INTERNATIONAL STANDARD ISO 5220-1981/ADDENDUM 1

Published 1984-09-01

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

ADDENDUM 1 : Variable primary flow rate control devices with induced flow facility

Distribution et diffusion de l'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
ADDITIF 1 : Régulateur de débit variable à entraînement d'air induit

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NOTE — This Addendum constitutes an annex to ISO 5220.

A.1 Introduction

This annex describes methods of test for variable air flow rate assemblies that are induction boxes. These are air control devices in which the secondary air flow from the surrounding space is induced by means of primary air in order to provide a substantially constant output flow rate, the control signal being provided by a thermostat or similar device.

The following methods of test are described :

— leakage tests (clause A.2);

— test to establish induced air flow rate and secondary air leakage (clause A.3);

— test of pressure requirement (clause A.4).

A.2 Leakage tests

A.2.1 Inlet valve leakage

A.2.1.1 Induction boxes with complete primary air shut-off shall be tested in a test rig as specified in ISO 5220, sub-clause 7.1.

A.2.1.2 Induction boxes without complete primary air shut-off do not require testing by inlet valve leakage tests.

A.2.2 Casing leakage

A.2.2.1 Casing leakage of an induction box may occur in two directions :

a) primary air may leak out of the high pressure section; and

b) secondary air may leak into the box after the nozzle, either through the closed induction damper or the box casing.

A.2.2.2 The casing leakage test is carried out to determine the leakage from the high pressure section of the box that may be subjected to pressure as a result of the pressure at the inlet duct. The high pressure section of the box shall be clearly defined and properly isolated during the test.

A.2.2.3 The high pressure section shall be tested and the results reported in accordance with ISO 5220, sub-clauses 7.2.1, 7.2.3 and 7.2.4.

A.2.2.4 The leakage test of the secondary air through the device casing or the closed air induction damper shall be carried out as described in clause A.3.

A.2.2.5 The secondary air leakage shall be reported.

A.3 Test to establish induced air flow rate and secondary air leakage

A.3.1 This test shall be conducted to determine the amount of air induced into the induction box at various primary air

UDC 697.922 : 533.6.08 Ref. No. ISO 5220-1981/Add. 1-1984 (E)

Descriptors : air distribution, air diffusion, air terminal devices, control devices, tests, performance tests, determination, air flow, flow rate, leak detection.

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Printed in Switzerland

Price based on 3 pages

ISO 5220-1981/Add. 1-1984 (E)

nozzle settings and various downstream duct resistances. The primary air nozzle setting of the box under test shall be indicated in the test data.

A.3.2 Downstream pressure measurements shall be taken in a test duct attached to the induction box outlet (see figure 7). The test duct shall be of size equal to the outlet and shall be a minimum of three equivalent diameters (D_e) in length. The plane in which pressure measurements are made in this test duct shall be at a location where uniform static pressure distribution exists within ± 10 % of the value at the measurement tapping. This plane shall be at a minimum distance of 2,5 equivalent diameters from the box outlet and a minimum distance of 0,5 equivalent diameters from the end of the duct.

A.3.3 The downstream pressure shall be referenced to the static pressure measured near to the induction damper, but outside the induced airstream (see figure 7).

A.3.4 The end of the test duct shall be fitted with a calibrated uniform resistance.

Calibration may be achieved using the primary air flow and with the induction damper and box casing sealed. Set the uniform resistance at the desired external downstream static pressure while maintaining the required primary air flow rate. Vary the primary air flow rate without adjustment of the resistance from 50 to 130 % of the operating primary air flow and prepare a calibration curve of downstream pressure against primary air flow rate.

The same procedure should be carried out for other settings of the uniform resistance.

A.3.5 With the control signal maintained for closed induction damper, unseal the induction damper and measure the primary air flow rate while maintaining the minimum inlet pressure measured in A.4.1 with the uniform resistance at the position of the previous calibration and measure the downstream pressure to determine the total air flow rate. The difference between the total air flow rate and the primary air flow rate is the secondary air leakage.

A.3.6 With the box adjusted to the maximum primary air flow rate setting, adjust the control signal to its maximum value. Maintain the inlet static pressure as in A.3.5, but without adjusting the uniform resistance. Measure the total air flow rate and primary air flow rate. The difference between the two flow rates is the induced air flow rate for the downstream pressure when measured as in A.3.3. Repeat the measurements for the control signal set at the mid- and minimum values.

A.3.7 Repeat the procedures specified in A.3.6 at both the mid- and maximum inlet pressures.

A.3.8 Repeat the procedures specified in A.3.6 and A.3.7 at the mid- and minimum primary flow rates.

A.3.9 Repeat the procedures specified in A.3.6, A.3.7 and A.3.8 for other settings of the uniform resistance.

