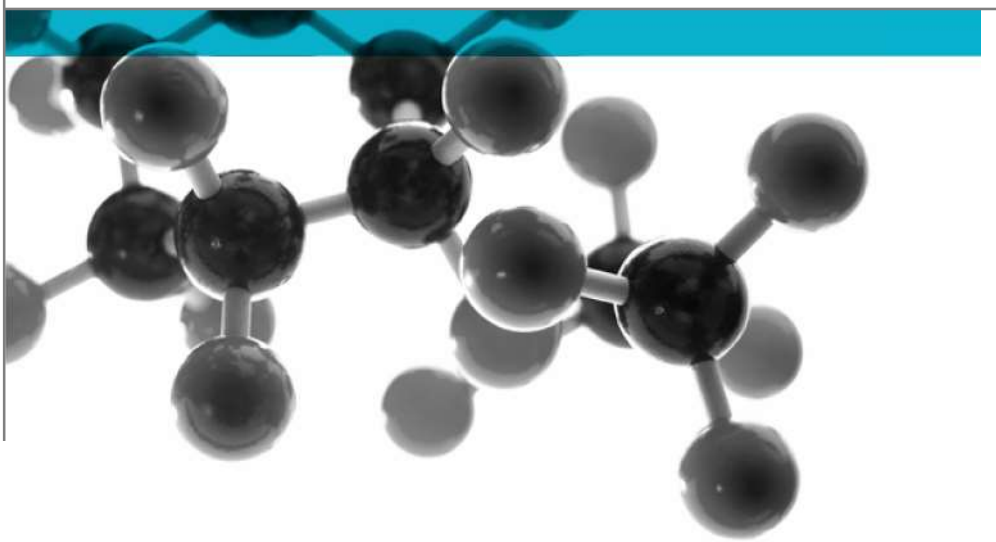
Exova
Chiltern House
Stocking Lane
Hughenden Valley
High Wycombe
Buckinghamshire
HP14 4ND

T: +44 (0) 1494 569 600
F: +44 (0) 1494 564 895
E: europe@exova.com
W: www.exova.com

Testing, calibrating, advising.

BS EN ISO 10140-2:2010



Test of: Arbor - Fenex 78t Side Swing Window

Acoustics - Laboratory measurement of sound insulation of building elements. Measurement of airborne sound insulation

Date: 27/04/2016

Copy: 1

Issue No.: 1

A Report To:
Selectron Elektrkimya Sanayi ve Ticaret Ltd Si
Dereboyu Cd.
Sengul Sk.
No: 6 34303 Halkali
Istanbul

Document Reference:
BMT/MTP/F15332/03

Exova
Chiltern House
Stocking Lane
Hughenden Valley
High Wycombe
Buckinghamshire
HP14 4ND

T: +44 (0) 1494 569 600
F: +44 (0) 1494 564 895
E: europe@exova.com
W: www.exova.com

Testing, calibrating, advising.

Exova – the new name for BM TRADA

On December 1st 2015, Chiltern International Fire Ltd and TRADA Technology Ltd (both trading as BM TRADA) commenced trading under the name Exova.

To coincide with this change, our Technical Reports, Test Reports, Product Assessments, company stationery and marketing collateral have been updated to reflect the Exova branding.

The validity of all documents previously issued by Chiltern International Fire Ltd and TRADA Technology Ltd including certificates, test reports and product assessments is unaffected by this change. A letter to this effect is available upon request by e-mailing europe@exova.com

About Exova

Exova is part of the Exova Group one of the world's leading laboratory-based testing groups, trusted by organisations to test and advise on the safety, quality and performance of their products and operations. Headquartered in Edinburgh, UK, Exova operates 143 laboratories and offices in 32 countries and employs around 4,500 people throughout Europe, the Americas, the Middle East and Asia/Asia Pacific. With over 90 years' experience, Exova specialises in testing across a number of key sectors from health sciences to aerospace, transportation, oil and gas, fire and construction.

Be assured that while the name will change, your service provision and primary contacts have not. What will be available to you is a wider team of testing experts and an extended range of testing capabilities.

