SLOVENSKI STANDARD
SIST EN 15259:2008

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Kakovost zraka - Meritve emisije nepremičnih virov - Zahteve za merilne odseke in merilna mesta ter namen meritev, načrt meritev in poročilo o meritvah

Air quality - Measurement of stationary source emissions - Requirements for measurement sections and sites and for the measurement objective, plan and report

Luftbeschaffenheit - Messung von Emissionen aus stationären Quellen - Anforderungen an Messstrecken und Messplätze und an die Messaufgabe, den Messplan und den Messbericht

Qualité de l'air - Mesurage des émissions de sources fixes - Exigences relatives aux sections et aux sites de mesurage et relatives à l'objectif, au plan et au rapport de mesurage

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13.040.40 Emisije nepremičnih virov Stationary source emissions

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EUROPEAN STANDARD

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English Version

Air quality - Measurement of stationary source emissions - Requirements for measurement sections and sites and for the measurement objective, plan and report

Qualité de l'air - Mesurage des émissions de sources fixes - Exigences relatives aux sections et aux sites de mesurage et relatives à l'objectif, au plan et au rapport de mesurage

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This European Standard was approved by CEN on 18 August 2007.

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Foreword

This document (EN 15259:2007) has been prepared by Technical Committee CEN/TC 264 “Air quality”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by April 2008, and conflicting national standards shall be withdrawn at the latest by April 2008.

This document has been prepared by WG 19 “Emissions monitoring strategy” of CEN/TC 264 as one of three documents on measurements of stationary source emissions consisting of:

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

— CEN/TS 15674, *Air quality — Measurement of stationary source emissions — Guidelines for the elaboration of standardised methods*

— CEN/TS 15675, *Air quality — Measurement of stationary source emissions — Application of EN ISO/IEC 17025:2005 to periodic measurements*

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

This European Standard defines requirements for

a) measurement sections and sites at waste gas ducts of industrial plants and

b) measurement objective, plan and report.

This European Standard is intended to ensure reliable and comparable results when used in conjunction with reference methods such as those that have been developed by CEN/TC 264.

This European Standard is important to plant designers, constructors, plant operators, testing laboratories, accreditation bodies and regulators.

This European Standard requires the specification of a measurement objective. There can be various objectives for measuring emissions, e.g.

- for assessing whether industrial installations are operating in compliance with IPPC permits [1] (emission limit value compliance assessment),
- for emissions declaration and reporting for emission inventories (e.g. local, national and international e.g. for EPER [1], [2]),
- for acceptance tests (proof of guarantee),
- in case of complaints,
- for obtaining a permit (e.g. following changes to process operations or plant design),
- after expiration of a set time interval to establish the condition of the plant,
- in case of interruption or disturbance of operations,
- within the framework of safety precaution investigations,
- for the calibration of continuously operating emission measuring systems,
- for checking the function of continuously operating emission measuring systems,
- to establish the cause of particular emission behaviour (e.g. the determination of the cause of a failure of the waste gas treatment to maintain the guaranteed/required level of cleaning),
- to give a prognosis of likely emission levels in special operating conditions, e.g. after changes of procedure, in case of disturbance or interruption, or in case of expansion of capacity,
- for establishing emission trading schemes [3],
- for determining emission factors and
- for assessing available techniques for an industry sector (e.g. at company, sector and EU level) [3].

1 Scope

This European Standard specifies the following requirements:

a) requirements for measurement sections and sites with respect to performing emission measurements;

b) requirements for the measurement objective, plan and report of emission measurements of air pollutants and reference quantities to be carried out in waste gas ducts at industrial plants.

This European Standard applies to periodic measurements using manual or automated reference methods (RM).

This European Standard specifies generic principles which can be applied to perform emission measurements at different plant types and to meet different measurement objectives.

NOTE The measurement objective is specified by the customer. The testing institute identifies the measurement objective and related regulatory requirements at the beginning of the measurement planning. Where measurements are being made for regulatory purposes, the customer should seek approval from the competent authority.

This European Standard specifies procedures for taking representative samples in waste gas ducts.

This European Standard specifies a procedure for finding the best available sampling point for automated measuring systems used for continuous monitoring of emissions.

The planning and reporting aspects of this European Standard are applicable to emission measurements at diffusive and fugitive emission sources.

This European Standard does not address aspects of structural safety of chimneys and ducts, construction of working platforms and safety of personnel using them.

2 Normative references

The following referenced documents are indispensable for the application 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.

Not applicable.

3 Terms and definitions

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

NOTE These terms and definitions are in accordance with VIM and CEN/TS 15674.

3.1
measurement
set of operations having the object of determining a value of a quantity

[VIM:1993, 2.1]

NOTE The operations can be performed automatically.

