

Appendix H Noise Monitoring Equipment Calibration Certificate

Certificate of Calibration

for

Description: *Sound Level Meter*
Manufacturer: *NTi*
Type No.: *XL2 (Serial No.: A2A-13661-E0)*
Microphone: *ACO 7052 (Serial No.: 73784)*
Preamplifier: *NTi Audio MA220 (Serial No.:6282)*

Submitted by:

Customer: *Acuity Sustainability Consulting Limited*
Address: *Unit 1908, Nos. 301-305 Castle Peak Road, Kwai
Chung, N.T.*

Upon receipt for calibration, the instrument was found to be:

- Within**
 Outside

the allowable tolerance.


The test equipment used for calibration are traceable to National Standards via:

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory

Date of receipt: 27 September 2019

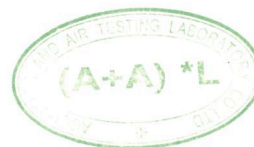
Date of calibration: 30 September 2019

Calibrated by: 
Calibration Technician

Certified by: 
Mr. Tang Cheuk Hang
Quality Manager

Date of issue: 30 September 2019

Certificate No.: APJ19-096-CC001



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1. Calibration Precaution:

- The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 24 hours, and switched on to warm up for over 10 minutes before the commencement of the test.
- The results presented are the mean of 3 measurements at each calibration point.

2. Calibration Conditions:

Air Temperature: 24.2 °C
 Air Pressure: 1006 hPa
 Relative Humidity: 40.8 %

3. Calibration Equipment:

	Type	Serial No.	Calibration Report Number	Traceable to
Multifunction Calibrator	B&K 4226	2288467	AV180064	HOKLAS

4. Calibration Results

Sound Pressure Level

Reference Sound Pressure Level

Setting of Unit-under-test (UUT)			Applied value		UUT Reading,	IEC 61672 Class 1
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz	dB	Specification, dB
40-140	dBA SPL	Fast	94	1000	94.0	±0.4

Linearity

Setting of Unit-under-test (UUT)			Applied value		UUT Reading,	IEC 61672 Class 1
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz	dB	Specification, dB
30-130	dBA SPL	Fast	94	1000	94.0	Ref
			104		104.0	±0.3
			114		114.0	±0.3

Time Weighting

Setting of Unit-under-test (UUT)			Applied value		UUT Reading,	IEC 61672 Class 1
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz	dB	Specification, dB
30-130	dBA SPL	Fast	94	1000	94.0	Ref
		Slow			94.0	±0.3

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Frequency Response

Linear Response

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB	
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz			
30-130	dB	SPL	Fast	94	31.5	94.0	±2.0
					63	93.8	±1.5
					125	93.9	±1.5
					250	93.9	±1.4
					500	93.8	±1.4
					1000	94.0	Ref
					2000	94.1	±1.6
					4000	94.2	±1.6
				8000	94.5	+2.1; -3.1	

A-weighting

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB	
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz			
30-130	dBA	SPL	Fast	94	31.5	54.6	-39.4±2.0
					63	67.7	-26.2±1.5
					125	77.8	-16.1±1.5
					250	85.2	-8.6±1.4
					500	90.7	-3.2±1.4
					1000	94.0	Ref
					2000	95.3	+1.2±1.6
					4000	95.2	+1.0±1.6
				8000	93.3	-1.1+2.1; -3.1	

C-weighting

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB	
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz			
30-130	dBC	SPL	Fast	94	31.5	91.0	-3.0±2.0
					63	93.1	-0.8±1.5
					125	93.6	-0.2±1.5
					250	93.9	-0.0±1.4
					500	93.9	-0.0±1.4
					1000	94.0	Ref
					2000	93.9	-0.2±1.6
					4000	93.4	-0.8±1.6
				8000	92.5	-3.0+2.1: -3.1	

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5. Calibration Results Applied

The results apply to the particular unit-under-test only. All calibration points are within manufacture's specification as IEC 61672 Class 1.

