

Appendix E Noise Monitoring Equipment Calibration Certificate

FACTORY CALIBRATION DATA OF THE SVAN 971 No. C119577

with preamplifier SVANTEK type SV 18 No. C122487 and

with microphone ACO type 7052E No. 85197

1. CALIBRATION* (acoustical)

LEVEL METER function; Range: Low; Reference frequency: 1000Hz; Sound Pressure Level: 114.03 dB.

Characteristic	Correct value [dB]	Indication [dB]	Error [dB]
Z	114.03	114.05	0.02
A	114.03	114.05	0.02
C	114.03	114.05	0.02

Calibration measured with the microphone ACO type 7052E No. 85197. Calibration factor: 0.74 dB.

2. LINEARITY TEST* (electrical)

LEVEL METER function; Range: Low; Characteristic: A; $f_{\text{sin}} = 31.5$ Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	83.0
Error [dB]	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0

LEVEL METER function; Range: Low; Characteristic: A; $f_{\text{sin}} = 1000$ Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	80.0	100.0	123.0
Error [dB]	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.0	-0.0	-0.0	-0.0

LEVEL METER function; Range: Low; Characteristic: A; $f_{\text{sin}} = 8000$ Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	80.0	100.0	122.0
Error [dB]	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.0	-0.0	-0.0	-0.0

LEVEL METER function; Range: High; Characteristic: A; $f_{\text{sin}} = 31.5$ 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; $f_{\text{sin}} = 1000$ 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]	-0.0	0.0	-0.0	-0.0	-0.1	-0.1	-0.0	-0.0	-0.0	-0.0

LEVEL METER function; Range: High; Characteristic: A; $f_{\text{sin}} = 8000$ Hz

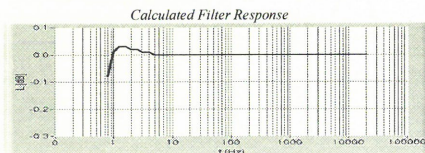
Nominal result LEQ [dB]	34.0	35.0	36.0	38.0	40.0	60.0	80.0	100.0	120.0	136.0
Error [dB]	-0.0	-0.0	-0.1	-0.1	-0.1	-0.1	0.0	0.0	-0.0	0.0

1/3 OCTAVE (1kHz); Range: Low; $f_{\text{sin}} = 1000$ 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

4. FREQUENCY RESPONSE* (electrical)

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



Measured Filter Response with Preamplifier SV18
(f-frequency, L-level)

f [Hz]	L [dB]	f [Hz]	L [dB]	f [Hz]	L [dB]
10	-0.1	63	0.0	4000	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; (Back-light - off); Calibration factor: 0dB

Characteristic	Z	A	C
Level [dB]	≤20	≤12	≤12

* measured with preamplifier SVANTEK type SV 18 No. C122487.

6. INTERNAL NOISE LEVEL (acoustical - compensated)

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

Range	Low	High
Indication [dB]	≤15	20.5

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	42%	1008 hPa

TEST EQUIPMENT

Item	Manufacturer	Model	Serial no.	Description
1.	SVANTEK	SVAN 401	100	Signal generator
2.	SVANTEK	SVAN 912A	4369	Sound & Vibration Analyser
3.	RIGOL	DM3068	DM30155100773	Digital multimeter
4.	SVANTEK	SV33B	93171	Acoustic calibrator
5.	SVANTEK	ST02	-	Microphone equivalent electrical impedance (18pF)

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 specification 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 type 4231 No 2292773.
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 SVANTEK Ltd.

Calibration specialist: Cezary Dardziński 

Test date: 2022-10-11

FACTORY CALIBRATION DATA OF THE SVAN 971 No. C132260
 with preamplifier SVANTEK type SV 18 No. C132221 and
 with microphone ACO type 7052E No. 82767

1. CALIBRATION* (acoustical)

LEVEL METER function; Range: Low; Reference frequency: 1000Hz; Sound Pressure Level: 114.03 dB.

