

BLX ACOUSTIC RESEARCH LABORATORY

Adalet Mah. Anadolu Cad. No:40 Tepekule İş

Merkezi, Ofis No:401 Bayraklı/İZMİR

Tel: 0232 462 06 66

e-mail: info@blx-arl.com

AB-1572-T

BLX-R-SA-184

10-23

TEST REPORT

TEST RAPORU

Customer Name Müşterinin Adı	: Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş.
Customer Address Müşterinin Adresi	: Savaş Caddesi, Söğüt Sokak No:1 Merter, İstanbul, Türkiye
Order No Talep Numarası	: 231012
Name and Identity of Test Specimen Numunenin Adı ve Tanımı	: AK 1100
Date of Report Rapor Tarihi	: 31.10.2023
Date of Test Test tarihi	: 30.10.2023
Date of Receiving of Test Item Numunelerin Kabul Tarihi	: 30.10.2023
Number of Pages of the Report Raporun Sayfa Sayısı	: 37

The Turkish Accreditation Agency (TÜRKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation (ILAC) for the Mutual recognition of test reports.

Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.

The test and/or measurement results, the uncertainties (if customer demand) with confidence probability and test methods are given on the following pages which are part of report.

Deney ve / veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (müşteri talep ettiğinde) ve deney metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

- BLX ACOUSTIC RESEARCH LABORATORY IS SUB-ORGANIZATION OF KARAKUTU ELECTROACUSTIC COMPANY.
- BLX AKUSTİK ARAŞTIRMA LABORATUVARI KARAKUTU ELEKTROAKUSTİK FİRMASININ BİR ALT KURULUŞUDUR.

Seal
Mühür

Date
Tarih

Person in charge of test
Deneyi Yapan

Person is charge of reporting
Raporlayan

Approval
Onaylayan



31.10.2023

Salih OKAN ERGANCAN

Altay OZANKAN

Erdal MARA

This report is only valid for the Laboratory Measurement Sound Absorption and Sound Absorption Coefficient in then Reverberation Chamber within the scope of ISO 354 on the date of 30.10.2023 under the conditions of Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir made for Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş. This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.

Test method Deney Metodu	: TS EN ISO 354:2003 Acoustics - Measurement of sound absorption in the reverberation room
Sampling Methods Numune Alma Prosedürü	: The report complies with Sample Taken Procedure that coded with number of BLX-PR-28
Test Results Deney Sonuçları	: AK 1100 $a_w=0.25$ was found.
Environmental conditions Çevre Şartları	: Temperature has been measured as 24.8°C, Relative Humidity has been measured as 63.0 % rH, Pressure has been measured as 1007.0 hPa.
Measurement uncertainty Ölçüm Belirsizliği	: The measurement uncertainty is ± 0.17
Opinions and interpretations Görüş ve Yorumlar	: The whole preparation process for the measurement has been made by BLX Acoustic Research Laboratory. Technical details of the sample has been obtained by the customer.

* Conformity with requirements or specifications/Ölçüm sonuçlarının şartnamelere veya standartlara uygunluk beyanı:

* Disclaimer/Feragat beyanı:

* Definition of Decision Rule/Karar kuralının açık tanımı:

Rule 1- If the measurement results before and after the consideration the uncertainties are both positive, the test result is positive.

Rule 2- If measurement results are positive but there is a shift to the negative zone when measurement uncertainties are taken into consideration, customer agreement is taken for conformity assessment.

Rule 3- If measurement results are negative but there is a shift to the positive zone when measurement uncertainties are taken into consideration, the result of the tests are negative.

Rule 4- If measurement results are inconvenient and also there is a shift to the negative zone when measurement uncertainties are taken into consideration, the result of tests are negative.

* Statement that the results are valid for the sample received/Sonuçların teslim alınan numune için geçerli olduğuna dair beyan:

* Additions to, deviations, or exclusions from the test method/Deney yönteminden eklemeler, çıkarmalar ve sapmalar:

"Experiments marked with the "****" specified in the report are not covered by Accreditation.