Uncertainties of Applied Value:

94 dB	31.5 Hz	± 0.10
	63 Hz	± 0.15
	125 Hz	± 0.10
	250 Hz	± 0.05
	500 Hz	± 0.05
	1000 Hz	± 0.05
	2000 Hz	± 0.05
	4000 Hz	± 0.05
	8000 Hz	± 0.10
104 dB	1000 Hz	± 0.05
114 dB	1000 Hz	± 0.05

The uncertainties are evaluated for a 95% confidence level.

Note:

The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allow for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. (A+A)*L shall not be liable for any loss or damage resulting from the use of the equipment.



Range: Low: Steady level nominal result = 60dB

Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5
MAX	Fast	Indication [dB]	60.1	60.0	59.1	57.3	55.3	51.8	48.9	46.0	42.0	39.0	36.0
		Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.1
	Slow	Indication [dB]	58.0	56.0	53.6	49.8	46.9	42.9	40.0	37.0	32.9	-	-
		Error [dB]	0.0	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-
SEL	-	Indication [dB]	60.1	57.1	53.1	50.1	47.1	43.1	40.1	37.1	33.1	30.1	27.0
		Error [dB]	0.0	-0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0

Range: Low: Steady level nominal result = 35dB

Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5
MAX	Fast	Indication [dB]	35.1	35.0	34.1	-	-	-	-	-	-	-	-
		Error [dB]	-0.0	-0.0	0.0	-	-	-	-	-	-	-	-
	Slow	Indication [dB]	33.0	31.0	27.6	-	-	-	-	-	-	-	-
		Error [dB]	-0.1	-0.0	-0.1	-	-	-	-	-	-	-	-
SEL	-	Indication [dB]	35.1	32.1	28.1	-	-	-	-	-	-	-	-
		Error [dB]	-0.0	-0.0	0.0	-	-	-	-	-	-	-	-

Range: High: Steady level nominal result = 134dB

Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5
MAX	Fast	Indication [dB]	134.1	134.0	133.1	129.3	125.8	122.9	120.0	116.0	113.0	110.0	107.0
		Error [dB]	-0.0	0.0	0.0	-0.0	-0.0	-0.1	0.0	-0.0	-0.0	-0.0	-0.1
	Slow	Indication [dB]	132.0	130.0	126.6	123.8	120.9	117.0	114.0	111.0	107.0	-	-
		Error [dB]	-0.1	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-	-
SEL	-	Indication [dB]	134.1	131.1	127.1	124.1	121.1	117.1	114.1	111.1	107.1	104.0	101.0
		Error [dB]	0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.1	-0.1

Range: High: Steady level nominal result = 54dB

Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5
MAX	Fast	Indication [dB]	54.1	54.0	53.1	51.5	49.3	-	-	-	-	-	-
		Error [dB]	0.0	0.0	0.0	0.0	-0.0	-	-	-	-	-	-
	Slow	Indication [dB]	52.1	50.0	46.6	43.9	40.9	-	-	-	-	-	-
		Error [dB]	-0.0	-0.0	-0.0	-0.1	-0.1	-	-	-	-	-	-
SEL	-	Indication [dB]	54.1	51.1	47.1	44.1	41.1	-	-	-	-	-	-
		Error [dB]	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-

Range: High: Steady level nominal result = 45dB

Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5
MAX	Fast	Indication [dB]	45.2	45.1	44.2	-	-	-	-	-	-	-	-
		Error [dB]	0.0	0.0	0.0	-	-	-	-	-	-	-	-
	Slow	Indication [dB]	43.1	41.0	37.7	-	-	-	-	-	-	-	-
		Error [dB]	-0.0	-0.0	-0.1	-	-	-	-	-	-	-	-
SEL	-	Indication [dB]	45.2	42.2	38.2	-	-	-	-	-	-	-	-
		Error [dB]	0.0	0.0	0.0	-	-	-	-	-	-	-	-

4. FREQUENCY RESPONSE (electrical)

LEVEL METER function: Characteristic: Z; Range: Low; Input signal = 120 dB.



