



SLOVENSKI STANDARD
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Prezračevanje stavb - Preskusni postopki in merilne metode za predajo klimatskih in prezračevalnih sistemov ter klimatskih sistemov za prezračevanje nestanovanjskih stavb

Ventilation for buildings - Test procedures and measurement methods to hand over air conditioning and ventilation systems and air conditioning systems for non-residential buildings

Lüftung von Gebäuden - Prüf- und Messverfahren für die Übergabe raumluftechnischer Anlagen und Luftbehandlungssysteme in Nichtwohngebäuden

Ventilation des bâtiments - Modes opératoires d'essai et méthodes de mesure pour la réception des systèmes de ventilation et de conditionnement d'air et des systèmes de conditionnement d'air pour les bâtiments non résidentiels

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ICS:

91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning systems
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Ventilation for buildings - Test procedures and measurement methods to hand over air conditioning and ventilation systems and air conditioning systems for non-residential buildings

Ventilation des bâtiments - Procédures d'essai et méthodes de mesure pour la réception des installations de conditionnement d'air et de ventilation

Lüftung von Gebäuden - Prüf- und Messverfahren für die Übergabe raumluftechnischer Anlagen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 156.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

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

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prEN 12599:2024 (E)**European foreword**

This document (prEN 12599:2024) has been prepared by Technical Committee CEN/TC 156 “Ventilation for buildings”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 12599:2012.

This document includes the following significant technical changes with respect to EN 12599:2012:

- the scope was modified so that EN 12599 applies for non-residential buildings. It was deleted that it can be used for residential buildings. The procedures specified can support handing over and inspections of systems.
- the normative references have been updated;
- the air flow measurement methods were transferred to EN 16211;
- the method of measuring the ductwork air tightness according to the air tightness classes of EN 16798-3 was included;
- Annex C on the determination of the extend of functional checks in measurements for e.g. similar locations was revised. New sampling levels based on sampling errors were specified;
- Annex D was included in Clause 8 “Measurements”;
- the surface area calculation of ductworks was included as new Annex D;
- “Special measurements” were renamed to “Additional measurements”;
- the determination of the measurement uncertainty was revised.

Introduction

The measurement methods and procedures presented in this document are specified in such a way that they are particularly suitable for the handover of ventilation and air conditioning systems even though verification of the fitness for purpose of the installed ventilation systems and air conditioning systems can be useful in different stages of the life cycle of ventilation systems. That means not only the stage of handing over. Due to the accessibility, for some measurements it might be of advantage to perform them during installation (e.g. air tightness).

The measuring methods in this document in connection with document EN 16211 are applicable in the frame of the energy inspection of air-conditioning systems according to EN 16798-17 and CEN/TR 16798-18.

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prEN 12599:2024 (E)**1 Scope**

This document specifies checks, measurement methods and procedures in order to verify the fitness for purpose of the installed ventilation systems and air conditioning systems according to design.

It establishes a procedure intended to technically support the handing over and inspection of these systems.

This document enables the choice between checks and measurements when sufficient, and additional measurements, when necessary.

This document applies to mechanical ventilation systems (including the mechanical part of hybrid systems) and full and (partial) air conditioning systems in non-residential (parts of) buildings.

This document does not apply to:

- heat generating systems and their control;
- refrigerating systems and their control;
- distribution of heating and cooling medium to the air handling units;
- compressed air supplying systems;
- water conditioning systems;
- central steam generating systems for air humidifying;
- electric supply systems.

This document is not applicable to ventilation systems and air conditioning systems for industrial or other special process environments.

2 Normative references

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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 16211, *Ventilation for buildings - Measurement of air flows on site - Methods*

EN 16798-3, *Energy performance of buildings - Ventilation for buildings - Part 3: For non-residential buildings - Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4)*

EN ISO 7730, *Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria (ISO 7730)*

JCGM 100, *Evaluation of measurement data — Guide to the expression of uncertainty in measurement*

3 Terms and definitions

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

ISO and IEC maintain terminology 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 handover

process of transferring responsibility for an installation to another person or organization

3.2 check

examination of something, without resorting to measurements, in order to make certain that it is correct or the way it should be

3.3 administrative check

check of documentation and specifications of an installation

3.4 completeness check

check of the completeness and the arrangement of an installation

3.5 functional check

check of the operation of a primary function of an installation

Note 1 to entry: An example of primary function of a ventilation installation is to provide air flow rate.