(*Applicable/when necessary))

The uncertainty given in the measurement results is extended uncertainty. Uncertainty is the result of multiplication with the $k=2$ scope factor, which provides a 95% reliability level for normal distribution.

This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in the Reverberation Room within the scope of ISO 354** on the date of **30.10.2023** under the conditions of **Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir** made for **Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş.** This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.

TABLE OF CONTENTS

1. INTRODUCTION	5
2. ABOUT MEASUREMENT OF SOUND ABSORPTION PARAMETERS	6
2.1. TERMS RELATED TO SOUND ABSORPTION	6
2.2. MEASUREMENT STANDARD	7
2.3. CALCULATION METHOD.....	7
3. SAMPLE INFORMATION	8
3.1. GENERAL	8
4. DEVICE INFORMATION USED IN MEASURING VOLUME AND MEASUREMENT	11
4.1. DEVICE INFORMATIONS.....	11
5. MEASUREMENT PROCESS	12
6. RESULTS OF MEASUREMENT.....	15
7. MEASUREMENT RESULTS.....	17
8. APPENDIX	17

*This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room** within the scope of ISO 354 on the date of 30.10.2023 under the conditions of Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir made for Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş. This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.*

TABLE OF FIGURES

Figure 3.1 The specimen	9
Figure 3.2 The specimen Detail	9
Figure 3.3 Sample photograph inside the reverberation room.....	10
Figure 3.4 Sample photograph inside the reverberation room.....	10
Figure 5.1 Mounting type indication of the specimen.....	12
Figure 5.2 Preparation process of measurement	13
Figure 5.3 Preparation process of measurement	13
Figure 5.4 Preparation process of measurement	14
Figure 5.5 Measurement of sound absorption.....	14
Figure 6.1 Measurement results.....	16

*This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room** within the scope of ISO 354 on the date of 30.10.2023 under the conditions of Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir made for Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş. This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.*

1. INTRODUCTION

On **30.10.2023**, Measurement results of Sound Absorption and Sound Absorption Coefficient in accordance with TS EN ISO 354 Standard are presented with this report. Measurements were taken between **14:00** and **15:00**.

Measurements were made according to the relevant section of TS EN ISO 354 standard. Measurements are made with calibrated with traceability chain in accordance with TS EN ISO/IEC 17025 standard with devices and equipment in accordance with the acceptance criteria of the relevant standard.

Measurement results are presented in Section 6 of the report.

Calibration certificates for all equipment used during measurement are presented in Appendix A.

In Appendix B, the plan drawing of room 1 where the Sound Absorption Test was carried out in the BLX Acoustic Research Laboratory is presented.

The accreditation certificate and attachment of BLX Acoustic Research Laboratory are presented in Appendix C.

*This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room within the scope of ISO 354** on the date of **30.10.2023** under the conditions of **Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir** made for **Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş.** This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.*

2. ABOUT MEASUREMENT OF SOUND ABSORPTION PARAMETERS

2.1. Terms related to Sound Absorption

Decibel (dB): Decibel (dB) is a relative unit of measurement widely used in acoustics. The dB is a logarithmic ratio between the measured level and a reference (threshold) level of 0 dB.

Background noise level ($L_{p,B}$): Measured sound pressure level in the receiving room from all sources except the loudspeaker in the source room.

Room Sound Absorption Area (A_{1-2}): It is the assumed area of a completely absorptive surface that has the same reverberation time as a given room, free from diffraction effects, as if the room had only the absorber.

Sample Sound Absorption Area (A_T): It is the difference between the equivalent sound absorption areas of the reverberation room when the test sample is in the room and when it is not in the room.

Sound Absorption Coefficient (α_s): It is the ratio of the equivalent sound absorption area of a test sample to the area of the test sample.

Weighted Sound Absorption Coefficient (α_w): Single-number frequency-independent value which equals the value of the reference curve at 500 Hz after shifting it as specified in this International Standard.

Sound Absorption Average (SAA): An odd-numbered rating of a material's sound absorption coefficients, rounded to the nearest 0.01, for 12 1/3 octave bands from 200 to 2500 Hz, measured according to ASTM C423.

