



SLOVENSKI STANDARD
oSIST prEN 50676:2018
01-junij-2018

Električna oprema za zaznavanje hladilnih plinov ali SF6 in merjenje njihove koncentracije - Zahteve za delovanje in preskusne metode

Electrical equipment used for detection and concentration measurement of refrigerant gases or SF6 - Performance requirements and test methods.

Elektrische Geräte zur Detektion und Konzentrationsmessung von Kältemittelgasen oder SF6 Anforderungen an das Betriebsverhalten und Prüfverfahren

Appareils électriques pour la détection et la mesure des hydrocarbures halogénés (gaz réfrigérants) ou du SF6 - Exigences de performance et méthodes d'essai

Ta slovenski standard je istoveten z: prEN 50676:2018

ICS:

13.320 Alarmni in opozorilni sistemi Alarm and warning systems

oSIST prEN 50676:2018

en

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 50676

April 2018

ICS

English Version

**Electrical equipment used for detection and concentration
measurement of refrigerant gases or SF6 Performance
requirements and test methods.**

Appareils électriques pour la détection et la mesure des
hydrocarbures halogénés (gaz réfrigérants) ou du SF6 -
Exigences de performance et méthodes d'essai

Elektrische Geräte zur Detektion und
Konzentrationsmessung von Kältemittelgasen oder SF6
Anforderungen an das Betriebsverhalten und Prüfverfahren

This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2018-07-13.

It has been drawn up by CLC/TC 216.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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

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

1	Contents	Page
2	European foreword	3
3	Introduction	4
4	1 Scope	5
5	2 Normative references	6
6	3 Terms and definitions	6
7	3.1 Gas properties	6
8	3.2 Types of equipment and components	9
9	3.3 Signals and alarms	11
10	3.4 Times	11
11	Figure 1 — Warm-up time in clean air (typical)	12
12	3.5 Miscellaneous	12
13	4 General requirements	13
14	4.1 Introduction	13
15	4.2 Construction	13
16	4.3 Adjustments	17
17	4.4 Battery-powered equipment	18
18	4.5 Gas detection transmitter for use with separate gas detection control units	18
19	4.6 Separate gas detection control units for use with gas detection transmitter(s)	18
20	4.7 Equipment using software and/or digital technologies	18
21	4.8 Labelling and marking	18
22	4.9 Instruction manual	19
23	5 Test methods	22
24	5.1 Overview	22
25	5.2 General requirements for tests	22
26	5.3 Samples and sequence of tests	22
27	5.4 Normal conditions for test	25
28	5.5 Tests	26
29	Annex A (normative) Gas specific performance requirements (EN 45544-1:2015)	31
30	Table A.1 — Gas specific performance requirements	31
31	Annex B (normative) Performance requirements under standard test conditions	32
32	Table B.1 — Performance requirements under standard test conditions	32
33	Bibliography	38

34 **European foreword**

35 This document (prEN 50676:2018) has been prepared by CLC/TC 216 “Gas detectors”.

36 This document is currently submitted to the Enquiry.

37 The following dates are proposed:

- latest date by which the existence of this document has to be announced at national level (doa) dor + 6 months
- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) dor + 12 months
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) dor + 36 months
(to be confirmed or modified when voting)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 50676:2020

<https://standards.iteh.ai/catalog/standards/sist/c3df8d9e-c7d9-4020-8e5a-d9d4541f83b7/sist-en-50676-2020>

prEN 50676:2018**38 Introduction**

39 PrEN 50676-1 will define test methods and performance requirements for all electrical equipment used for the
40 detection of refrigerant gases as defined in EN 378-1 as well as SF₆ by means of concentration measurement.

41 PrEN 50676-1 is addressed to the manufacturers of such equipment and the test laboratories which validate
42 it.

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

46 Some of these refrigerants have already been taken into account by other standards such as
47 EN 60079-29-1:2016 for flammable gases and EN 45544 series for toxic gases in workplace atmospheres.
48 This standard will consider the refrigerant gases in EN 378 series not already considered in the above cited
49 standards. The level of safety shall be the same as in the already existing standards.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 50676:2020

<https://standards.iteh.ai/catalog/standards/sist/c3df8d9e-c7d9-4020-8e5a-d9d4541f83b7/sist-en-50676-2020>

50 1 Scope

51 This document will define test methods and performance requirements for all electrical equipment used for the
52 detection of the refrigerant gases as defined in EN 378-1 as well as SF₆ by means of concentration
53 measurement.

54 NOTE 1 For the purposes of this standard, the term “refrigerant gases” includes refrigerant gases defined in EN 378-1
55 as well as SF₆.