3.6 balancing

process of adjusting the flow rates in each circuit of an installation to meet the specifications

4 Test and check procedure

To verify the fitness of purpose of an installed system by checks and measurements it is necessary to specify performance criteria for the checks and measurements (e.g. maximal permissible errors, sample selection) as well as for the installation (e.g. tolerances). Annex F gives a list of specifications.

The following steps shall be carried out in the given order:

- a) completeness checks;
- b) functional checks;
- c) measurements;
- d) additional measurements;
- e) report.

In general, functional checks and measurements on the system are performed for each component of the system. For same kind of components at comparable locations and operation conditions the functional checks and measurements may be performed on a sample selection. The extent of functional checks and measurements shall be determined according to Annex C.

Ensure the system is running in adjusted and safe condition.

The additional measurements in accordance with Clause 9 and Annex E shall be carried out only when required and especially agreed.

The steps of the checks, measurements and report are shown in Table 1.

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Table 1 — List of checks, measurements and report to verify the quality of the systems

Required steps	Purpose	Activities	Annexes
Administrative check	Verify that the documentation of the installation is complete	Check the Completeness of documents 1. Specifications 2. Inventory 3. operation and maintenance 4. measurement reports	Annex A
Completeness checks	Ensure that the ventilating and air conditioning system has been installed entirely in accordance with contract	1. Comparison of equipment with the design 2. Compliance with technical rules (contract and official) 3. Balancing 4	Annex A
Functional checks	Verify the operation of the system	1. Put system into use 2. Operation of components and system 3. Accessibility 4. Cleanliness	Annex C Determination of extent Annex B Survey of performance of components and systems
Measurements	Verify on a statistical basis that the system achieves the values according to design	1. Determine which measurements and recordings are necessary 2. Extent of measurements, specified by means the sampling level SL 3. Measurements 4. Accompanying measurements (see 8.5) 5. Air tightness	Annex C Determination of extent
Additional measurements (if necessary)	In case of doubts concerning the quality of the system or parts of the system additional measurements can be applicable.	1. Determine which measurements and recordings are necessary 2. Determine uncertainty of the measurements 3. Measurements	Annex E Additional measurements
Report See Clause 9		1. Report 2. Handing over the report	Annex A Example of completeness check report

5 Administrative check

Prior to inspection, checks and measurements of the installation on site the administrative check of the available documents shall be done.

It shall be checked whether all relevant documents are available, including

- A list of all specifications;
- all inventory documents;
- all documents necessary for operation, maintenance;
- the balancing reports;
- the existing reports of measurements (e.g. the air tightness test) if any.

Details of the administrative check are included in Annex A.

6 Completeness check

The completeness check is intended to ensure that installation is done according to specification and in compliance with the relevant technical rules.

The following checks are included:

- Comparison of the delivered system with the specification, with regard to amount, number of pieces and material and, if necessary, also with regard to characteristics and spare parts;
- Comparison of the delivered system with the specification, with regard to location of material and components;
- Comparison of the delivered system with the specification, with regard to arrangement of the installation;

Check that the balancing has been done according to the report.

An example description of the completeness check is included in Annex A.

7 Functional checks

The purpose of the functional check is to verify the operation of installation in different operational conditions in compliance with the relevant technical rules and the specification. The check shows whether the particular elements of the system such as filters, fans, heat exchangers, coolers, humidifiers etc. have been properly installed.

In the case of occupancy control or demand control it should be checked if the reaction of the system to changes of sensor value is in accordance with the design requirements.

Functional checks shall be carried out on all types of installed equipment.

Before starting the checks, a checklist should be drawn up.

The extent of functional checks is specified in Annex C.

The locations for the checks should be specified.

Instruction for the procedure and a list of functional checks are given in Annex B.