3.2
individual measurement
measurement carried out over a defined period of time

NOTE Information on the start and end time of the measurement can be of importance, e.g. in case of parallel measurements of the reference method with an automated measuring system to be calibrated or validated.

3.3
periodic measurement
determination of a measurand at specified time intervals

NOTE The specified time intervals may be regular (e.g. once every month) or irregular. Measurands can include the amount or physical property of an emission. Measurements are usually made using portable equipment for typically less than 24 h.

3.4
grid measurement
determination of a measurand in a given grid of measurement points in the measurement plane

3.5
measurand
particular quantity subject to measurement

[VIM:1993, 2.6]

NOTE The measurand is a quantifiable property of the waste gas under test, for example mass concentration of a measured component, temperature, velocity, mass flow, oxygen content and water vapour content.

3.6
measured component
constituent of the waste gas for which a defined measurand is to be determined by measurement

3.7
reference quantity
specified physical or chemical quantity which is needed for conversion of the measurand to standard conditions

NOTE Reference quantities are e.g. temperature (T_{ref} = 273,15 K), pressure (p_{ref} = 101,325 kPa), water vapour volume fraction (h_{ref} = 0 %) and oxygen volume fraction o_{ref}.

3.8
reference method
RM
measurement method taken as a reference by convention, which gives the accepted reference value of the measurand

NOTE 1 A reference method is fully described.

NOTE 2 A reference method can be a manual or an automated method.

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

3.9
standard reference method
SRM
reference method prescribed by European or national legislation

NOTE Standard reference methods are used e.g. to calibrate and validate AMS and for periodic measurements to check compliance with limit values.

3.10
automated measuring system
AMS
measuring system permanently installed on site for continuous monitoring of emissions

NOTE An AMS is a method which is traceable to a reference method.

[EN 14181:2004, 3.2]

3.11
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 Measurement site is also known as sampling site.

3.12
measurement section
region of the waste gas duct which includes the measurement plane(s) and the inlet and outlet sections

3.13
measurement plane
plane normal to the centreline of the duct at the sampling position

NOTE Measurement plane is also known as sampling plane.

3.14
hydraulic diameter
d_h
quotient of four times the area A and the perimeter P of the measurement plane

$$d_h = \frac{4 \times A}{P} \quad (1)$$

3.15
measurement line
line in the sampling plane along which the sampling points are located, bounded by the inner duct wall

NOTE Measurement line is also known as sampling line.

3.16
measurement point
position in the measurement plane at which the sample stream is extracted or the measurement data are obtained directly

NOTE Measurement point is also known as sampling point.

3.17
representative measurement point
measurement point at which the local mass flow density of the substance to be determined is equal to the mass flow density averaged over the measurement plane

3.18
measurement port
opening in the waste gas duct along the measurement line, through which access to the waste gas is gained

NOTE Measurement port is also known as sampling port or access port.

3.19
clearance area
area of free space at the working platform outside the waste gas duct without obstacles in which the appropriate measuring probes are moved and handled

NOTE See Table 1 in 5.2.3.2.

3.20
measurement objective
scope of the measurement programme

3.21
measurement plan
structured procedure to fulfil a defined measurement objective

3.22
measurement report
report established by the testing laboratory according to the customer request and containing at least the information required in the standards applied in the measurements programme, in particular this European Standard

3.23
site review
visit conducted by the testing laboratory before undertaking emission measurements to ensure that the physical and logistical situation is fully understood before arriving on-site to conduct work

NOTE The site review provides information essential for determining the appropriate measurement method and development of the measurement plan.

3.24
timing
time at which samples or measurements are taken

NOTE Timing can be crucial to obtaining a result which is relevant to the measurement objective.

3.25
sampling duration
period of time over which the sample is taken

3.26
mass concentration
c
quotient of mass m of the measured component and gas volume V

$$c = \frac{m}{V} \tag{2}$$

3.27
mass flow rate
$\dot{m}$
quotient of the mass m flowing through the measurement plane and the time t

$$\dot{m} = \frac{m}{t} \tag{3}$$

3.28
mass flow density
$\dot{m}_{\mathrm{d}}$
quotient of mass flow rate $\dot{m}$ and corresponding cross-sectional area a

$$\dot{m}_{\mathrm{d}} = \frac{\dot{m}}{a} \tag{4}$$

3.29
sample volumetric flow
volumetric flow extracted from the main stream for determination of the measured component

3.30
volumetric flow rate
quotient of the volume flowing through a plane and the time

3.31
testing laboratory
laboratory that performs tests

NOTE 1 The term *testing laboratory* can be used in the sense of a legal entity, a technical entity or both.