If you have any questions, please do not hesitate to contact a member of the team and we will do our best to answer them. We appreciate your business to date and we look forward to working with you in the future.

Kind regards

Exova

T: +44 (0) 1494 569 600
E: europe@exova.com

Contents

Page No.

Summary of Performance

The following performance was achieved from the specimens tested. Full details of the testing and specimen construction are described in the report.

Test No.	Product Name	Product Type	Glazing configuration	Test Result (R_w (C;C_{tr})
1	Arbor - Fenex 78t Side Swing Window	Single casement window	6/16/4 Low-E, Argon Warmedge	37 (0;-3) dB
2	Arbor - Fenex 78t Side Swing Window	Single casement window	8.8 (44.2)/16/4 Low-E, Argon Warmedge	40 (-1;-4) dB
3	Arbor - Fenex 78t Side Swing Window	Single casement window	8.8 (44.2)/16/13.1 (66.3), Argon Warmedge	37 (0;-2) dB
4	Arbor - Fenex 78t Side Swing Window	Single casement window	10 Low-E/16/8.8 (44.2), Argon Warmedge	25 (0;-2) dB

1 Introduction

The test specimen was supplied by the sponsor and delivered to EXOVA on 18 January 2015. The specimen was installed into a timber stud partition within the test chamber by Exova.

Test Details

The specimen was tested to BS EN ISO 10140-2:2010 Acoustics - Laboratory measurement of sound insulation of building elements. Measurement of airborne sound insulation

Testing was conducted at Exova, Chiltern House, Stocking Lane, Hughenden Valley, Buckinghamshire. HP14 4ND on the 19 January 2015.

For details of the testing, please see Section 3, Methodology.

Supporting Construction Description

The partition consisted of two wall leaves separated by a 150mm air gap. Each wall leaf was constructed of nominal 45mm x 90mm softwood studs at 600mm centres with two layers of 15mm plasterboard on each face. The stud wall cavities were filled with 100mm thick Rockwool insulation.

2 Test Specimen Details

Product Name	Arbor - Fenex 78t Side Swing Window
Product Type	Single casement window
Material Type	Timber
Overall Dimensions	1230mm wide x 1480mm high x 92mm deep
Casement Dimensions	1146mm wide x 1396mm high x 78mm deep
Variations between Tests	4 tests were conducted on this product with variations in: • Glazing configuration Refer to Summary of Results & Test Data Sheets in Appendix 1 for details of the variations.

Casement

	Material/type	Dimensions (mm)	Density (kg/m³)
Stiles and rails	Pine*	78 x 64	450*
Joints	Finger jointed / Conduit*	-	-
Adhesive	D4*	-	-

* As stated by sponsor, not checked by laboratory

Frame

	Material/type	Dimensions (mm)	Density (kg/m³)
Stiles and rails	Pine*	92 x 57	450*
Rebate	Single type	74 x 18	-
Joints	Finger jointed / Conduit*	-	-
Adhesive	D4*	-	-

* As stated by sponsor, not checked by laboratory

Hardware

	Make/type	Size (mm)	Fixing details (dimensions in mm)
Hinges	2No. ASSA (Ref. 3211-1)*	100 length	4No. 4 x 30 screws into frame 4No. 4 x 30 screws into casement
Locking mechanism	ASSA espagnolette (Ref. Spa 976 MK)*	1275 length	6No. 3.5 x 30 screws
Keeps	2No. ASSA hook bolt receivers (Ref. 4710)*	45 x 22	1No. 4 x 30 screws
Safety device	*No further detail provided by sponsor*	90 x 30	2No. 4 x 30 and 1No. 3.5 x 35 screws 4No. 4 x 30 screws
Handles	Secristyle Virage (Ref. EBC40SCL)*	130 lever length	2No. 5 x 55 screws

* As stated by sponsor, not checked by laboratory

Perimeter sealing details

	Make/type	Size (mm)	Location
Casement edges	None present	-	-
Frame reveal	Uniform EPDM (Ref. DE 34)*	8 wide	On rebate upstand
Seal continuity	Uninterrupted by hardware	-	-

