



SLOVENSKI STANDARD

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Električna oprema za zaznavanje hladilnih plinov in merjenje njihove koncentracije - Zahteve za delovanje in preskusne metode

Electrical equipment used for detection and concentration measurement of refrigerant gases - Performance requirements and test methods

Elektrische Geräte zur Detektion und Konzentrationsmessung von Kältemittelgasen - Anforderungen an das Betriebsverhalten und Prüfverfahren

Appareils électriques utilisés pour la détection et la mesure de la concentration de gaz frigorigènes - Exigences de performance et méthodes d'essai

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Electrical equipment used for detection and concentration measurement of refrigerant gases - Performance requirements and test methods

Appareils électriques utilisés pour la détection et la mesure de la concentration de gaz frigorigènes - Exigences de performance et méthodes d'essai

Elektrische Geräte zur Detektion und Konzentrationsmessung von Kältemittelgasen - Anforderungen an das Betriebsverhalten und Prüfverfahren

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 50676:2019) has been prepared by CLC/TC 216 "Gas detectors".

The following dates are fixed:

- latest date by which this document has (dop) 2020-11-04
to be implemented at national level by
publication of an identical national
standard or by endorsement
- latest date by which the national (dow) 2022-11-04
standards conflicting with this document
have to be withdrawn

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EN 50676:2019 (E)

Introduction

This document specifies test methods and performance requirements for all electrical equipment used for gas detection in refrigerant applications as defined in EN 378-1:2016 by means of concentration measurement.

This document is addressed to the manufacturers of such equipment and test laboratories which validate it.

The tendency to use low-GWP refrigerant gases in the refrigeration and HVAC market (F-Gas Regulation) has intensified the considerations of safety measures for low-GWP gases as some are flammable, toxic and can cause lack of oxygen.

This document covers all refrigerant gases and defines performance requirements for the detection equipment, mentioned in EN 378-3:2016 as gas detectors or sensors, used in refrigerant applications. The level of safety is expected to be the same as in the already existing performance standards for general-purpose equipment, i.e. EN 60079-29-1 concerning refrigerant flammable gases and EN 45544 series concerning refrigerant toxic gases in atmospheres. Refrigerant gases not mentioned by EN 378-1:2016 are also covered by this standard following the categorization scheme of EN 378-1:2016.

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1 Scope

This document specifies general requirements for the construction, testing and performance of electrically operated refrigerant fixed gas detection equipment in safety applications. This document does not specify requirements for portable locating leak detectors for refrigerant application as already covered by EN 14624:2012.

This document is applicable to equipment whose primary purpose is to provide an indication, alarm and/or other output function to warn of the presence of refrigerant gases in an industrial or commercial environment and, in some cases, to initiate automatic or manual protective actions. It is applicable to equipment in which the sensor automatically generates an electrical signal when gas is present.

This standard does not apply to gas detection equipment:

- for non-refrigerant application;
- used for air pollution monitoring;
- sampling systems, which are not integral part of the gas detection equipment;
- open path gas detection;
- residential applications;
- process control;
- for applications in mines;
- portable locating leak detectors for refrigerant application

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2 Normative references

[SIST EN 50676:2020](https://standards.iteh.ai/catalog/standards/sist/c3df8d9e-e7d9-4020-8e5a-01141e1155a0/2020)

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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.

EN 378-1:2016, *Refrigerating systems and heat pumps - Safety and environmental requirements - Part 1: Basic requirements, definitions, classification and selection criteria*

EN 45544-1, *Workplace atmospheres - Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours - Part 1: General requirements and test methods*

EN 45544-2, *Workplace atmospheres - Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours - Part 2: Performance requirements for apparatus used for exposure measurement*

EN 45544-3, *Workplace atmospheres - Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours - Part 3: Performance requirements for apparatus used for general gas detection*

EN 45544-4, *Workplace atmospheres - Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours - Part 4: Guide for selection, installation, use and maintenance*

EN 60079-29-1:2016, *Explosive atmospheres - Part 29-1: Gas detectors - Performance requirements of detectors for flammable gases*

IEC 60335-2-40, *Household and similar electrical appliances - Safety - Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 60079-29-1, EN 45544 series and the following apply.

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 Gas properties**3.1.1****refrigerant**

fluid used for heat transfer in a refrigerating system, which absorbs heat at a low temperature and a low fluid pressure and expels heat at a higher temperature and a higher pressure usually involving changes of the state of the fluid

3.1.2**halocarbon and hydrocarbon**

either:

- CFC: fully-halogenated halocarbon containing only chlorine, fluorine and carbon;
- HCFC: halocarbon containing hydrogen, chlorine, fluorine and carbon;
- HFC: halocarbon containing only hydrogen, fluorine and carbon;
- PFC: fully fluorinated halocarbon containing only fluorine and carbon;
- HC: hydrocarbon containing only hydrogen and carbon

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[SOURCE: EN 378-1:2016, 3.7.14]

3.1.3**hydrocarbon**

contains only hydrogen and carbon

3.1.4**global warming potential****GWP**

climatic warming potential of a greenhouse gas relative to that of carbon dioxide ('CO₂'), calculated in terms of the 100-year warming potential of one kilogram of a greenhouse gas relative to one kilogram of CO₂

3.1.5**poison****poison for sensors**

substance which leads to temporary or permanent loss of sensor sensitivity

3.1.6**reference value**

value used as the basis to specify requirements such as measuring range, resolution and alarm set point

3.1.7**measuring range**

range of measured values of gas concentration over which the accuracy of the equipment lies within specified limits

3.1.8

group of gases

defined by the manufacturer to be measured with one piece of equipment without modification of hardware or software which can be represented by a reference gas also defined by the manufacturer

3.1.9

reference gas

representative gas of a group of gases

Note 1 to entry: Only the reference gas is specifically tested in correspondence with the performance requirements of this present standard.

