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2023-10-10
B104146/66 Version 1 RFD/STY

Fabric type “Savoy”
Manufacturer Gabriel A/S

Determination of the airflow resistance according to DIN EN ISO 9053-1

Test Report No. B104146/66

Client:	Gabriel A/S Hjulmagervej 55 9000 Aalborg DENMARK
Consultant:	Dipl.-Ing. (FH) Dominik Reif
Report date:	2023-10-10
Delivery date of test object:	2023-10-02
Date of test:	2023-10-05
Total number of pages:	9 pages, thereof 4 pages text 3 pages Appendix A 2 pages Appendix B

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1 Task

On behalf of Gabriel A/S, 9000 Aalborg, Denmark, the airflow resistance of the fabric type “Savoy” was to be determined according to DIN EN ISO 9053-1 [1].

2 Basis

This test report is based on the following documents:

[1] DIN EN ISO 9053-1: Acoustics – Determination of airflow resistance – Part 1: Static airflow method (ISO 9053-1:2018); German version EN ISO 9053-1:2018. March 2019

[2] DIN EN ISO 5084: Textiles – Determination of thickness of textiles and textile products (ISO 5084:1996); German version EN ISO 5084:1996. October 1996

3 Test object

The tested fabric is described in Table 1. The indicated characteristic values were determined by the testing laboratory on the basis of a sample delivered by the manufacturer. Three samples of the fabric were tested. Each measured sample had the dimensions of 210 mm x 297 mm.

The thickness of the fabric was determined according to DIN EN ISO 5084 [2] (per sample mean value of three positions, pressure 1.00 kPa, pressure-foot 2,000 mm²).

Table 1. Test object.

Test object (manufacturer’s information)	**Sample 15378/**	**Area specific mass m'' [g/m²]**	**Thickness t [mm]**
Fabric: “Savoy” Colour: Light Orange Material: 100 % PES	01	407	1.55
	02	396	1.54
	03	406	1.57
Mean		403	1.55

4 Execution of measurements

The airflow resistance was determined according to DIN EN ISO 9053-1 [1].

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

5 Measurement results

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

For the tested fabric, the following specific airflow resistance was determined:

Table 2. Specific airflow resistance.

Fabric type "Savoy"	**Specific airflow resistance R_S / (Pa s / m)**	**Appendix A, page**
Sample 1/3 (no. 15378/01)	1396	1
Sample 2/3 (no. 15378/02)	1427	2
Sample 3/3 (no. 15378/03)	1462	3
Mean	**1428**	--