* As stated by sponsor, not checked by laboratory

Glazing

	Make/type/size (mm)	Location (dimensions in mm)
Glass type & configuration	**See Appendix 1 and data sheets for relevant information**	-
Overall size	1036 wide x 1292 high	-
Sight size	1014 wide x 1264high	-
Glazing bead	Aluminium profile 15 x 12 for top and sides *No further detail provided by sponsor*	Externally beaded
	Aluminium profile 35 x 25 for bottom *No further detail provided by sponsor*	Externally beaded
Bead fixings	Clipped onto 25 x 15 clips, each fixed with 1No. 3 x 25 screw	-
Sealants	Silicone*	Between rebate upstand and glass
	Silicone*	Between beads and glass

* As stated by sponsor, not checked by laboratory

3 Methodology

Airborne Sound Insulation Test

- The loudspeakers were placed in the corners of the source room
- The sound level meter was calibrated prior to testing.
- 5 measurements were taken in the source room, at fixed positions.
- 5 measurements were taken in the receive room at fixed positions.
- Background measurements were taking at each third octave frequency between 50Hz and 5000Hz.
- 6 Reverberation measurements were taken in the receive room, in accordance with BS EN ISO 3382-2:2008 interrupted, engineering method.
- Calculations, including C & C_{tr}, were carried out in accordance with BS EN ISO 717-1

- The sound reduction index was calculated using the following formula from BS EN ISO 10140-2:2010:

$$R_w = L1 - L2 + 10Log\left(\frac{S}{A}\right)\ dB$$

Where:

L1 is the logarithmic average of the source room measurements
L2 is the logarithmic average of the receive room measurements
S is the area of the test specimen
A is the equivalent absorption area, where $A = \frac{0.16V}{T}$

Where:

V = The volume of the receive room
T = the reverberation time measured in seconds

1. Logarithmic average of 5 Measurements (L1 & L2)
2. Deduction of L1s from L2s
3. Area of test specimen (S) divided by equivalent sound absorption area (A)
4. Weighted Final Result R_w dB

Test Equipment

Equipment	Equipment reference number
Bruel & Kjear Sound Level Meter (Type 2270)	ACT-009
Bruel & Kjear Microphones (Type 4189)	ACT-010 & ACT-016
Bruel & Kjear Calibrator (Type 4231)	ACT-011
Amplifiers	ACT-007 & ACT-049
Noise Generators	ACT-008 & ACT-009
Loudspeakers (EV ZX1-90PA)	ACT-006, ACT-021, ACT-022
Graphic Equaliser (DBX Dual Channel)	ACT-023

4 Parameters & Limitations

Parameters

The test fulfilled all criteria required of ISO 10140-2, including:

- Sound level meter (microphone) was located as required
- Sound sources (loudspeakers) were located as required
- Reverberation Time readings were greater than 20dB but not so large that the observed decay cannot be represented by a straight line.
- Background noise measurements were 10dB below L2 measurements.
- Temperature was reported to within ± 0.1°C
- Barometric pressure was reported to within ± 0.01 Mbar (±1 Pa)
- Humidity was reported to within ± 1%
- Frequencies 50Hz, 63Hz and 80Hz are outside of our UKAS accreditation, and are for reference only. These frequencies do not affect the over R_w figure.
- R'_{max} of the test chambers was measured to be 65dB
- The test chambers are two cuboid rooms 5.49m wide and a ceiling height of 2.58m, volumes of chambers for testing are reported with the individual test data

Limitations

- The results only relate to the behaviour of the specimen submitted for test, as described in the Technical Specification (Section 2), and under the particular conditions of test.
- The results are not intended to be the sole criteria for assessing the acoustic performance of the element in use nor do they necessarily reflect the actual behaviour once installed on site.
- The specification and interpretation of test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over 5 years old should be considered by the user. EXOVA will be able to offer a review of the procedures adopted for a particular test to ensure that they are consistent with current practices.
- The results are solely for use by the sponsor and the stated purpose.
- The sponsor cannot rely on information provided without consent from EXOVA.
- Any recommendations are specific to the assignment and the sponsor.
- Extracts from the report are not permitted.

