Chartered Building Consultancy

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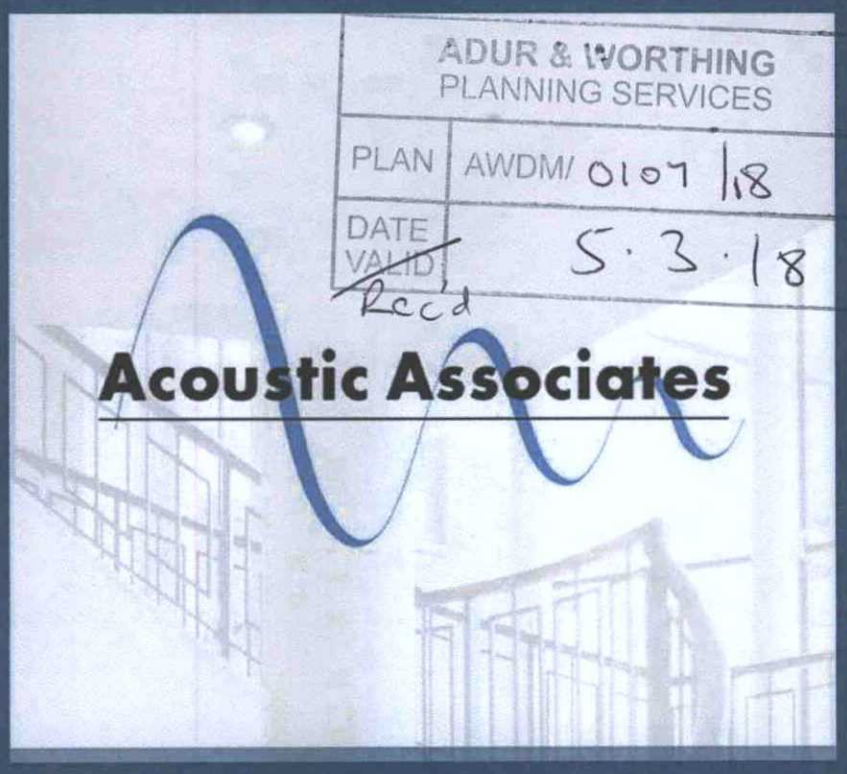
Sound Insulation Test Report



Client:	Thermacoustic Ltd (TAL)
Site Address:	2 Southwick Square, Southwick, West Sussex, BN42 4FJ
Reported By:	Simon Barrett BSc(Hons) MSc MIOA
Checked By:	George Orton BEng(Hons) MIOA
Date Written:	1 March 2018
Test Date:	28 February 2018
Report Number:	J2420
ANC Registration No.:	117
Field Test Type:	For Compliance with Airborne and Impact Sound Insulation Requirements for Floors.

Providing Better Living, Working & Learning Environments

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Table of Contents

1 Summary 3
1.1 Details of Sound Insulation Tests 3
2 Test Report 4
2.1 General 4
3 Results 5
3.1 General 5
3.2 Separating Floors (Airborne) 5
3.3 Element Construction Details 6
3.4 Test Method 7
4 References 8
5 Glossary of Terms 8
Appendices 9

1 Summary

1.1 Details of Sound Insulation Tests

The tests detailed in this report were carried out on 28 February 2018 for Thermacoustic Ltd (TAL) to check the acoustic performance of party floors at 2 Southwick Square, Southwick, West Sussex, BN42 4FJ.

The tests detailed in this report have been carried out in full accordance with BS EN ISO 140-4 [1].

The report also compares the results achieved with the levels prescribed in Approved Document E of The Building Regulations 2003 [5] in order to check for compliance. All the procedures in Annex B of Approved Document E of The Building Regulations have been followed. The following test types were carried out:

Test Type:	No. of Room Pair Tests
Vertical Airborne (Floors):	3

Approved Document E states that the individual value of airborne insulation achieved should be not less than $D_{nT,w} + C_{tr} = 43$ dB for party floors in between converted dwellings.

