

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Explosive atmospheres -
Part 29-0: Gas detection equipment - General requirements and test methods**

**Atmosphères explosives -
Partie 29-0: Détecteurs de gaz - Exigences générales et méthodes d'essai**



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**Explosive atmospheres -
Part 29-0: Gas detection equipment -
General requirements and test methods**

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This first edition of IEC 60079-29-0 cancels and replaces the second edition of 60079-29-1 published in 2016 and its Amendment 1:2020, and the first edition of IEC 60079-29-4 published in 2009. In addition, IEC 60079-29-0 Type TX-SM cancels and replaces Type SM of the first edition of IEC 62990-1; however, Type TX-HM will remain within the standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
31/1889/FDIS	31/1935/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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A list of all parts in the IEC 60079-29 series, published under the general title *Explosive atmospheres*, can be found on the IEC website.

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- reconfirmed,
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- revised.

INTRODUCTION

This part of IEC 60079-29 specifies general requirements, test methods and acceptance criteria that apply to flammable, oxygen and toxic gas detection equipment intended to detect gases and vapours and to provide an indication, alarm or other output function for personnel or property protection in industrial and commercial applications. This part of IEC 60079-29 was developed for the purpose of aligning requirements and test methods of gas detection equipment within a single consolidated document for consistency.

Although a wide range of conditions can be encountered in practice, this document specifies requirements to be fulfilled by gas detection equipment when tested under prescribed laboratory conditions.

General and performance requirements for Type TX-HM gas detection equipment intended for occupational exposure measurement in the region of Occupational Exposure Limit Values are set out in IEC 62990-1.

Consideration needs to also be given to the following relevant international standards:

IEC 60079-29-2, *Explosive atmospheres - Part 29-2: Gas detectors - Selection, installation, use and maintenance of detectors for flammable gases and oxygen*

IEC 62990-2, *Workplace atmospheres - Part 2: Gas detectors - Selection, installation, use and maintenance of detectors for toxic gases and vapours*

IEC 60079-29-3, *Explosive atmospheres - Part 29-3: Gas detectors - Guidance on functional safety of fixed gas detection systems*

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1 Scope

This part of IEC 60079-29 specifies general requirements, test methods and acceptance criteria that apply to flammable, oxygen and toxic gas detection equipment intended to detect gases and vapours and to provide an indication, alarm or other output function for personnel or property protection in industrial and commercial applications.

NOTE 1 The term gas detection equipment is often referred to as the term gas detector.

NOTE 2 The terms 'gas' and 'gases' used in this document are also intended to include 'vapour' and 'vapours'.

This document applies to the following gas detection equipment:

- Gas detection equipment Type "FL" intended for the detection of flammable gases:
 - Type FL-Group I, in mines susceptible to firedamp;
 - Type FL-Group II, in locations other than mines susceptible to firedamp; and
 - Type FL-OP, open path gas detection equipment for flammable gases.
- Gas detection equipment Type "O2" intended for the detection of oxygen:
 - Type O2-DE, detection of oxygen deficiency or oxygen enrichment; and
 - Type O2-IN, inertisation as measuring function for explosion protection.

NOTE 3 Inertisation is an explosion protection technique where an explosive atmosphere is purged with inert gas.

- Gas detection equipment Type "TX" intended for the detection of toxic gases:
 - Type TX-SM, detection in areas for safety monitoring applications and typically using alarm signalling;
 - Type TX-HM, occupational exposure measurement in the region of occupational exposure limit values; and

NOTE 4 Type TX-HM gas detection equipment performance requirements reside in IEC 62990-1.

- Type TX-OP, open path gas detection equipment for toxic gases.

NOTE 5 This document addresses equipment giving a level of performance suitable for general purpose applications. Specific applications might require particular tests or evaluations that are additional to and separate from the compliance with this document.

