



TISCH ENVIRONMENTAL, INC.  
 145 SOUTH MIAMI AVE  
 VILLAGE OF CLEVELAND, OH  
 45002  
 513.467.9000  
 877.263.7610 TOLL FREE  
 513.467.9009 FAX

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Jan 18, 2017 Rootmeter S/N 0438320 Ta (K) - 294  
 Operator Tisch Orifice I.D. - 2154 Pa (mm) - 755.65

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	1.4530	3.2	2.00
2	NA	NA	1.00	1.0420	6.4	4.00
3	NA	NA	1.00	0.9290	7.9	5.00
4	NA	NA	1.00	0.8840	8.8	5.50
5	NA	NA	1.00	0.7300	12.8	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
1.0035	0.6906	1.4197	0.9957	0.6853	0.8821
0.9993	0.9590	2.0078	0.9915	0.9516	1.2475
0.9972	1.0734	2.2448	0.9894	1.0651	1.3948
0.9960	1.1268	2.3543	0.9883	1.1180	1.4628
0.9907	1.3571	2.8394	0.9830	1.3466	1.7642
Qstd slope (m) = 2.12779			Qa slope (m) = 1.33238		
intercept (b) = -0.04273			intercept (b) = -0.02655		
coefficient (r) = 0.99982			coefficient (r) = 0.99982		
y axis = SQRT[H2O(Pa/760) (298/Ta)]			y axis = SQRT[H2O(Ta/Pa)]		

CALCULATIONS

Vstd = Diff. Vol [(Pa-Diff. Hg)/760] (298/Ta)  
 Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]  
 Qa = Va/Time

For subsequent flow rate calculations:

Qstd = 1/m{ [SQRT(H2O(Pa/760) (298/Ta))] - b}  
 Qa = 1/m{ [SQRT H2O(Ta/Pa)] - b}

**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk



**TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET**

Project : Environmental Monitoring Works For Contract No. KLN/2015/07			Date of Calibration: 4-Jan-18
Location : KER1b			Next Calibration Date: 3-Apr-18
Brand:	Tisch		Technician: Toby Wan
Model:	TE-5170	S/N: 3482	

CONDITIONS			
Sea Level Pressure (hPa):	1016.7	Corrected Pressure (mm Hg):	763
Temperature (°C):	19	Temperature (K):	292

CALIBRATION ORIFICE			
Make:	Tisch	Qstd Slope:	2.12779
Model:	TE-5025A	Qstd Intercept:	-0.04273
Calibration Date:	18-Jan-17	Expiry Date:	18-Jan-18
S/N:	2154		

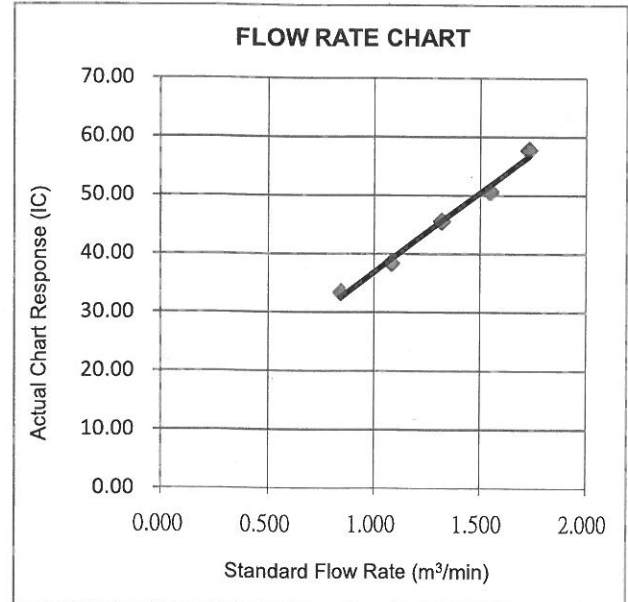
CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m <sup>3</sup> /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	4.80	-8.10	12.900	1.729	57.00	57.70	Slope = 27.0898 Intercept = 9.7861 Corr. coeff.: 0.9954
13	3.70	-6.60	10.300	1.547	50.00	50.61	
10	2.50	-5.00	7.500	1.323	45.00	45.55	
7	0.90	-4.10	5.000	1.084	38.00	38.46	
5	0.00	-3.00	3.000	0.844	33.00	33.40	

**Calculations:**

$Qstd = 1/m[\text{sqrt}(H2O(Pa/Pstd)(Tstd/Ta)) - b]$   
 $IC = I[\text{sqrt}(Pa/Pstd)(Tstd/Ta)]$   
 Qstd = standard flow rate  
 IC = corrected chart response  
 I = actual chart response  
 m = calibrator Qstd slope  
 b = calibrator Qstd intercept  
 Ta = actual temperature during calibration (deg K)  
 Pa = actual pressure during calibration (mm Hg)  
 Tstd = 298 deg K  
 Pstd = 760 mm Hg

**For subsequent calculation of sampler flow:**

$1/m((I[\text{sqrt}(298/Tav)(Pav/760)] - b)$   
 m = sampler slope  
 b = sampler intercept  
 I = chart response  
 Tav = daily average temperature  
 Pav = daily average pressure