5 Authorisation

	Issued by:	**Authorised by:**
Signature:		
Name:	Lee Grant-Riach	Martin Durham
Title:	Technical Officer	Lead Technical Officer
Date of Issue	27th April 2016	

Appendix 1 – Summary of Results & Test Data Sheets (4 Pages)

Product Name	Arbor - Fenex 78t Side Swing Window
Product Type	Single casement window

Data Sheet Ref.	Variations		Test Result R_w ($C;C_{tr}$)
MTP/F15332/03/P014	Glazing configuration	6/16/4 Low-E, Argon Warmedge	37 (0;-3) dB
MTP/F15332/03/P015	Glazing configuration	8.8 (44.2)/16/4 Low-E, Argon Warmedge	40 (-1;-4) dB
MTP/F15332/03/P016	Glazing configuration	8.8 (44.2)/16/13.1 (66.3), Argon Warmedge	37 (0;-2) dB
MTP/F15332/03/P017	Glazing configuration	10 Low-E/16/8.8 (44.2), Argon Warmedge	25 (0;-2) dB

Laboratory measurement to BS EN ISO 10140-2 - Airborne Sound Insulation of

1762

Sponsor:	**Selectron Elektrkimya Sanayi ve Ticaret Ltd Si**
Product Name	**Arbor - Fenex 78t Side Swing Window**
Product Type	Single casement window
Material Type	Timber
Variations:	
Glazing configuration	6/16/4 Low-E, Argon Warmedge

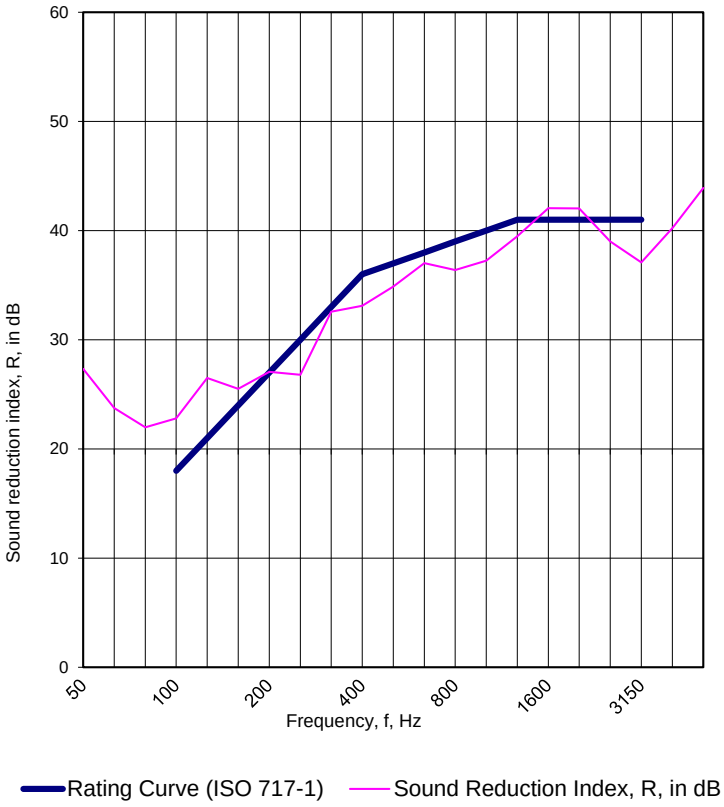
For detailed technical specification, please refer to Section 2 of the report

Data sheet Ref. MTP/F15332/03/P014
Date of Test: 19/01/2015

Source Room Volume:	86.00 m^3
Receive Room Volume:	68.00 m^3
Specimen Installed By:	Exova
Area of Specimen (S):	1.80 m^2
Temp. in Test Rooms:	18.7 °C
Static Pressure:	99970.0 Pa
Humidity in Test Rooms:	29.7 %

f, Hz	*R* ,dB	
50+	≥	27.3
63+		23.8
80+		22.0
100		22.8
125		26.5
160		25.5
200		27.1
250		26.8
315		32.6
400		33.1
500		34.9
630		37.0
800		36.4
1000		37.2
1250		39.5
1600		42.1
2000		42.0
2500		39.0
3150		37.1
4000		40.2
5000		43.9
AAD		-22.4

