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2015-02-11
M104146/08 MRE/KRR

Fabric “HUSH“
Manufacturer Gabriel A/S

Determination of the airflow resistance according to EN 29053

Test Report No. M104146/08

Client:	Gabriel A/S Hjulmagervej 55 9000 Aalborg Denmark
Consultant:	Dipl.-Ing. (FH) Dominik Reif Dipl.-Ing. (FH) Eva Müller
Date of report:	2015-02-11
Delivery date of test objects:	2015-01-28
Date of test:	2015-02-09
Total number of pages:	In total 9 pages: 4 pages text, 3 pages Appendix A, and 2 pages Appendix B.

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1 Task

On behalf of Gabriel A/S, DK – 9000 Aalborg, the airflow resistance of three samples of the fabric type “HUSH” was to be determined according to EN 29053 [1].

2 Basics

This test report is based on the following document:

[1] EN 29053 “Acoustics – Materials for acoustical applications – Determination of airflow resistance”. March 1993

3 Test objects

The tested fabric is described in Table 1. The indicated characteristic values were determined by the testing laboratory on the basis of the sample.

Table 1. Test object.

Test object (manufacturer’s information)	**Area specific mass m'' [g/m²]**	**Thickness d [mm]**	**Appendix A, page**
Sample 1: fabric type “HUSH”, manufacturer Gabriel A/S material: 80 % polyester, 20 % viscose	189	1.15	1
Sample 2: fabric type “HUSH”, manufacturer Gabriel A/S material: 80 % polyester, 20 % viscose	192	1.20	2
Sample 3: fabric type “HUSH”, manufacturer Gabriel A/S material: 80 % polyester, 20 % viscose	185	1.15	3

4 Execution of measurements

The airflow resistance was determined according to EN 29053 [1].

The test method, the test facility and the test equipment used are described in Appendix B.

5 Measurement results

For the tested fabric type “HUSH” an average specific airflow resistance of

$$R_s = 101 \text{ Pa} \cdot \text{s/m}$$

was determined.

The determined air flow resistances of each of the three samples are shown in Table 2.

The measurement results are shown in diagrams and tables in the test certificate in Appendix A of this report.

Table 2. Determined airflow resistances of the fabric “HUSH”.

Test object	**Airflow resistance R_s [Pa · s/m]**	**Appendix A, page**
Sample 1: fabric type “HUSH”	101	**1**
Sample 2: fabric type “HUSH”	102	**2**
Sample 3: fabric type “HUSH”	99	**3**

6 Remarks

The test results exclusively relate to the investigated subjects and conditions described.

Dipl.-Ing (FH) Eva Müller

Dipl.-Ing. (FH) Dominik Reif

DAkkS Deutsche Akkreditierungsstelle D-PL-14119-07-00

Durch die DAkkS Deutsche Akkreditierungsstelle GmbH
nach DIN EN ISO/IEC 17025 akkreditiertes Prüflaboratorium.
Die Akkreditierung gilt für die in der Urkunde aufgeführten Prüfverfahren.

