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Stationary source emissions - Guidance on the application of EN 14181:2004

Emissionen aus stationären Quellen - Leitlinien zur Anwendung der EN 14181:2004

Emissions de sources fixes - Lignes directrices relatives à l'application de l'EN 14181:2004

Ta slovenski standard je istoveten z: FprCEN/TR 15983

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Stationary source emissions - Guidance on the application of EN 14181:2004

Emissions de sources fixes - Lignes directrices relatives à
l'application de l'EN 14181:2004

Emissionen aus stationären Quellen - Leitlinien zur
Anwendung der EN 14181:2004

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

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

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Foreword

This document (FprCEN/TR 15983:2009) 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 TC Approval.

Introduction

This CEN Technical Report provides supporting guidance on the application of EN 14181:2004. It is based on the growing experiences with EN 14181:2004 throughout the CEN member countries. EN 14181:2004 specifies three levels of quality assurance (QAL), known as QAL1, QAL2 and QAL3 as well as an Annual Surveillance Test (AST). This Technical Report explains the requirements of these levels of quality assurance to achieve a consistent application of EN 14181:2004.

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1 Scope

This CEN Technical Report provides guidance for applying the European Standard EN 14181:2004.

This CEN Technical Report provides guidance only on applying the quality assurance levels QAL1, QAL2 and QAL3 as well as the annual surveillance test (AST).

2 Terms and definitions

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

2.1
air quality characteristic
 one of the quantifiable properties relating to an air mass under investigation, for example, concentration of a constituent

[EN 14181:2004, 3.1]

2.2
automated measuring system
AMS
 measuring system permanently installed on site for continuous monitoring of emissions

[EN 14181:2004, 3.2]

NOTE 1 An AMS is the automated application of a monitoring method, which is traceable to a reference method.

NOTE 2 Apart from the analyser, an AMS includes facilities for taking samples (e.g. sample probe, sample gas lines, flow meters, regulators, delivery pumps) and for sample conditioning (e.g. dust filter, moisture removal devices, converters, diluters). This definition also includes testing and adjusting devices that are required for regular functional checks.

2.3
calibration function
 linear relationship between the values of the SRM and the AMS with the assumption of a constant residual standard deviation

[EN 14181:2004, 3.3]

NOTE The calibration function is established during QAL2 on stack gases.

2.4
competent authority
 organisation which implements the requirements of EU Directives and regulates installations, which must comply with the requirements of applicable European Standards

[EN 15267-1:2009, 3.3]

2.5
confidence interval (two-sided)
 when T_1 and T_2 are two functions of the observed values such that, θ being a population parameter to be estimated, the probability $P_r(T_1 \leq \theta \leq T_2)$ is at least equal to $(1 - \alpha)$ [where $(1 - \alpha)$ is a fixed number, positive and less than 1], the interval between T_1 and T_2 is a two-sided $(1 - \alpha)$ confidence interval for θ

[EN 14181:2004, 3.5]

NOTE In this document, the standard deviation σ_0 is estimated in QAL2 by parallel measurements with a SRM. It is assumed that the requirement for σ_0 , presented in terms of an allowable uncertainty budget i.e. variability, is provided by the regulators (e.g. in some EU Directives). In the procedures of this standard, the premise is that the required variability is given as σ_0 itself, or as a quarter of the length of the full 95 % confidence interval.

2.6

CUSUM chart

calculation procedure in which the amount of drift and change in precision is compared to the corresponding uncertainty components which are obtained during QAL1

[EN 14181:2004, 3.6]

2.7

drift

monotonic change of the calibration function over stated period of unattended operation, which results in a change of the measured value

[EN 14181:2004, 3.7]

NOTE This refers to a change in the response of the AMS to a determinant which does not change.

2.8

emission limit value

ELV

limit value related to the uncertainty requirement

[EN 14181:2004, 3.8]

NOTE For EU directives it is the daily emission limit value that relates to the uncertainty requirement.

2.9

extractive AMS

AMS having the detection unit physically separated from the gas stream by means of a sampling system

[EN 14181:2004, 3.9]

2.10

instability

change in the measured value comprised of drift and dispersion resulting from the change in the calibration function over a stated period of unattended operation, for a given value of the air quality characteristic

NOTE 1 Drift and dispersion specify the monotonic and stochastic change with time of the output signal, respectively.

NOTE 2 This refers to a change in the response of the AMS to a determinant which does not change.

NOTE 3 Adapted from EN 14181:2004, 3.10.