However as this situation deals with commercial space, the Local Planning Authority requires that the airborne sound insulation of the floor/ceiling between the commercial space and the flat above achieves an enhanced value of $D_{nT,w} + C_{tr} = 50$dB.

- **The results show that for test 1 (Ground Floor Commercial – Flat 102 Bedroom 1), the result achieves a value of $D_{nT,w} + C_{tr} = 45$dB**
- **The results show that for test 2 (Ground Floor Commercial – Flat 102 Bedroom 2, with acoustic tiles in place), the result achieves a value of $D_{nT,w} + C_{tr} = 43$dB**
- **The results show that for test 2 (Ground Floor Commercial – Flat 102 Bedroom 2, with acoustic tiles OUT OF place), the result achieves a value of $D_{nT,w} + C_{tr} = 42$dB**

- **The results show that all of the room pairs tested do not yet satisfy the requirements of the Local Planning Authority and improvements would need to be made to the separating structure in order to satisfy this condition and improve the airborne sound insulation in the worst-case, by at least 8dB.**

- **Following improvement works, it would normally be required that the construction is tested again.**

2 Test Report

2.1 General

Client Name:	Thermacoustic Ltd (TAL)
Address:	1 Spencer Terrace 45 Upper Bognor Road Bognor Regis West Sussex PO21 1HS UK
Site:	2 Southwick Square, Southwick, West Sussex, BN42 4FJ
Type of Property:	Commercial Space on the Ground floor to be converted to a Micropub, with existing flats above.
Test conducted by:	Simon Barrett BSc(Hons) MSc MIOA Acoustic Associates Sussex Ltd 8 Highdown House Shoreham Airport Shoreham-by-Sea West Sussex BN43 5PB
Date of tests:	28 February 2018
Note:	Acoustic Associates Sussex Ltd is listed on the list of ANC Registered Members and was at the time of the testing

3 Results

3.1 General

Results of the measurements, in terms of single-figure ratings, are provided below. They are provided as Weighted Standardised Level Differences $D_{nTw} + C_{tr}$ (for airborne sound) as required by BS EN ISO 140-4 [1]. They are also defined in ISO 717-1 [2], which deals with airborne insulation.

On the following pages, the graphical results are presented, together with the underlying data from which the single-figure ratings are calculated.

Approved Document E of The Building Regulations: Resistance to the passage of sound [3] sets out the following requirements for converted flats:

Airborne Sound Insulation:
The insulation values for airborne insulation for conversions floors shall not be less than $D_{nTw} + C_{tr}$ = 43 dB.

The Local Planning Authority requires that for this particular space with commercial on the ground floor below existing flats, the airborne sound insulation shall not be less than $D_{nT,w} + C_{tr}$ = 50dB.

3.2 Separating Floors (Airborne)

Source Room	Vol (m^3)	Receiving Room	Vol (m^3)	Common Area (m^2)	DnTw (dB)	DnTw + Ctr (dB)	Local Authority Minimum Pass Criterion (dB)	Pass/Fail	Test Reference 12420/	Comments
Ground Floor Commercial	>100	Flat 102 Bedroom 1	44	18	51	45	50	Fail	1	Acoustic Tiles in Place
Ground Floor Commercial	>100	Flat 102 Bedroom 2	36	14	51	43	50	Fail	2	Acoustic Tiles in Place
Ground Floor Commercial	>100	Flat 102 Bedroom 2	36	24	49	42	50	Fail	3	Acoustic Tiles out of Place

N.B. For the purposes of interpretation of the tabulated data above, with airborne sound insulation it is the level difference that is being measured between rooms and the higher the result the better the insulation.

3.3 Element Construction Details

Party floor construction consisted of the following:

Carpet and Underlay
Existing Concrete Floor
2" Timber Battens
2 layers of Plasterboard

In between the shop and bedroom 1 there was no timber battened ceiling in place.