8 Measurements

8.1 General

The purpose of the measurements is to verify that the system achieves the design conditions and set points as specified.

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Together with the measurements results, the measurement conditions shall be recorded according to the measurement procedures in 8.4.

When measurements take place at other conditions than design conditions they may be converted into temperature and pressure design conditions.

If some of the tests are already done prior to the handing over the documentation should be verified in the administrative check.

8.2 Range of measurements

Table 2 indicates which measurements are necessary for each type of ventilation and air conditioning system.

The extent of measurements is defined in Annex C.

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Table 2 — Measurements

		Total system	Central system/appliance				Duct-work	Room					
Type of systems/Functions		Additional cleanliness test	Current drawn and power by the motor	air flow ^a	air temperature ^a	pressure drop across filter	ductwork leakage test	Supply air flow (mechanical)	extract air flow (mechanical)	supply air temperature ^b	supply air humidity	sound pressure level	Indoor air velocity
Ventilation System	Z	2	2	1	0	1	2	1	1	0	0	2	2
	H	2	2	1	1	1	2	1	1	2	0	2	2
	C	2	2	1	1	1	2	1	1	2	2	2	2
	M/D	2	2	1	1	1	2	1	1	2	1	2	2
Partial air conditioning system	HC	2	2	1	1	1	2	1	1	1	2	2	2
	HM/HD/CM/CD	2	2	1	1	1	2	1	1	1	1	2	2
	MD	2	2	1	1	1	2	1	1	2	1	2	2
	HCM/MCD/CHD/HMD	2	2	1	1	1	2	1	1	1	1	2	2
Full air conditioning system	HCMD	2	2	1	1	1	2	1	1	1	1	2	2
Explanations													
Figures 0–2 indicate the relevance of a measurement in order to verify the fitness of purpose of the system.													
0 measurement not relevant													
1 required measurement													
2 optional measurement													
C cooling													
D dehumidification													
H heating													
M humidification (moisture)													
Z without any thermodynamic functions (zero)													
^a Outdoor air, supply and exhaust air													
^b Depending on control principles, if relevant													

8.3 Procedure

Before starting the measurement, the measuring locations shall be specified and the procedures and measuring devices shall be agreed upon and given in the technical documents.

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The number of measuring points in a room should take into account the floor area and the measured parameters. At least one measuring position is required for measurements in rooms of area up to 20 m²; larger rooms should be subdivided accordingly. For the measurements in the room, the measuring positions in the occupied zone shall be agreed on between the parties concerned, preferably at positions intended for intensive occupancy.

With regard to the selection of the measuring instruments the overall uncertainty shall be taken into account.

The indoor climate factors and air flow rates, heating, cooling and humidifying performances, electrical characteristics and other design data shall be measured at the ventilation system design air flow rate. The expanded measurement uncertainty of the measured values is given in Table 3.

Table 3 — Expanded measurement uncertainty U of measurands

Measurand	Expanded measurement uncertainty U^a
Air flow rate, each individual room	±15 %
Air flow rate, each system	±10 %
Supply air temperature	±2 °C
Relative humidity [RH]	±15 % RH
Air velocity in occupied zone	±0,05 m/s
Air temperature in occupied zone	±1,5 °C
A-weighted sound pressure level in the room	±3 dBA
^a This document does not define tolerances for the design values itself.	

Lower expanded measurement uncertainties can be required. This should be defined in the documentation of the system.

8.4 Measuring methods and measuring devices

8.4.1 General

In the case of measurements in ducts and air conditioning systems with negative pressure, measurement error due to an air infiltration by the opening made for the insertion of the measuring device should be avoided.

In any case, the openings in the ducts shall be sealed after measuring.

Take into account that weather conditions may influence the measurement and measurement uncertainty.

8.4.2 Measurement of the air flow rate

The air flow rate can be evaluated by different methods according to EN 16211.

The air flow rate of the ventilation system is measured in the duct or system and the following methods can be used:

- Fixed devices for air flow rate measurement, or
- Multi-point measurement in the duct cross-section with or without measurement plane criteria.