NOTE 6 Although the focus of this document is gas detection equipment for use in 'explosive atmospheres', this document can be applicable to detection in areas not formally classified as 'explosive atmospheres'.

NOTE 7 Refrigerant gas detection equipment used for life, health and safety area monitoring are within the scope of this document or IEC 62990-1.

This document is not applicable to equipment:

- used for medical applications;
- used only in laboratories for analysis or measurement;
- used only for process monitoring or control purposes (such as a gas analyser);
- used in the domestic environment;
- used in environmental air pollution monitoring;
- used for flue gas analysis;
- used for sampling systems external to the gas detection equipment;
- with samplers and concentrators such as sorbents or paper tape having an irreversible indication;
- consisting of a passive optical receiver without a dedicated optical source;
- equipment within the scope of IEC 60335-2-40 and IEC 60335-2-89.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60079-29-2, *Explosive atmospheres - Part 29-2: Gas detectors - Selection, installation, use and maintenance of detectors for flammable gases and oxygen*

IEC 62990-2, *Workplace atmospheres - Part 2: Gas detectors - Selection, installation, use and maintenance of detectors for toxic gases and vapours*

IEC 60068-2-6, *Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)*

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

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61000-4-29, *Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests*

IEC 61326-1, *Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements*

IEC 62990-1, *Workplace atmospheres - Part 1: Gas detectors - Performance requirements of detectors for toxic gases*

ISO/IEC 80079-20-1, *Explosive atmospheres - Part 20-1: Material characteristics for gas and vapour classification - Test methods and data*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

3.1 Gas properties

3.1.1

ambient air

<gas detection> normal atmosphere surrounding the equipment

3.1.2

clean air

<gas detection> air that is free of gases or vapours to which the sensor is sensitive or which influence the performance of the sensor

3.1.3

reference air

<gas detection> air with an oxygen volume fraction of $(21 \pm 0,4) \%$

3.1.4**zero test gas**

<gas detection> gas, that is free of the gas(es) to be measured and interfering and contaminating substances, the purpose of which is calibration/adjustment of the equipment zero

3.1.5**standard test gas**

<gas detection> test gas with a composition specified to be used for all tests unless otherwise stated

3.1.6**flammable gas**

DEPRECATED: combustible gas

<gas detection> gas or vapour which, when mixed with air in a certain proportion, will form an explosive atmosphere

Note 1 to entry: For the purposes of this part of IEC 60079-29, the term "flammable gas" includes flammable vapours.

[SOURCE: IEC 60079-10-1:2020, 3.6.4, modified – "or vapour" dropped from term and Note to entry added. Admitted and deprecated terms also added]

3.1.7**toxic gas**

<gas detection> gas or vapour that can be harmful to human health and/or the performance of persons due to its physical or physico-chemical properties

3.1.8**poison**

<gas detection> substance that leads to temporary or permanent change of performance, particularly loss of sensitivity of the sensing element

3.1.9**volume fraction**

V/V

quotient of the volume of a specified component and the sum of the volumes of all components of a gas mixture before mixing

Note 1 to entry: The volume fraction and volume concentration take the same value if, at the same state conditions, the sum of the component volumes before mixing and the volume of the mixture are equal. However, because the mixing of two or more gases at the same state conditions is usually accompanied by a slight contraction or, less frequently, a slight expansion, this is not generally the case.

Note 2 to entry: All volumes are with respect to the pressure and the temperature of the gas mixture.

3.2 Structure (or composition) of gas detection equipment**3.2.1****alarm-only equipment**

<gas detection> equipment with an alarm but not having an indication of measured value

3.2.2**aspirated equipment**

<gas detection> equipment that samples the gas by drawing it to the gas sensor

Note 1 to entry: A hand operated or electric pump is often used to draw gas to the sensor.