56 This document specifies general requirements for the construction, testing and performance of electrically
57 operated refrigerant gas detection equipment in safety applications.

58 The application is intended to also consider electrical equipment in refrigeration systems according to the F-
59 Gas Regulation.

60 This document is applicable to apparatuses whose primary purpose is to provide an indication, alarm and/or
61 other output function to warn of the presence of refrigerant gases or SF₆ in an industrial or commercial
62 environment and, in some cases, to initiate automatic or manual protective actions. It is applicable to
63 apparatuses in which the sensor automatically generates an electrical signal when gas is present.

64 Some of these refrigerant gases could be also classified as toxic gases or vapours intended for exposure
65 measurement or as flammable gases.

66 In accordance with the classification of the gas and the tasks covered in EN 60079-29-1:2016,
67 EN 45544-2:2015 and EN 45544-3:2015 for refrigeration application, three different types of equipment are
68 provided (see also Table A.1).

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

72 - Type II: Refrigerant gas detection equipment for A1, A2L, B1, B2L refrigerant gases as per safety class in
73 EN 378-1:2016 Annex E in accordance with OEL values. The equipment shall follow the performances in
74 EN 45544-2:2015.

75 - Type III Refrigerant gas detection equipment not covered by Type I or Type II for refrigerant gases A1,
76 A2L, B1, B2L as per safety class in EN 378-1:2016 Annex E. The equipment shall follow the performances
77 in EN 45544-3:2015

78 This document does not apply to non-refrigerant applications:

79 - monitoring of combustible gases in the range up to 20 % or up to 100 % of the LEL level, covered by
80 EN 60079-29-1:2016;

81 - workplace atmospheres, covered by the EN 45544 series.

82 This document is not applicable to equipment:

83 - used for air pollution monitoring;

84 - external sampling systems;

85 - open path gas detection;

86 - residential applications;

87 - process control;

88 - leakage (emission rate monitoring) detection system for SF₆.

prEN 50676:2018

89 NOTE 2 SF₆ equipment is typically located in large and ventilated rooms or outdoor, so that monitoring SF₆
 90 concentrations in the surrounding atmosphere does not permit a reliable detection of leakages.

91 **2 Normative references**

92 The following documents are referred to in the text in such a way that some or all of their content constitutes
 93 requirements of this document. For dated references, only the edition cited applies. For undated references,
 94 the latest edition of the referenced document (including any amendments) applies.

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

97 EN 378-3:2016, *Refrigerating systems and heat pumps - Safety and environmental requirements - Part 3:*
 98 *Installation site and personal protection*

99 EN 45544-1:2015, *Workplace atmospheres - Electrical apparatus used for the direct detection and direct*
 100 *concentration measurement of toxic gases and vapours - Part 1: General requirements and test methods*

101 EN 45544-2:2015, *Workplace atmospheres - Electrical apparatus used for the direct detection and direct*
 102 *concentration measurement of toxic gases and vapours - Part 2: Performance requirements for apparatus*
 103 *used for exposure measurement*

104 EN 45544-3:2015, *Workplace atmospheres - Electrical apparatus used for the direct detection and direct*
 105 *concentration measurement of toxic gases and vapours - Part 3: Performance requirements for apparatus*
 106 *used for general gas detection*

107 EN 50270:2015, *Electromagnetic compatibility - Electrical apparatus for the detection and measurement of*
 108 *combustible gases, toxic gases or oxygen*

109 EN 50271:2018, *Electrical apparatus for the detection and measurement of combustible gases, toxic gases or*
 110 *oxygen - Requirements and tests for apparatus using software and/or digital technologies*

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

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

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

115 **3 Terms and definitions**

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

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

- 118 • IEC Electropedia: available at <http://www.electropedia.org/>
- 119 • ISO Online browsing platform: available at <http://www.iso.org/obp>

