

STN	Vetranie budov. Meranie objemového prietoku vzduchu vo vetracích systémoch. Metódy.	STN EN 16211
		12 8022

Ventilation for buildings - Measurement of air flows on site - Methods

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. 10/15

Obsahuje: EN 16211:2015

121734

Úrad pre normalizáciu, metrológiu a skúšobníctvo SR, 2015

Podľa zákona č. 264/1999 Z. z. v znení neskorších predpisov sa môžu slovenské technické normy rozmnrožovať a rozširovať iba so súhlasom Úradu pre normalizáciu, metrológiu a skúšobníctvo SR.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 16211

July 2015

ICS 17.120.10; 91.140.30

English Version

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

Systèmes de ventilation pour les bâtiments - Mesurages de
débit d'air dans les systèmes de ventilation - Méthodes

Lüftung von Gebäuden - Luftvolumenstrommessung in
Lüftungssystemen - Verfahren

This European Standard was approved by CEN on 5 March 2015.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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, 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

Contents	Page
Foreword	4
1 Scope	5
2 Normative references	5
3 Terms, definitions and symbols	5
3.1 Terms and definitions	5
3.2 Symbols	5
4 Principles and parameters of influence	7
4.1 Hydraulic diameter	7
4.2 Flow disturbances	7
4.3 Air density, ρ	7
4.4 Dynamic pressure, p_d	7
4.5 Corrections for air density, ρ	8
5 Sources of errors	8
5.1 General	8
5.2 Systematic errors	9
5.3 Random errors	10
6 Measurement uncertainty	10
6.1 Overall measurement uncertainty	10
6.2 Standard instrument uncertainty, u_1	11
6.3 Standard method uncertainty, u_2	11
6.4 Standard reading uncertainty, u_3	11
6.5 Expanded measurement uncertainty, U_m	11
7 Measurement requirements	12
7.1 Method requirements and corrections	12
7.2 Measurements using a manometer	12
7.3 Measurements using an anemometer	13
7.4 Measurements using Pitot static tube	13
7.5 Measuring temperature and barometric pressure	13
7.6 Mean value calculation of measurement signal	13
8 Methods for measurement of air flows in ducts – ID (In Duct) methods	13
8.1 Overview of recommended methods	13
8.2 Point velocity measurements using a Pitot static tube (method ID 1) or an anemometer (method ID 2)	14
8.2.1 Method description	14
8.2.2 Preparations to be made at the site of measurement	15
8.2.3 Measurement procedure	18
8.2.4 Corrections of measured values and calculation of air flow	19
8.2.5 Standard method uncertainty	20
8.3 Fixed devices for flow measurement – Method ID 3	20
8.3.1 Method description	20
8.3.2 Preparations of measurements — Equipment	20
8.3.3 Measurement procedure	21
8.3.4 Correction of measured values	21
8.3.5 Standard method uncertainty	21
8.4 Tracer gas measurement – Method ID 4	21
8.4.1 Method description	21
8.4.2 Equipment	22
8.4.3 Calculation of air flow	23
8.4.4 Standard measurement uncertainty	23
8.4.5 Conditions for homogeneous mixing of tracer gas	24

9	Methods for measurement of air flows in Supply ATDs (air terminal devices) – ST (Supply (Air) Terminal (Devices)) methods	25
9.1	Overview of recommended methods	25
9.2	Measurement of reference pressure – Method ST 1	25
9.2.1	Introduction	25
9.2.2	Equipment.....	26
9.2.3	Correction of measured values	26
9.2.4	Standard method uncertainty	27
9.3	Measurement with tight bag – Method ST 2.....	27
9.3.1	Method description	27
9.3.2	Limitations	27
9.3.3	Equipment.....	27
9.3.4	Preparation	28
9.3.5	Measurement	28
9.3.6	Correction of measured values	28
9.3.7	Standard method uncertainty	28
9.4	Measurements with flow hood – Method ST 3	28
9.4.1	Introduction	28
9.4.2	Equipment.....	29
9.4.3	Measurement	30
9.4.4	Correction of measured values	31
9.4.5	Standard method uncertainty	31
10	Methods for Exhaust ATDs (air terminal devices) – ET (Exhaust (Air) Terminal (Devices)) methods	32
10.1	Overview of recommended methods	32
10.2	Measurement of reference pressure at exhaust ATD – Method ET 1	32
10.2.1	Method description	32
10.2.2	Limitations	33
10.2.3	Equipment.....	33
10.2.4	Correction of measured values	33
10.2.5	Standard method uncertainty	34
10.3	Measurement using a flow hood – Method ET 2.....	34
10.3.1	Introduction	34
10.3.2	Equipment.....	34
10.3.3	Measurement	35
10.3.4	Correction of measured values	36
10.3.5	Standard method uncertainty	36
Annex A (informative) Uncertainties.....	37	
A.1	Examples of calculations	37
A.2	Compound uncertainties.....	38
A.3	Example of applications	38
Bibliography	39	

Foreword

This document (EN 16211:2015) has been prepared by Technical Committee CEN/TC 156 "Ventilation for buildings", the secretariat of which is held by BSI.

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 January 2016, and conflicting national standards shall be withdrawn at the latest by January 2016.

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

Measurement methods which are both correct and easy to use are developed and standardized to enable the commissioning and operational monitoring of air processing installations. Interior climate and air quality can often be improved considerably if the heating and ventilation system is managed in a way that ensures good functioning in the long term. It is thus important that the system is designed and constructed to allow measurement and monitoring to be performed using established and approved methods.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: 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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies simplified methods for the measurement of air flows on site. It provides a description of the air flow methods and how measurements are performed within the margins of stipulated method uncertainties.

One measurement method is to take point velocity measurements across a cross-section of a duct to obtain the air flow. This simplified method is an alternative to the method described in ISO 3966 and EN 12599. This European Standard requests certain measurement conditions (length of straight duct and uniform velocity profile) to be met to achieve the stipulated measurement uncertainties for the simplified method.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12792, *Ventilation for buildings — Symbols, terminology and graphical symbols*

EN 14277, *Ventilation for buildings — Air terminal devices — Method for airflow measurement by calibrated sensors in or close to ATD/plenum boxes*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN