

International Standard



5220

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Air distribution and air diffusion — Aerodynamic testing and rating of constant and variable dual or single duct boxes and single duct units

Distribution et diffusion d'air — Méthodes d'essais aérauliques et présentation des caractéristiques des boîtes à simple ou double conduit, à débit fixe ou réglable, et des appareils à simple conduit

First edition — 1981-12-15

UDC 697.922 : 533.6.08

Ref. No. ISO 5220-1981 (E)

Descriptors : air flow, flow rate, air duct, air diffusion, air terminal devices, flow measurement, pressure measurement, temperature measurement, symbols, tests.



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5220 was developed by Technical Committee ISO/TC 144, *Air distribution and air diffusion*, and was circulated to the member bodies in November 1979.

It has been approved by the member bodies of the following countries :

Austria	Germany, F.R.	Sweden
Belgium	Italy	United Kingdom
Czechoslovakia	Korea, Rep. of	USA
Finland	Romania	
France	South Africa, Rep. of	

No member body expressed disapproval of the document.

Air distribution and air diffusion — Aerodynamic testing and rating of constant and variable dual or single duct boxes and single duct units

Section one :General

1 Scope

This International Standard specifies methods for the aerodynamic testing and rating of assemblies suitable for use with air distribution systems operating at high or low velocity and high or low pressure.

The tests included in this International Standard cover :

- a) leakage past a closed inlet valve or control valve;
- b) casing leakage;
- c) characteristics of the constant or variable flow rate controller;
- d) degree of temperature mixing achieved by a dual duct box;
- e) flow rate characteristics for single duct units.

These tests are designed to determine the performance of the assemblies and the results will enable the comparison of suitability of such assemblies when correctly installed in a high or low velocity/pressure air distribution system.

2 Field of application

The following tests are applicable to each class of equipment as indicated :

2.1 Dual duct boxes :

- a) test for control valve leakage;
- b) test for casing leakage;
- c) test for flow rate control (constant or variable);
- d) test for temperature mixing.

2.2 Single duct boxes :

- a) test for control valve leakage;
- b) test for casing leakage;
- c) test for constant flow rate control;
- d) test for variable flow rate control :
 - throughout the operating range;
 - if capable of being reduced to zero;
 - if fitted with an inlet valve.

NOTE — Assemblies with variable primary flow rate control devices with induced flow facilities (induction boxes) will be the subject of an addendum to this International Standard.

2.3 Single duct units :

- a) test for casing leakage;
- b) test for flow rate characteristics.

3 References

ISO 3258, *Air distribution and air diffusion — Vocabulary*.

ISO 5221, *Air distribution and air diffusion — Guide to methods of measuring air flow rate in an air handling duct*.¹⁾

4 Definitions

The definitions of terms used in this International Standard are in accordance with ISO 3258.

1) At present at the stage of draft.

5 Symbols and abbreviations

The following nomenclature is used throughout this International Standard :

5.1 Symbols

Table 1

Symbol	Quantity	Corresponding SI unit	Dimensions
A	Internal cross-sectional area of duct	m^2	L^2
D_e	Equivalent diameter $\sqrt{\frac{4A}{\pi}}$	m	L
p	Absolute static pressure	Pa	$\text{M L}^{-1} \text{T}^{-2}$
p_a	Atmospheric pressure	Pa	$\text{M L}^{-1} \text{T}^{-2}$
p_d	Velocity pressure $\rho \frac{v^2}{2}$	Pa	$\text{M L}^{-1} \text{T}^{-2}$
p_r	Stagnation (or absolute total) pressure	Pa	$\text{M L}^{-1} \text{T}^{-2}$
p_s	Static gauge pressure ($p - p_a$)	Pa	$\text{M L}^{-1} \text{T}^{-2}$
p_t	Total pressure ($p_r - p_a$)	Pa	$\text{M L}^{-1} \text{T}^{-2}$
Δp	Flow meter pressure difference	Pa	$\text{M L}^{-1} \text{T}^{-2}$
Δp_t	Conventional total pressure differential for an air density of $1,2 \text{ kg/m}^3$ at the inlet to the assembly under test	Pa	$\text{M L}^{-1} \text{T}^{-2}$
q_v	Volume rate of air flow at the flow meter	m^3/s	$\text{L}^3 \text{T}^{-1}$
q_{vL}	Leakage volume rate of air flow through a closed inlet valve or variable flow rate controller set for zero flow ¹⁾	m^3/s	$\text{L}^3 \text{T}^{-1}$
v	Velocity	m/s	L T^{-1}
Δy	Conventional value of energy loss per unit mass	J/kg	$\text{L}^2 \text{T}^{-2}$
ρ	Air density	kg/m^3	M L^{-3}
θ	Thermodynamic temperature	K	Θ
θ	Celsius temperature	$^{\circ}\text{C}$	θ

1) Or the appropriate measurable value, in suitable units, relating to the positional indication of the control valve, or the setting of the variable air flow rate controller, for electric, system-powered or other types of assembly.

5.2 Suffixes

- 1 is the inlet of the unit under test
- 2 is the outlet of the unit under test
- c is the cold side
- h is the hot side
- u is the measuring point upstream of the flow meter

Table 2

Range m^3/s	Accuracy of measurement %
From 0,07 to 7	2,5
From 0,007 to 0,07	5

Flow meters may be calibrated *in situ* by means of the pitot-static tube traverse techniques described in ISO 5221.

6.1.2 Leakage air flow meters shall have the following ranges and accuracies :

Table 3

Range m^3/s	Accuracy of measurement
Up to and including 0,018	0,000 9 m^3/s
More than 0,018	5 %

Alternatively, other devices such as variable-area, flow-rate meters or integrating air flow meters of the positive displacement type may be used if calibrated in accordance with the specifications given in 6.1.3 c).

6 Instrumentation

6.1 Air flow rate measurement

The air flow rate shall be measured using instruments in accordance with ISO 5221.

6.1.1 Air flow meters shall have the following ranges and accuracies :