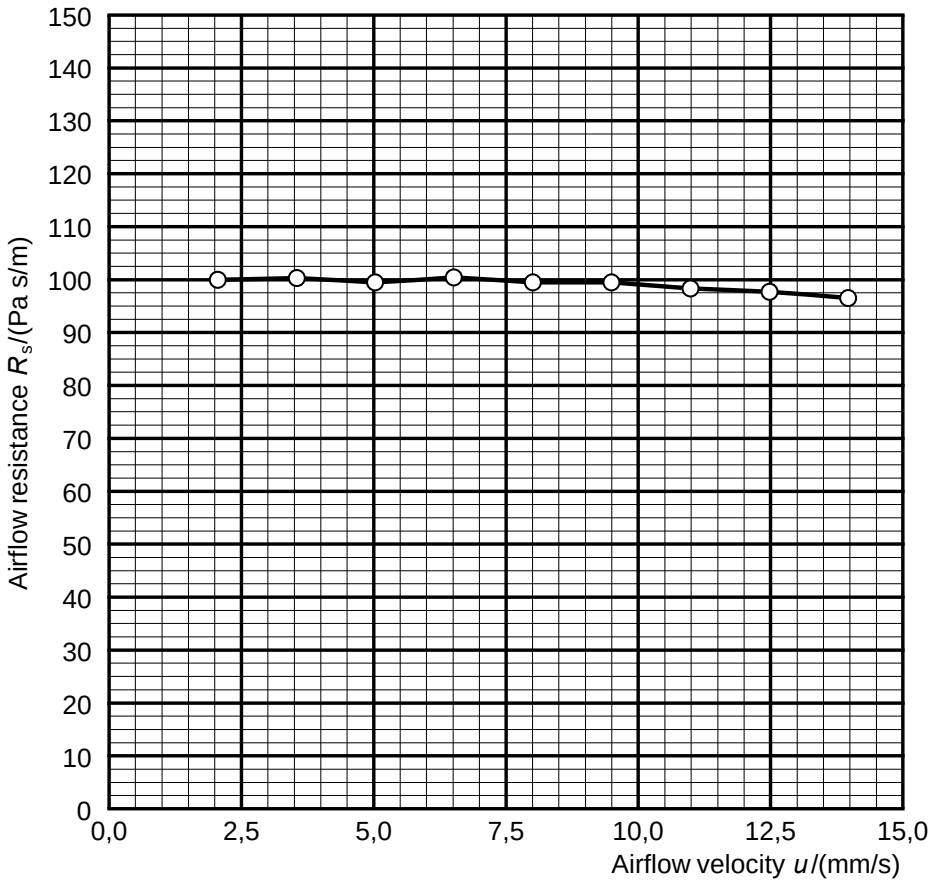
EN 29053
Determination of airflow resistance

Client: Gabriel A/S
Hjulmagervej 55
9000 Aalborg, Denmark
Project No.: M104146
Mueller-BBM Probe No.: 10056
Test object: fabric Hush, sample no. 01
colour: 60156
composition: 80 % polyester, 20 % viscose

Diameter: 100 mm
Thickness: 1.15 mm
Area-specific mass: 189 g/m²

Barometric pressure:
B = 94,6 kPa
Temperature:
θ = 22,8 °C
Relative humidity:
r. h. = 10,1 %

u/ (mm/s)	R_s/ (Pa s/m)
2.06	100
3.55	100
5.03	99
6.51	100
8.01	99
9.49	99
10.98	98
12.48	98
13.97	96



Airflow resistance R_s = 101 Pa s/m

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Laboratory: Planegg
Responsible: Dipl.-Ing. (FH) Eva Müller
Date: 2015/02/04

