Test report of
the measurement of the housing leakages

Customer: Aerotechnik Siegwart GmbH
Untere Hofwiesen
66299 Friedrichsthal

Test object: Airtight multi-leaf dampers, ID no. 255
W x H = 1000 mm x 669 mm, gear version

Test basis: DIN EN 1751, issue 01.99

Test date: 11-02-2009

Inspected by: Mahren (Graduate Engineer – Dipl. Ing. (FH))

Test report no.: L-SL-56-2/airtight multi-leaf dampers (class C)

No. of pages: 5

1. General information

Aerotechnik E. Siegwart GmbH, Friedrichsthal, commissioned us to inspect the housing leakages of an airtight multi-leaf damper (class C) in accordance with DIN EN 1751. The purpose of the test was to establish whether DIN EN 1751-C.3 requirements were met.

2. Description of the inspected system

The description of the inspected damper in accordance with the manufacturer’s specification is included in enclosure 1. The documents presented to us do not contain production tolerances.

3. Test structure and realisation of measurements

The test station structure was realised as illustrated in DIN EN 1751-illustration 2b. A diaphragm gas meter was used to measure the air volume and a differential pressure measuring instrument (Spezial Instruments) to measure the pressure.

4. Measuring results

Measuring results are listed in table 1 of the report.

The leakage air flows measured are less than values specified in DIN EN 1751 (as illustrated in table 1).

The test did not include an examination of type or design acceptance, an examination of endurance, material research or production inspection. The measuring results are only valid for the inspected damper.

Table 1

Housing leakages of multi-leaf damper in accordance with DIN EN 1751, class C

Dimensions W x H [mm x mm]	Perimeter [m]	Δp [Pa]	Free surface [m²]	Permissible leakage air flow $\left[\frac{l}{h \bullet m^2}\right]$	Measured leakage air flow $\left[\frac{l}{h \bullet m^2}\right]$
1000 x 669	3,338	1000	3,338	962	159,8

Table 2

List of measuring instruments employed:

Ser. no.	Measuring instrument designation	Measurement range	Measurement uncertainty	Calibrated yes/no	Comment
1	Diaphragm gas meter	0….10 m³/h	± 1,0% of measurement value	yes	
2	Micromanometer Manufacturer: SI	0....200 Pa 0….2000Pa	± 0,5% of measurement value	yes yes	

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Sulzbach, 18-02-2008

Building Services and Conveying Engineering
Assessor:

Signature

Mahren (Graduate Engineer – Dipl. Ing. (FH))

Enclosure
Manufacturer's description
Calculation example

TC

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Calculation example:

Airtight multi-leaf damper in accordance with DIN EN 1751, class C, 1000 mm x 669 mm

Width	1000 mm
Height	669 mm
Test pressure	1000 Pa
Free surface A	3,338 m²

Perimeter: 2 • 1,0 m + 2 • 0,669 m = 3,338 m

Equivalent length 1 m:

3,338 m • 1 m = 3,338 m²

Class C:

$0{,}003 \bullet p_t^{0{,}65} \bullet 10^{-3}\ m^3 \bullet s^{-1} \bullet m^{-2}$

In case of 1000 Pa:

$0{,}003 \bullet 1000^{0{,}65} \bullet 10^{-3}\ m^3 \bullet s^{-1} \bullet m^{-2}$

$0{,}2674 \bullet 10^{-3}\ m^3 \bullet s^{-1} \bullet m^{-2}$ corresponds to: $962\ l \bullet h^{-1} \bullet m^{-2}$

Measurement value: 533,7 l/h

Leakage:

V [l / h] / A [m²] = 533,7 / 3,338 • l / h • m² = 159,8 l / h • m²

159,8 l/ h • m² < 962 l / h • m²

$0{,}044 \bullet 10^{-3} \bullet m^3 \bullet s^{-1} \bullet m^{-2} < 0{,}2674 \bullet 10^{-3}\ m^3 \bullet s^{-1} \bullet m^{-2}$

Aerotechnik E. Siegwart GmbH

Description of the airtight multi-leaf damper (class 4) pursuant to DIN EN 1751

Type:	JL ID no. 255
Construction year:	2005
Width:	1000 mm
Hight:	669 mm
No. of blades:	4
Flange profile:	C-form, height 38 mm
Frame depth:	175 mm, gear version

The airtight multi-leaf damper consists of a frame made from Sendzimir galvanized sheet steel in which the individual blades are laterally mounted at 165 mm intervals with tolerance journal bearings (Sendzimir galvanized) in super polyamide bushings. These in turn are pressed into frame to form airtight seal.

The airtight bearing bushing pressed into the frame is hydroformed (extruded) in the sheet material of the frame side for improved fixing and covered on the outside with a grooved cap. The cap simultaneously forms a stop to prevent the bearing bushing from falling out and shifting. The holes for the bearings are mechanically punched and deep drawn so that the axial distance between the individual blades is maintained with an accuracy of + 0,1 mm relative to each other with regard to airtight requirements. One shaft is longer than the others. An actuation lever is secured to this shaft. The shaft passes through a plastic cover that has a hole with a narrower diameter, thus functioning as an airtight seal for the shaft diameter. Rotary motion is transmitted to the individual blades by an external linkage (opposite or same direction) fitted on one end of the blades. The linkage is put on form-locking shaft extensions and is fixed there. The gap seal between the blade and the frame is provided by a special seal component with a similar shape to the blade. This component is made of systhetic vinyl rubber-based closed-cell cellular plastic. The seal components are fitted on one side with foil as an anti-friction layer, enabling a slight rotary movement. The blade profile is rhombic, with one side having a U-shaped groove. The seal embedded in this U-shaped groove has a seal lip on its extreme end that compensates for any existing unevenness and assists sealing of the blades relative to each other.

The gap seal between the uppermost blade and upper frame and between lower blade and lower frame is provided with a special profile EPDM rubber that forms an airtight seal against the upper and lower frame when the multi-leaf damper is closed. The stop angle previously required on the upper and lower frame is thus dispended with in this design.

All damper movements are realised with a minimum wear factor, as rolling movements occur in part or suitable materials are used which do not cause any wear when they come into contact with each other.

The desired damper size is realised by adding or removing blades. Free selection of blade length enables an additional dimensioning option, so all damper sizes are, in principle, of the same structure and equipped with the same components. All parts are produced mechanically as serial components to ensure dimensional stability, a prerequisite for uniform quality of sealing where other dimensions are involved.

Friedrichsthal, 20-01-2005 Ku/wä