3.1.10

correction factor

factor defined by the manufacturer to convert the measurement values of a given gas from a group in relation to the defined reference gas

3.1.11

acute-toxicity exposure limit

ATEL

maximum recommended refrigerant concentration determined in accordance with EN 378-1 and intended to reduce the risks of acute toxic hazards to humans in the event of a refrigerant release

[SOURCE: EN 378-1:2016, 3.7.5, modified]

3.1.12

occupational exposure limit value

OELV

limit of the time-weighted average of the concentration of a chemical agent in the air within the breathing zone of a worker in relation to a specified reference period

Note 1 to entry: The term "limit value" is often used as a synonym for "occupational exposure limit value", but the term "occupational exposure limit value" is preferred because there is more than one limit value (e.g., biological limit value and occupational exposure limit value).

Note 2 to entry: Occupational exposure limit values (OELVs) are often set for reference periods of 8 h, but can also be set for shorter periods or concentration excursions.

3.1.13

machinery room

space that is designed to house compressors and pressure vessels

3.2 Types of equipment and components

3.2.1

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 mA to 20 mA), intended to be utilized with separate gas detection control units or signal processing data acquisition, central monitoring and similar systems, and which typically processes information from various locations and sources including, but not limited to gas detection equipment

3.2.2

alarm-only equipment

equipment having an alarm but not a display or other device to indicate the measured gas concentration

Note 1 to entry: In EN 14624 and EN 378-3, this type of electrical equipment is defined as an indicating fixed gas detector.

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3.3 Times

3.3.1

time of response**tx**

time interval, when the equipment is in a warmed-up condition, between the time when an instantaneous variation in volume ratio is produced at the equipment inlet and the time when the response reaches a stated percentage (x) of the final indication

Note 1 to entry: This document refers to t_{90} as the time of response.

3.3.2

warm-up time

time interval, with the equipment in a stated atmosphere, between the time when the equipment is switched on and the time when the indication reaches and remains within the stated tolerances

Note 1 to entry: For an example see Figure 1.

Note 2 to entry: Warm-up time is not applicable to spot-reading equipment.

**Key**

- 1 power off in clean air
- 2 power on in clean air
- 3 apparatus zero
- 4 specified tolerance band on zero indication
- 5 warm-up time
- y indication
- x time

Figure 1 — Warm-up time in clean air (typical)

4 General requirements

4.1 Introduction

- Type I: Refrigerant gas detection equipment for A2, A2L, A3, B3 refrigerants and ammonia (R717) as per safety class in EN 378-1:2016, Annex E in accordance with explosion protection. The equipment shall follow the existing performances in EN 60079-29-1 for ranges up to 20 % LFL and or 0 % – 100 % LFL. and performance requirements in EN 378 series

Equipment shall fulfil the general requirements of EN 60079-29-1 and the thresholds specified in EN 378 series.

- Type II: Refrigerant gas detection equipment for A1, A2L, B1, B2L refrigerants as per safety class in Annex E of EN 378-1:2016. Performance of the equipment shall be in accordance with general requirements in EN 45544-1 in combination with EN 45544-2 and suitable for exposure measurements in workplace atmospheres.

Equipment shall fulfil the general requirements of EN 45544-1 in conjunction with EN 45544-2.

- Type III: Refrigerant gas detection equipment for A1, A2L, B1, B2L refrigerants as per safety class in Annex E of EN 378-1:2016 not covered by Type I or Type II. Performance of the equipment shall be in accordance with general requirements in EN 45544-1 in combination with EN 45544-3 and EN 378 series.

Equipment shall fulfil the general requirements of EN 45544-1 in conjunction with EN 45544-3 and the thresholds specified in EN 378 series.

Following extensions and deviations from these general requirements are applicable.

4.2 Construction

4.2.1 General

EN 60079-29-1 and EN 45544 series shall apply.

4.2.2 Measuring ranges and correction factor

4.2.2.1 General

The maximum measuring range for Type I and Type III equipment or the reference value for Type II equipment for each gas to be measured shall be as specified in Table 1.

If a reference gas is specified for a group of gases the related correction factor shall not exceed the limits of min. 0,25 to max. 4.

Equipment shall comply to the maximum thresholds specified in the EN 378 series.

For applications covered by F-Gas Directive (F-Gas EU-517/2014) the range and the thresholds shall be referenced from the National Standards.

Table 1 — Measuring ranges, reference values and maximum alarm thresholds

	Type I	Type II	Type III	Maximum alarm thresholds ^a
Gas	Measuring range Refrigerant gas detection equipment for A2, A2L, R717, A3, B3 refrigerant gases shall follow EN 60079-29-1	Reference value Refrigerant gas detection equipment for A1, A2L, B1, B2L shall follow EN 45544-2	Measuring range Refrigerant gas detection equipment for A1, A2L, B1, B2L not covered by type I or II shall follow EN 45544-3	EN 378 series IEC 60335-2-40
HC Hydrocarbons	0 % – 100 % LEL 0 % – 20 % LEL	-	-	<25% LEL
Ammonia	0 % – 100 % LEL (0-150000 ppm) 0 % – 20 % LEL (0-30000 ppm)	20 ppm	0 ppm – 5 000 ppm	Pre-set <500 ppm Main alarm <30,000 ppm (<20% LEL)