**CHOI KAM HO**  
Project Consultant

**Report Date:** 4<sup>th</sup> January, 2018

**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk



**TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET**

Project : Environmental Monitoring Works For Contract No. KLN/2015/07			Date of Calibration: 4-Jan-18
Location : KTD1a			Next Calibration Date: 3-Apr-18
Brand:	Tisch		Technician: Toby Wan
Model:	TE-5170	S/N: 4037	

CONDITIONS			
Sea Level Pressure (hPa):	1016.7	Corrected Pressure (mm Hg):	763
Temperature (°C):	19	Temperature (K):	292

CALIBRATION ORIFICE			
Make:	Tisch	Qstd Slope:	2.12779
Model:	TE-5025A	Qstd Intercept:	-0.04273
Calibration Date:	18-Jan-17	Expiry Date:	18-Jan-18
S/N:	2154		

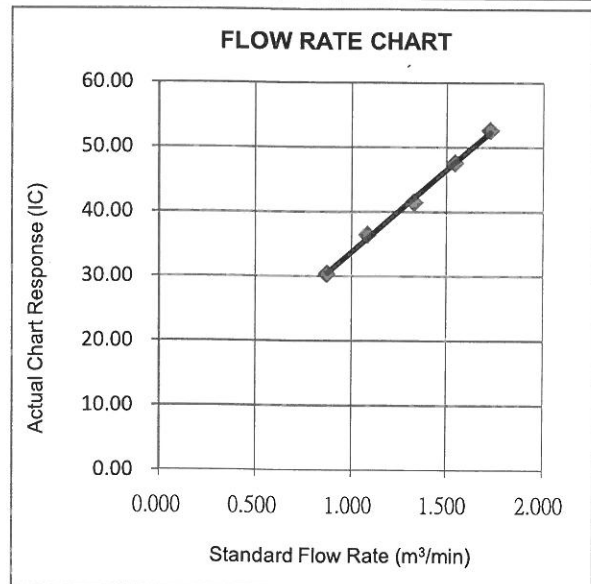
CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m³/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	4.90	-8.00	12.900	1.729	52.00	52.64	Slope = 25.5019 Intercept = 8.2352 Corr. coeff.: 0.9985
13	3.60	-6.70	10.300	1.547	47.00	47.57	
10	2.40	-5.20	7.600	1.332	41.00	41.50	
7	1.00	-4.00	5.000	1.084	36.00	36.44	
5	0.10	-3.10	3.200	0.871	30.00	30.37	

**Calculations:**

$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta)) - b]$   
 $IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$   
 Qstd = standard flow rate  
 IC = corrected chart response  
 I = actual chart response  
 m = calibrator Qstd slope  
 b = calibrator Qstd intercept  
 Ta = actual temperature during calibration (deg K)  
 Pa = actual pressure during calibration (mm Hg)  
 Tstd = 298 deg K  
 Pstd = 760 mm Hg

**For subsequent calculation of sampler flow:**

$1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)] - b)$   
 m = sampler slope  
 b = sampler intercept  
 I = chart response  
 Tav = daily average temperature  
 Pav = daily average pressure



**CHOI KAM HO**  
Project Consultant

Report Date: 4<sup>th</sup> January, 2018

# MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

# MaterialLab

## TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Environmental Monitoring Works For Contract No. KLN/2015/07			Date of Calibration: 4-Jan-18		
Location : KTD2a			Next Calibration Date: 3-Apr-18		
Brand:	Tisch		Technician: Toby Wan		
Model:	TE-5170	S/N:	3838		

CONDITIONS					
Sea Level Pressure (hPa):	1016.7	Corrected Pressure (mm Hg):	763		
Temperature (°C):	19	Temperature (K):	292		

CALIBRATION ORIFICE					
Make:	Tisch	Qstd Slope:	2.12779		
Model:	TE-5025A	Qstd Intercept:	-0.04273		
Calibration Date:	18-Jan-17	Expiry Date:	18-Jan-18		
S/N:	2154				

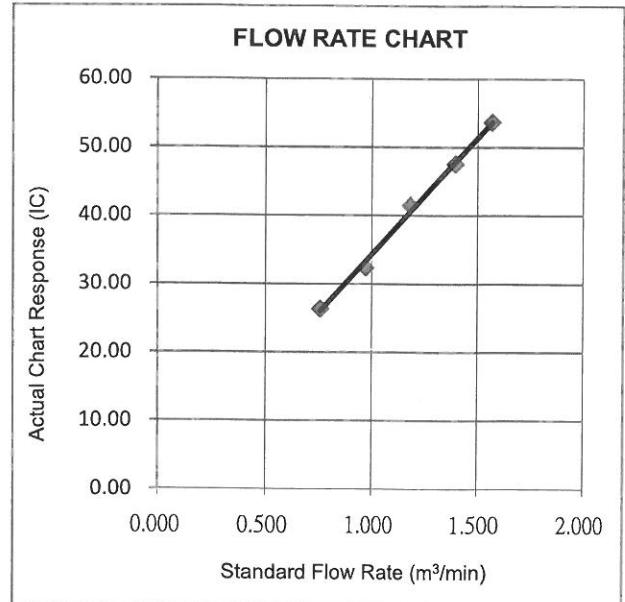
CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m <sup>3</sup> /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	5.50	-5.10	10.600	1.569	53.00	53.65	Slope = 34.0537 Intercept = 0.2281 Corr. coeff.: 0.9981
13	4.50	-3.90	8.400	1.399	47.00	47.57	
10	3.30	-2.70	6.000	1.185	41.00	41.50	
7	2.40	-1.60	4.000	0.972	32.00	32.39	
5	1.40	-1.00	2.400	0.757	26.00	26.32	