Noise Reduction Coefficient (NRC): It is the odd-numbered rating of a material's sound absorption coefficients, rounded to the nearest 0.05, for 4 1/3 octave bands, 250 Hz, 500 Hz, 1000 Hz and 2000 Hz, measured according to ASTM C423.

Reverberation Time (T): Reverberation time is a measure of the time required for reflecting sound to "fade away" in an enclosed area after the source of the sound has stopped. The time it takes a reverberant sound field to decay 60 dB after the source is interrupted.

White Noise: White noise is a random signal having equal intensity at different frequencies, giving it a constant power spectral density.

This report is only valid for the Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room within the scope of ISO 354 on the date of 30.10.2023 under the conditions of Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir made for Gentağ Tekstil Ürünleri San. ve Tic. A.Ş. This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.

Pink Noise: Pink noise is a signal or process with a frequency spectrum such that the power spectral density (power per frequency interval) is inversely proportional to the frequency of the signal. In pink noise, each octave interval (halving or doubling in frequency) carries an equal amount of noise energy.

2.2. Measurement Standard

It was carried out by BLX Acoustic Research Laboratory on **30.10.2023** in accordance with TS EN ISO 354 standard. Below are the standards referenced during the preparation of the report numbered **BLX-R-SA-184**.

- TS EN ISO 354:2003 Acoustics - Measurement of sound absorption in the reverberation room
- TS 1477 EN ISO 266:1997 Acoustic- Preferred frequencies
- TS ISO 9613-1:1993 Acoustic – Reduction of sound as it spreads outside – Part 1: Calculation of the cooling of sound by atmosphere
- TS EN 61260-1:2014 Electroacoustics - Octave-band and fractional-octave-band filters - Part 1: Specifications
- ASTM E795-16 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests

2.3. Calculation Method

The calculation process was carried out using the formulas specified in ISO 354 standard.

The sound absorption coefficient α_s of a plane absorber or a specified array of test objects shall be calculated using the formula (Formula 1);

$$\alpha_s = \frac{A_T}{S}$$

Formula 1

In this formula;

α : It is the ratio of the equivalent sound absorption area of a test sample to the area of the test sample.

A_T : The equivalent sound absorption area of the test specimen, in square metres.

S : The area, in square metres, covered by the test specimen.

*This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room** within the scope of ISO 354 on the date of 30.10.2023 under the conditions of Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir made for Genuğ Tekstil Ürünleri San. ve Tic. A.Ş. This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.*

3. SAMPLE INFORMATION

3.1. General

All technical specifications of the sample measured were obtained by the customer, In order to prepare the sample for measurement, the shipment and assembly operations were carried out by **Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş.**

The measurement was taken by placing the sample parallel to the floor of the test room. The measurement was carried out within the scope of the ISO 354 standard.

The area of sample which had been placed directly on the floor of the reverberation chamber(Type A Mounting) is **12.0 m²**.

Technical information of the sample to be measured;

- Material Weight: 1100 g /m²
- Material Thickness: 9 mm

*This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room within the scope of ISO 354** on the date of **30.10.2023** under the conditions of **Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir** made for **Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş.** This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.*

Application detail photographs of the sample in preparation for measurement are given in Figure 3.1 to 3.4.