Calculated Filter Response

Measured Filter Response with Preamplifier SV18 (frequency: Level)

f [Hz]	L [dB]	f [Hz]	L [dB]	f [Hz]	L [dB]	f [Hz]	L [dB]
10	0.0	100	0.0	1000	0.0	10000	0.0
12.5	0.0	125	0.0	8000	0.0		
16	0.0	250	0.0	16000	0.0		
20	0.0	500	0.0	20000	0.0		
25	0.0	1000	0.0				
31.5	0.0	2000	0.0				

All frequencies are nominal center values for the 1/3 octave bands

5. INTERNAL NOISE LEVEL (electrical - compensated)

LEVEL METER function: Range: Low; (Backlight - off); Calibration factor: (dB)

Characteristic	Z	A	C
Level [dB]	≤30	≤12	≤12

measured with preamplifier SVANTER type SV18 No. 78763

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6. INTERNAL NOISE LEVEL (acoustical - compensated)

LEVEL METER function: Characteristic: A; (Backlight - off)

Range	Low	High
Indication [dB]	≤15	19.8

Noise measured in special chamber, with reference microphone G.R.A.S type 40AN No 73421

ENVIRONMENTAL CONDITIONS

Temperature	Relative humidity	Ambient pressure
23 °C	25%	1016 hPa

TEST EQUIPMENT

Item	Manufacturer	Model	Serial no.	Description
1	SVANTER	SVAN-401	87	Signal generator
2	SVANTER	SVAN-912A	6120	Sound & Vibration Analyser
3	RIGOL	DM3068	DNF30155100773	Digital multimeter
4	SVANTER	SV33	48878	Acoustic calibrator
5	SVANTER	ST02	-	Microphone equivalent electrical impedance (189F)

CONFORMITY & TEST DECLARATION

1. Herewith Svantek company declares that this instrument has been calibrated and tested in compliance with the internal ISO9001 procedures and meets all specifications given in the Manual(s) or respectively surpass them
2. The acoustic calibration was performed using the Sound Calibrator and is traceable to the GUM (Central Office of Measures) reference standard - sound level calibrator Dpe 4231 No 2392773
3. The information appearing on this sheet has been compiled specifically for this instrument. This form is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein
4. This calibration sheet shall not be reproduced except in full, without written permission of the SVANTER Ltd

Calibration specialist: Krzysztof Czachor

Test date: 2019-02-06

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FACTORY CALIBRATION DATA OF THE SV/AN 971 No. 77731
 with preamplifier SVANTEK type SV18 No. 78763 and with microphone ACO type 7052E No. 72681

1. CALIBRATION* (acoustical)

LEVEL METER function, Range Low, Reference frequency: 1000Hz, Sound Pressure Level: 113.97 dB

Characteristic	Correct value [dB]	Indication [dB]	Error [dB]
Z	113.97	114.01	0.04
A	113.97	114.01	0.04
C	113.97	114.01	0.04

Calibration measured with the microphone ACO type 7052E No. 72681, Calibration factor: -0.20 dB

2. LINEARITY TEST* (electrical)

LEVEL METER function, Range Low, Characteristic: A, $f_{me} = 31.5$ Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	80.0	100.0	120.0
Error [dB]	0.1	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.0

LEVEL METER function, Range Low, Characteristic: A, $f_{me} = 1000$ Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	80.0	100.0	120.0
Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0

LEVEL METER function, Range Low, Characteristic: A, $f_{me} = 8000$ Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	80.0	100.0	120.0
Error [dB]	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0

LEVEL METER function, Range High, Characteristic: A, $f_{me} = 31.5$ Hz

Nominal result LEQ [dB]	34.0	35.0	36.0	38.0	40.0	60.0	80.0	97.0
Error [dB]	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0

LEVEL METER function, Range High, Characteristic: A, $f_{me} = 1000$ Hz

Nominal result LEQ [dB]	34.0	35.0	36.0	38.0	40.0	60.0	80.0	100.0	120.0	137.0
Error [dB]	0.1	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0

LEVEL METER function, Range High, Characteristic: A, $f_{me} = 8000$ Hz

Nominal result LEQ [dB]	34.0	35.0	36.0	38.0	40.0	60.0	80.0	100.0	120.0	136.0
Error [dB]	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0