3.2.3**automatically aspirated equipment**

<gas detection> aspirated equipment with an integral pump or separate pump, which is connected directly to the equipment

3.2.4

diffusion equipment

<gas detection> equipment in which the transfer of gas from the atmosphere to the sensor takes place without aspirated flow

3.2.5

fixed equipment

equipment fastened to a support, or otherwise secured in a specific location when energized

[SOURCE: IEC 60079-0:2017, 3.31.2]

3.2.6

portable equipment

<gas detection> equipment intended to be carried by a person during its operation

Note 1 to entry: Portable equipment carried by a person during its operation is sometimes referred to as hand-held equipment. This also includes equipment which is carried when the user is not interacting directly with it (for example, carried on a belt holster or clipped to a person's clothing).

Note 2 to entry: Examples of portable equipment include mobile phones, remote controls for in-ear or on-ear audio devices, hearing aids, flammable / toxic gas detectors, powered tools.

Note 3 to entry: Portable gas detection equipment, typically less than 1 kg, can be operated by only one hand.

Note 4 to entry: Larger equipment can be operated by the user while it is carried either by hand, by a shoulder strap or carrying harness.

[SOURCE: IEC 60079-0:2017, 3.31.4, modified – modification of Notes 1 and 2 to entry, addition of Notes 3 and 4 to entry]

3.2.7

transportable equipment

equipment not intended to be carried by a person during operation, nor intended for fixed installation

[SOURCE: IEC 60079-0:2017, 3.31.5]

3.2.8

gas detection transmitter

fixed gas detection equipment that provides a conditioned electronic signal or output indication to a generally accepted industry standard (such as 4 to 20 mA), intended to be utilized with separate gas detection control units or signal processing data acquisition, central monitoring and similar systems

3.2.9

gas detection control unit

equipment intended to provide display indication, alarm functions, output contacts or alarm signal outputs or any combination when operated with integral or remote sensor(s)

3.2.10

separate gas detection control unit

equipment intended to provide display indication, alarm functions, output contacts or alarm signal outputs or any combination when operated with gas detection transmitter(s)

3.2.11

equipment with integral sensor(s)

<gas detection> equipment that provides display indication, alarm functions, output contacts or alarm signal outputs using a sensor which is within or directly assembled to the equipment housing

3.2.12

accessory

<gas detection> component which can be fitted to the equipment for a special purpose and that is referenced in the instructions

EXAMPLE External gas pump, sampling probe, hoses, collecting cone, weather protection device.

3.3 Sensors

3.3.1

sensing element

<gas detection> part of the sensor that is sensitive to the gas or vapour to be measured

3.3.2

measuring principle

<gas detection> principle that makes the sensing element or the sensor sensitive to the gas or vapour to be measured

3.3.3

sensor

<gas detection> assembly in which the sensing element is housed and that may also contain associated circuit components

3.3.4

integral sensor

<gas detection> sensor that is within or directly assembled to a gas detection control unit, gas detection transmitter, or to transportable or portable equipment

3.3.5

remote sensor

<gas detection> sensor that is installed separately, but is connected to a gas detection control unit, gas detection transmitter, or to transportable or portable equipment

3.4 Supply of gas to equipment

3.4.1

sample line

<gas detection> means by which the gas being sampled is conveyed to the sensor

Note 1 to entry: Accessories such as filters or water traps are often included in the sample line.

3.4.2

sampling probe

<gas detection> separate accessory sample line that is optionally attached to the equipment

3.4.3

adjustment

<gas detection> procedure carried out to minimize the deviation of the indication from the test gas concentration

Note 1 to entry: When the equipment is adjusted to give an indication of zero in zero test gas, the procedure is called 'zero adjustment'.

3.4.4

calibration

<gas detection> procedure that establishes the relationship between an indication and the concentration of a test gas

3.4.5

calibration kit

<gas detection> means of presenting test gas to the equipment for the purpose of calibrating, adjusting or verifying the operation of the equipment

Note 1 to entry: The calibration kit can be used for verifying the operation of the alarms if the concentration of the test gas is beyond the alarm set-point.

