



**SLOVENSKI STANDARD**  
**oSIST prEN 17340:2018**  
**01-december-2018**

---

**Emisije nepremičnih virov - Določevanje masne koncentracije fluoriranih spojin, izraženih v obliki fluorovodikove kisline (HF) - Standardna referenčna metoda**

Stationary source emissions - Determination of mass concentration of fluorinated compounds expressed as HF - Standard reference method

Emissionen aus stationären Quellen - Bestimmung des Massenkonzentration von gasförmigen Fluoriden, angegeben als HF - Standardreferenzverfahren

Emissions de sources fixes - Détermination de la concentration massique en composés fluorés exprimée en HF - Méthode de référence

**Ta slovenski standard je istoveten z: prEN 17340**

---

**ICS:**

13.040.40      Emisije nepremičnih virov      Stationary source emissions

**oSIST prEN 17340:2018**

**en,fr,de**



EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**DRAFT**  
**prEN 17340**

November 2018

---

ICS 13.040.40

English Version

## Stationary source emissions - Determination of mass concentration of fluorinated compounds expressed as HF - Standard reference method

Emissions de sources fixes - Détermination de la concentration massique en composés fluorés exprimée en HF - Méthode de référence

Emissionen aus stationären Quellen - Bestimmung des Massenkonzentration von gasförmigen Fluoriden, angegeben als HF - Standardreferenzverfahren

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 264.

If this draft becomes a European Standard, CEN 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 CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and 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 STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

---

<b>Contents</b>	<b>Page</b>
European foreword.....	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions .....	8
4 Symbols and abbreviations .....	14
5 Measuring principle .....	15
5.1 General.....	15
5.2 Measuring principle .....	15
6 Sampling equipment.....	16
6.1 General.....	16
6.1.1 Introduction .....	16
6.1.2 Sampling line with side stream (first case) .....	16
6.1.3 Sampling line without side stream (second case) .....	17
6.2 Sampling probe .....	17
6.3 Filter housing.....	17
6.4 Particle filter.....	17
6.5 Temperature controller.....	17
6.6 Absorbers.....	18
6.7 Sample gas pump.....	18
6.8 Gas volume meter .....	19
7 Field operation.....	19
7.1 Measurement planning .....	19
7.2 Sampling strategy.....	19
7.2.1 General.....	19
7.2.2 Measurement section and measurement plane.....	19
7.2.3 Minimum number and location of measurement points.....	20
7.2.4 Sampling time and volume sampled .....	20
7.2.5 Measurement ports and working platform .....	20
7.3 Preparation of the glassware and the absorption solution .....	20
7.4 Assembling the equipment .....	21
7.5 Field blank.....	21
7.6 Heating of the sampling line.....	21
7.7 Leak test.....	21
7.8 Performing sampling .....	22
7.8.1 Introduction of the sampling probe in the duct.....	22
7.8.2 Sampling.....	22
7.8.3 Rinsing of the sampling system and preparation of the samples.....	23
8 Analysis.....	23
8.1 General.....	23
8.2 Preparing samples of washing bottles.....	23
8.3 Methods for treatment of dust collected in the probe and on the filter.....	24