1/3 OCTAVE (1kHz), Range Low, $f_{me} = 1000$ Hz

Nominal result [dB]	25.0	30.0	40.0	60.0	80.0	100.0	120.0	123.0
Error [dB]	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	-0.0

3. TONE BURST RESPONSE*

LEVEL METER function, Characteristic: A, $f_{me} = 4000$ Hz, Burst duration: 2s

Range Low, Steady level nominal result = 120dB

Result	Detector		500		200		100		50		20		10		5		2		1		0.5		0.25		
	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	
MAX	Fast	120.1	0.0	120.0	0.0	119.1	0.0	117.5	0.0	115.2	0.0	111.8	0.0	108.9	0.0	102.0	0.0	99.0	0.0	96.0	0.0	93.0	0.0	91.0	0.0
	Slow	118.0	0.0	115.9	0.0	109.8	0.0	106.8	0.0	102.9	0.0	99.9	0.0	96.9	0.0	91.0	0.0	88.0	0.0	85.0	0.0	82.0	0.0	79.0	0.0
SEL	Fast	120.1	0.0	117.1	0.0	115.1	0.0	110.1	0.0	107.1	0.0	103.1	0.0	100.1	0.0	97.0	0.0	95.1	0.0	90.0	0.0	87.0	0.0	83.9	0.0
	Slow	120.1	0.0	117.1	0.0	115.1	0.0	110.1	0.0	107.1	0.0	103.1	0.0	100.1	0.0	97.0	0.0	95.1	0.0	90.0	0.0	87.0	0.0	83.9	0.0



1/2" Prepolarized Condenser Microphone

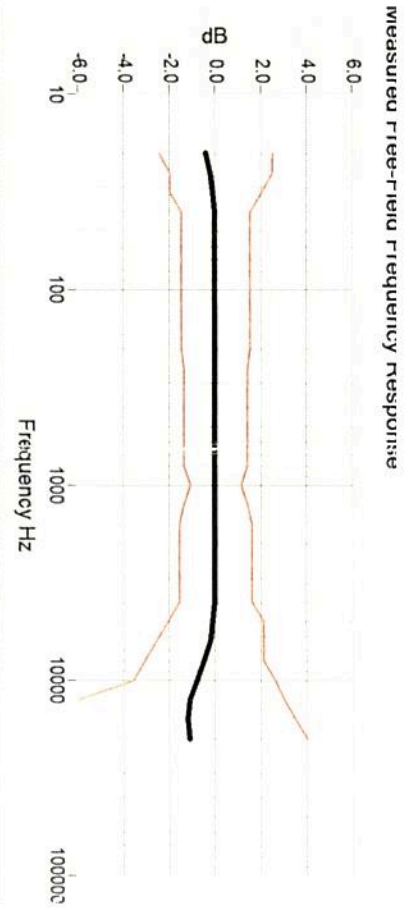
Calibration Chart

Type: **7052E** Serial No: **72681**

Measured sensitivity: **35.41 mV/Pa**

Manufacturer: **ACO PACIFIC**

Date: **2019-01-21** Signature: *[Signature]*



Environmental Calibration Conditions: **22 °C 28 % 1010 hPa**

Certificate of Calibration

for

Description: *Sound Level Meter*
Manufacturer: *NTi Audio*
Type No.: *XL2 (Serial No.: A2A-13548-E0)*
Microphone: *ACO 7052 (Serial No.:60997)*
Preamplifier: *NTi Audio MA220 (Serial No.:5287)*

Submitted by:

Customer: *Acuity Sustainability Consulting Limited*
Address: *Unit 1908, iPlace, Nos. 301-305 Castle Peak Road,*
Kwai Chung, New Territories

Upon receipt for calibration, the instrument was found to be:

- Within**
 Outside

the allowable tolerance.

