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de l'accréditation, de la sécurité et qualité
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ILNAS-EN 17507:2021

**Road vehicles - Portable Emission
Measuring Systems (PEMS) -
Performance assessment**

Véhicules routiers - Systèmes portatifs de
mesure des émissions (PEMS) -
Vérification de la performance

Straßenfahrzeuge - Mobile
Abgasmesssysteme (PEMS) -
Leistungsbewertung

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National Foreword

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**Road vehicles - Portable Emission Measuring Systems
(PEMS) - Performance assessment**

Véhicules routiers - Systèmes portatifs de mesure des
émissions (PEMS) - Vérification de la performance

Straßenfahrzeuge - Mobile Abgasmesssysteme (PEMS)
- Leistungsbewertung

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European foreword

This document (EN 17507:2021) has been prepared by Technical Committee CEN/TC 301 “Road vehicles”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by March 2022, and conflicting national standards shall be withdrawn at the latest March 2022.

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.

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Introduction

The intention of this document is to determine the measurement uncertainty of mobile vehicle exhaust emission testing equipment (e.g. Portable Emissions Measurement Systems, PEMS) under consideration of applicable legal requirements (e.g. European Legislation on Light-Duty Real Driving Emission measurement, RDE).

The specific aims include the following:

- To be able to assess PEMS (for gaseous and particle number emissions) under various operating environments with the intention of predicting PEMS performance and uncertainty over the whole range of conditions used. For the time being, it focusses on light-duty-vehicle application and serves as a basis for assessing the uncertainty of heavy-duty emission measurement using PEMS.
- To be able to evaluate the deviation of gaseous PEMS under various light-duty on-road test conditions and heavy-duty PEMS test conditions against known analyser systems under standard laboratory conditions for the specified gas, which is traceable to national or international primary standards.
- To be able to evaluate the deviation of Particle Number (PN) - PEMS under various light-duty on-road test conditions and heavy-duty PEMS test conditions against a known analyser system under standard laboratory conditions for the same sample, which is traceable to national or international primary or secondary standards.
- To define the means for demonstrating that the PEMS equipment is stable and the measurement quality is sufficient between PEMS equipment service intervals.
- To provide input to the development of future specifications and quantified information about instrument and process accuracy to help improve the accuracy and robustness of PEMS systems and on-road measurements.
- To set a framework for determining the measurement uncertainty by analysing available data and providing a method for data evaluation.

In particular, the derivation of the uncertainty according to all parts of the document allows the following:

- The instrument measurement uncertainty can be evaluated.
- The instrument measurement uncertainty on-road can be reported as a part of the measurement result following ISO 10012:2003.
- The results of an investigation based on this document provides information about the suitability of the equipment for the intended use.
- Transparency with respect to the instrument measurement uncertainty of currently available equipment.
- Transparency with respect to the testing processes for the measurement uncertainty.
- Assessment of the statistical significance of the difference of measurement results.

1 Scope

This document defines the procedures for assessing the performance of test equipment that is used for the on-road measurement of tailpipe emissions of light-duty vehicles, on the basis of a common test procedure that simulates the range of conditions experienced during on-road tests.

This document prescribes:

- the tests to be conducted, and
- a procedure to determine, for any type of PEMS equipment, an appropriate uncertainty margin to reflect its performance over those conditions.

The key test variables are as follows (but not limited to the ones mentioned):

- a) temperature, humidity and pressure (including step-wise or gradual changes),
- b) acceleration and deceleration (longitudinal and lateral),
- c) vibration, inclination and shock tests,
- d) instrument positioning on a vehicle,
- e) combinations of (a) to (d),
- f) cross-interferences,
- g) signal-processing, data treatment and time alignment, and
- h) calculation methods (excluding the regulatory post-processing of data).

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 ISO 29463 (all parts), *High-efficiency filters and filter media for removing particles in air (ISO 29463 (all parts))*

ISO 27891:2015, *Aerosol particle number concentration - Calibration of condensation particle counters*

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

3 Terms, definitions and symbols

3.1 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 <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1.1**analyser**

component of a Measurement Module(s) for detecting the gaseous or particle emission concentrations

Note 1 to entry: The type is defined by the specific analyser model and the applied analytical principle or the combination of multiple analytical principles.

3.1.2**filtered air**

air filtered with a high efficiency filter according to EN ISO 29463-1, class 35H

3.1.3**inspection decision**

result of an inspection

3.1.4**inspection****inspection process**

conformity evaluation by observation and judgement accompanied as appropriate by measurement, testing or gauging

3.1.5**limit of error****maximum permissible error**

extreme value of measurement error, with respect to a known reference quantity value, permitted by specifications or regulations for a given measurement, measuring instrument, or measuring system

3.1.6**measurement standard**

realization of the definition of a given quantity, with stated quantity value and associated measurement uncertainty, used as a reference

3.1.7**measuring and test equipment**

device used for making measurements, alone or in conjunction with one or more supplementary devices

3.1.8**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

3.1.9**measurement uncertainty**

non-negative parameter characterizing the dispersion of the quantity values being attributed to a measurand, based on the information used

3.1.10**module**

discrete or integrated sub-component within a PEMS, which supports the analyser(s) with the necessary supplementary components to fulfil the necessary requirements for each pollutant being measured