Note 2 to entry: A mask for calibration and test is an example of a calibration kit.

3.4.6

mask for calibration and test

<gas detection> device that can be attached to the equipment to present a test gas to the sensor in a reproducible manner

3.5 Signals and alarms

3.5.1

measured value

<gas detection> calculated concentration of gas or vapour that results from processing the sensor signal

Note 1 to entry: The measured value can be further processed before indication (for example, filtering or averaging).

3.5.2

indication

<gas detection> representation of the measured value on an output or display

3.5.3

indication range

<gas detection> range of indications over which the equipment is capable of indicating

SEE: Figure 1 [get full document from standards.iteh.ai](https://standards.iteh.ai)

3.5.4

lower limit of indication

<gas detection> smallest indication within the indication range

SEE: Figure 1

3.5.5

upper limit of indication

<gas detection> largest indication within the indication range

SEE: Figure 1

3.5.6

measuring range

<gas detection> range of indications of gas concentration over which the accuracy of the equipment lies within specified limits

SEE: Figure 1

3.5.7**lower limit of measurement**

<gas detection> smallest measured value within the measuring range

Note 1 to entry: Lower limit of measuring range can be zero.

SEE: Figure 1

3.5.8**upper limit of measurement**

<gas detection> largest measured value within the measuring range

SEE: Figure 1

Note 1 to entry: Indications below the lower limit of measurement or above the upper limit of measurement will not necessarily meet the requirements of this document.

Note 2 to entry: Depending upon the gas detection technology employed, the limits might exactly align.

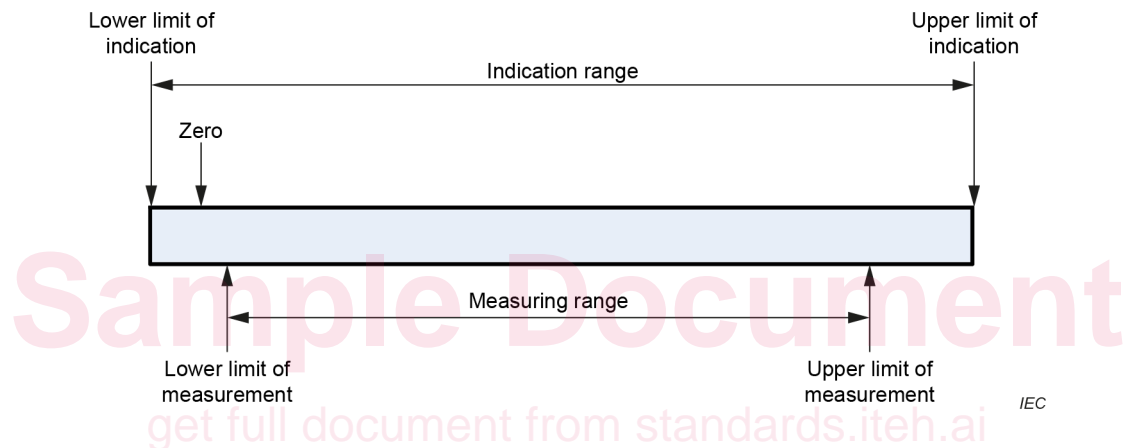


Figure 1 – Relationship between indication range and measuring range

3.5.9**alarm set point**

<gas detection> setting of the equipment at which the measured concentration will cause the equipment to initiate an indication, alarm or other output function

3.5.10**latching alarm**

<gas detection> alarm that, once activated, requires deliberate action to be deactivated

3.5.11**fault signal**

<gas detection> audible, visible or other type of output, different from the alarm signal, permitting, directly or indirectly, a warning or indication that the equipment is not working satisfactorily

3.5.12**special state**

<gas detection> state of the equipment other than that in which the intent is monitoring of gas concentration and, if the equipment provides alarms, alarming

Note 1 to entry: Special state includes warm-up, calibration mode and fault condition.