The test equipment used for calibration are traceable to National Standards via:

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory

Date of receipt: 8 January 2019

Date of calibration: 10 January 2019

Calibrated by: _____
Calibration Technician

Certified by: _____
Mr. Ng Yan Wa
Laboratory Manager

Date of issue: 10 January 2019

Certificate No.: APJ18-157-CC001

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1. Calibration Precaution:

- The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 24 hours, and switched on to warm up for over 10 minutes before the commencement of the test.
- The results presented are the mean of 3 measurements at each calibration point.

2. Calibration Conditions:

Air Temperature: 22.3 °C
 Air Pressure: 1006 hPa
 Relative Humidity: 71.3 %

3. Calibration Equipment:

	Type	Serial No.	Calibration Report Number	Traceable to
Multifunction Calibrator	B&K 4226	2288467	AV180064	HOKLAS

4. Calibration Results

Sound Pressure Level

Reference Sound Pressure Level

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz		
30-130	dBA SPL	Fast	94	1000	94.0	±0.4

Linearity

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz		
30-130	dBA SPL	Fast	94	1000	94.0	Ref
			104		104.0	±0.3
			114		114.0	±0.3

Time Weighting

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz		
30-130	dBA SPL	Fast	94	1000	94.0	Ref
		Slow			94.0	±0.3

Frequency Response

Linear Response

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB	
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz			
30-130	dB	SPL	Fast	94	31.5	94.0	±2.0
					63	94.1	±1.5
					125	94.1	±1.5
					250	94.0	±1.4
					500	94.0	±1.4
					1000	94.0	Ref
					2000	93.8	±1.6
					4000	93.8	±1.6
					8000	92.7	+2.1; -3.1

A-weighting

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB	
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz			
30-130	dBA	SPL	Fast	94	31.5	54.8	-39.4±2.0
					63	67.9	-26.2±1.5
					125	78.0	-16.1±1.5
					250	85.4	-8.6±1.4
					500	90.8	-3.2±1.4
					1000	94.0	Ref
					2000	95.1	+1.2±1.6
					4000	94.8	+1.0±1.6
					8000	91.6	-1.1+2.1; -3.1

C-weighting

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB	
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz			
30-130	dBC	SPL	Fast	94	31.5	91.0	-3.0±2.0
					63	93.2	-0.8±1.5
					125	93.9	-0.2±1.5
					250	94.0	-0.0±1.4
					500	94.0	-0.0±1.4
					1000	94.0	Ref
					2000	93.7	-0.2±1.6
					4000	93.0	-0.8±1.6
					8000	89.7	-3.0 +2.1; -3.1

5. Calibration Results Applied

The results apply to the particular unit-under-test only. All calibration points are within manufacture's specification as IEC 61672 Class 1.

Uncertainties of Applied Value:

94 dB	31.5 Hz	± 0.05
	63 Hz	± 0.05
	125 Hz	± 0.10
	250 Hz	± 0.10
	500 Hz	± 0.10
	1000 Hz	± 0.05
	2000 Hz	± 0.05
	4000 Hz	± 0.10
	8000 Hz	± 0.10
104 dB	1000 Hz	± 0.05
114 dB	1000 Hz	± 0.05

The uncertainties are evaluated for a 95% confidence level.

Note:

The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allow for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. (A+A)*L shall not be liable for any loss or damage resulting from the use of the equipment.





ISO9001 certified

Sound Level Calibrator

Type: **SV33B** Serial No: **83042**

Calibration Chart

Sound pressure level: **114.07 dB** (THD: **0.74 %**)
Frequency: **1000 Hz**

Short term level stability: **0.05 dB**
Frequency stability: **0.01 %**

Measurement conditions

Temperature: **23 °C**
Relative humidity: **33 %**
Ambient pressure: **1006 hPa**

Reference conditions

Temperature: **23.0 °C**
Relative humidity: **50 %**
Ambient pressure: **1013.2 hPa**

CONFORMITY & TEST DECLARATION

The stated level is valid at reference conditions.
Measured according to IEC 60942:2003.
The stated level is relative to 20 μ Pa .

The level is traceable to GUM (Central Office of Measures, Poland) with a calculated uncertainty less than ± 0.15 dB (2*sd).

Calibration specialist :

Date : 2019-02-21