MÜLLER-BBM

Fabric "Twist"
Manufacturer Gabriel A/S

Determination of the
airflow resistance according to EN 29053

Test Report No. M104146/24

Client:	Gabriel A/S Hjulmagervej 55 9000 Aalborg Denmark
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Delivery date of test objects:	2017-04-26
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Accredited testing laboratory according to ISO/IEC 17025

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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 "Twist", colour 60011, 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. 1993

3 Test conditions and test objects

3.1 Test conditions

The test object was placed directly in the sample holder with a diameter of 100 mm. The complete edge of the test object was hermetically sealed.

3.2 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 "Twist", manufacturer Gabriel A/S material: 100 % polyester	214	0.8	**1**
Sample 2: Fabric type "Twist", manufacturer Gabriel A/S material: 100 % polyester	218	0.8	**2**
Sample 3: Fabric type "Twist", manufacturer Gabriel A/S material: 100 % polyester	210	0.8	**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 "Twist" a specific airflow resistance of

$$R_s = 146 \text{ Pa} \cdot \text{s/m}$$

was determined.

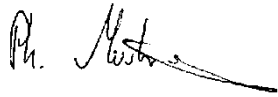The determined air flow resistances of each of the three samples are shown in table 2.

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 "Twist".

Test object	Airflow resistance R_s [Pa · s/m]	Appendix A, page
Sample 1: Fabric type "Twist"	149	**1**
Sample 2: Fabric type "Twist"	141	**2**
Sample 3: Fabric type "Twist"	149	**3**
Mean value	146	

6 Remarks

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

M.Eng. Philipp Meistring
(Responsible for technical content)

Dipl.-Ing. (FH) Dominik Reif
(Project Manager)

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Akkreditierungsstelle
D-PL-14119-07-00

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EN 29053
Determination of airflow resistance

Customer: Gabriel A/S
Hjulmagervej
DK-9000 Aalborg

Project: M104146
Sample number: 12472
Test object: TWIST 60011 - Sample 1
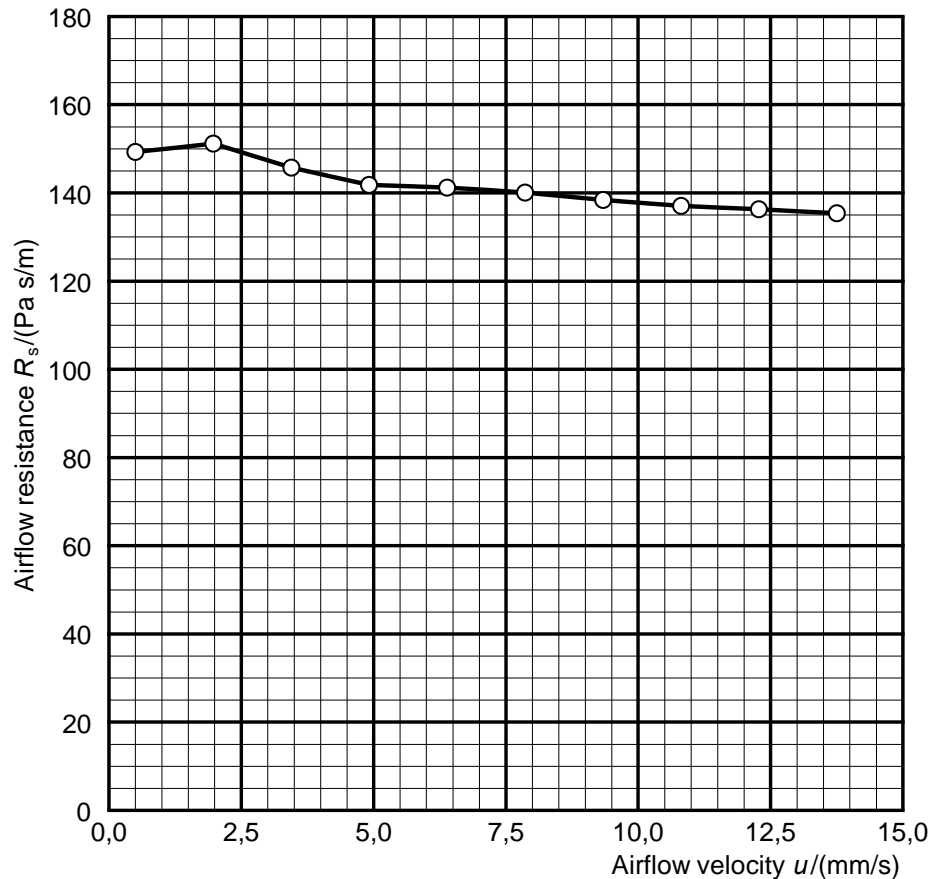
Diameter: 100 mm
Thickness: 0.8 mm
Area-specific mass: 214 g/m^2