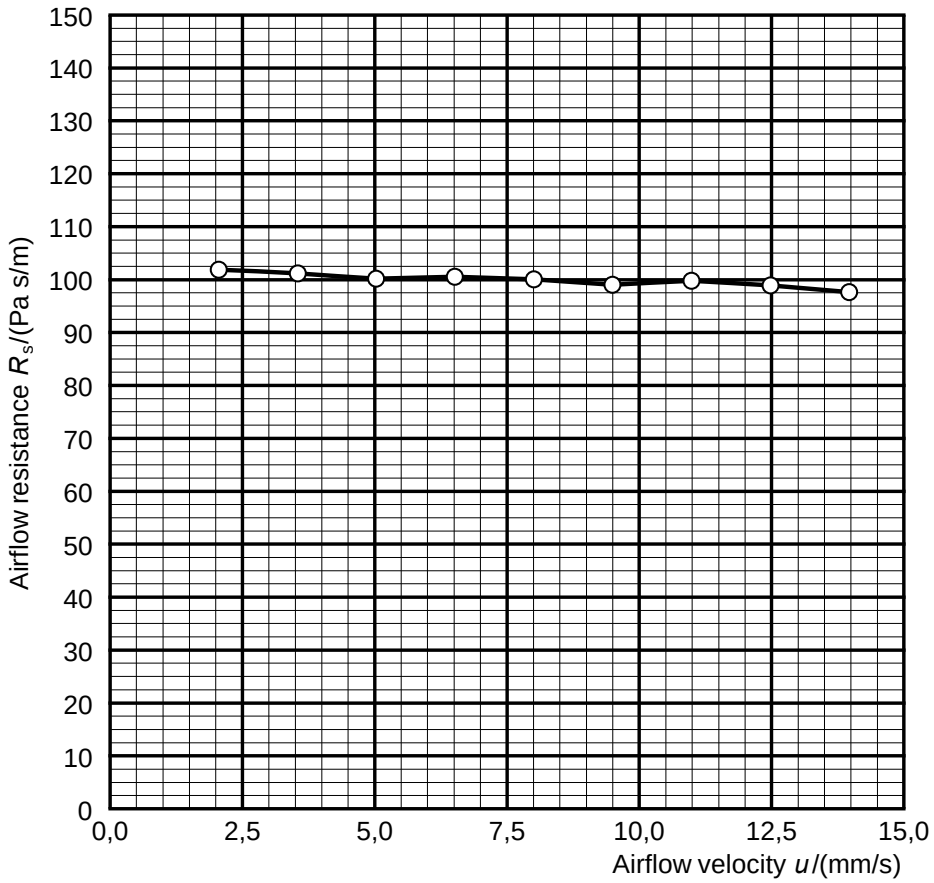
EN 29053
Determination of airflow resistance

Client: Gabriel A/S
Hjulmagervej 55
9000 Aalborg, Denmark
Project No.: M104146
Mueller-BBM Probe No.: 10057
Test object: fabric Hush, sample no. 02
colour: 60156
composition: 80 % polyester, 20 % viscose

Diameter:	100	mm
Thickness:	1.2	mm
Area-specific mass:	192	g/m^2

Barometric pressure:
B = 94,6 kPa
Temperature:
θ = 22,8 °C
Relative humidity:
r. h. = 10,7 %

u/ (mm/s)	R_s/ (Pa s/m)
2.06	102
3.55	101
5.03	100
6.51	101
8.01	100
9.49	99
10.98	100
12.48	99
13.96	98



Airflow resistance R_s = 102 Pa s/m

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Laboratory: Planegg
Responsible: Dipl.-Ing. (FH) Eva Müller
Date: 2015/02/04

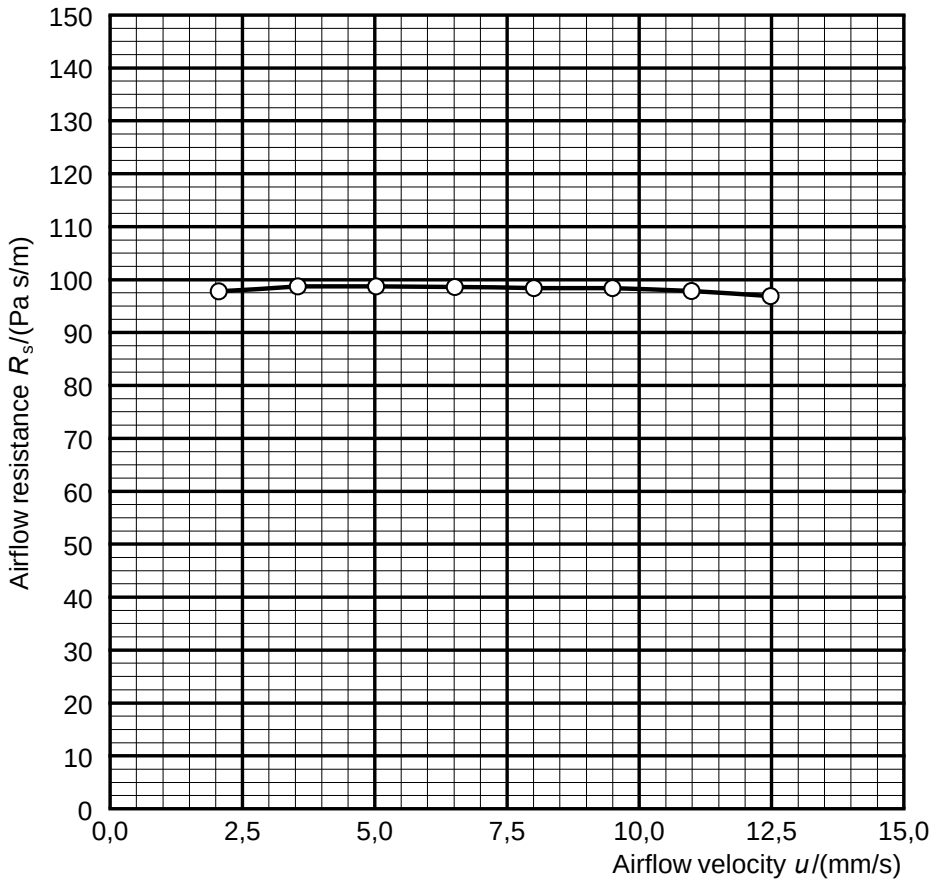
EN 29053
Determination of airflow resistance