6 Remarks

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

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

EN ISO 9053-1
Determination of airflow resistance

Client: Gabriel A/S
Hjulmagervej 55
DK-9000 Aalborg
Denmark

Project number: B104146

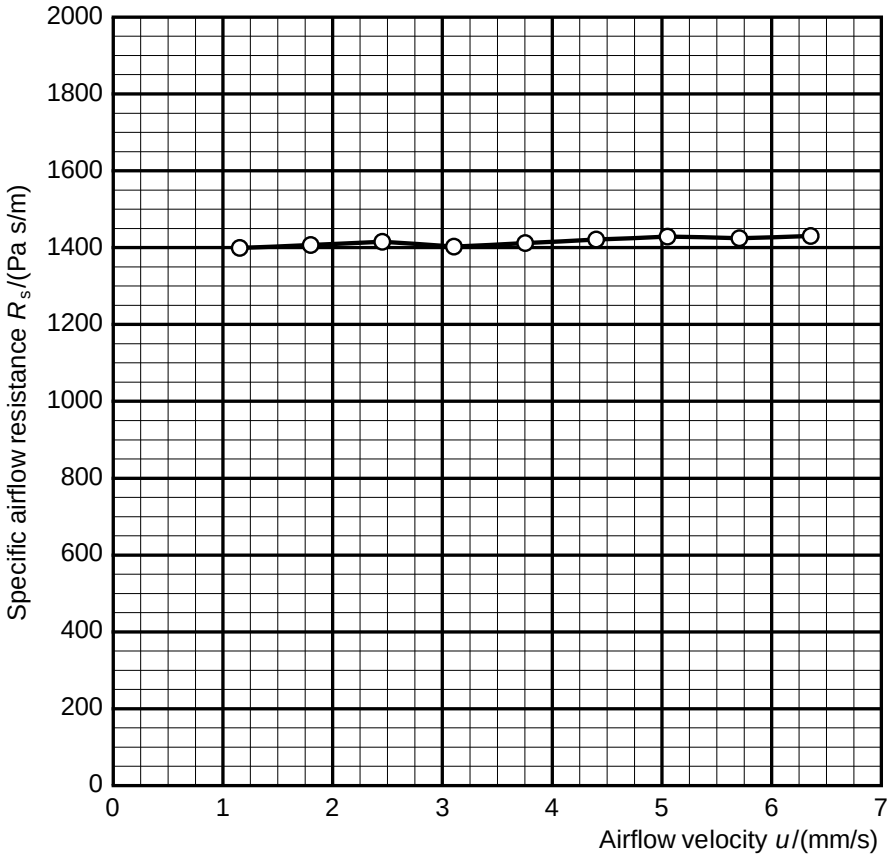
Sample number: 15378/01

Test object: Design: Savoy - Sample 1
Colour: Light Orange
Material: 100 % PES

Diameter:	100	mm
Thickness:	1.55	mm
Area-specific mass:	407	g/m^2

Barometric pressure:
B = 96,0 kPa
Temperature:
θ = 23,6 °C
Relative humidity:
r. h. = 29,8 %

u/ (mm/s)	R_s/ (Pa s/m)
1.15	1399
1.80	1406
2.45	1415
3.10	1403
3.75	1411
4.40	1421
5.05	1428
5.71	1424
6.36	1430



Specific airflow resistance R_s(0.5 mm/s) = 1396 Pa s/m

Laboratory: Planegg
Responsible: Reif
Date: 2023-10-05

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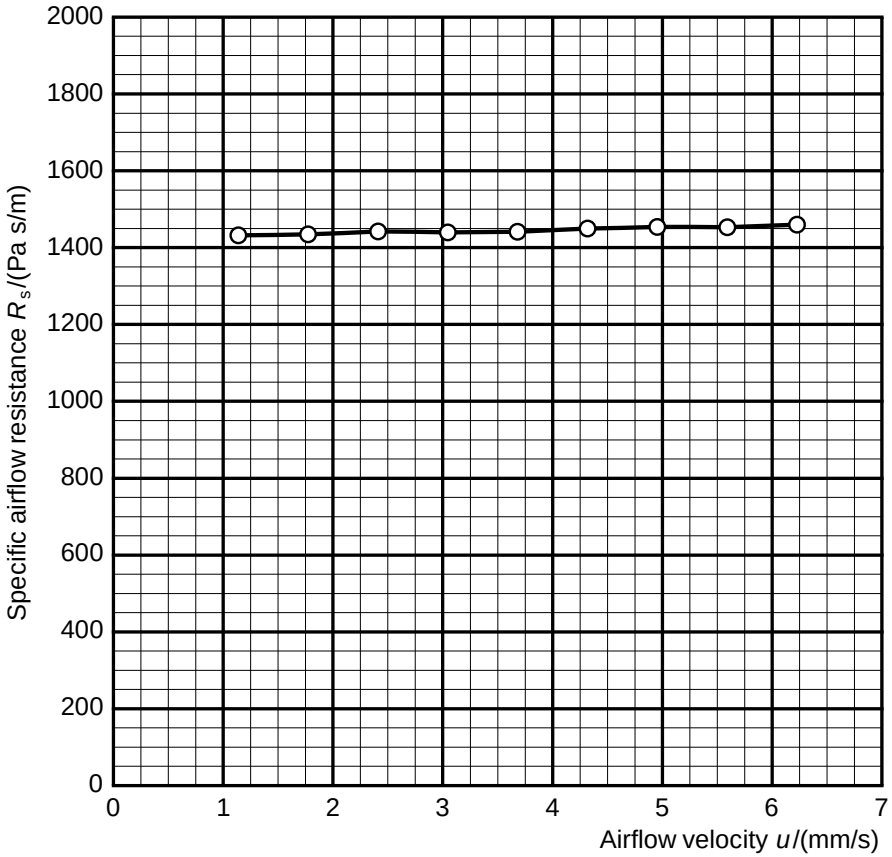
EN ISO 9053-1
Determination of airflow resistance

Client: Gabriel A/S
Hjulmagervej 55
DK-9000 Aalborg
Denmark
Project number: B104146
Sample number: 15378/02
Test object: Design: Savoy - Sample 2
Colour: Light Orange
Material: 100 % PES

Diameter: 100 mm
Thickness: 1.54 mm
Area-specific mass: 396 g/m^2

Barometric pressure:
B = 96,1 kPa
Temperature:
θ = 23,7 °C
Relative humidity:
r. h. = 22,2 %

u/ (mm/s)	R_s/ (Pa s/m)
1.14	1432
1.77	1434
2.41	1442
3.05	1439
3.68	1441
4.32	1450
4.95	1454
5.59	1453
6.23	1459