Barometric pressure:
B = 95,1 kPa
Temperature:
θ = 21,7 °C
Relative humidity:
$r.\,h.$ = 22,6 %

$u/$ (mm/s)	$R_s/$ (Pa s/m)
0.50	149
1.97	151
3.44	146
4.92	142
6.39	141
7.86	140
9.33	138
10.81	137
12.28	136
13.75	135

Airflow resistance R_s = 149 Pa s/m

Laboratory: Planegg
Responsible: Schwezow
Date: 2017-05-02

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EN 29053
Determination of airflow resistance

Customer: Gabriel A/S
Hjulmagervej
DK-9000 Aalborg

Project: M104146
Sample number: 12472
Test object: TWIST 60011 - Sample 2

Diameter: 100 mm
Thickness: 0.8 mm
Area-specific mass: 218 g/m^2

Barometric pressure:
B = 95,3 kPa
Temperature:
θ = 21,8 °C
Relative humidity:
$r.\ h.$ = 27,1 %

$u/$ (mm/s)	$R_s/$ (Pa s/m)
0.49	137
1.96	145
3.44	140
4.91	136
6.38	135
7.85	134
9.32	133
10.79	132
12.26	131
13.72	130

Airflow resistance R_s = 141 Pa s/m

Laboratory: Planegg
Responsible: Schwezow
Date: 2017-05-02

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EN 29053
Determination of airflow resistance

Customer: Gabriel A/S
                         Hjulmagervej
                         DK-9000 Aalborg