3.4 Test Method

Before any measurements were taken, the meter was calibrated. The calibration procedure was repeated at the end of the tests to check for any calibration 'drift'. No significant drift occurred.

Resistance to Airborne Sound

Two loudspeakers were placed facing into the corners, separated from each other, at different heights in the source room and angled across the room to create a diffuse sound field. An amplifier was used to broadcast pink noise through the loudspeakers using two individual noise generators. The spectrum shape of the reverberant noise was checked to ensure that each $^1/_3$ octave band was within 6 dB of its neighbouring bands. The spectrum shape was adjusted if necessary to comply with this criterion.

Measurements were taken in the source room at each $^1/_3$ octave band centre frequency between 100 Hz and 3.15 kHz using the "sweep" technique as described in ISO140 (30 secs.). Further measurements were then taken in the same way in the receiving room on the other side of the test element. The reverberation time was also obtained using the interrupt stationery method for each $^1/_3$ octave centre frequency in the receiving room. This was spatially averaged over 6 positions in the room.

Ambient sound pressure levels (without the source operating) were also taken at each frequency in the receiving rooms to check that ambient noise levels were at least 10 dB below the measured levels due to generated noise and thus did not contribute to the measured levels. These too were spatially-averaged. Type of noise radiated: Broadband pink noise. Dominant sources of background noise were as follows: None Significant

Equipment used:

Description	Type	Serial	Manufacturer	Calibration Expiry Date	Calibration Certificate No.
Type 1 Sound and vibration Measurement System	Symphonie	941	01dB	23/11/2018	164314
Mic/Channel1	26AK	18138	GRAS	23/11/2018	164314
SLM Calibrator	GA607(B)	041173	Castle	24/04/2019	153805
Sound Source	2 Speaker	-	Neutrik/Mackie (Thump)	-	-
Sound Source	Reverb	-	Mackie	-	-

N.B. for calibration certificates and details see appendix.

4 References

1. BS EN ISO 140-4:1998: *Field measurements of airborne sound insulation between rooms*

2. BS EN ISO 717-1: 1997: *Rating of sound insulation in buildings and of building elements. Part 1: Airborne Sound Insulation.*

3. The Building Regulations 2000 (as amended 2003). *Approved Document E: Resistance to the Passage of Sound.*

5 Glossary of Terms

$D_{nT,w}$ **Weighted Standardised Level Difference.** A single-figure value of airborne sound insulation performance, derived according to procedures in BS EN ISO 717-1, based on the D_{nT} values at different frequencies (100-3150 Hz third octave bands).

D_{nT} **Standardised Level Difference.** A frequency-dependent measurement of airborne sound insulation, calculated using the following formula:

$$D_{nT} = L_1 - L_2 + 10\log(T/T_0)\ dB$$

Where:
L_1 is the energy-averaged sound pressure level due to the pink noise source measured in the source room using a sweep technique.
L_2 is the energy-averaged sound pressure level measured in the receiving room using a sweep technique.
T is the mean receiving room reverberation time (derived from T_{30} measured in seconds).
T_0 is the reference reverberation time (= 0.5s for dwellings).

C_{tr} **Spectrum Adaptation Term** calculated in accordance with BS EN ISO 717-1, to characterise airborne sound insulation with respect to typical outdoor noise sources (A-weighted urban traffic noise).

