

STN P	Ochrana ovzdušia Hodnotenie výkonnosti snímačov kvality ovzdušia Časť 2: Častice vo vonkajšom ovzduší	STN P CEN/TS 17660-2 83 5740
------------------	--------------------------------------------------------------------------------------------------------------------------	------------------------------------------------

Air quality - Performance evaluation of air quality sensor systems - Part 2: Particulate matter in ambient air

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 02/25

Táto predbežná slovenská technická norma je určená na overenie. Prípadné pripomienky pošlite do decembra 2026 Úradu pre normalizáciu, metrológiu a skúšobníctvo Slovenskej republiky.

Obsahuje: CEN/TS 17660-2:2024

140034



TECHNICAL SPECIFICATION

CEN/TS 17660-2

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

December 2024

ICS 13.040.20

English Version

Air quality - Performance evaluation of air quality sensor systems - Part 2: Particulate matter in ambient air

Qualité de l'air - Évaluation des performances des systèmes capteurs de la qualité de l'air - Partie 2 :
Particules dans l'air ambiant

Luftbeschaffenheit - Leistungsbewertung von Luftqualitätssensorsystemen - Teil 2: Partikelförmige Stoffe in der Außenluft

This Technical Specification (CEN/TS) was approved by CEN on 6 October 2024 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

CEN/TS 17660-2:2024 (E)

Contents	Page
European foreword	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Symbols and abbreviations	10
5 Principle of the evaluation	13
6 Performance requirements	17
7 General requirements for the performance of tests	19
8 Laboratory tests of sensor system	19
9 Field tests	21
10 Classification based on the test results	31
11 Test report	32
Annex A (informative) Co-location of sensor systems, deployment and management of a network of sensor systems	36
A.1 Background	36
A.2 Co-location and deployment	36
A.2.1 Individual sensor systems	36
A.2.2 Sensor networks	37
A.3 Calibration and validation of networks	39
Annex B (informative) Evaluation of the effect of electromagnetic fields on the sensor system measurements	40
Annex C (informative) Air composition in different outdoor type of sites	41
Annex D (informative) Selecting the climate for a field trial site	45
Annex E (normative) Ordinary least square regression formulae	47
(informative) Values for $u_{(bs, RM)}$	49
Annex F (informative) Example of field tests for the classification process	52
Annex G (informative) PM testing chamber design for validating coarse particle measurements	54
Bibliography	55

European foreword

This document (CEN/TS 17660-2:2024) 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.

CEN/TS 17660, *Air quality — Performance evaluation of air quality sensor systems* consists of the following parts:

- *Part 1: Gaseous pollutants in ambient air*
- *Part 2: Particulate matter in ambient air*

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

CEN/TS 17660-2:2024 (E)**Introduction**

Sensor systems are generally seen as emerging measuring devices for the monitoring of air quality. Sensor systems provide a fast and low-cost complement to the reference and equivalent measurement methods as defined in Directive 2008/50/EC on ambient air quality and cleaner air for Europe [1]. Sensor systems could allow for air pollution monitoring at a lower cost and with a higher spatial density than with the reference and equivalent measurement methods. They also allow for new air pollution applications including monitoring in complex topographies, at traffic junctions, in street canyons, at remote sites, on mobile platforms (pedestrians, cyclists, vehicles, trams) and for citizen science studies, e.g. monitoring around areas of local concern, schools, or parks.

Sensor systems use one or more low-cost sensors that are based on several technologies. However, sensor systems share two common features, portability and low-cost, compared with traditional reference or equivalent measurement methods. Typically, sensor systems can continuously monitor air pollution with fast response times ranging from a few tens of seconds to a few minutes.

Currently, the use of sensor systems for air quality monitoring is limited by the low accuracy of measurements that they can achieve. Additionally, there was no unambiguous protocol for evaluating sensor systems with a structured metrological approach, ensuring traceability from sensor system measurements to national and international standards. A protocol will enable exhaustive and transparent evaluation of sensor systems that can be an important step towards including sensor system measurements into the monitoring of air quality for regulatory and non-regulatory purposes.

The protocol in this document applies to sensor systems and supports the requirements of Directive 2008/50/EC. This procedure evaluates whether the measurement uncertainty of the sensor system meets the data quality objectives defined in Directive 2008/50/EC for indicative measurements. This protocol also allows for a less demanding evaluation of the performance of sensor systems for non-regulatory measurements.

This document defines common procedures and requirements for the evaluation of the performance of sensor systems to facilitate mutual recognition by the relevant bodies or stakeholders and thereby minimise both administrative and cost burdens on manufacturers. It does not describe the roles and responsibilities of manufacturers, test laboratories and relevant bodies under these procedures.

1 Scope

This document specifies the general principles, including testing procedures and requirements, for the classification of performance of low-cost sensor systems for the monitoring of particulate matter in ambient air at fixed sites. The classification of sensor systems includes tests that are performed under prescribed conditions. It does not guarantee performance in locations that are different from the tests, variations in meteorological climate from the test programme or account for stability over time, which can only be assessed under ongoing quality control strategies.

The described procedure is applicable to the determination of the mass concentration of particulate matter. The pollutants that are considered in this document are PM₁₀ and PM_{2,5} in the range of concentrations expected in ambient air.

This document provides a classification that is consistent with the requirements for indicative measurements and objective estimation defined in Directive 2008/50/EC. In addition, it provides a classification for applications (non-regulatory measurements) that require more relaxed performance criteria.

This document applies to sensor systems used as individual systems. It does not apply to sensor systems as part of a sensor network. However, for some applications (e.g. in cities) sensor systems are deployed as part of a sensor network. Annex A provides information on the use of sensor systems as nodes in a sensor network.

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 15267-1, *Air quality - Assessment of air quality monitoring equipment - Part 1: General principles of certification*

EN 15267-2, *Air quality - Assessment of air quality monitoring equipment - Part 2: Initial assessment of the manufacturer's quality management system and post certification surveillance for the manufacturing process*

EN 16450, *Ambient air — Automated measuring systems for the measurement of the concentration of particulate matter (PM₁₀; PM_{2,5})*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN