BS EN 16445:2013



BSI Standards Publication

Ventilation for buildings — Air diffusion — Aerodynamic testing and rating for mixed flow application: non-isothermal procedure for cold jet

bsi.

...making excellence a habit.™

Document Sharing Hub

Full document details: BS EN 16445:2013

National foreword

This British Standard is the UK implementation of EN 16445:2013.

The UK participation in its preparation was entrusted to Technical Committee RHE/2, Ventilation for buildings, heating and hot water services.

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.

© The British Standards Institution 2013. Published by BSI Standards Limited 2013

ISBN 978 0 580 75374 9

ICS 91.140.30

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

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2013.

Amendments issued since publication

Date	Text affected

AVA Documents
Document Sharing Hub

Full document details: BS EN 16445:2013

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16445

February 2013

ICS 91.140.30

English Version

Ventilation for buildings - Air diffusion - Aerodynamic testing and rating for mixed flow application: non-isothermal procedure for cold jet

Ventilation des bâtiments - Bouches d'air - Essais aérodynamiques et étalonnage pour applications de fluides mixtes pour les essais non-isothermes pour jet froid

Lüftung von Gebäuden - Luftverteilung - Aerodynamische Prüfung und Bewertung von Mischstromanwendungen: Nicht-isothermes Verfahren für einen Kaltluftstrahl

This European Standard was approved by CEN on 8 December 2012.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

© 2013 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Ref. No. EN 16445:2013: E

Documents
Document Sharing Hub

Full document details: BS EN 16445:2013

Contents

Page

Foreword 3

1 Scope 4

2 Normative references 4

3 Terms and definitions 4

4 Symbols (and abbreviated terms) 6

5 Requirements 7
5.1 Instrumentation 7
5.1.1 Air flow rate measurement 7
5.1.2 Temperature measurements 7
5.1.3 Velocity measurements 7
5.2 Test room and conditions 7
5.3 ATD isothermal characteristics 7

6 Test to measure the non isothermal air discharge characteristics of a supply ATD 8
6.1 Installation of ATD 8
6.2 Test procedure for horizontal cold jet 10
6.2.1 Test conditions 10
6.2.2 Preliminary conditions prior to formal measurement 10
6.2.3 Measurements 11

7 Report 19
7.1 Test conditions 19
7.2 Results 19

Bibliography 21

Documents
Document Sharing Hub

Full document details: BS EN 16445:2013

Foreword

This document (EN 16445:2013) 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 August 2013, and conflicting national standards shall be withdrawn at the latest by August 2013.

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.

According to the CEN/CENELEC Internal Regulations, the national standards organisations 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.

AVA Documents
Document Sharing Hub

Full document details: BS EN 16445:2013

1 Scope

This European Standard specifies methods for the laboratory aerodynamic testing and rating of air terminal devices for mixed flow applications, including the specification of suitable test facilities and measurement techniques. This standard applies to laboratory testing of ATD for technical characterisation.

The standard gives only tests for the assessment of characteristics of the air terminal devices for mixed flow applications, under non-isothermal conditions with a cold jet. It does not cover the testing of isothermal or low velocity terminal devices which are covered by other published standards.

This European Standard applies to ventilation or air conditioning systems designed for the maintenance of comfort conditions for buildings. It is not applicable in the case of systems for the control of industrial or other special process environments. In the latter case however, it may be referred to if the system technology is similar to that of the above mentioned ventilation and air conditioning systems.

The principles described in this European Standard can also be used on site or in a lab for full-scale measurements.