Appendices

Graphical & Tabular Presentation of Results

and

Equipment Calibration Certificates

Standardized Sound Insulation according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Client : Thermacoustic Ltd

Test date : 28/02/18

Description and identification of the building and measurement direction :

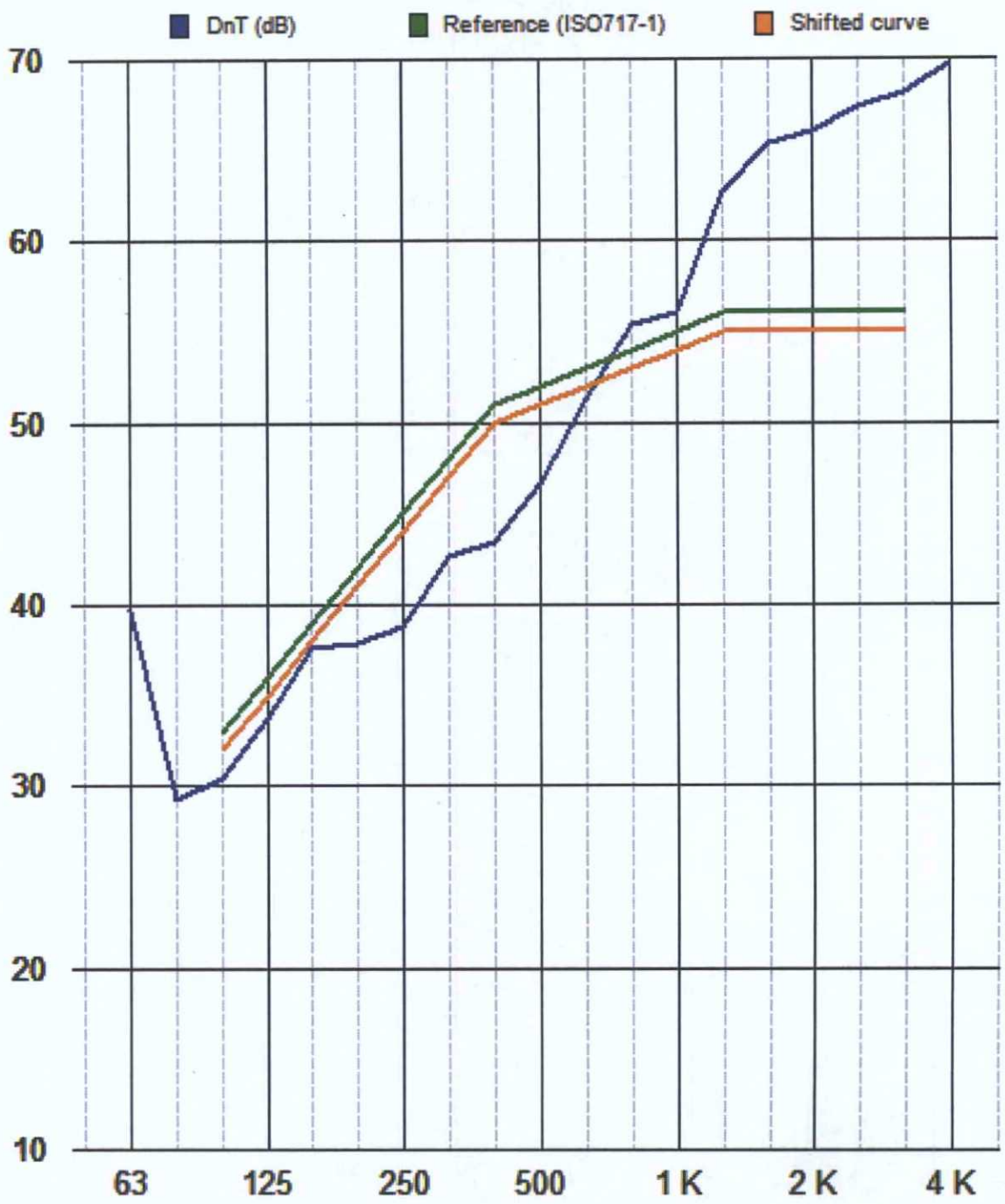
2 Southwick Square, Southwick, BN42 4FJ: Ground Floor Commercial – Flat 102 Bedroom 1 (Vertical)

(Ceiling Tiles In Place).

Volume of emission room (m^3) : >100m^3 (Approx.)

Volume of receiving room (m^3) : 44m^3 (Approx.)