Client: Gabriel A/S
Hjulmagervej 55
9000 Aalborg, Denmark
Project No.: M104146
Mueller-BBM Probe No.: 10058
Test object: fabric Hush, sample no. 03
colour: 60156
composition: 80 % polyester, 20 % viscose

Diameter: 100 mm
Thickness: 1.15 mm
Area-specific mass: 185 g/m²

Barometric pressure:
B = 94,6 kPa
Temperature:
θ = 22,8 °C
Relative humidity:
r. h. = 9,4 %

u/ (mm/s)	R_s/ (Pa s/m)
2.06	98
3.55	99
5.03	99
6.51	99
8.01	98
9.50	98
10.98	98
12.48	97



Airflow resistance R_s = 99 Pa s/m

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Laboratory: Planegg
Responsible: Dipl.-Ing. (FH) Eva Müller
Date: 2015/02/04

Description of the test procedure for the determination of the airflow resistance

1 Measurand

The specific airflow resistance R_S of the test object was determined. For this purpose the air pressure difference in front of as well as behind the test object was measured at different volumetric airflow rates. The specific airflow resistance $R_{S,I}$ for each volumetric airflow rate q_i determined was calculated using the following equation:

$$R_{S,i} = \frac{\Delta p_i A}{q_i}$$

With

$R_{S,i}$ specific airflow resistance in Pa s/m;

Δp_i air pressure difference across the test object with respect to the atmosphere in Pa;

A cross-sectional area of the test object perpendicular to the direction of flow in m^2;

q_i volumetric airflow rate passing through the test object in m^3/s;

u_i linear airflow velocity in m/s;

In addition the linear airflow velocity u_i was determined:

$$u_i = \frac{q_i}{A}$$

The indicated measurement result is the specific airflow resistance R_S, which is calculated for an airflow velocity of u = 0.0005 m/s by extrapolation with help of the linear regression.

2 Test procedure

The direct airflow method (method A according to EN 29053) was applied. A steady unidirectional airflow with different air flow rates is pressed through the test object in the specimen holder. The resulting pressure drop between the two free faces of the test object is measured.

The specimen holder had a diameter of D = 100 mm.

3 List of test equipment

The test equipment used is listed in Table B.1.

Table B.1. Test equipment.

Name	**Manufacturer**	**Type**	**Serial-No.**
Measurement system airflow resistance	Müller-BBM	M89319-00	315003
Software for measurement and evaluation	Müller-BBM	m|ars	v1.0.0.2
Digital measuring slide	Mitutoyo	CD-15PPR	07019377
Electronic balance	Kern	440-49N	WC0633572