Frequency range for rating in accordance with ISO 717-1



R_w =	**37 dB**
R_w+C =	**37 dB**
R_w+C_{tr} =	**34 dB**

$C_{(50-3150)}$ =	0 dB	$C_{tr\ (50-3150)}$ =	-4 dB
$C_{(50-5000)}$ =	0 dB	$C_{tr\ (50-5000)}$ =	-4 dB
$C_{(100-5000)}$ =	0 dB	$C_{tr\ (100-5000)}$ =	-3 dB

Lee Grant-Riach
Technical Officer

+ indicates that the frequency is outside of our UKAS accreditation and is for information only

Laboratory measurement to BS EN ISO 10140-2 - Airborne Sound Insulation of

1762

Sponsor:	**Selectron Elektrkimya Sanayi ve Ticaret Ltd Si**
Product Name	**Arbor - Fenex 78t Side Swing Window**
Product Type	Single casement window
Material Type	Timber
Variations:	
Glazing configuration	8.8 (44.2)/16/4 Low-E, Argon Warmedge

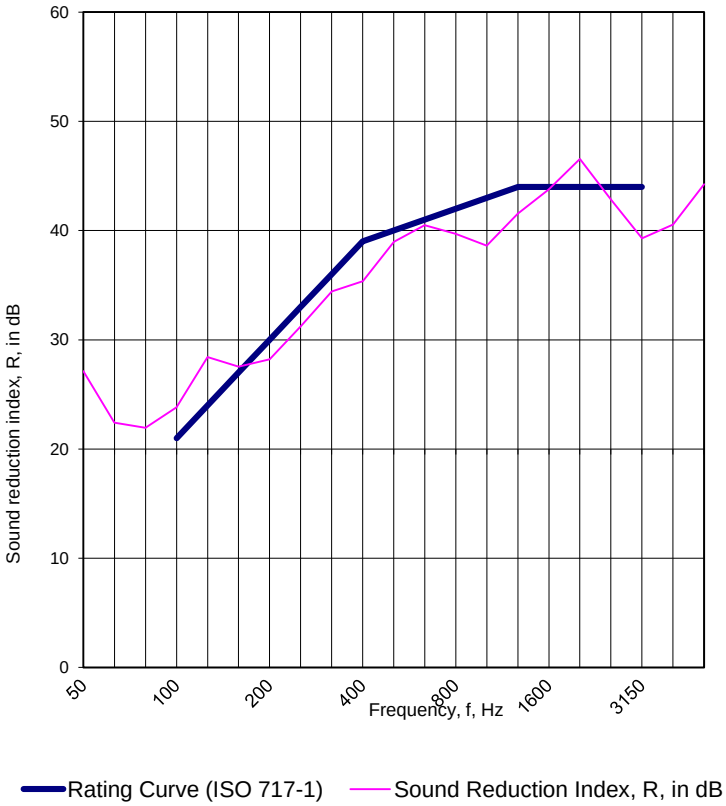
For detailed technical specification, please refer to Section 2 of the report

Data sheet Ref. MTP/F15332/03/P015
Date of Test: 19/01/2015

Source Room Volume:	86.00 m^3
Receive Room Volume:	68.00 m^3
Specimen Installed By:	Exova
Area of Specimen (S):	1.80 m^2
Temp. in Test Rooms:	18.7 °C
Static Pressure:	99970.0 Pa
Humidity in Test Rooms:	29.7 %

f, Hz		*R* ,dB
50+	≥	27.1
63+		22.4
80+		21.9
100		23.8
125		28.4
160		27.5
200		28.2
250		31.2
315		34.4
400		35.4
500		39.0
630		40.5
800		39.7
1000		38.6
1250		41.6
1600		43.8
2000		46.6
2500		42.8
3150		39.3
4000		40.6
5000		44.2
AAD		-25.5