NOTE 2 A testing laboratory undertakes work at the laboratory's permanent facilities, at sites away from their permanent facilities and in temporary or mobile laboratories.

NOTE 3 The sampling and analysis stages often occur at different locations as the analysis stage can be carried out at a permanent laboratory.

3.32
customer
organization or person that defines the measurement objective and receives the measurement report

NOTE Adapted from EN ISO 9000:2005, Definition 3.3.5.

4 Symbols and abbreviations

4.1 Symbols

a	cross-sectional area
A	area of the measurement plane
c	mass concentration
d	diameter of the duct
d_h	hydraulic diameter
F	statistical value of the F-test
h_m	measured water vapour content as volume fraction
h_{ref}	standard water vapour content as volume fraction
m	mass
$\dot{m}$	mass flow rate
$\dot{m}_d$	mass flow density
N	number of measurements
o_m	measured oxygen content as volume fraction
o_{ref}	standard oxygen content as volume fraction
P	perimeter of the measurement plane
p_m	measured pressure

p_{ref}	standard pressure
r_i	ratio of actual value $y_{i,grid}$ of the measurand in the grid and the value $y_{i,ref}$ of the reference measurement
$\bar{r}$	average of the ratios r_i
s_{grid}	standard deviation of the grid measurements
s_{inh}	standard deviation due to the inhomogeneity of the waste gas
s_{pos}	standard deviation of combined grid and reference measurement
s_{ref}	standard deviation of the reference measurements
t	time
T_m	measured temperature (absolute)
T_{ref}	standard temperature (absolute)
U_{perm}	permissible expanded uncertainty
U_{pos}	expanded uncertainty of the combined grid and reference measurement
U_{ref}	expanded uncertainty related to the reference measurements at the fixed point
v	velocity of the gas in the measurement plane
V	volume
$\dot{V}$	volume flow rate
$y_{i,grid}$	measured value at the ith sampling point
$y_{i,ref}$	ith measured value at the reference point

4.2 Abbreviations

AMS	Automated Measuring System
RM	Reference Method
SRM	Standard Reference Method
SCR	Selective Catalytic Reduction
SNCR	Selective Non Catalytic Reduction

5 Principles

5.1 General

Reliable and comparable results representative of the emissions in the context of the measurement objective (see Annex G) can be achieved provided that

a) measurement section and site, preferably created at the plant design stage, are available to enable a representative sample to be taken,

b) measurement objective and the measurement plan are available before measurements are carried out,

c) sampling strategy is specified in the measurement plan to meet the measurement objective,

d) report of the results is produced which includes all relevant information and

e) competent testing laboratories are used.

NOTE Requirements on the competence of laboratories are specified in EN ISO/IEC 17025 and CEN/TS 15675.

Figure 1 illustrates key stages of periodic measurements of emissions from stationary sources.