Specific airflow resistance R_s(0.5 mm/s) = 1427 Pa s/m

Laboratory: Planegg
Responsible: Reif
Date: 2023-10-05

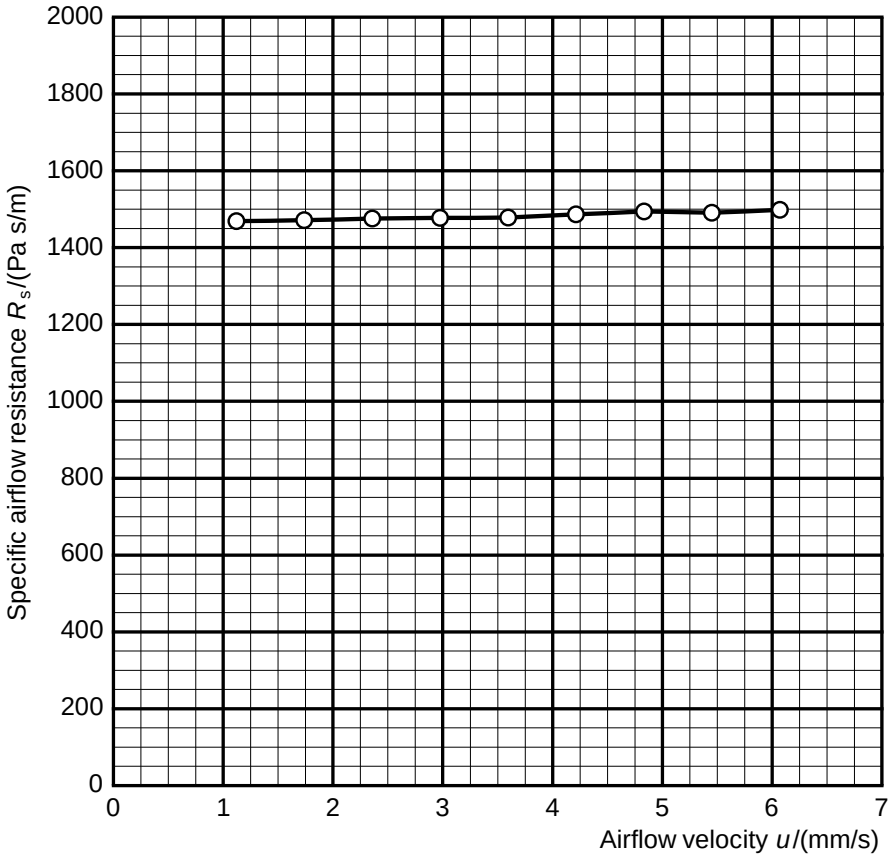
EN ISO 9053-1
Determination of airflow resistance

Client: Gabriel A/S
Hjulmagervej 55
DK-9000 Aalborg
Denmark
Project number: B104146
Sample number: 15378/03
Test object: Design: Savoy - Sample 3
Colour: Light Orange
Material: 100 % PES

Diameter: 100 mm
Thickness: 1.57 mm
Area-specific mass: 406 g/m^2

Barometric pressure:
B = 96,1 kPa
Temperature:
θ = 23,8 °C
Relative humidity:
$r.\ h.$ = 19,1 %

u/ (mm/s)	R_s/ (Pa s/m)
1.12	1469
1.74	1471
2.36	1475
2.98	1477
3.60	1478
4.21	1486
4.83	1494
5.45	1491
6.07	1498



Specific airflow resistance R_s(0.5 mm/s) = 1462 Pa s/m

Laboratory: Planegg
Responsible: Reif
Date: 2023-10-05

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:

$$R_{S,i} = \frac{\Delta p_i \cdot A}{q_{v,i}}$$

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

$q_{v,i}$ 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:

$$u_i = \frac{q_{v,i}}{A}$$

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 (static airflow method according to DIN EN ISO 9053-1 [1]) was applied. A steady unidirectional airflow with different airflow 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 Precision

For the test method DIN EN ISO 9053-1 [1] states a reproducibility of approx. 15 % for open porous foam materials. This information was determined on the basis of round robin tests.

4 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 Acoustic Solution	m|ars	Version 1.23.8256. 29682
Thickness gauge	Hans Schmidt & Co. GmbH	D-2000-C0913	2985
Electronic balance	Kern	KB1200-2N	W1402353