Frequency range for rating in accordance with ISO 717-1



R_w =	**40 dB**
R_w+C =	**39 dB**
R_w+C_{tr} =	**36 dB**

$C_{(50-3150)}$ =	-1 dB	$C_{tr\ (50-3150)}$ =	-5 dB
$C_{(50-5000)}$ =	0 dB	$C_{tr\ (50-5000)}$ =	-5 dB
$C_{(100-5000)}$ =	0 dB	$C_{tr\ (100-5000)}$ =	-4 dB

Lee Grant-Riach
Technical Officer

+ indicates that the frequency is outside of our UKAS accreditation and is for information only

Laboratory measurement to BS EN ISO 10140-2 - Airborne Sound Insulation of

1762

Sponsor:	**Selectron Elektrkimya Sanayi ve Ticaret Ltd Si**
Product Name	**Arbor - Fenex 78t Side Swing Window**
Product Type	Single casement window
Material Type	Timber
Variations:	
Glazing configuration	8.8 (44.2)/16/13.1 (66.3), Argon Warmedge

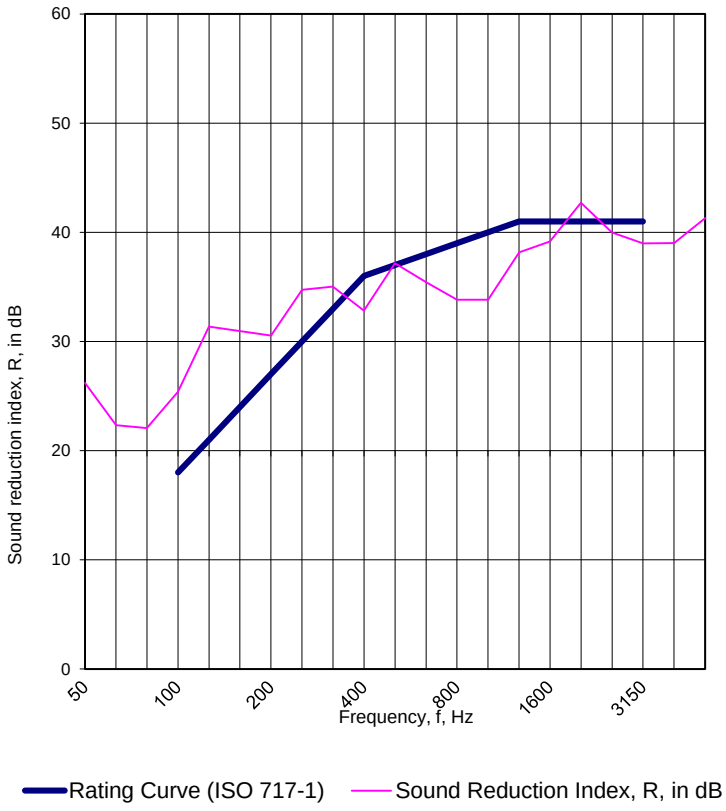
For detailed technical specification, please refer to Section 2 of the report

Data sheet Ref. MTP/F15332/03/P016
Date of Test: 19/01/2015

Source Room Volume:	86.00 m^3
Receive Room Volume:	68.00 m^3
Specimen Installed By:	Exova
Area of Specimen (S):	1.80 m^2
Temp. in Test Rooms:	18.7 °C
Static Pressure:	99970.0 Pa
Humidity in Test Rooms:	29.7 %

f, Hz		*R* ,dB
50+	≥	26.2
63+		22.3
80+		22.1
100		25.4
125		31.4
160		31.0
200		30.5
250		34.7
315		35.0
400		32.8
500		37.2
630		35.4
800		33.8
1000		33.8
1250		38.2
1600		39.2
2000		42.7
2500		40.0
3150		39.0
4000		39.0
5000		41.3
AAD		-24.8

Frequency range for rating in accordance with ISO 717-1



R_w =	**37 dB**
R_w+C =	**37 dB**
R_w+C_{tr} =	**35 dB**

$C_{(50-3150)}$ =	0 dB	$C_{tr\ (50-3150)}$ =	-3	dB
$C_{(50-5000)}$ =	0 dB	$C_{tr\ (50-5000)}$ =	-3	dB
$C_{(100-5000)}$ =	0 dB	$C_{tr\ (100-5000)}$ =	-2	dB