Frequency f , (Hz)	Dn,T (third octave) , dB
50	---
63	>= 39.7
80	29.3
100	30.5
125	33.7
160	37.6
200	37.9
250	38.8
315	42.7
400	43.4
500	46.6
630	51.3
800	55.4
1000	56.1
1250	62.7
1600	>= 65.3
2000	>= 66.0
2500	>= 67.4
3150	>= 68.2
4000	>= 69.8
5000	---



Evaluation according to ISO 717-1 of Dn,T,w (C ; Ctr) (dB) : 51 (-1 ; -6)

Evaluation based upon field measurements, obtained with an expert method

Report N° : J2420/1

Test company : Acoustic Associates Sussex Ltd

Date : 01/03/2018

Signature : Simon Barrett

Standardized Sound Insulation according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Client : Thermacoustic Ltd **Test date** : 28/02/18

Description and identification of the building and measurement direction :

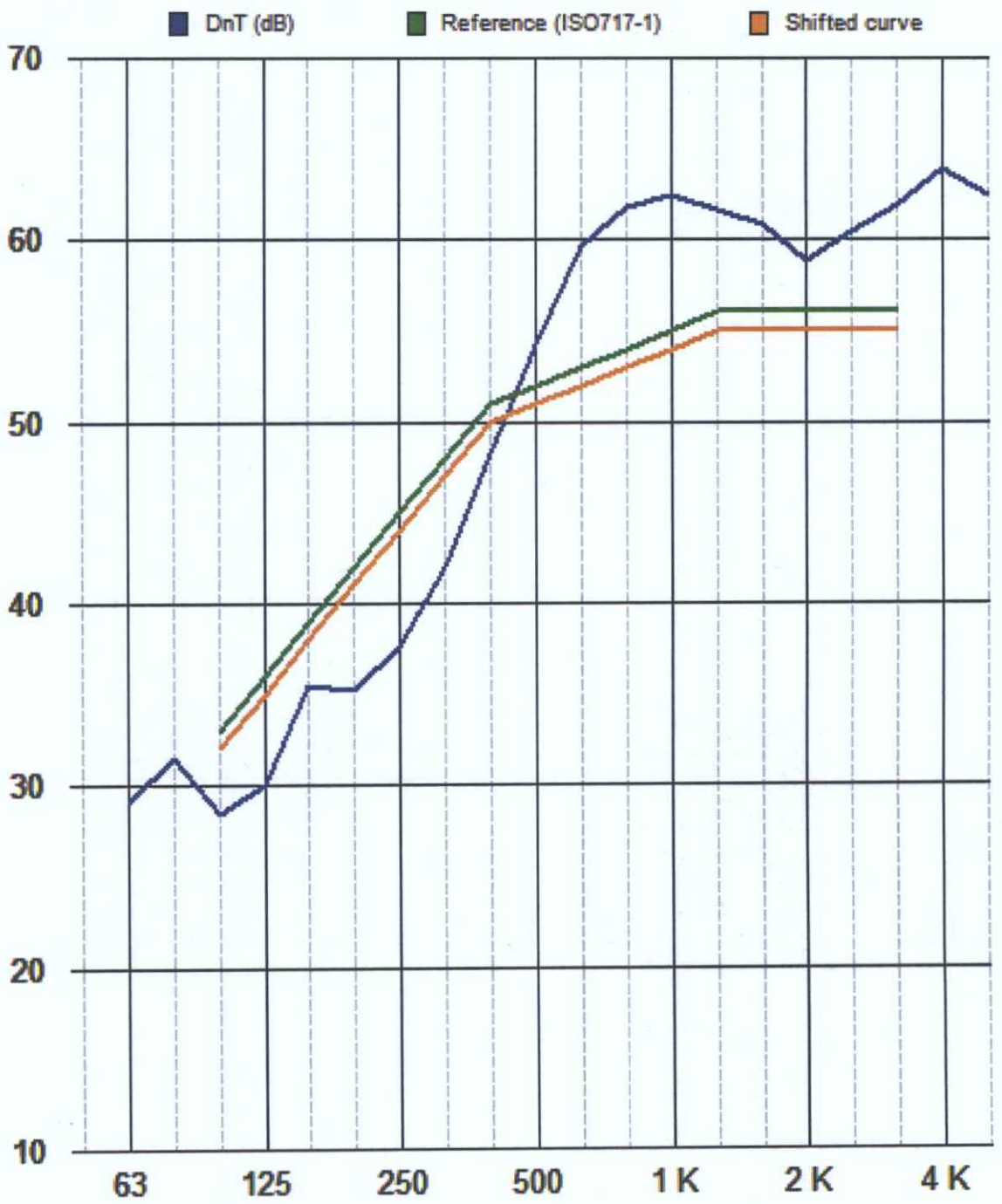
2 Southwick Square, Southwick, BN42 4FJ: Ground Floor Commercial – Flat 102 Bedroom 2 (Vertical)