120 **3.1 Gas properties**

121 **3.1.1**

122 **ambient air**

123 normal atmosphere surrounding the equipment

- 124 **3.1.2**
 125 **clean air**
 126 air that is free of refrigerant gases, SF₆ and interfering or contaminating substances
- 127 **3.1.3**
 128 **refrigerant**
 129 fluid used for heat transfer in a refrigerating system, which absorbs heat at a low temperature and a low fluid
 130 pressure and expels heat at a higher temperature and a higher pressure usually involving changes of the state
 131 of the fluid
- 132 [SOURCE: EN 378-1:2016 3.7.1]
- 133 **3.1.4**
 134 **flammable gas**
 135 gas or vapour which, when mixed with air in a certain proportion, will form an explosive atmosphere
- 136 **3.1.5**
 137 **toxic gas**
 138 general term for any gas or vapour that can be harmful to human health toxic
- 139 **3.1.6**
 140 **halocarbon**
 141 halocarbon:
- 142 — CFC: fully halogenated halocarbon containing only chlorine, fluorine and carbon;
 - 143 — HCFC: halocarbon containing hydrogen, chlorine, fluorine and carbon;
 - 144 — HFC: halocarbon containing only hydrogen, fluorine and carbon;
 - 145 — PFC: fully fluorinated halocarbon containing only fluorine and carbon
- 146 [SOURCE: EN 378-1:2016 3.7.14, modified]
- 147 **3.1.7**
 148 **hydrocarbon**
 149 HC: hydrocarbon containing only hydrogen and carbon
- 150 [SOURCE: EN 378-1:2016 3.7.14, modified]
- 151 **3.1.8**
 152 **lower flammable limit**
 153 LFL
 154 concentration of flammable gas or vapour in air, below which an explosive gas atmosphere does not form
- 155 Note 1 to entry: For the purposes of Ex Equipment, this is also known as lower explosive limit (LEL).
- 156 Note 2 to entry: The concentration may be expressed as either a volume fraction or a mass per unit volume.
- 157 **3.1.9**
 158 **global warming potential**
 159 GWP
 160 climatic warming potential of a greenhouse gas relative to that of carbon dioxide ('CO₂'), calculated in terms
 161 of the 100-year warming potential of one kilogram of a greenhouse gas relative to one kilogram of CO₂

prEN 50676:2018

- 162 **3.1.10**
 163 **poisons**
 164 poisons for sensors
 165 substances which lead to temporary or permanent loss of sensor sensitivity
- 166 **3.1.11**
 167 **volume fraction**
 168 v/v
 169 quotient of the volume of a specified component and the sum of the volumes of all components of a gas mixture
 170 before mixing, all volumes referring to the pressure and the temperature of the gas mixture
- 171 Note 1 to entry: The volume fraction and volume concentration take the same value if, at the same state conditions, the
 172 sum of the component volumes before mixing and the volume of the mixture are equal. However, because the mixing of
 173 two or more gases at the same state conditions is usually accompanied by a slight contraction or, less frequently, a slight
 174 expansion, this is not generally the case.
- 175 Note 2 to entry: This is also known as concentration.
- 176 Note 3 to entry: Assuming the ideal behaviour of gases, the volume ratio coincides with the molar ratio (mol/mol). The
 177 ppm units are equivalent to the International System of Units 10^{-6} vol/vol.
- 178 **3.1.12**
 179 **zero gas**
 180 gas recommended by the manufacturer, which is free of refrigerant gases, SF₆, and interfering and
 181 contaminating substances, the purpose of which is calibration/adjustment of the equipment zero
- 182 **3.1.13**
 183 **standard test gas**
 184 test gas with a composition specified for each piece of equipment and gas to be used for all tests unless stated
 185 otherwise
- 186 **3.1.14**
 187 **reference value**
 188 value used as the basis to specify requirements such as measuring range, resolution and alarm set point
- 189 **3.1.15**
 190 **measuring range**
 191 range of measured values of gas concentration over which the accuracy of the equipment lies within specified
 192 limits
- 193 **3.1.16**
 194 **lower limit of measurement**
 195 smallest measured value within the measuring range
- 196 **3.1.17**
 197 **upper limit of measurement**
 198 largest measured value within the measuring range
- 199 **3.1.18**
 200 **group of gases**
 201 group of different gases defined by the manufacturer to be measured with one piece of equipment without
 202 modification of hardware or software

203 **3.1.19**
 204 **reference gas**
 205 reference gas is the representative gas of a group of gases

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

208 **3.1.20**
 209 **correction factor**
 210 factor defined by the manufacturer to convert the measurement values of a given gas from a group in relation
 211 to the defined reference gas

212 Note 1 to entry: The correction factor may not exceed the limits of min. 0,25 to max. 4.

213 **3.1.21**
 214 **acute-toxicity exposure limit**
 215 ATEL
 216 concentration of a refrigerant designated to prevent problems resulting from acute toxicity

217 **3.1.22**
 218 **occupational exposure limit value**
 219 OELV
 220 limit of the time-weighted average of the concentration of a chemical agent in the air within the breathing zone
 221 of a worker in relation to a specified reference period

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

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

227 **3.1.23**
 228 **machinery**
 229 refrigerating equipment forming a part of the refrigerating system, including, but not limited to, any or all of the
 230 following: compressor, condenser, liquid receiver, evaporator and connecting piping