A.3.10 Report the induced air flow rate and total air flow rate as percentages of the primary air flow rate for each condition tested.

A.4 Test of pressure requirement

A.4.1 This test determines the minimum total and static pressure differentials (Δp_t and Δp_s), in pascals, that is required at given primary air flow rates through the pressure reducing or modulating damper in the fully open position (with the secondary damper closed) for specific sizes and/or types of induction boxes. The air flow tested shall be through a single duct into the box, the box discharging to the atmosphere through a similar duct three equivalent diameters long, the duct being of size equal to the box outlet dimensions. The upstream test arrangement and the minimum operating pressure shall be in accordance with ISO 5220, clause 8.

NOTE — The pressure required to overcome the external downstream resistance from the box under test should be excluded from the minimum pressure requirement readings.

A.4.2 The pressure measurement in the outlet duct shall be performed in a plane a minimum of 2,5 equivalent diameters from the box outlet. A static pressure traverse in the plane of the pressure measurement shall be made to establish that the distribution of p_s is uniform within ± 10 % at the measurement tap with any flow rate between the median and maximum capacity, such traverse being made prior to each test.

A.4.2.1 The static pressure (p_s) shall be corrected to standard air conditions.

A.4.2.2 The velocity pressure (p_d) based on the average inlet and outlet duct velocities shall be added to the respective p_s values to determine total pressure (p_t) at both the inlet and the outlet connections to the box under test. The values of Δp_t and Δp_s shall be determined by subtracting the respective outlet pressures from the inlet pressures.

A.4.3 All normally open, pressure reducing or modulating dampers shall be set so that the rated air flow is through a single duct into the device and so that it discharges to the atmosphere through the outlet duct connection.

A.4.4 For each size and/or type of device under test, measurements shall be made at a minimum of three air flow rates (at approximately maximum, minimum and median capacities). The results of these tests shall be plotted to show the variation of the total and static pressure differentials (Δp_t and Δp_s) with flow rate.

A.4.5 If more than one size or number of pressure reducing valves or modulating dampers are normally fitted to any given size and/or type of induction box, a minimum of three tests shall be carried out in accordance with A.4.4 and recorded for each configuration.

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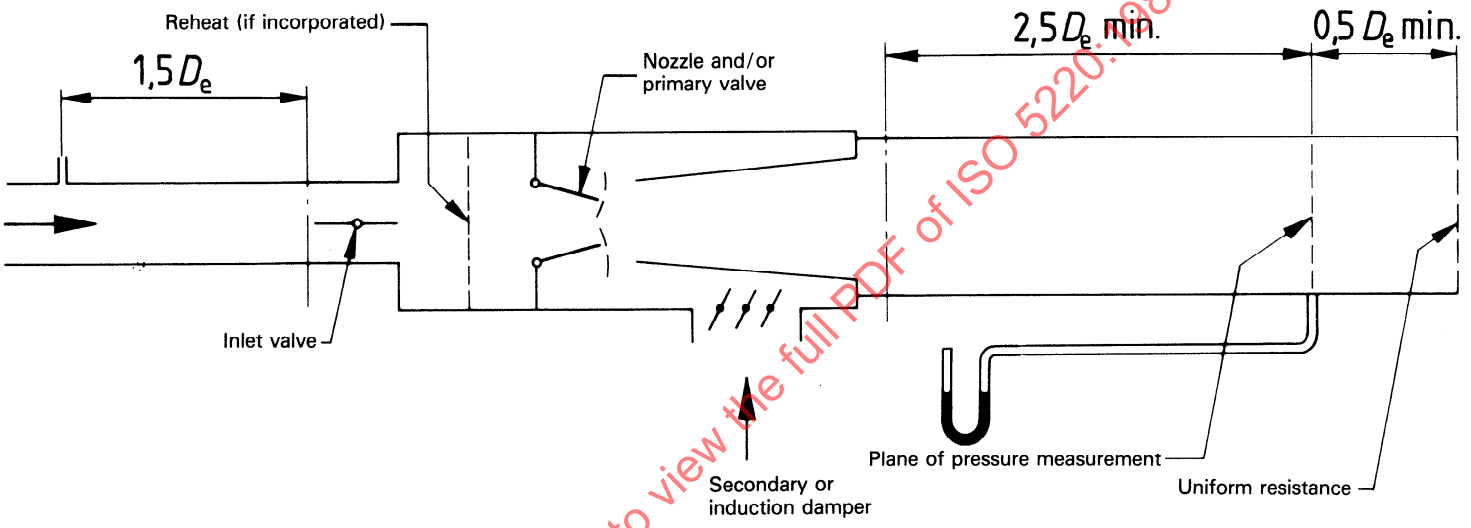

Figure 7 — Typical induction box test installation

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