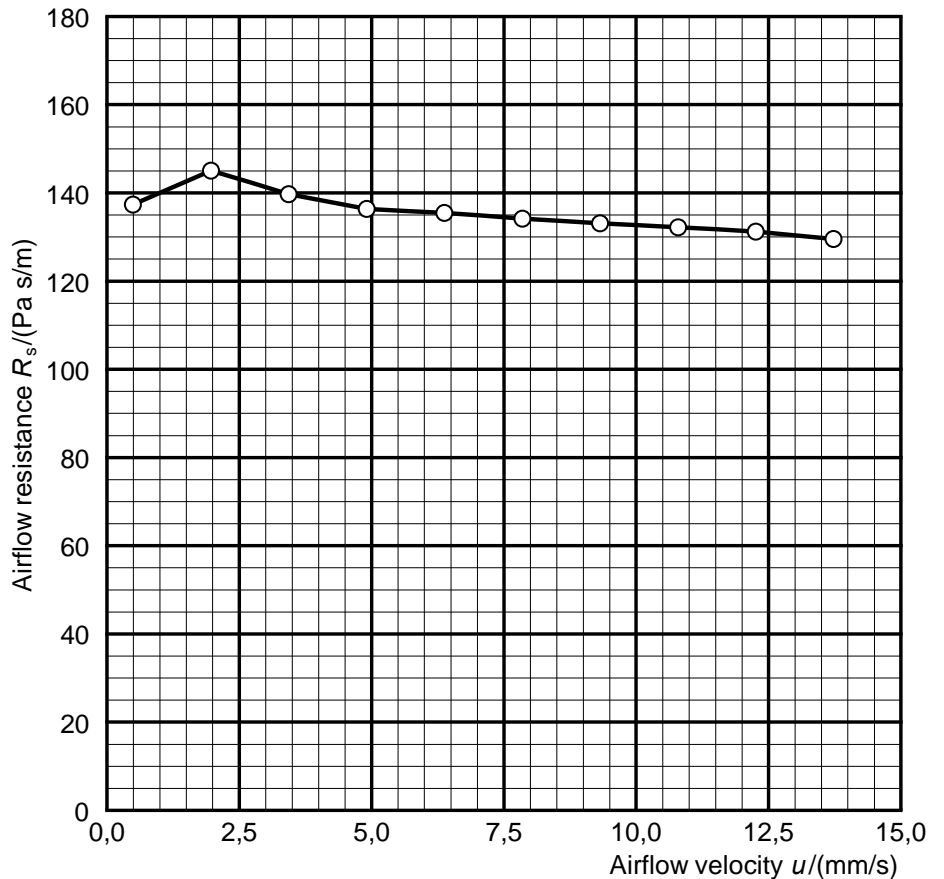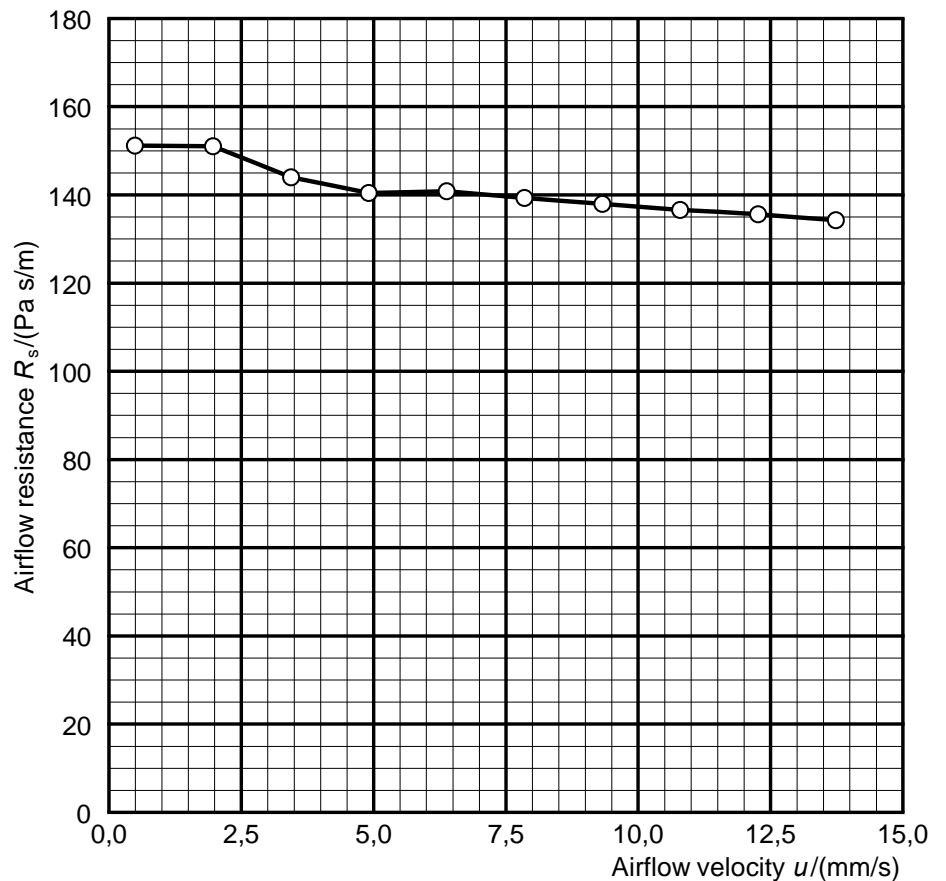**Project:**   M104146
Sample number: 12472
Test object: TWIST 60011 - Sample 3

Diameter: 100 mm
Thickness: 0.8 mm
Area-specific mass: 210 g/m^2

Barometric pressure:
B = 95,3 kPa
Temperature:
θ = 21,9 °C
Relative humidity:
$r.\,h.$ = 21,6 %

u/ (mm/s)	R_s/ (Pa s/m)
0.49	151
1.97	151
3.44	144
4.91	140
6.38	141
7.85	139
9.32	138
10.79	137
12.26	136
13.73	134

Airflow resistance R_s = 149 Pa s/m

Laboratory: Planegg
Responsible: Schwezow
Date: 2017-05-02

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 [1]) 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.	Calibration valid until
Measurement system airflow resistance	Müller-BBM	M89319-00	315003	2018-03
Software for measurement and evaluation	Müller-BBM	m|ars	v1.0.0.2	
Digital measuring slide	Mitutoyo	CD-15PPR	07019377	2019-03
Electronic balance	Kern	KB1200-2N	W1402353	2019-03
Electronic balance	Kern	440-49N	WC0633572	2019-03