Figure 1	24
8.4 Analysis	24
9 Determination of the characteristics of the method: sampling and analysis	24
9.1 General	24
9.2 Performance characteristics for the method and applicable performance criteria	25
9.2.1 General	25
9.2.2 Sampling procedure	25
9.2.3 Analysis procedure - Sources of uncertainty	26
9.2.4 Performance criterion of analysis	27
9.3 Establishment of the uncertainty budget	27
10 Expression of results	28
10.1 Volume of dry sampled gas	28
10.1.1 General	28
10.1.2 For the main line (particulate Fluorine)	28
10.1.3 For the secondary line (gaseous Fluorine)	28
10.2 Calculation of HF concentration on dry gas basis	29
10.3 Expression of results on wet gas basis under standard conditions	29
10.4 Expression of results with respect to a reference CO <sub>2</sub> content	30
10.5 Expression of results with respect to a reference O <sub>2</sub> content	30
11 Test report	31
Annex A (informative) Type of sampling device	32
Annex B (normative) Treatment of filters method	33
B.1 Filter treatment with sodium carbonate	33
B.2 Modus operandi in case of presence of elements sequestering fluorides	33
B.3 Alkaline attack	33
B.4 Pyrohydrolysis	33
B.4.1 Principle	33
B.4.2 Reagents and solutions	34
B.4.3 Equipment	34
B.4.4 Operating procedure	35
Annex C (normative) Description of the three analytical techniques for the determination of HF	36
C.1 Matrix interferences	36
C.2 Ionometry	36
C.2.1 Principle	36
C.2.2 Scope	36
C.2.3 Reagents	36
C.2.4 Equipment	37
C.2.5 Sampling	37
C.2.6 Operating procedure	37
C.2.6.1 Calibration	37
C.2.6.2 Determination	38

## prEN 17340:2018 (E)

C.2.7	Expression of the results .....	38
C.3	Spectrophotometry .....	38
C.3.1	Principle .....	38
C.3.2	Interferents .....	38
C.3.3	Scope .....	38
C.3.4	Reagents and products.....	38
C.3.5	Equipment .....	40
C.3.6	Operating procedure .....	40
C.3.6.1	Blank test .....	40
C.3.6.2	Measurement.....	40
C.3.6.3	Expression of the results .....	40
C.4	Ion chromatography .....	41
C.4.1	Principle .....	41
C.4.2	Interferences .....	41
C.4.3	Limit of detection .....	41
C.4.4	Reagents and solutions .....	41
C.5	Equipment .....	42
C.5.1	Ion chromatography system (see standard EN ISO 10304-1):.....	42
C.5.2	Laboratory equipment .....	43
C.5.3	Quality criteria for separation column .....	43
C.6	Operating procedure .....	44
C.7	Expression of the results .....	44
<b>Annex D (informative) Example of evaluation of compliance of the reference method for HF with emission measurement requirements - First case: the measurand is the concentration of hydrofluoric acid and gaseous and bound to particulates fluorides.....</b>		
D.1	Uncertainty estimation process.....	45
D.1.1	General.....	45
D.1.2	Determination of the model equation .....	45
D.1.3	Quantification of uncertainty components.....	45
D.1.4	Calculation of the combined uncertainty .....	45
D.2	Site specific conditions.....	46
D.3	Performance characteristics of the method.....	46
D.4	Calculation of standard uncertainty of the measured concentration .....	49
D.4.1	Calculation of total HF concentration .....	49
D.4.2	Model equation and application of the rule of propagation.....	51
D.4.3	Results of standard uncertainty calculations .....	54

<b>Annex E (informative) Example of evaluation of compliance of the reference method for HF with emission measurement requirements - Second case: the measurand is the concentration of hydrofluoric acid and gaseous fluorides</b> .....	<b>57</b>
<b>E.1 Uncertainty estimation process</b> .....	<b>57</b>
<b>E.1.1 General</b> .....	<b>57</b>
<b>E.1.2 Determination of the model equation</b> .....	<b>57</b>
<b>E.1.3 Quantification of uncertainty components</b> .....	<b>57</b>
<b>E.1.4 Calculation of the combined uncertainty</b> .....	<b>57</b>
<b>E.2 Specific conditions in the field</b> .....	<b>58</b>
<b>E.3 Performance characteristics of the method</b> .....	<b>59</b>
<b>E.4 Calculation of standard uncertainty of concentration measured</b> .....	<b>60</b>
<b>E.4.1 Model equation and application of rule of uncertainty propagation</b> .....	<b>60</b>
<b>E.4.2 Results of the standard uncertainties calculations</b> .....	<b>62</b>
<b>Relative standard uncertainty</b> .....	<b>62</b>
<b>E.4.3 Estimation of the combined uncertainty</b> .....	<b>63</b>
<b>E.5 Calculation of the overall (or expanded) uncertainty</b> .....	<b>63</b>
<b>E.6 Uncertainty associated to the mass concentration of gaseous fluorides at O<sub>2</sub> reference concentration</b> .....	<b>63</b>
<b>Annex F (normative) Determination of water vapour concentration for water saturated gas, at <math>p_{std} = 101,325</math> kPa</b> .....	<b>65</b>
<b>Annex G (informative) Calculation of the uncertainty associated with a concentration expressed on dry gas and at an oxygen reference concentration</b> .....	<b>69</b>
<b>G.1 Uncertainty associated with a concentration expressed on dry gas</b> .....	<b>69</b>
<b>G.2 Uncertainty associated with a concentration expressed at an oxygen reference concentration</b> .....	<b>71</b>
<b>Bibliography</b> .....	<b>74</b>