Characteristic	Correct value [dB]	Indication [dB]	Error [dB]
Z	114.03	114.05	0.02
A	114.03	114.05	0.02
C	114.03	114.05	0.02

Calibration measured with the microphone ACO type 7052E No. 82767. Calibration factor: 0.68 dB.

2. LINEARITY TEST* (electrical)

 LEVEL METER function; Range: Low; Characteristic: A; $f_{in} = 31.5$ Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	83.0
Error [dB]	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0

 LEVEL METER function; Range: Low; Characteristic: A; $f_{in} = 1000$ Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	80.0	100.0	123.0
Error [dB]	0.1	0.1	0.1	0.0	0.1	0.0	-0.0	-0.0	0.0	-0.0

 LEVEL METER function; Range: Low; Characteristic: A; $f_{in} = 8000$ Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	80.0	100.0	122.0
Error [dB]	0.1	0.1	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0	-0.0

 LEVEL METER function; Range: High; Characteristic: A; $f_{in} = 31.5$ 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; $f_{in} = 1000$ 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	0.1	0.1	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0

 LEVEL METER function; Range: High; Characteristic: A; $f_{in} = 8000$ Hz

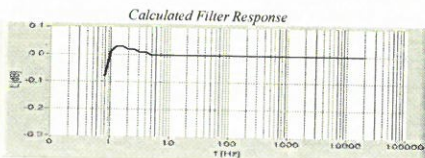
Nominal result LEQ [dB]	34.0	35.0	36.0	38.0	40.0	60.0	80.0	100.0	120.0	136.0
Error [dB]	0.1	0.0	0.1	0.0	0.0	-0.0	-0.0	-0.0	-0.0	0.0

 1/3 OCTAVE (1kHz); Range: Low; $f_{in} = 1000$ Hz

Nominal result [dB]	25.0	30.0	40.0	60.0	80.0	100.0	120.0	123.0
Error [dB]	0.1	0.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0

4. FREQUENCY RESPONSE* (electrical)

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


 Measured Filter Response with Preamplifier SV18
 (f-frequency, L-level)

f [Hz]	L [dB]	f [Hz]	L [dB]	f [Hz]	L [dB]
10	-0.1	63	0.0	4000	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; (Back-light - off) ; Calibration factor: 0dB

Characteristic	Z	A	C
Level [dB]	≤20	≤12	≤12

* measured with preamplifier SVANTEK type SV 18 No. C132221.

6. INTERNAL NOISE LEVEL (acoustical - compensated)

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

Range	Low	High
Indication [dB]	≤15	20.4

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

ENVIRONMENTAL CONDITIONS

Temperature	Relative humidity	Ambient pressure
21 °C	43%	1012 hPa

TEST EQUIPMENT

Item	Manufacturer	Model	Serial no.	Description
1.	SVANTEK	SVAN 401	100	Signal generator
2.	SVANTEK	SVAN 912A	4369	Sound & Vibration Analyser
3.	RIGOL	DM3068	DM30155100773	Digital multimeter
4.	SVANTEK	SV33B	93171	Acoustic calibrator
5.	SVANTEK	ST02	-	Microphone equivalent electrical impedance (18pF)

CONFORMITY & TEST DECLARATION

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Calibration specialist: Cezary Dardziński

Test date: 2022-10-27

FACTORY CALIBRATION DATA OF THE SVAN 971 No. C132261
 with preamplifier SVANTEK type SV 18 No. C132231 and
 with microphone ACO type 7052E No. 85231

1. CALIBRATION* (acoustical)

 LEVEL METER function; Range: Low; Reference frequency: 1000Hz; Sound Pressure Level: **114.07 dB**.

Characteristic	Correct value [dB]	Indication [dB]	Error [dB]
Z	114.07	114.07	0.00
A	114.07	114.07	0.00
C	114.07	114.07	0.00

Calibration measured with the microphone ACO type 7052E No. 85231. Calibration factor: 0.95 dB.

