SLOVENSKI STANDARD
SIST EN 14789:2017

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Nadomešča:
SIST EN 14789:2005

Emisije nepremičnih virov - Določevanje volumske koncentracije kisika - Standardna referenčna metoda: paramagnetizem

Stationary source emissions - Determination of volume concentration of oxygen - Standard reference method: Paramagnetism

Emissionen aus stationären Quellen - Bestimmung der Volumenkonzentration von Sauerstoff - Standardreferenzverfahren: Paramagnetismus

Emissions de sources fixes - Détermination de la concentration volumique en oxygène - Méthode de référence normalisée: Paramagnétisme

Ta slovenski standard je istoveten z: **EN 14789:2017**

ICS:

13.040.40	Emisije nepremičnih virov	Stationary source emissions

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EUROPEAN STANDARD
NORME EUROPÉENNE
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English Version

Stationary source emissions - Determination of volume concentration of oxygen - Standard reference method: Paramagnetism

Emissions de sources fixes - Détermination de la concentration volumique en oxygène - Méthode de référence normalisée: Paramagnétisme

Emissionen aus stationären Quellen - Bestimmung der Volumenkonzentration von Sauerstoff - Standardreferenzverfahren: Paramagnetismus

This European Standard was approved by CEN on 26 September 2016.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 14789:2017) has been prepared by Technical Committee CEN/TC 264 “Air quality”, the secretariat of which is held by DIN.

This document supersedes EN 14789:2005.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2017, and conflicting national standards shall be withdrawn at the latest by July 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

Annex E provides details of significant technical changes between this document and the previous edition.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: 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 the United Kingdom.

1 Scope

This European Standard specifies the standard reference method (SRM) based on the paramagnetic principle for the determination of the oxygen concentrations in flue gases emitted to the atmosphere from ducts and stacks. It includes the sampling and the gas conditioning system as well as the analyser.

This European Standard specifies the performance characteristics to be determined and the performance criteria to be fulfilled by portable automated measuring systems (P-AMS) based on this measurement method. It applies to periodic monitoring and the calibration or control of automated measuring systems (AMS) permanently installed on a stack, for regulatory or other purposes.

This European Standard specifies criteria for demonstration of equivalence of an alternative method (AM) to the SRM by application of EN 14793:2017.

This European Standard has been validated during field tests on waste incineration, co-incineration and large combustion plants and on a recognized test bench. It has been validated for sampling periods of 30 min in the range from 3 % to 21 %. Oxygen concentration values, expressed as volume concentrations, are used to allow results of emission measurements to be standardised to the oxygen reference concentration and dry gas conditions required e.g. by EU Directive 2010/75/EC on industrial emissions.

NOTE The characteristics of installations, the conditions during field tests and the values of repeatability and reproducibility in the field are given in Annex A.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 14793:2017, *Stationary source emission — 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*

EN 15267-4:2017, *Air quality — Certification of automated measuring systems — Part 4: Performance criteria and test procedures for automated measuring systems for periodic measurements of emissions from stationary sources*

EN ISO 14956:2002, *Air quality - Evaluation of the suitability of a measurement procedure by comparison with a required measurement uncertainty (ISO 14956:2002)*

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

3 Terms and definitions

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

NOTE In this European Standard, the volume concentration of oxygen is expressed in percent.

3.1
standard reference method
SRM
reference method prescribed by European or national legislation

[SOURCE: EN 15259:2007]

3.2
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]

3.3
measurement method
method described in a written procedure containing all the means and procedures required to sample and analyse, namely field of application, principle and/or reactions, definitions, equipment, procedures, presentation of results, other requirements and measurement report

[SOURCE: EN 14793:2017]

3.4
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]

3.5
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]

3.6
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 interferents, 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.

[SOURCE: EN 15267-4:2017]

3.7
portable automated measuring system
P-AMS
automated measuring system which is in a condition or application to be moved from one to another measurement site to obtain measurement results for a short measurement period

Note 1 to entry: The measurement period is typically 8 h for a day.

Note 2 to entry: The P-AMS can be configured at the measurement site for the special application but can be also set-up in a van or mobile container. The probe and the sample gas lines are installed often just before the measurement task is started.

[SOURCE: EN 15267-4:2017]

3.8
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: Calibration should not be confused with adjustment of a measuring system.

3.9
adjustment
set of operations carried out on a measuring system so that it provides prescribed indications corresponding to given values of a quantity to be measured

Note 1 to entry: The adjustment can be made directly on the instrument or using a suitable calculation procedure.

3.10
span gas
test gas used to adjust and check a specific point on the response line of the measuring system

3.11
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.

3.12
interference
negative or positive effect upon the response of the measuring system, due to a component of the sample that is not the measurand

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. presence of interfering gases, ambient temperature or pressure of the gas sample.

3.14
ambient temperature
temperature of the air around the measuring system

3.15
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]

3.16
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]

3.17
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]

3.18
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.

[SOURCE: EN 15259:2007]

3.19
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]

3.20
performance characteristic
one of the quantities (described by values, tolerances, range) assigned to equipment in order to define its performance

3.21
response time
duration between the instant when an input quantity value of a measuring instrument or measuring system is subjected to an abrupt change between two specified constant quantity values and the instant when a corresponding indication settles within specified limits around its final steady value

Note 1 to entry: By convention time taken for the output signal to pass from 0 % to 90 % of the final variation of indication.

3.22
short-term zero drift
difference between two zero readings at the beginning and at the end of the measurement period

3.23
short-term span drift
difference between two span readings at the beginning and at the end of the measurement period

3.24
lack of fit
systematic deviation, within the measurement range, between the measurement result obtained by applying the calibration function to the observed response of the measuring system measuring test gases and the corresponding accepted value of such test gases

Note 1 to entry: Lack of fit can be a function of the measurement result.

Note 2 to entry: The expression “lack of fit” is often replaced in everyday language by “linearity” or “deviation from linearity”.

3.25
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:

— same measurement method;

— same laboratory;

— same measuring system, used under the same conditions;

— same location;

— repetition over a short period of time.

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

Note 3 to entry: In this European Standard the repeatability is expressed as a value with a level of confidence of 95 %.

3.26
repeatability in the field

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

Note 1 to entry: These conditions include:

— same measurement method;

— two sets of equipment, the performances of which are fulfilling the requirements of the measurement method, used under the same conditions;

— 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 can be expressed quantitatively in terms of the dispersion characteristics of the results.

Note 3 to entry: In this European Standard, the repeatability under field conditions is expressed as a value with a level of confidence of 95 %.

3.27
reproducibility 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:

— same measurement method;

— several sets of equipment, the performances of which are fulfilling the requirements of the measurement method, used under the same conditions;

— same location;

— implemented by several laboratories.

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

Note 3 to entry: In this European Standard, the reproducibility under field conditions is expressed as a value with a level of confidence of 95 %.

3.28
residence time in the measuring system
time period for the sampled gas to be transported from the inlet of the probe to the inlet of the measurement cell

3.29
uncertainty
parameter associated with the result of a measurement, that characterises the dispersion of the values that could reasonably be attributed to the measurand

3.30
standard uncertainty
u
uncertainty of the result of a measurement expressed as a standard deviation

3.31
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)

3.32
expanded uncertainty
U
quantity defining an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand

$$U = k \times u_c$$

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.