**prEN 17340:2018 (E)**

**European foreword**

This document (prEN 17340:2018) has been prepared by Technical Committee CEN/TC 264 “Air quality”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST-TS CEN/TS 17340:2020

<https://standards.iteh.ai/catalog/standards/sist/8a2bf6a7-92b8-4831-a0ab-617a39c3711d/sist-ts-cen-ts-17340-2020>



## 1 Scope

This document specifies a manual method for the determination of the concentration of fluorinated compounds expressed in HF. Two cases are presented:

- first case: the measurand is the concentration of hydrofluoric acid and gaseous and bound to particulates fluorides;
- second case: the measurand is the concentration of hydrofluoric acid and gaseous fluorides.

Three analytical techniques are proposed: ionometry, spectrophotometry and ion-exchange chromatography.

This document specifies the performance characteristics to be determined and the performance criteria to be fulfilled when it is used as the Standard Reference Method (SRM) for periodic monitoring and for calibration or control of Automated Measuring Systems (AMS) permanently installed on a stack, for regulatory or other purposes.

This document applies to more or less dust-laden flue gases whose HF concentration may vary between 0,1 mg/m<sup>3</sup> and 10 mg/m<sup>3</sup>, at standard conditions of pressure and temperature (see NOTE). The quantification limit of the method is estimated at 0,1 mg/m<sup>3</sup> for a sampled volume of 0,1 m<sup>3</sup>.

Interference may occur for some matrices. Known elements that may lead to interference are mentioned in Annex C.

NOTE The Emission Limit Values (ELV) are expressed in mg HF/m<sup>3</sup>, for dry gases at the standard conditions:  $T_{\text{std}}$ : 273 K and  $P_{\text{std}}$ : 101,3 kPa.

## 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.

EN 1911, *Determination of mass concentration of gaseous chlorides expressed as HCl — Standard reference method — (classification index: X 43-32X)*

EN 14793:2017, *Stationary source emissions - Demonstration of equivalence of an alternative method with a reference method*

EN 15259:2007, *Air quality - Measurement of stationary source emissions - Requirements for measurement sections and sites and for the measurement objective, plan and report*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

EN 13284-1, *Stationary source emissions - Determination of low range mass concentration of dust - Part 1: Manual gravimetric method*

EN ISO 10304-1, *Water quality - Determination of dissolved anions by liquid chromatography of ions - Part 1: Determination of bromide, chloride, fluoride, nitrate, nitrite, phosphate and sulfate (ISO 10304-1)*

EN ISO 14956, *Air quality - Evaluation of the suitability of a measurement procedure by comparison with a required measurement uncertainty (ISO 14956)*

**prEN 17340:2018 (E)****3 Terms and definitions**

For the purposes of this document, the following terms and definitions 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****absorber**

device in which the compound to be trapped is absorbed into the absorption solution

**3.2****absorption efficiency ( $\epsilon$ )**

ratio of quantity of the analyte  $q_1$  collected in the first absorber divided by the quantity of the analyte collected in the series of absorbers

**3.3****alternative method (AM)**

measurement method which complies with the criteria given by this European Standard with respect to the reference method

Note 1 to entry: An alternative method can consist of a simplification of the reference method.

[SOURCE: EN 14793:2017]

**3.4****analytical repeatability in the laboratory**

closeness of the agreement between the results of successive measurements of the same measurand carried out under the same conditions of measurement

Note 1 to entry: Repeatability conditions include:

- the same measurement procedure;
- the same laboratory;
- the same measuring instrument, used under the same conditions;
- the same location;
- repetition over a short period of time.

Note 2 to entry: Repeatability may be expressed quantitatively in terms of the dispersion characteristics of the results. In this document, repeatability is expressed as a value with a repeatability standard deviation of 95 %.

### 3.5

#### **automated measuring system (AMS)**

entirety of all measuring instruments and additional devices for obtaining a result of measurement

Note 1 to entry: Apart from the actual measuring device (the analyser), an AMS includes facilities for taking samples (e.g. probe, sample gas lines, flow meters and regulator, delivery pump) and for sample conditioning (e.g. dust filter, pre-separator for interferences, cooler, converter). This definition also includes testing and adjusting devices that are required for functional checks and, if applicable, for commissioning.

Note 2 to entry: The term “automated measuring system” (AMS) is typically used in Europe. The term “continuous emission monitoring system” (CEMS) is also typically used in the UK and USA.

### 3.6

#### **calibration**

set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring method or measuring system, and the corresponding values given by the applicable reference

Note 1 to entry: In case of automated measuring systems (AMS) permanently installed on a stack the applicable reference is the standard reference method (SRM) used to establish the calibration function of the AMS.

Note 2 to entry: In case of manual methods the applicable reference can be reference materials used as calibration standards to establish the relationship between the output signal of the analytical device and the reference values.

Note 3 to entry: Calibration should not be confused with adjustment of a measuring system.

### 3.7

#### **chemical blank value**

fluorine ion content of an unexposed sample of the absorption solution, completed with reagents that are added to the solution before analysis if necessary

### 3.8

#### **emission limit value (ELV)**

emission limit value according to regulations on the basis of 30 min, 1 hour or 1 day

### 3.9

#### **detection limit ( $L_D$ )**

concentration value of the measurand below which there is at least 95% level of confidence that the measured value corresponds to a sample free of that measurand

### 3.10

#### **field blank procedure**

procedure used to ensure that no significant contamination has occurred during all the steps of the measurement

Note 1 to entry: This includes for instance the equipment preparation in laboratory, its transport and installation in the field as well as the subsequent analytical work in the laboratory.

### 3.11

#### **field blank**

value determined by a specific procedure used to ensure that no significant contamination has occurred during all the measurement steps and to verify that the operator can reach a level of quantification suitable for the measurement

**prEN 17340:2018 (E)****3.12****hydrofluoric acid (HF)**

particulate HF: inorganic fluorinated compounds present in the filter and analysed according to one of the methods described in Annex C originating from both the hydrofluoric acid trapped by the particles and the filter and the particulate fluorinated compounds present in the effluent

- gaseous HF: fluorinated compounds not retained by the filter and trapped in the absorbers
- Total HF: sum of particulate HF and of gaseous HF

**3.13****influence quantity**

quantity that is not the measurand but that affects the result of the measurement

Note 1 to entry: Influence quantities are e.g. ambient temperature, atmospheric pressure, presence of interfering gases in the flue gas matrix or pressure of the gas sample.

**3.14****measurand**

particular quantity subject to measurement

[SOURCE: EN 15259:2007]

Note 1 to entry: The measurand is a quantifiable property of the stack gas under test, for example mass concentration of a measured component, temperature, velocity, mass flow, oxygen content and water vapour content.

**3.15****measurement series**

several successive measurements carried out on the same measurement plane and at the same process operating conditions

**3.16****measurement site**

place on the waste gas duct in the area of the measurement plane(s) consisting of structures and technical equipment, for example working platforms, measurement ports, energy supply

Note 1 to entry: Measurement site is also known as sampling site.

[SOURCE: EN 15259:2007]

**3.17****measurement plane**

plane normal to the centreline of the duct at the sampling position

Note 1 to entry: Measurement plane is also known as sampling plane.

