TÜV
SAARLAND

Test Report

Test centre:	TÜV Saarland e. V. Am TÜV 1 66280 Sulzbach
Test object:	Airtight multi-leaf damper (class 4), ID no. 255 W x H = 1000 mm x 669 mm, gear version
Customer:	Aerotechnik Siegwart GmbH Untere Hofwiesen 66299 Friedrichsthal
Scope of 2nd commission:	Measurement of the leakage air flow in accordance with DIN EN 1751
Test basis:	DIN EN 1751, issue 01.99
Test date:	31-03-2005
Inspected by:	Mahren (Graduate Engineer – Dipl. Ing. (FH))
Test report no.:	60404A0216/G airtight multi-leaf damper (class 4)
No. of pages.:	5

1. General information

Aerotechnik Siegwart GmbH, Friedrichsthal commissioned us to inspect the sealing characteristics of an airtight multi-leaf damper (class 4) in accordance with DIN EN 1751. The purpose of the test was to establish whether DIN EN 1751 requirements were met.

2. Description of the inspected system

The description of the inspected damper in accordance with the manufacturer's specifications 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 is illustrated in the enclosure. A diaphragm gas meter was utilised to measure the air volume and a differential pressure measuring instrument (SI) to measure the pressure.

4. Measuring results

Measuring results are listed in table 1 of the report.

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

The inspection described here was not intended as a type or design acceptance test, endurance test, material test or production inspection, and no requirement for such existed. The measurement results are only valid for the inspected damper.

Table 1

Airtight multi-leaf damper in accordance with DIN EN 1751, class 4

Dimensions W x H [mm x mm]	Blade [unit]	Δp [Pa]	V [m³/h]	Free surface [m²]	Permissible leakage air flow $[\frac{m^3}{h-m^2}]$	Measured leakage air flow $[\frac{m^3}{h-m^2}]$
1000 x 669	4	100	0.9232	0.669	5.8	1.38
		250	1.6658	0.669	9.2	2.49
		500	2.5088	0.669	12.8	3.75
		1000	4.1010	0.669	18.0	6.13

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 … 2000 Pa	± 0.5 % of measurement value	yes yes	

TÜV
SAARLAND

Sulzbach, 02-05-05

Building Services and Conveying Engineering
Assessor:

Signature

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

Enclosure
Manufacturer's description
Test structure
Calculation example

TC

Date:

Distributor:
File no.: 60404A0216
5 copies: Aerotechnik Siegwart; c/o H. Kuhn, Untere Hofwiesen, 66299 Friedrichsthal

Calculation example:

Airtight multi-leaf damper in accordance with DIN EN 1751, class 4

Width	1000 mm
Height	669 mm
Test pressure	1000 Pa
Free surface A	0.669 m²

Permissible leakage air flow q_{vLDA} in $l + s^{-1} \cdot m^{-2}$ from Fig. C 1 of DIN EN 1751 at a test pressure of 1000 Pa, class 4:

$q_{vLBA} = 5\ l - s^{-1} \cdot m^{-2}$, equivalent to $18\ m^3 \cdot h^{-1} \cdot m^{-2}$

Measurement value: $V = 4.1010\ m^3/h$

Leakage air flow:

$$q_{vLBA} = \frac{V[m^3/h]}{A[m^2]} = \frac{4.1010}{0.669} \cdot \frac{m^3}{h - m^2}$$

$$= 6.13\ m^3 \cdot h^{-1} \cdot m^{-2} < 18\ m^3 \cdot h^{-1} \cdot m^{-2}$$

Aerotechnik E. Siegwart GmbH

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

Type:	JL ID no. 255
Construction year:	2005
Width:	1000 mm
Height:	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 galvanised sheet steel in which the individual blades are laterally mounted at 165 mm intervals with tolerance journal bearings (Sendzimir galvanised) in super polyamide bushings. These in turn are pressed into the frame to form an 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 aluminium gears fitted on one end of the blades. The gear teeth are practically free of play. The gap seal between the gear and side frame is provided by a disk made of synthetic vinyl rubber-based closed-cell cellular plastic. The gap seal between the blade and the frame on the side with no gear is provided by a special seal component with a similar shape to the blade. This component is also made of synthetic vinyl rubber-based closed-cell cellular plastic. Both 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 the 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 dispensed with in this design.

All damper movements are realised with a minimum wear factor, as rolling movements occur in part or suitable materials are utilised 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