SLOVENSKI STANDARD
SIST-TS CEN/TS 17153:2018

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Prezračevanje stavb - Korekcija pretoka zraka glede na okoljske pogoje

Ventilation for buildings - Correction of air flow rate according to ambient conditions

Lüftung von Gebäuden - Korrektur des Luftstroms entsprechend der Umgebungsbedingungen

Ventilation des bâtiments - Correction du débit d'air en fonction des conditions ambiantes

Ta slovenski standard je istoveten z: **CEN/TS 17153:2018**

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91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning systems

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TECHNICAL SPECIFICATION

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English Version

Ventilation for buildings - Correction of air flow rate according to ambient conditions

Ventilation des bâtiments - Correction du débit d'air en fonction des conditions ambiantes

Lüftung von Gebäuden - Korrektur des Luftstroms entsprechend der Umgebungsbedingungen

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European foreword

This document (CEN/TS 17153:2018) has been prepared by Technical Committee CEN/TC 156 “Ventilation for buildings”, the secretariat of which is held by BSI.

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Introduction

The formula to correct the air flow rate depending on ambient conditions that is stated in some standards published by CEN/TC 156 is not correct. This document gives a correct formula and the way it has been obtained. CEN/TC 156 working groups are invited to use the content of this document in their standards. Those working groups can use the correct formula only or more depending on the level of explanation needed for the understanding of their standards.

1 Scope

This document gives guidelines to correct the measured air flow rate when measuring conditions are different from standard conditions.

It applies to a power-law formula giving the air flow rate as a function of a pressure difference with an air flow rate coefficient, *C*, varying with temperature and pressure.

This document applies to:

— passive elements of air distribution systems with a cross-section area that does not depend on pressure;

— volume flow rate (and not mass flow rate).

This document is applicable to (but not limited to):

— EN 1507, *Ventilation for buildings — Sheet metal air ducts with rectangular section — Requirements for strength and leakage*;

— EN 1751, *Ventilation for buildings — Air terminal devices — Aerodynamic testing of damper and valves*;

— EN 12237, *Ventilation for buildings — Ductwork — Strength and leakage of circular sheet metal ducts*;

— EN 13141-1, *Ventilation for buildings — Performance testing of components/products for residential ventilation — Part 1: Externally and internally mounted air transfer devices*;

— EN 13141-2, *Ventilation for buildings — Performance testing of components/products for residential ventilation — Part 2: Exhaust and supply air terminal devices*;

— EN 13141-9, *Ventilation for buildings — Performance testing of components/products for residential ventilation — Part 9: externally mounted humidity controlled air transfer device*;

— EN 13141-10, *Ventilation for buildings — Performance testing of components/products for residential ventilation — Part 10: humidity controlled extract air terminal device*;

— EN 15727, *Ventilation for buildings — Ducts and ductwork components, leakage classification and testing*.

This document does not apply to:

— fans;

— air terminal devices with automatically controlled openings (variable openings).

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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12792 apply.

4 Symbols, abbreviations and subscripts

For the purposes of this document, the symbols, abbreviations and subscripts given in EN 12792 and those listed in Table 1 apply.

Table 1 — Symbols, abbreviations and subscripts

Symbol	Designation	Unit
C	air flow rate coefficient	$m^3/(s \cdot Pa^n)$
Δp	relative pressure	Pa
μ	dynamic viscosity	kg/(m·s)
n	flow exponent	—
p_a	atmospheric pressure	Pa
q_v	air flow rate	m^3/s
ρ	air density	kg/m^3
T	air temperature	K
Subscript	**Designation**	**Unit**
meas	related to air flowing through the measurement device	—
test	related to air flowing through the product under test	
ref	related to reference conditions	—

5 Correction of air flow rate

The correction of air flow rate should be applied when the measurement is made in volume flow rate. In case the measurement is done in mass flow rate, the measured mass flow rate should be converted in volume flow rate before applying the correction.

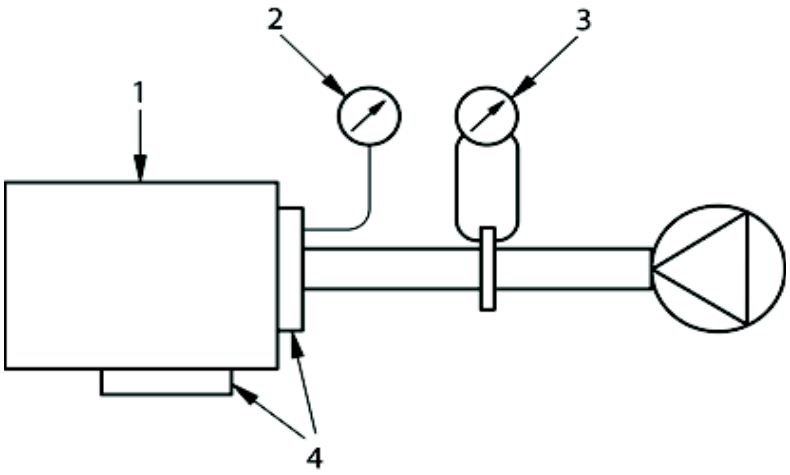
Considering the document in reference [5], the air flow rate in an air distribution system can be written following Formula (1) with symbols of Table 1.

$$q_v = C \cdot \Delta p^n \tag{1}$$

Considering reference [5]:

$$C \text{ is proportional to } \frac{\rho^{n-1}}{\mu^{2n-1}} \tag{2}$$

Figure 1 gives the arrangement for leakage measurement in technical ductwork products.



Key

1 product under test (with T_{test} and p_{test} relating to the temperature and pressure conditions of the air flowing through the product under test (1))

2 manometer

3 air flow meter (with T_{meas} and p_{meas} relating to the temperature and pressure conditions of the air flowing through the air flow meter (3))

4 end caps

Figure 1 — Arrangement for leakage measurement in technical ductwork products

Air flow rate coefficient, C, can be transposed from test conditions seen by the product under test to reference conditions using Formula (3).

$$\frac{C_{test}}{C_{ref}} = \left(\frac{\rho_{test}}{\rho_{ref}}\right)^{n-1} \cdot \left(\frac{\mu_{ref}}{\mu_{test}}\right)^{2n-1} \tag{3}$$

The density varies with atmospheric pressure, p_a, and temperature, T, as shown in Formula (4) using the ideal gas law.

$$\rho = \rho_{ref} \cdot \left(\frac{p_a}{p_{aref}}\right) \cdot \left(\frac{T_{ref}}{T}\right) \tag{4}$$

The dynamic viscosity, μ, only varies with temperature according to Formula (5).

$$\mu = \left(17{,}1 + 0{,}048 \cdot (T - 273{,}15)\right) \cdot 10^{-6} \tag{5}$$

For a given relative pressure, Δp, Formula (6) gives the air flow rate correction.

$$q_{vref} = q_{vtest} \cdot \frac{C_{ref}}{C_{test}} \tag{6}$$

In addition, mass conservation leads to Formula (7)

$$q_{vtest} = q_{vmeas} \cdot \frac{\rho_{meas}}{\rho_{test}} \tag{7}$$

By inserting Formula (7) in Formula (6), Formula (8) is obtained.