2.11

instrument reading

indication of the measured value directly provided by the AMS without using the calibration function

[EN 14181:2004, 3.11]

2.12

intrinsic uncertainty

uncertainty component originating from the AMS itself, independent of the installation

FprCEN/TR 15983:2009 (E)**2.13****legislation**

Directives, Acts, ordinances and regulations

[EN 14181:2004, 3.12]

2.14**measurand**

particular quantity subject to measurement

[EN 14181:2004, 3.13]

2.15**measured value**

estimated value of the air quality characteristic derived from an output signal

NOTE 1 This usually involves calculations related to the calibration process and conversion to required quantities.

NOTE 2 Adapted from EN 14181:2004, 3.14.

2.16**non-extractive AMS**

AMS having the detection unit in the gas stream or in a part of it

[EN 14181:2004, 3.15]

2.17**outlier**

observation that lies an abnormal distance from other values in a set of data, and therefore has a low probability of being a valid data point

2.18**period of unattended operation**

maximum admissible interval of time for which the performance characteristics will remain within a predefined range without external servicing, e.g. refill, calibration, adjustment

[EN 14181:2004, 3.16]

2.19**peripheral AMS or SRM**

measuring system or SRM used to gather the data required to convert the measured values to standard reference conditions, i.e. AMS or SRM for moisture, temperature, pressure and oxygen

[EN 14181:2004, 3.17]

2.20**precision**

closeness of agreement of results obtained from the AMS for successive zero readings and successive span readings at defined time intervals

[EN 14181:2004, 3.18]

2.21**reference material**

material simulating a known concentration of the input parameter, by use of surrogates and traceable to national standards

NOTE Surrogates normally used are calibration gasses, gas cells, gratings or filters.

[EN 14181:2004, 3.19]

2.22

response time

time taken for an AMS to respond to an abrupt change in value of the air quality characteristic

[EN 14181:2004, 3.20]

2.23

span reading

instrument reading of the AMS for a simulation of the input parameter at a fixed elevated concentration

[EN 14181:2004, 3.21]

NOTE 1 This simulation is intended to test as much as possible all the measuring elements of the system, which contribute significantly to its performance.

NOTE 2 The span reading is approximately 80% of the measurement range.

2.24

standard conditions

conditions as given in the EU-directives to which measured values have to be standardised to verify compliance with the emission limit values

[EN 14181:2004, 3.22]

2.25

standard deviation

positive square root of: the mean squared deviation from the arithmetic mean divided by the number of degrees of freedom

NOTE The number of degrees of freedom is the number of measurements minus 1.

[EN 14181:2004, 3.23]

2.26

standard reference method

SRM

method described and standardised to define an air quality characteristic, temporarily installed on site for verification purposes

NOTE Also known as a reference method.

[EN 14181:2004, 3.24]

2.27

uncertainty

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

[EN 14181:2004, 3.25]

2.28

variability

standard deviation of the differences of parallel measurements between the SRM and AMS

[EN 14181:2004, 3.26]

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2.29

zero reading

instrument reading of the AMS on simulation of the input parameter at zero concentration, which tests as much as possible all the measuring elements of the AMS, that contribute significantly to its performance

NOTE Adapted from EN 14181:2004, 3.23.

3 Symbols and abbreviations

3.1 Symbols

a	intercept of the calibration function
b	slope of the calibration function
C	mass concentration in mg/m^3
D_i	difference between measured SRM value y_i and calibrated AMS value \hat{y}_i
\bar{D}	average of D_i
E	emission limit value
E_{otm}	extinction of the optical transmission monitor
i	index
k_v	test value for the variability test based on a χ^2 -test, with a β -value of 50 %, for N numbers of paired measurements
L	control limit value
L_{mp}	length of the measurement path in m
m_0	target value (chart centre line)
n	number of checks
N	number of paired samples in parallel measurements
P	percentage value
R^2	correlation coefficient
s_{AMS}	standard deviation of the AMS at zero and span level
s_D	standard deviation of the differences D_i in parallel measurements
$t_{0,95}$	students t -factor for a confidence level of 95 %
x_i	i^{th} measured signal obtained with the AMS
y_i	i^{th} measured result obtained with the SRM
\hat{y}_i	best estimate for the true value, calculated from the AMS measured signal x_i by means of the calibration function
y_{span}	span value
Z	critical value in the Grubbs's test
Z_i	test value of i^{th} data pair in the Grubbs's test
z_i	weighted average taking the past and the last check into account
λ	smoothing parameter