231 **3.1.24**
 232 **machinery room**
 233 space that is designed to house compressors and pressure vessels

234 **3.1.25**
 235 **control room**
 236 location where relevant personnel are stationed on a full-time basis for implementing various measures if alarm
 237 is initiated

238 **3.2 Types of equipment and components**

239 **3.2.1**
 240 **aspirated equipment**
 241 equipment that samples the gas by drawing it to the gas sensor, e.g. by means of a hand-operated or electric
 242 pump

243 **3.2.2**
 244 **continuous duty equipment**
 245 equipment that is powered for long periods of time, but may have either continuous or intermittent sensing

- 246 **3.2.3**
 247 **diffusion equipment**
 248 equipment in which the transfer of gas from the atmosphere to the gas sensor takes place by random molecular
 249 movement, i.e. under conditions in which there is no aspirated flow
- 250 **3.2.4**
 251 **fixed equipment**
 252 equipment that is intended to have all parts permanently installed
- 253 **3.2.5**
 254 **portable equipment**
 255 battery powered, spot-reading or continuous duty equipment that has been designed to be readily carried from
 256 place to place and to be used while it is being carried and includes but is not limited to:
- 257 a) hand-held equipment, typically less than 1 kg, which requires use of only one hand to operate,
 258 b) personal monitors, similar in size and mass to hand-held equipment, that are continuously operating (but
 259 not necessarily continuously sensing) while they are attached to the user, and
- 260 c) larger equipment that can be operated by the user while it is carried either by hand, by a shoulder strap
 261 or carrying harness and which may or may not have a hand directed probe
- 262 **3.2.6**
 263 **transportable equipment**
 264 equipment not intended to be portable but which can be readily moved from one place to another
- 265 **3.2.7**
 266 **gas detection transmitter**
 267 fixed gas detection equipment that provide a conditioned electronic signal or output indication to a generally
 268 accepted industry standard (such as 4 mA to 20 ma), intended to be utilized with separate gas detection control
 269 units or signal processing data acquisition, central monitoring and similar systems, which typically process
 270 information from various locations and sources including, but not limited to gas detection equipment
- 271 **3.2.8**
 272 **alarm-only equipment**
 273 equipment having an alarm but not having a display or other device to indicate the measured gas concentration
- 274 **3.2.9**
 275 **gas detection control unit**
 276 equipment intended to provide a display indication, alarm functions, output contacts and/or alarm signal
 277 outputs or any combinations when operated with remote sensor(s)
- 278 **3.2.10**
 279 **separate gas detection control unit**
 280 equipment intended to provide a display indication, alarm functions, output contacts or alarm signal outputs or
 281 any combination when operated with gas detection transmitter(s)
- 282 **3.2.11**
 283 **calibration mask**
 284 device that when applied to the sensor provides the continuous and renovated gas supply to the sensor such
 285 that the gas concentration reaching the sensing element remains unchanged
- 286 **3.2.12**
 287 **remote gas sensor**
 288 sensor that is not integral to the main body of the equipment

289	3.2.13	
290	sensor	
291	assembly in which the sensing element is housed and that may also contain associated circuit components	
292	3.2.14	
293	sensing element	
294	part of the sensor which is sensitive to the gas/vapour to be measured	
295	3.3 Signals and alarms	
296	3.3.1	
297	alarm set point	
298	fixed or adjustable equipment setting that is intended to pre-set the level of concentration at which the	
299	equipment will automatically initiate an indication, alarm or other output function	
300	3.3.2	
301	fault signal	
302	audible, visible or other type of output, different from the alarm signal, permitting, directly or indirectly, a warning	
303	or indication that the equipment is not working satisfactorily	
304	3.3.3	
305	latching alarm	
306	alarm that, once activated, requires deliberate action to be deactivated	
307	3.3.4	
308	special state	
309	all states of the equipment other than those in which monitoring of gas concentration takes place, e.g., warm-	
310	up, calibration mode or fault condition	
311	3.3.5	
312	alarm indication	
313	audible or visible indication activated when a pre-set concentration level is reached	
314	3.3.6	
315	time weighted average concentration	
316	TWA concentration	
317	concentration of gas in the air integrated over time and divided by the specified reference period	
318	3.3.7	
319	indicators	
320	means to provide visible and/or audible information	
321	3.3.8	
322	output	
323	physical interface that drives external actuators	
324	EXAMPLES	Air extractors, remote warning and alarm devices.
325	3.4 Times	
326	3.4.1	
327	drift	
328	variation in the equipment indication with time at any fixed gas volume fraction (including clean air) under	
329	constant ambient conditions	