2. LINEARITY TEST* (electrical)

 LEVEL METER function; Range: Low; Characteristic: A; $f_{up}=31.5$ Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	83.0
Error [dB]	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0

 LEVEL METER function; Range: Low; Characteristic: A; $f_{up}=1000$ Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	80.0	100.0	123.0
Error [dB]	0.1	0.0	0.1	0.0	0.0	0.0	-0.0	0.0	0.0	0.0

 LEVEL METER function; Range: Low; Characteristic: A; $f_{up}=8000$ Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	80.0	100.0	122.0
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; $f_{up}=31.5$ 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; $f_{up}=1000$ 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	0.1	0.1	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0

 LEVEL METER function; Range: High; Characteristic: A; $f_{up}=8000$ Hz

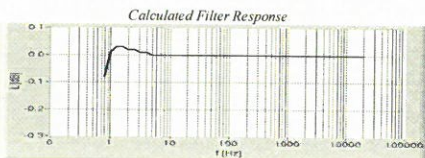
Nominal result LEQ [dB]	34.0	35.0	36.0	38.0	40.0	60.0	80.0	100.0	120.0	136.0
Error [dB]	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	-0.0

 1/3 OCTAVE (1kHz); Range: Low; $f_{up}=1000$ Hz

Nominal result [dB]	25.0	30.0	40.0	60.0	80.0	100.0	120.0	123.0
Error [dB]	0.1	0.0	0.0	-0.0	0.0	0.0	0.0	0.0

4. FREQUENCY RESPONSE* (electrical)

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


 Measured Filter Response with Preamplifier SV18
 (f-frequency, L-level)

f [Hz]	L [dB]	f [Hz]	L [dB]	f [Hz]	L [dB]
10	-0.1	63	0.0	4000	-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; (Back-light - off); Calibration factor: 0dB

Characteristic	Z	A	C
Level [dB]	≤20	≤12	≤12

* measured with preamplifier SVANTEK type SV 18 No. C132231.

6. INTERNAL NOISE LEVEL (acoustical - compensated)

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

Range	Low	High
Indication [dB]	≤15	20.9

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

ENVIRONMENTAL CONDITIONS

Temperature	Relative humidity	Ambient pressure
22 °C	47%	1011 hPa

TEST EQUIPMENT

Item	Manufacturer	Model	Serial no.	Description
1.	SVANTEK	SVAN 401	100	Signal generator
2.	SVANTEK	SVAN 912A	4369	Sound & Vibration Analyser
3.	RIGOL	DM3068	DM30155100773	Digital multimeter
4.	SVANTEK	SV33B	93171	Acoustic calibrator
5.	SVANTEK	ST02	-	Microphone equivalent electrical impedance (18pF)

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 specification 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 type 4231 No 2292773.
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 SVANTEK Ltd.

Calibration specialist: Cezary Dardziński



Test date: 2022-10-28

Certificate of Calibration

for

Description: *Sound Level Meter*
Manufacturer: *SVANTEK*
Type No.: *971 (Serial No.: 96062)*
Microphone: *13905*
Preamplifier: *SVANTEK SV 18 (Serial No.:C132231)*

Submitted by:

Customer: *Acuity Sustainability Consulting Limited*
Address: *Unit E, 12/F., Ford Glory Plaza,
Nos. 37-39 Wing Hong Street,
Cheung Sha Wan, Kowloon, Hong Kong*

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

- Within (31.5Hz – 8kHz)**
 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 July 2023

Date of calibration: 3 August 2023

Date of NEXT calibration: 2 August 2024

Calibrated by: _____
Calibration Technician

Certified by: _____
*Mr. Ng Yan Wa
Laboratory Manager*

Date of issue: 3 August 2023

Certificate No.: APJ23-049-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: 22.6 °C
 Air Pressure: 1006 hPa
 Relative Humidity: 52.9 %