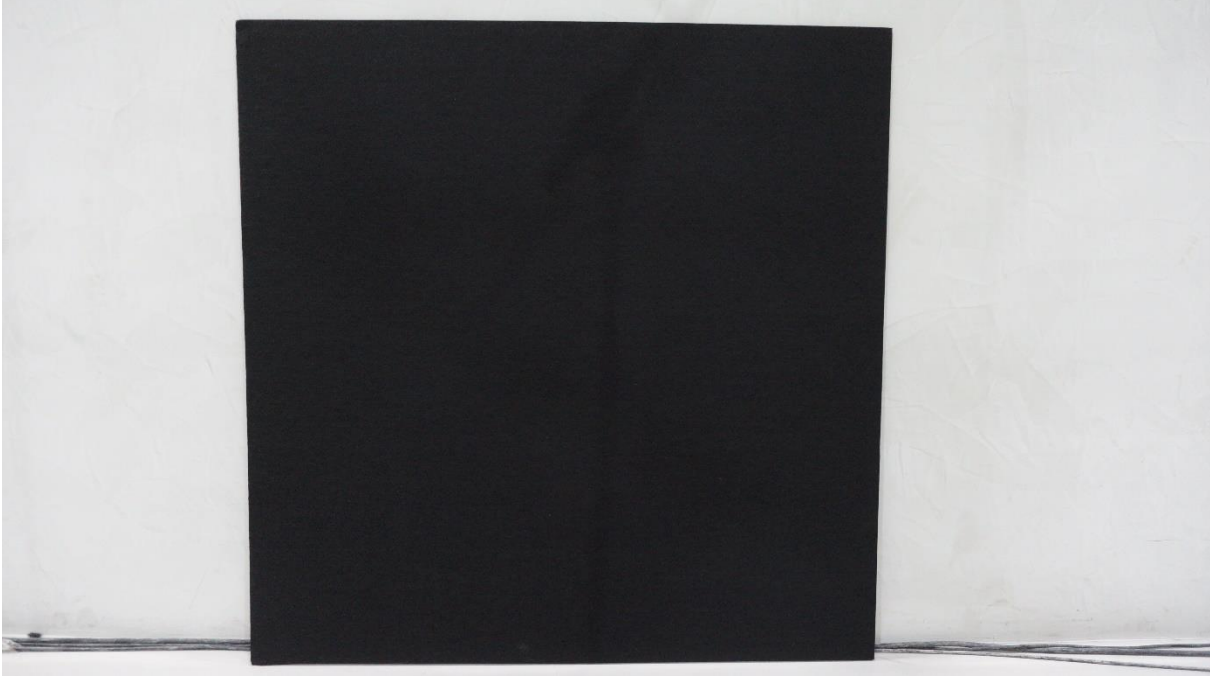


Figure 3.1 The specimen

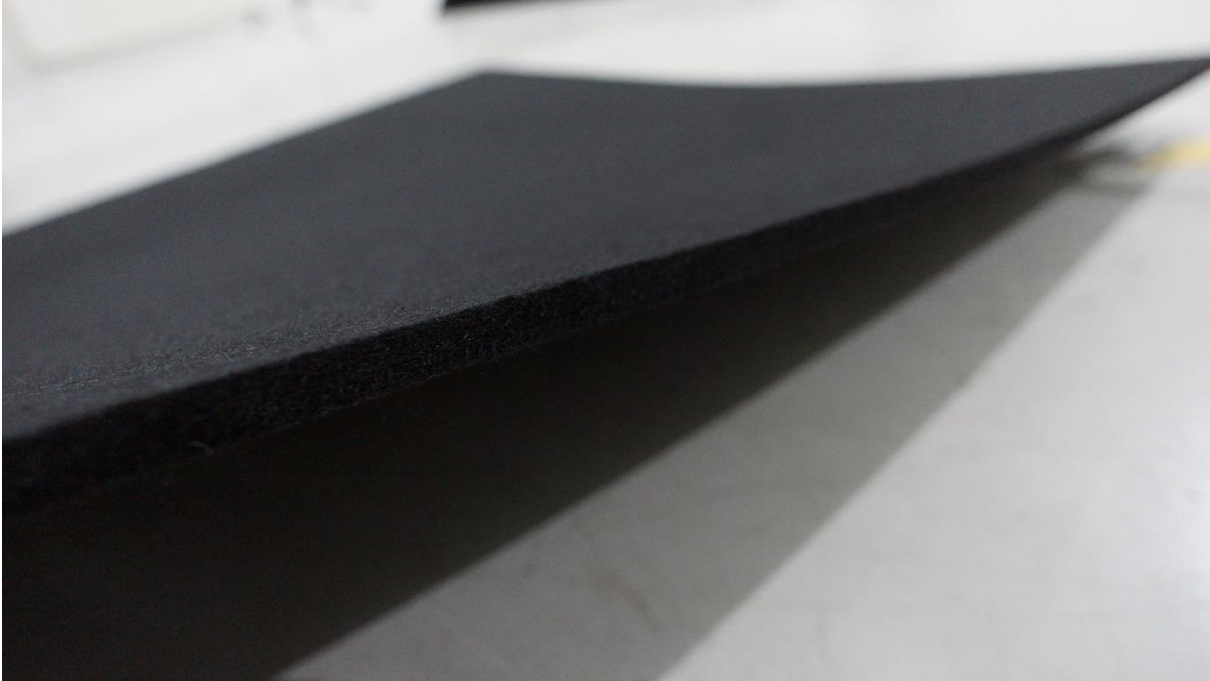


Figure 3.2 The specimen Detail

*This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room** within the scope of ISO 354 on the date of 30.10.2023 under the conditions of Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir made for Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş. This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.*