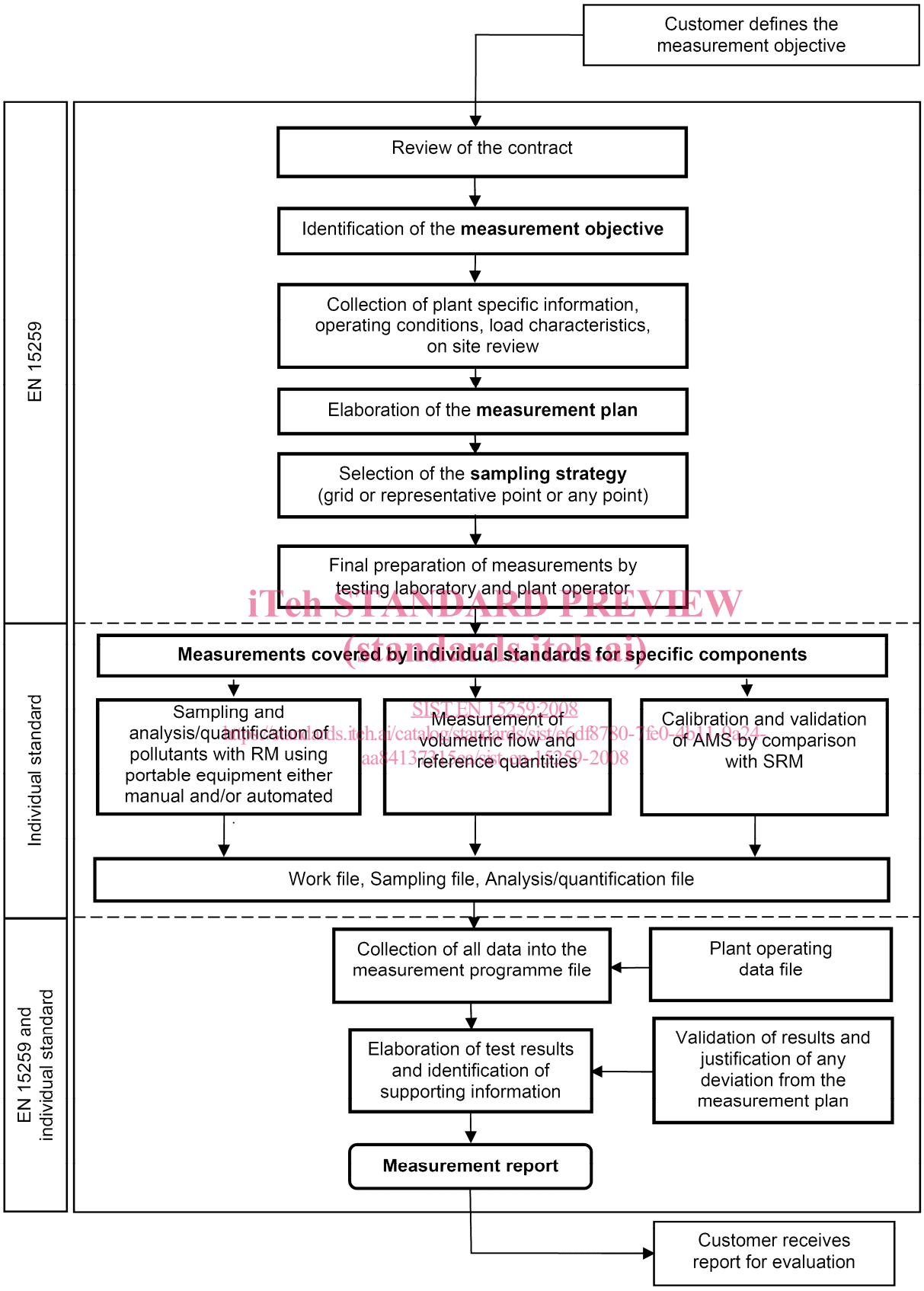

Figure 1 — Illustration of key stages of periodic measurements of emissions from stationary sources

5.2 Measurement section and measurement site

Plants designed or adapted to enable representative sampling have a section of the waste gas ducting engineered to ensure an ordered flow profile free from vortexing and backflow, where a measurement plane is located that provides a grid of sampling points sufficient to assess the distribution of measurands and reference quantities. The measurement site allows access to the sampling plane for typical sampling equipment via a platform that enables measurement personnel to work safely and efficiently.

5.3 Measurement objective and measurement plan

The measurement objective specifies the work to be carried out, the plant operating conditions under which measurements are to be taken, any plant or process related information to be collected, working procedures to be used and any associated requirements. The results of these considerations are outlined in the measurement plan. To ensure that the measurement plan meets the measurement objective it is important to ensure that the measurement section has been assessed and any deviations from standard geometry is taken into account. Measurements are performed by suitable qualified personnel, under adequate supervision. In view of the measurement objective, simplified procedures may be used in some circumstances provided that the plant conditions are well understood and provided it is acceptable within the measurement objective. Any deviations from the standard procedures described in European Standards are justified and reported.

5.4 Sampling strategy

The sampling strategy ensures that a representative sample is taken. The procedures specified in Clause 8 are chosen to suite the degree of homogeneity of the measurand distribution and any anticipated variability in time. Procedures are adopted to identify the number and placement of the sampling points and the sampling duration at each point.

5.5 Measurement report

The measurement report provides the results of measurement supported by a comprehensive account of the measurements, a description of the measurement objective, and the measurement plan. It also provides sufficient detail to enable the results to be traced back through the calculations to the collected basic data and process operating conditions.

6 Measurement section and measurement site

6.1 General

Suitable measurement sections and measurement sites are necessary to obtain reliable and comparable emission measurement results. Therefore, appropriate measurement sections and sites shall be planned when designing a plant (see [4]). Terms related to the measurement section and site are illustrated in Figure 2.

Emission measurements in flowing gases require defined flow conditions in the measurement plane, i.e. an ordered and stable flow profile without vortexing and backflow so that the velocity and the mass concentration of the measured component in the waste gas can be determined. These requirements result from the definition of the mean concentration (see Annex G). This is the only way in which results from different measurements, for example on different plants, can be compared.

Emission measurements require appropriate measurement ports and working platforms. Therefore, the installation of measurement ports and working platforms shall be taken into account in the planning phase of a measurement section.

Specifications of regulations and official requirements shall be taken into account in the selection and specification of measurement sections and sites. Expert advice should be sought.

NOTE Aspects of structural safety of chimneys and ducts as well as construction of working platforms and safety of personnel using them are not treated in this European Standard.