which the atmosphere is being monitored and through which gases in the atmosphere are free to move.

3.5.2
optical axis
The median line of the optical path.

3.5.3
optical path
The path traversed by optical radiation from an optical transmitter to an optical receiver. The radiation may traverse the path once, twice or many times depending on the form taken by the instrument.

3.5.4
optical radiation
The ultra-violet, visible or infra-red regions of the electromagnetic spectrum.

3.5.5
albedo
The proportion of incident light scattered back from a surface.

3.5.6
transmitter
An assembly in which the optical transmitting element(s) are housed and which may contain associated optical and electrical components.

3.5.7
transceiver
An assembly in which the optical detecting element(s) and optical transmitting element(s) are housed and which may contain associated optical and electrical components.

3.5.8
receiver
An assembly in which the optical detecting element(s) are housed and which may contain associated optical and electrical components.

3.5.9
retroreflector
An individual or multiple arrangement of reflecting corners of cubes arrayed so that light is reflected back parallel to its incident path.

3.5.10
gas cell
A sealed enclosure with transparent ends which can be filled with test gases.

3.6 Performance characteristics

3.6.1
drift
Variation with time of the indication produced by the apparatus under normal conditions when monitoring a fixed distribution of gas concentration in the optical path.

3.6.2
time of response t_x (not applicable to spot reading apparatus)
The time interval, with the apparatus stabilized, between the time when an instantaneous variation in the integral concentration is produced in the optical path and the time when the indication reaches a stated percentage (x) of its final value.

3.7 Atmospheric optics (see annex A)

3.7.1
transmittance
The fraction of luminous flux which remains in a single beam after traversing an optical path of a given length in the atmosphere

3.7.2
meteorological optical range (MOR)
The length of path in the atmosphere required to reduce the luminous flux in a collimated beam from an incandescent lamp, at a colour temperature of 2 700 °K, to 0,05 of its original value.

4 General requirements

4.1 Introduction

4.1.1 Apparatus shall comply with the requirements of Part 1 and subsequent relevant Parts of this European Standard.

4.1.2 All parts of the open path gas detection apparatus intended for use in potentially combustible atmospheres shall comply with the appropriate regulations for explosion protection.

4.1.3 Electrical assemblies and components shall comply with the appropriate construction and test requirements of 4.2 and clause 5 respectively.

4.1.4 Optical radiation produced by the apparatus shall conform to the requirements given in EN 60825-1:1994.

4.1.5 In the design of software-controlled apparatus, special account shall be taken of the risks arising from faults in the programme.

4.2 Construction

4.2.1 General

4.2.1.1 Equipment and safety systems shall be so designed and manufactured as to avoid physical injury or other harm which might be caused by direct or indirect contact.

4.2.1.2 All parts of the apparatus shall be suitable for purpose and capable of withstanding, without damage or impairment of performance, the effects of vibration, dust, corrosive media and adverse climatic conditions to be expected during operational use in environments in which the apparatus is intended to be used. When apparatus is intended for use in marine environments, care shall be taken in selecting materials with regard to their resistance to corrosion.

NOTE 1: Mountings for the separate parts of the apparatus should be sufficiently robust and rigid to ensure that the necessary stability of the optical system is maintained to enable the apparatus to operate correctly in all conditions expected in the environment in which the apparatus is intended to be used.

NOTE 2: Fine adjustment of the optical beam direction should be possible and an indication should be provided to confirm that satisfactory alignment of the optical beam has been achieved. Such equipment need not form a permanent feature of the apparatus.

4.2.1.3 All apparatus shall be constructed to facilitate where applicable, regular functional, service, and calibration checks.

4.2.2 Indicating devices

4.2.2.1 Indications and output signals

An indication or output signal shall be provided to show that the apparatus is switched on.

If the apparatus is not operational, for example by inhibition, beam blockage or a fault, a signal or output shall be provided. If these conditions are separately indicated, they shall be clearly identified.

Indicating or controlling devices, where provided, need not be an integral part of the apparatus.

When apparatus is intended for the measurement of integral gas concentration (LEL metre or ppm metre) the indication shall allow the performance requirements of subsequent Parts of this European Standard to be measured to the required accuracy.

The indication or output signal shall be a measure of the actual integral concentration over the open path having taken into account the number of times the measuring radiation traversed the open path (e.g. two times for a transceiver with retroreflector).

When the apparatus is intended for alarm only, the manufacturers shall provide or identify suitable points for connecting an indicating or recording device for testing the compliance of the apparatus with this European Standard or the other Parts as applicable.

4.2.2.2 When individual indicator lights are incorporated in the apparatus they shall be coloured as follows:

a) alarm indicators shall be coloured RED;

b) fault, inhibition and beam blockage indicators shall be coloured YELLOW;

c) power supply indicators and normal operation indicators shall be coloured GREEN.