Figure 3.3 Sample photograph inside the reverberation room

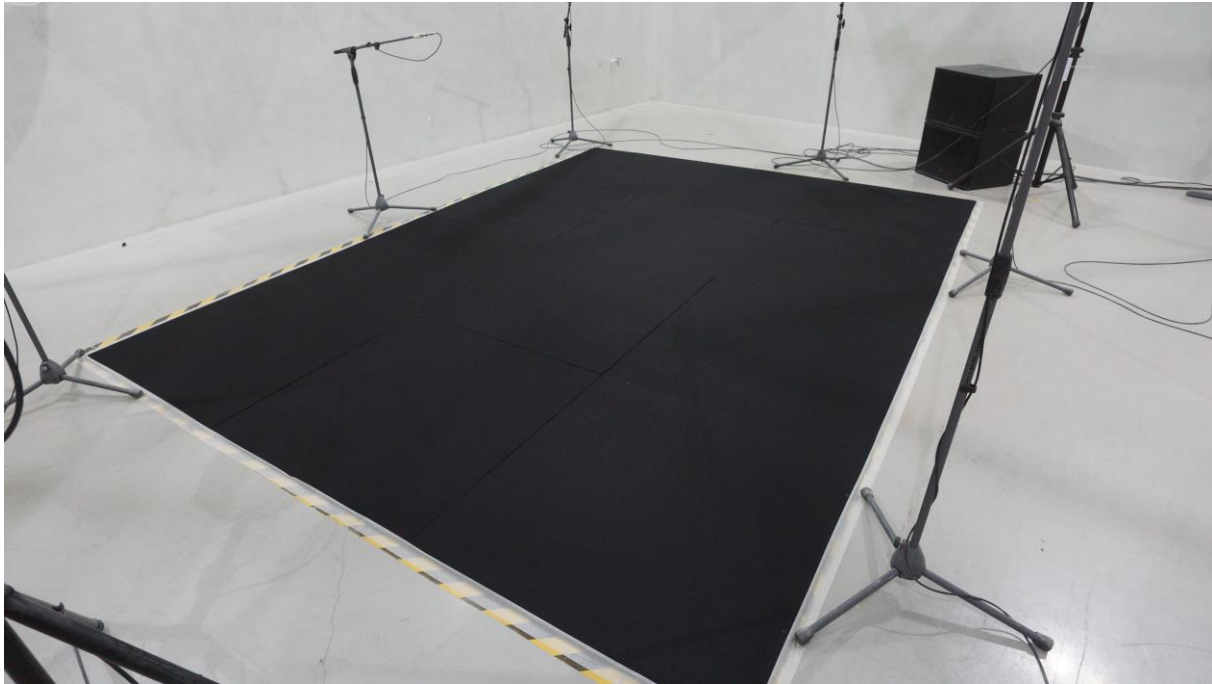


Figure 3.4 Sample photograph inside the reverberation room

This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room** within the scope of ISO 354 on the date of 30.10.2023 under the conditions of Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir made for **Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş.** This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.

