PD CEN/TS 17198:2018

BSI Standards Publication

Stationary source emissions - Predictive Emission Monitoring Systems (PEMS) - Applicability, execution and quality assurance

National foreword

This Published Document is the UK implementation of CEN/TS 17198:2018.

The UK participation in its preparation was entrusted to Technical Committee EH/2/1, Stationary source emission.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2018

ISBN 978 0 580 97069 6

ICS 13.040.99

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 August 2018.

Amendments/corrigenda issued since publication

Date	Text affected

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 17198

August 2018

ICS 13.040.99

English Version

Stationary source emissions - Predictive Emission Monitoring Systems (PEMS) - Applicability, execution and quality assurance

Émission des sources fixes - Systèmes prédictifs de suivi des émissions atmosphériques - Applicabilité, mise en oeuvre et assurance qualité

Emissionen aus stationären Quellen - Systeme zur Bestimmung von Emissionen mittels kontinuierlich überwachter Prozessparameter (PEMS) - Eignung, Anwendung und Qualitätssicherung

This Technical Specification (CEN/TS) was approved by CEN on 16 March 2018 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

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.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. CEN/TS 17198:2018: E

Contents

Page

European foreword ..... **iv**

Introduction ..... **v**

1 Scope **7**

2 Normative references **7**

3 Terms and definitions **7**

4 Symbols and abbreviations **9**
4.1 Symbols 9
4.2 Abbreviations 10

5 Certification requirements for PEMS software **11**
5.1 General 11
5.2 Relation to EN 15267-1 12
5.3 Relation to EN 15267-2 12
5.4 Certification of PEMS software — performance criteria and test procedures 12
5.4.1 Introduction 12
5.4.2 General requirements 13
5.4.3 Laboratory testing 14
5.4.4 Field testing 16

6 Performance requirements for a PEMS **19**
6.1 General 19
6.2 Applicability of PEMS 19
6.3 PEMS performance 19
6.3.1 PEMS building data 19
6.3.2 PEMS operating envelope 20
6.3.3 Uncertainty of PEMS 20
6.4 Sensor validation 25
6.4.1 General 25
6.4.2 Sensor maintenance procedures 25
6.4.3 Sensor validation procedures 25
6.4.4 Sensor validation input parameters 25
6.4.5 Sensor validation output frequency 26
6.4.6 Sensor validation uncertainty 26
6.4.7 Use of reconciled data generated by the sensor validation system 26
6.5 Emission model integrity 26
6.6 PEMS documentation 26
6.6.1 General 26
6.6.2 Description of the installation and plant 26
6.6.3 Description of PEMS applicability 27
6.6.4 Description of the PEMS 27
6.6.5 Description of the quality assurance system 27
6.6.6 Description of the PEMS maintenance 27

7 Quality assurance requirements for a PEMS **27**
7.1 General 27
7.2 QAL1 28
7.3 QAL2 28
7.3.1 Functional test 28
7.3.2 Validation 28
7.3.3 Initial validation 29
7.3.4 Initial check 29
7.3.5 Collection of data for model building and initial validation in one period 29
7.4 QAL3, regular checking of the PEMS 30
7.5 Annual surveillance test 30
7.5.1 General 30

7.5.2 Validity and variability test 30
7.6 Reporting on quality assurance 30

8 Maintenance of a PEMS 30
8.1 Routine PEMS checks 30
8.2 Incidental PEMS maintenance 31
8.3 Documentation of maintenance 31

Annex A (informative) **Example of a PEMS report for a NO_x PEMS for a steam boiler 32**

Annex B (informative) **Testing PEMS uncertainty when using reconciled data 44**

Annex C (informative) **Flow chart of quality assurance requirements 45**

Bibliography 50

European foreword

This document (CEN/TS 17198:2018) has been prepared by Technical Committee CEN/TC 264 “Air quality”, the secretariat of which is held by DIN.

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

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to announce this Technical Specification: 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.

Introduction

Predictive emission monitoring systems (PEMS) are used for continuous monitoring of emissions at stationary sources as an alternative and/or backup for automated measuring systems (AMS). PEMS define the relationship between a number of characteristic process parameters of an emission source and the corresponding emission concentration. If the characteristic process parameters are continuously monitored it is possible with a PEMS to continuously determine the emission concentration of the emission source.

PEMS are deduced using process data and, where required, emission data from the emission source. Using these data the PEMS is modelled. PEMS contains an emissions model and a sensor validation system for quality assurance of incoming process data.

PEMS are plant-specific emission monitoring systems and vary as regards to methodology and design:

— relational models (emission concentration as a function of one or more process parameters): theoretical or empirical relations that are fitted to a plant-specific emission data set;

— nonlinear statistical models, e.g. neural network models, or other multiple regression techniques.

Where a component or process is specifically stated, the reference is provided as an example.

The range of application of PEMS is limited to plants with well-defined fuels and operating conditions, using inherent emission control systems. If multiple fuels are used all fuel variations are reflected in the emission model. Using inherent emission control systems means not having a downstream emission abatement system.

PEMS is illustrated in Figure 1. It consists of:

— PEMS software, which is certified according to an EN 15267 procedure, with the exceptions stated in this Technical Specification;

— PEMS emissions model, which is documented by a QAL1 and validated by a QAL2 procedure according to EN 14181, with the exceptions stated in this Technical Specification;

— PEMS sensor validation system, which is documented by a QAL1 and validated by a QAL2 procedure according to EN 14181, with the exceptions stated in this Technical Specification.