3. Calibration Equipment:

	Type	Serial No.	Calibration Report Number	Traceable to
Multifunction Calibrator	B&K 4226	2288467	AV220061	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		
25.0-124.2	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		
25.0-124.2	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		
25.0-124.2	dBA SPL	Fast	94	1000	94.0	Ref
		Slow			94.0	±0.3

Certificate No.: APJ23-049-CC001



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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			
25.0-124.2	dB	SPL	Fast	94	31.5	94.3	±2.0
					63	94.2	±1.5
					125	94.1	±1.5
					250	94.1	±1.4
					500	94.0	±1.4
					1000	94.0	Ref
					2000	93.7	±1.6
					4000	93.1	±1.6
				8000	91.9	+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			
25.0-124.2	dBA	SPL	Fast	94	31.5	55.3	-39.4±2.0
					63	68.2	-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	94.9	+1.2±1.6
					4000	94.1	+1.0±1.6
				8000	90.9	-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			
25.0-124.2	dBC	SPL	Fast	94	31.5	91.3	-3.0±2.0
					63	93.3	-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	93.6	-0.2±1.6
					4000	92.4	-0.8±1.6
				8000	89.1	-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	± 0.05
	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.



CALIBRATION CERTIFICATE

Product : SOUND CALIBRATOR
Type : NC-75
Serial number : 35124528
Manufacturer : RION CO., LTD.
Calibration quantities : Sound pressure level (with reference standard microphone)
Calibration method : Measured by specified secondary standard microphone
according to JCSS calibration procedure specified by RION.
Ambient conditions : Temperature 23.9 °C, Relative humidity 49 %,
Static pressure 100.6 kPa
Calibration date : 02/11/2022 (DD/MM/YYYY)
Calibration location : 3-20-41 Higashimotomachi, Kokubunji, Tokyo 185-8533, Japan
RION CO., LTD. Calibration Room

We hereby certify that the results of this calibration were as follows.

Issue date : 09/11/2022 (DD/MM/YYYY)

Junichi Kawamura
Manager
Quality Assurance Section,
Quality Assurance Department,
Environmental Instrument Division,
RION CO., LTD.
3-20-41 Higashimotomachi, Kokubunji,
Tokyo 185-8533, Japan



This certificate is based on article 144 of the Measurement Law and indicates the result of calibration in accordance with measurement standards traceable to Primary Measurement Standards (National Standards) which realizes the physical units of measurement according to the International System of Units (SI).

The accreditation symbol is attestation of which the result of calibration is traceable to Primary Measurement Standards (National Standards).

The certificate shall not be reproduced except in full, without the written approval of the issuing laboratory.

The calibration laboratory who issued this calibration certificate conforms to ISO/IEC 17025:2017.

This calibration certificate was issued by the calibration laboratory accredited by IA Japan who is a signatory to the Mutual Recognition Arrangement (MRA) of International Laboratory Accreditation Cooperation (ILAC) and Asia Pacific Accreditation Cooperation (APAC). This (These) calibration result(s) may be accepted internationally through ILAC/APAC MRA.

CALIBRATION RESULT

1. Sound pressure level (with reference standard microphone)

Measured value	Expanded uncertainty *1
93.99 dB	0.09 dB

Specified secondary standard microphone:

Type : 4160

Serial number : 2973341

Reference Sound pressure : 2×10^{-5} Pa

*1 Defines an interval estimated to have a level of confidence of approximately 95 %.

Coverage factor $k=2$

Calibration result is the calibration value in ambient conditions during calibration.

BE OUT OF JCSS CALIBRATION

1. Frequency

Measured value	Measurement uncertainty ($k=2$)
1000.0 Hz	2.7×10^{-4} Hz

Working measurement standard universal counter:

Type : 53132A

Serial number : MY40005574

(JCSS Calibration Certificate No. 2208001889940)

2. Total distortion

Measured value
0.2 %

Working measurement standard distortion meter:

Type : VA-2230A

Serial number : 11076061

(A2LA Calibration Certificate No. 1502-03109)

- closing -