4. DEVICE INFORMATION USED IN MEASURING VOLUME AND MEASUREMENT

The volume of the reverberation chamber where the measurement is made has a volume of **223.2 m³**. At the time of measurement, the temperature is **29.4 °C**, the pressure is **1007.0 hPa**, and the relative humidity is **63.0 %**. The measurement was carried out depending on the numbers specified by the relevant standard.

Measurement within the scope of ISO 354 Standard, A total of 48 measurements were taken for suitable source and microphone positions, and the average of these measurements was calculated.

Symmetry is avoided in the selection of microphone positions.

The heights, locations and directions of the 8 microphones used in the measurement are different from each other.

All the processes that took place during the preparation process and the measurement period of the sample are recorded with camera.

The properties of the reverberation room :

- The floor area of the reverberation room is **44.5** square meters and its height is **5** meters.
- There are **18** diffuser panels of **5.5 kg/m²**, each of which is **5.5 m²** in the reverberation room where the measurement is taken.
- The average sound absorption performance between **500-5000 Hz** is **1.20**
- According to ISO 9613 standard, environmental conditions are controlled at the beginning and end of the measurement and adaptation to ambient conditions is ensured.

4.1. DEVICE INFORMATIONS

- SINUS Apollo Lite 8D
- NTI Audio DS3 Dodecahedron Omnidirectional Loudspeakers
- I-Tech HD Power Amplifier
- GRAS 46AQ 1/2" CCP Microphone Set
- RCF S 12 Bass Reflex Subwoofer
- Microphone Rotation Boom
- Grass 42AG Microphone Calibrator
- Grass 42AG Acoustic Calibrator-Temperature / Humidity Meter
- Stanley Tape Measure
- Extech EN 100 – Barometer

*This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room** within the scope of **ISO 354** on the date of **30.10.2023** under the conditions of **Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir** made for **Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş.** This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.*

5. MEASUREMENT PROCESS

TYPE A MOUNTING

The test sample is mounted or placed directly opposite the surface of a room, for example, on the floor of the reverberation room.

If necessary, adhesives or mechanical stabilizers can be used to hold the test sample during the experiment without leaving the slightest air gap.

The perimeter edges of the test sample should be closed or coated to prevent sound absorption of these edges.

The perimeter edges of the test sample may be acoustically sealed or coated with a reflective frame.

The mounting type of the sample is shown in Figure 5.1.

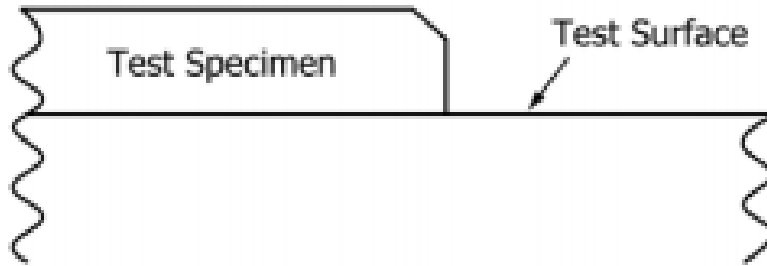


FIG. 1 Type A Mounting

Figure 5.1 Mounting type indication of the specimen

*This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room** within the scope of ISO 354 on the date of 30.10.2023 under the conditions of Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir made for Genuğ Tekstil Ürünleri San. ve Tic. A.Ş. This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.*

The photograph of the measured room and the process of measurement are shown in Figure 5.2 to Figure 5.5.



Figure 5.2 Preparation process of measurement



Figure 5.3 Preparation process of measurement

*This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room** within the scope of **ISO 354** on the date of **30.10.2023** under the conditions of **Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir** made for **Gentüğ Tekstil Ürünleri San. ve Tic. A.Ş.** This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.*



Figure 5.4 Preparation process of measurement



Figure 5.5 Measurement of sound absorption

*This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room** within the scope of **ISO 354** on the date of **30.10.2023** under the conditions of **Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir** made for **Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş.** This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.*

6. RESULTS OF MEASUREMENT

Measurement result are given in Figure 6.1.