(Ceiling Tiles In Place).

Volume of emission room (m^3) : >100m^3 (Approx.)

Volume of receiving room (m^3) : 36m^3 (Approx.)

Frequency f , (Hz)	Dn,T (third octave) , dB
50	>= ---
63	>= 29.1
80	31.5
100	28.4
125	30.1
160	35.5
200	35.2
250	37.6
315	42.0
400	48.2
500	54.2
630	>= 59.7
800	>= 61.8
1000	>= 62.4
1250	>= 61.6
1600	>= 60.8
2000	>= 58.9
2500	>= 60.5
3150	>= 61.9
4000	63.9
5000	62.4



Evaluation according to ISO 717-1 of Dn,T,w (C ; Ctr) (dB) : 51 (-2 ; -8)

Evaluation based upon field measurements, obtained with an expert method

Report N° : J2420/2 **Test company** : Acoustic Associates Sussex Ltd

Date : 01/03/2018 **Signature** : Simon Barrett

Standardized Sound Insulation according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Client : Thermacoustic Ltd

Test date : 28/02/18

Description and identification of the building and measurement direction :

2 Southwick Square, Southwick, BN42 4FJ: Ground Floor Commercial – Flat 102 Bedroom 2 (Vertical)

(Ceiling Tiles Opened Up).

Volume of emission room (m^3) : $100m^3$ (Approx.)

Volume of receiving room (m^3) : $36m^3$ (Approx.)

Frequency f , (Hz)	Dn,T (third octave) , dB
50	---
63	30.7
80	32.6
100	28.1
125	27.1
160	32.9
200	35.5
250	35.1
315	40.1
400	47.0
500	53.0
630	58.1
800	>= 60.0
1000	>= 61.8
1250	>= 61.4
1600	>= 60.2
2000	>= 58.7
2500	>= 58.8
3150	>= 63.3
4000	>= 68.7
5000	>= 70.1



Evaluation according to ISO 717-1 of Dn,T,w (C ; Ctr) (dB) : 49 (-2 ; -7)

Evaluation based upon field measurements, obtained with an expert method

Report N° : J2420/3

Test company : Acoustic Associates Sussex Ltd

Date : 01/03/2018

Signature : Simon Barrett

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 23 November 2016 CERTIFICATE NUMBER: **164314**

BS EN ISO 9001:2008 APPROVED BY **LRQA**

CERT No 953910

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Approved Signatory

Electronically Authorised Document

- ☒ P K CLARK
- ☐ R J WADE
- ☐ M A FROST
- ☐ M S PARDOE

Customer	**ACOUSTIC ASSOCIATES SUSSEX LTD**
Order No	**RION01-2016**
Equipment Description	**DUAL CHANNEL REAL-TIME SOUND AND VIBRATION MEASUREMENT SYSTEM**
Manufacturer	**01DB-STELL MVI TECHNOLOGIES**
Model	**SYMPHONIE**
Serial No	**00941**
Ident No	**NOT KNOWN**
Date Of Calibration	**23 NOVEMBER 2016**

INSTRUMENT CONDITION	
Adjustments Made	**YES**
Repairs Made	**NO**

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22ºC ± 3ºC and 45% ± 15% RH.