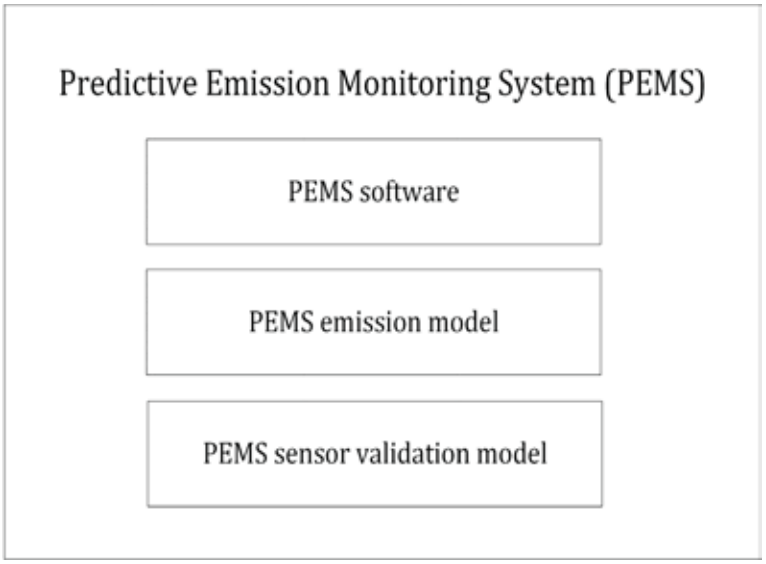

Figure 1 — Predictive emission monitoring system

PEMS software used for building, operating and quality assuring PEMS is illustrated in Figure 2.

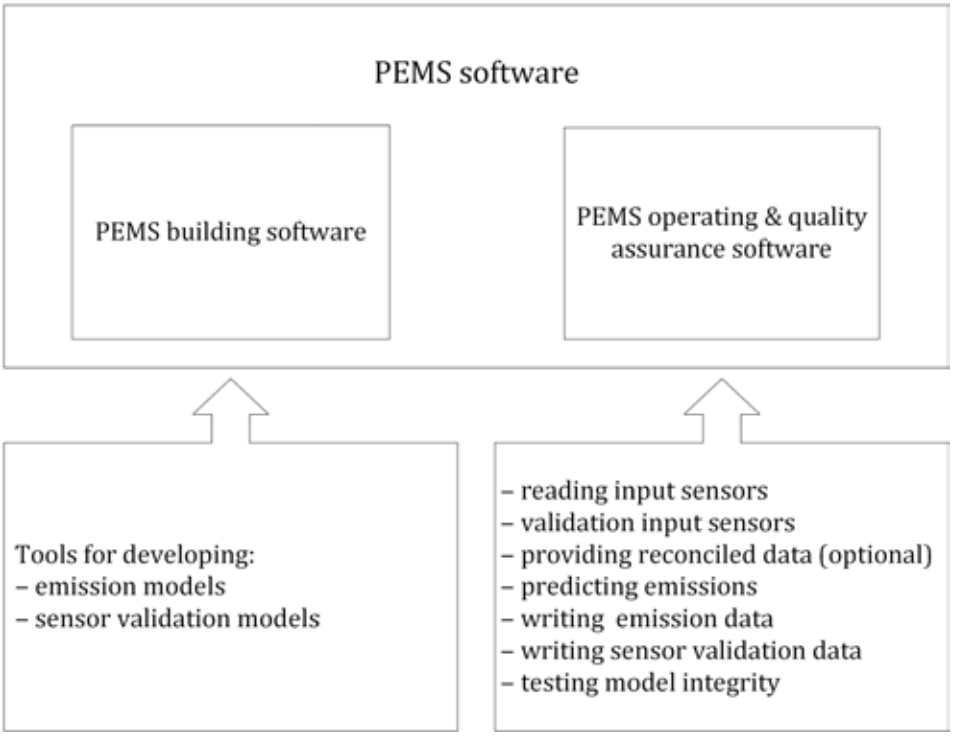

Figure 2 — PEMS software

This Technical Specification does not provide requirements for PEMS hardware. If the PEMS requires specific hardware, relevant standards for certification of PEMS hardware are used.

1 Scope

This Technical Specification gives requirements for the certification of PEMS software and for the performance and quality assurance for a PEMS to prove suitability for its measuring task and to ensure that the PEMS continues to perform within the specified performance during operation of the PEMS.

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 14181, *Stationary source emissions — Quality assurance of automated measuring systems*

EN 15267-1:2009, *Air quality — Certification of automated measuring systems — Part 1: General principles*

EN 15267-2:2009, *Air quality — Certification of automated measuring systems — Part 2: Initial assessment of the AMS manufacturer's quality management system and post certification surveillance for the manufacturing process*

EN 15267-3, *Air quality — Certification of automated measuring systems — Part 3: Performance criteria and test procedures for automated measuring systems for monitoring emissions from stationary sources*

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

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

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

VDI 4201 *Part 1:2010, Performance criteria on automated measuring and electronic data evaluation systems for monitoring emissions — Digital interface — General requirements*

VDI 4201 *Part 2:2014, Performance criteria on automated measuring and electronic data evaluation systems for monitoring emissions — Digital interface — Specific requirements for Profibus*

VDI 4201 *Part 3:2012, Performance criteria on automated measuring and electronic data evaluation systems for monitoring emissions — Digital interface — Specific requirements for Modbus*

VDI 4201 *Part 4:2012, Performance criteria on automated measuring and electronic data evaluation systems for monitoring emissions — Digital interface — Specific requirements for OPC*

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
automated measuring system
AMS
measuring system permanently installed on site for continuous monitoring of emissions or measurement of peripheral parameters

Note 1 to entry: An AMS is a method which is traceable to a reference method.