*This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room within the scope of ISO 354** on the date of **30.10.2023** under the conditions of **Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir** made for **Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş.** This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.*

Measurement of sound absorption in a reverberation room ISO 354

Laboratory measurements of the sound absorption coefficient in a reverberation room

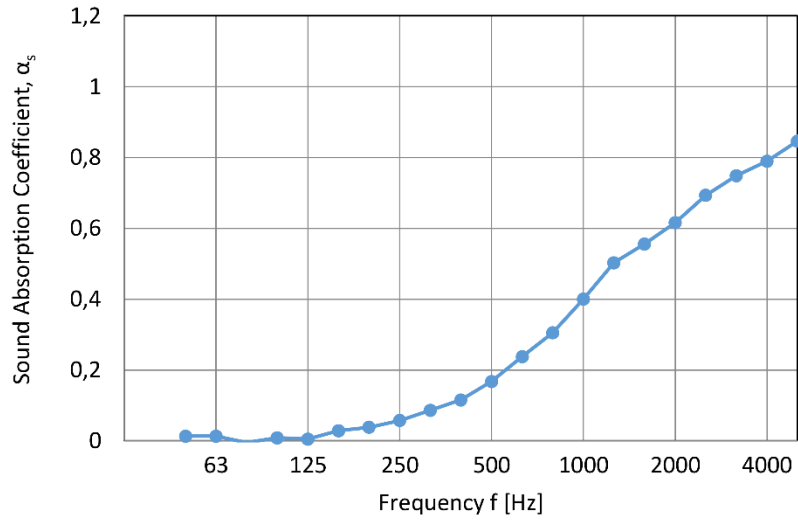
Manufacturer: Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş.
 Client: Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş.
 Test specimen mounted by: BLX-ARL
 Description of test specimen: AK 1100

Date of test: 30.10.2023



	θ [°C]	rH[%]	P[hPa]	Room: 01
Without specimen:	24,9	63	1007	Volume: 223.2 m ³
With specimen:	24,8	63	1007	Specimen Area: 12 m ²

Frequency f [Hz]	α_s 1/3 Octave	α_p Octave
50	0,0	
63	0,0	0,01
80	0,0	
100	0,0	
125	0,0	0,01
160	0,0	
200	0,0	
250	0,1	0,06
315	0,1	
400	0,1	
500	0,2	0,17
630	0,2	
800	0,3	
1000	0,4	0,40
1250	0,5	
1600	0,6	
2000	0,6	0,62
2500	0,7	
3150	0,7	
4000	0,8	0,80
5000	0,8	



α_s Sound absorption coefficient according to ISO 354
 α_p Practical sound absorption coefficient according to ISO 11654

Rating according to ISO 11654:
Weighted sound absorption coefficient
 $\alpha_{w=}$ **0,25**
 Sound absorption class: **E**

Rating according to ASTM C423:
Noise Reduction Coefficient NRC = 0,3
Sound Absorption Average SAA = 0,31

No of Test Report: BLX-R-SA-184

Name of test institute: BLX ACOUSTIC RESEARCH LAB.

Tested by
Salih Okan ERCAN

Reported by
Altay OZANKAN

Approved by
Erdal KARA



Figure 6.1 Measurement results

7. MEASUREMENT RESULTS

- The relevant result is presented in Figure 6.1.
- No visible damage was detected on the test sample during the test.

8. APPENDIX

- Calibration certificates for the devices used during measurement are presented in Appendix-A.
- In Appendix B, a plan and cross-section drawings from the BLX Acoustic Research Laboratory are presented.
- In Appendix C, an accreditation certificate and supplement from the BLX Acoustic Research Laboratory are presented.

*This report is only valid for the **Laboratory Measurement of Sound Absorption and Sound Absorption Coefficient in then Reverberation Room within the scope of ISO 354** on the date of **30.10.2023** under the conditions of **Egemenlik Mahallesi 6106/18 Sokak No:13 Bornova / İzmir** made for **Gentuğ Tekstil Ürünleri San. ve Tic. A.Ş.** This report can not be whole or partially copied and reproduced without the permission of the BLX Acoustic Research Laboratory. Unsigned and unsealed reports are invalid. The results of the measurement relate only conditions during measurement.*