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 12238, *Ventilation for buildings — Air terminal devices — Aerodynamic testing and rating for mixed flow application*

EN 12239, *Ventilation for buildings — Air terminal devices — Aerodynamic testing and rating for displacement flow applications*

EN 13182, *Ventilation for buildings — Instrumentation requirements for air velocity measurements in ventilated spaces*

3 Terms and definitions

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

3.1
supply air
air entering a supply air terminal device from an upstream duct

3.2
exhaust air
air leaving an exhaust air terminal device into a downstream duct

3.3
local measured mean air velocity
measured value of local airstream velocity as described in EN 12238

3.4
treated space
enclosure served by an air distribution system; in this standard this is the test room

Documents
Document Sharing Hub
Full document details: BS EN 16445:2013

3.5
envelope
geometrical surface in a treated space where the local measured air velocity has the same value and is the reference velocity (generally 0,5 m/s) associated with this envelope

3.6
throw (for a supply air terminal device)
maximum distance between the centre of the core and a plane which is tangent to a specified envelope, such as 0,25 $m.s^{-1}$, 0,5 $m.s^{-1}$, etc. and the centre of the ATD

3.7
drop (for a supply air terminal device)
vertical distance between the lowest horizontal plane tangent to a specified envelope, such as 0,25 $m.s^{-1}$, 0,5 $m.s^{-1}$, etc., and the centre of the ATD

3.8
rise (for a supply air terminal device)
vertical distance between the highest horizontal plane tangent to a specified envelope, such as 0,25 $m.s^{-1}$, 0,5 $m.s^{-1}$, etc., and the centre of the ATD

3.9
spread (for a supply air terminal device)
maximum distance between two vertical planes tangent to a specified envelope, such as 0,25 $m.s^{-1}$, 0,5 $m.s^{-1}$, etc., and perpendicular to a plane through the centre of the ATD

Note 1 to entry: There may be two different spreads, not always equal: One for the left side, the other for the right side (considered when looking at the treated space from the supply air terminal device).

3.10
distance to maximum spread
distance from the centre of the ATD to the maximum spread determined

3.11
separation distance
for cold jet with Coanda effect on ceiling, distance between the centre of the ATD and the point where the jet separates from the ceiling to drop

3.12
supply temperature
temperature of air in supply ATD

3.13
room air temperature
arithmetical average value of room air temperature measured in the occupied zone outside the envelope of the jet

3.14
temperature quotient
ratio of the local temperature difference at point x and at the point of discharge

$$\theta_Q = \Delta\theta_x / \Delta\theta_0$$

where

$\Delta\theta_0$ is the temperature difference between supply and room air

$\Delta\theta_x$ is the temperature difference between the point of maximum velocity in the distance x from the ATD and room air

Documents
Document Sharing Hub
Full document details: BS EN 16445:2013

3.15
free area
A_f
sum of the minimum measured areas at each opening in the ATD through which air can pass

3.16
effective area
A_k
effective area in the ATD measured as described in EN 12238

3.17
effective velocity
v_k
effective velocity in the ATD measured as described in EN 12238

4 Symbols (and abbreviated terms)

Symbol	Quantity	SI unit
h h_1 h_2…	Distances from ceiling at which measurements are made on vertical sections	m
Δp	Pressure difference (for a pressure difference device)	Pa
q_v	Volume rate of flow	$m^3.s^{-1}$
v	Velocity	$m.s^{-1}$
v_x	Maximum mean velocity at distance x from centre of supply air terminal device	$m.s^{-1}$
x	Distance from supply ATD along the centreline of the jet	m
x_s	Separation distance	m
X	Throw	m
Y	Spread	m
Z	Drop	m
θ_Q	Temperature quotient	
$\Delta\theta_0$	Temperature difference between supply and room air	K
$\Delta\theta_x$	Temperature difference between the point of maximum velocity in the distance x from the ATD and room air	K
ρ	Density of air	$kg.m^{-3}$
A_f	Free area of the ATD	m^2
A_k	Effective area of the ATD (k factor area)	m^2
A_d	Area corresponding to the cross section of the nominal size of the duct to which the device is fitted (neck area)	m^2
b_R	Test room width (Figure 1)	m
h_R	Test room height (Figure 1)	m
l_R	Test room length (Figure 1)	m
R	Area parameter that relates to the effective size of the ATD (see EN 12238)	m^2
S	Linear parameter that relates to the effective size of the ATD (see EN 12238)	m
v_k	Effective velocity in the ATD $\left(\frac{q_v}{A_k}\right)$	$m.s^{-1}$

Documents
Document Sharing Hub
Full document details: BS EN 16445:2013