[SOURCE: EN 15259:2007]

**3.18****measurement port**

opening in the waste gas duct along the measurement line, through which access to the waste gas is gained

Note 1 to entry: Measurement port is also known as sampling port or access port.

[SOURCE: EN 15259:2007]

**3.19****measurement line**

line in the measurement plane along which the measurement points are located, bounded by the inner duct wall

Note 1 to entry: Measurement line is also known as sampling line.

**3.20****measurement point**

position in the measurement plane at which the sample stream is extracted or the measurement data are obtained directly

Note 1 to entry: Measurement point is also known as sampling point.

[SOURCE: EN 15259:2007]

**3.21****measuring system**

set of one or more measuring instruments and often other devices, including any reagent and supply, assembled and adapted to give information used to generate measured quantity values within specified intervals for quantities of specified kinds

[SOURCE: JCGM 200:2012]

**3.22****performance characteristic**

one of the quantities (described by values, tolerances, range) assigned to equipment in order to define its performance

**3.23****quantification limit ( $L_Q$ )**

lowest amount of an analyte that is quantifiable with a given confidence level

Note 1 to entry: For a manual method the limit of quantification is usually calculated as ten times the standard deviation of blank measurements provided that the blank value is negligible. This corresponds to a confidence level of 95 %.

**prEN 17340:2018 (E)****3.24****reference method (RM)**

measurement method taken as a reference by convention, which gives the accepted reference value of the measurand

Note 1 to entry: A reference method is fully described.

Note 2 to entry: A reference method can be a manual or an automated method.

Note 3 to entry: Alternative methods can be used if equivalence to the reference method has been demonstrated.

[SOURCE: EN 15259:2007]

**3.25****uncertainty budget**

calculation table combining all sources of uncertainty as defined in EN ISO 14956 or ENV 13005 in order to calculate the overall uncertainty of the method at a specified value

**3.26****standard uncertainty**

$u$

uncertainty of the result of a measurement expressed as a standard deviation

**3.27****combined uncertainty**

$u_c$

standard uncertainty attached to the measurement result calculated by combination of several standard uncertainties according to the principles laid down in ISO/IEC Guide 98-3 (GUM)

**3.28****expanded uncertainty**

$U$

quantity defining a level of confidence about the result of a measurement that may be expected to encompass a specific fraction of the distribution of values that could reasonably be attributed to a measurand

$$U = k \times u$$

Note 1 to entry: In this European Standard, the expanded uncertainty is calculated with a coverage factor of  $k = 2$ , and with a level of confidence of 95 %.

Note 2 to entry: The expression overall uncertainty is sometimes used to express the expanded uncertainty.

**3.29****sampling location**

specific area close to the sampling plane where the measurement devices are set up

**3.30****standard reference method (SRM)**

reference method prescribed by European or national legislation

[SOURCE: EN 15259:2007]

[VIM 3.6]

### 3.31

#### **repeatability of the measurement method in the field**

closeness of the agreement between the results of simultaneous measurements of the same measurand carried out with two sets of equipment meeting the performance criteria set out in the document under the same conditions of measurement

Note 1 to entry: These conditions include:

- the same measurement procedure;
- two sets of equipment, the performance of which fulfils the requirements of the reference method, used under the same conditions
- the same location;
- implemented by the same laboratory;
- typically calculated on short periods of time in order to avoid the effect of changes of influence parameters (e.g. 30 min).

Note 2 to entry: Repeatability may be expressed quantitatively in terms of the dispersion characteristics of the results.

### 3.32

#### **reproducibility of the measurement method in the field**

closeness of the agreement between the results of simultaneous measurements of the same measurand, carried out with several sets of equipment under the same conditions of measurement

Note 1 to entry: These conditions are called “field reproducibility conditions” and include:

- the same measurement procedure;
- several sets of equipment, the performance of which fulfils the requirements of the reference method, used under the same conditions;
- the same location;
- measurements carried out by several laboratories.

Note 2 to entry: Reproducibility may be expressed quantitatively in terms of the dispersion characteristics of the results.