Lee Grant-Riach
Technical Officer

+ indicates that the frequency is outside of our UKAS accreditation and is for information only

Laboratory measurement to BS EN ISO 10140-2 - Airborne Sound Insulation of

1762

Sponsor:	**Selectron Elektrkimya Sanayi ve Ticaret Ltd Si**
Product Name	**Arbor - Fenex 78t Side Swing Window**
Product Type	Single casement window
Material Type	Timber
Variations:	
Glazing configuration	10 Low-E/16/8.8 (44.2), Argon Warmedge

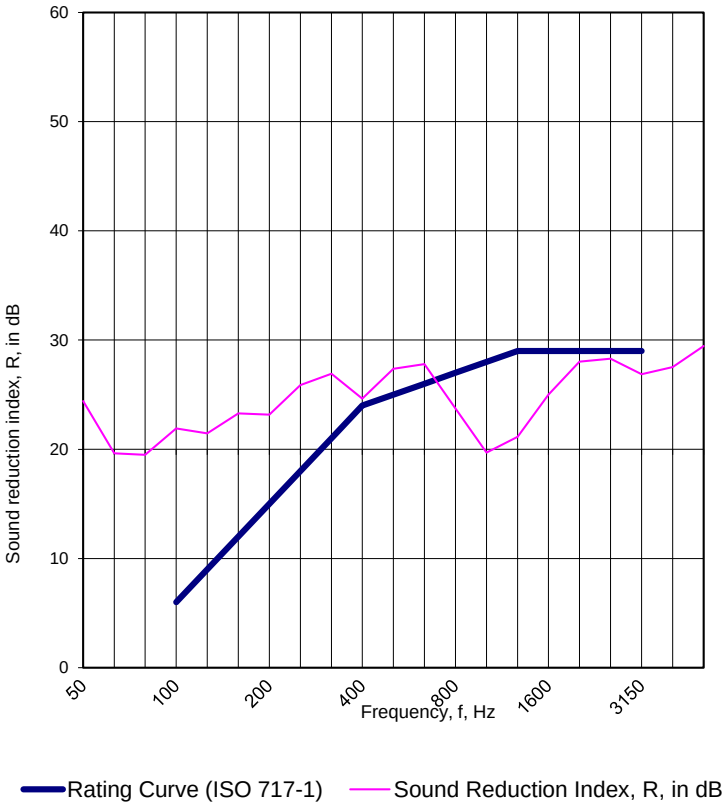
For detailed technical specification, please refer to Section 2 of the report

Data sheet Ref. MTP/F15332/03/P017
Date of Test: 19/01/2015

Source Room Volume:	86.00 m^3
Receive Room Volume:	68.00 m^3
Specimen Installed By:	Exova
Area of Specimen (S):	1.80 m^2
Temp. in Test Rooms:	18.7 °C
Static Pressure:	99970.0 Pa
Humidity in Test Rooms:	29.7 %

f, Hz		*R* ,dB
50+	≥	24.4
63+		19.6
80+		19.5
100		21.9
125		21.4
160		23.3
200		23.2
250		25.9
315		26.9
400		24.6
500		27.4
630		27.8
800		23.7
1000		19.7
1250		21.1
1600		25.0
2000		28.0
2500		28.3
3150		26.9
4000		27.5
5000		29.5
AAD		-27.3

Frequency range for rating in accordance with ISO 717-1



R_w =	**25 dB**
R_w+C =	**25 dB**
R_w+C_{tr} =	**23 dB**

$C_{(50-3150)}$ =	0 dB	$C_{tr\ (50-3150)}$ =	-2	dB
$C_{(50-5000)}$ =	0 dB	$C_{tr\ (50-5000)}$ =	-2	dB
$C_{(100-5000)}$ =	0 dB	$C_{tr\ (100-5000)}$ =	-2	dB

Lee Grant-Riach
Technical Officer

+ indicates that the frequency is outside of our UKAS accreditation and is for information only