PROCEDURE

Measurements were performed in accordance with the in house laboratory procedure 2123
All equipment used has been calibrated/verified against measurement standards or reference equipment traceable to International or National Measurement Standards as specified in our control procedure WI64
The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
The attached results are a true record of the levels required to return the instrument to the original stated manufacturer's specification and accuracy where known.

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

BS EN ISO 9001:2008 APPROVAL CERTIFICATE No. 953910

CERTIFICATE NUMBER
164314

INSTRUMENTS USED

EQUIPMENT	SERIAL No	CERTIFICATE No	CAL DUE
Bruel & Kjaer 4226	2952856	U23034	07 Nov 2017

Notes:

MEASUREMENT UNCERTAINTIES

The expanded uncertainty quoted refers to the measured values only, with no account being taken of the instruments ability to maintain its calibration. The expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

PARAMETER	RANGE	EXPANDED UNCERTAINTY
d.c. Resistance	0.01Ω - 400MΩ	± 409ppm
	400MΩ - 1TΩ	± 1%
d.c. Voltage	0V – 1kV	± 79ppm
d.c. Voltage	1.01kV-15kV	± 2.2%
d.c. Current	0mA – 20A	± 437ppm
a.c. Voltage	0mV – 1.05kV	± 1.2%
a.c. Current	0mA – 20A	± 0.5%
Frequency	0.5Hz – 20GHz	± 0.1ppm
Capacitance	0.5nF – 40mF	± 1.1%
Time	0 - 1 Hour	± 1s
Distortion	10mV - 100V	± 1.4mV
Temperature (Dry Block)	-30°C - 350°C	± 1%
Temperature (Simulation)	-270°C - 1800°C	± 0.57%
Pressure	10mBar - 35Bar	± 0.04%
Torque	0.1 - 1100Nm	± 0.5%
Weight	2g - 157kg	± 0.03%
Humidity	0% - 90%	± 1%
Shock & Impulse Hammers		± 4%
Spring Hammers		± 0.015J
Sound	Frequency	± 0.06%
Sound	Level	± 0.16dB
Tachometers	60rpm - 96000rpm	± 0.1%
Anemometers	2.5m/s to 15m/s	± 2.0%
Vibration Meters	10Hz - 1kHz	± 5%
Vibration Calibrators		± 3%
Mechanical Measurement	<200mm	± 0.0003mm
	>200mm	± 0.002mm
Inductance		± 0.1%
Power (VA)		± 1%
Power (RF)		± 0.5dB

This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

BS EN ISO 9001:2008 APPROVAL CERTIFICATE No. 953910

CERTIFICATE NUMBER

164314

RESULT SHEET 3166 – 72-947 SOUND LEVEL METER

AS FOUND

1) ACOUSTIC LEVEL
@1kHz

Channel	Applied	Limits	Measured	Units	Error %
1	94	±2%	94.2	dB	0.21
2	94	±2%	94.1	dB	0.11

POST ADJUSTMENT

1) ACOUSTIC LEVEL
@1kHz

Channel	Applied	Limits	Measured	Units	Error %
1	94	±2%	94.0	dB	0.00
2	94	±2%	94.0	dB	0.00

MICROPHONES

Channel	Microphone Model	Serial Number	Corrected Sensitivity	Units
1	26AK	18138	$4.198e^{-02}$	V/Pa
2	26AK	13887	$4.785e^{-02}$	V/Pa

COMMENTS
Calibration carried out in accordance with BS7580 part 1 1997, section 5.6.1.

TEST ENGINEER **M A FROST** **DATE 23 NOVEMBER 2016**