### Calculations:

$Qstd = 1/m[\text{sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$   
 $IC = I[\text{sqrt}(Pa/Pstd)(Tstd/Ta)]$   
 Qstd = standard flow rate  
 IC = corrected chart response  
 I = actual chart response  
 m = calibrator Qstd slope  
 b = calibrator Qstd intercept  
 Ta = actual temperature during calibration (deg K)  
 Pa = actual pressure during calibration (mm Hg)  
 Tstd = 298 deg K  
 Pstd = 760 mm Hg

### For subsequent calculation of sampler flow:

$1/m((I)[\text{sqrt}(298/Tav)(Pav/760)]-b)$   
 m = sampler slope  
 b = sampler intercept  
 I = chart response  
 Tav = daily average temperature  
 Pav = daily average pressure



**CHOI KAM HO**  
Project Consultant

Report Date: 4<sup>th</sup> January, 2018

# FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,  
5 Lok Yi Street, Tai Lam,  
Tuen Mun, N.T.,  
Hong Kong.

Tel : +852 2450 8233  
Fax : +852 2450 6138  
E-mail : matlab@fugro.com  
Website : www.fugro.com

# MaterialLab

Report no.: 172379CA171674

Page 1 of 1

## CALIBRATION CERTIFICATE OF SOUND LEVEL METER

### Client Supplied Information

Client : MaterialLab Consultants Ltd.

Address : Room 723 & 725, 7F., Block B Profit Industrial Building, 1-15 Kwai Fung Crescent, Kwai Chung, N.T.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Sound Level Meter  
Manufacturer : Casella  
Model No. : Casella (Model no. CEL-63X(meter), CEL-251(microphone), CEL-495(Preamplifier))  
Serial No. : 1057034 (meter), 01308 (microphone), 002672 (Preamplifier)  
Next Calibration Date : 30-Jul-2018  
Specification Limit : EN 61672: 2003 Type 1

### Laboratory Information

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)

Equipment ID. : R-108-1

Date of Calibration : 31-Jul-2017 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of MaterialLab

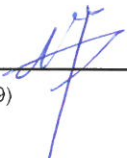
Method Used : By direct comparison

### Calibration Results :

Parameters	Mean Value (dB)	Specification Limit(dB)
A-weighting frequency response	4000Hz	2.5
	2000Hz	0.5
	1000Hz	-1.0
	500Hz	-4.5
	250Hz	-10.0
	125Hz	-17.4
	63Hz	-27.3
	31.5Hz	-40.0
Differential level linearity	94dB-104dB	± 0.6
	104dB-114dB	± 0.6

### Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. For calibration: Reference SPL are 94, 104 & 114dB, range setting is 20-140dB & time weighing is fast
4. The equipment complies with EN 61672: 2003 Type 1 sound level meter for the above measurement.

Checked by :   
CA-R-297 (22/07/2009)

Date : 28-2017

Certified by : 

Date : 28-8-2017

Kwok Chi Wa (Assistant Manager)

\*\* End of Report \*\*

# Certificate of Conformity and Calibration

**Instrument Model:-** CEL-633A  
**Serial Number** 0873599  
**Firmware revision** V006-01

**Microphone Type:-** CEL-251  
**Serial Number** 1910

**Preamplifier Type:-** CEL-495  
**Serial Number** 003318

**Instrument Class/Type:-** 1



**Applicable standards:-**

IEC 61672: 2002 / EN 60651 (Electroacoustics - Sound Level Meters)  
 IEC 60651 1979 (Sound Level Meters), ANSI S1.4: 1983 (Specifications For Sound Level Meters)

**Note:-** The test sequences performed in this report are in accordance with the current Sound level meter Standard - IEC61672. The combination of tests performed are considered to confirm the products electro-acoustic performance to all applicable standards including superceeded Sound Level Meter Standards - IEC60651 and IEC60804.

**Test Conditions:-** 20 °C      **Test Engineer:-** Nicola Cartwright  
 50 %RH      **Date of Issue:-** April 5, 2017  
 1011 mBar

**Declaration of conformity:-**

This test certificate confirms that the instrument specified above has been successfully tested to comply with the manufacturer's published specifications. Tests are performed using equipment traceable to national standards in accordance with Casella's ISO 9001:2008 quality procedures. This product is certified as being compliant to the requirements of the CE Directive.

**Test Summary:-**

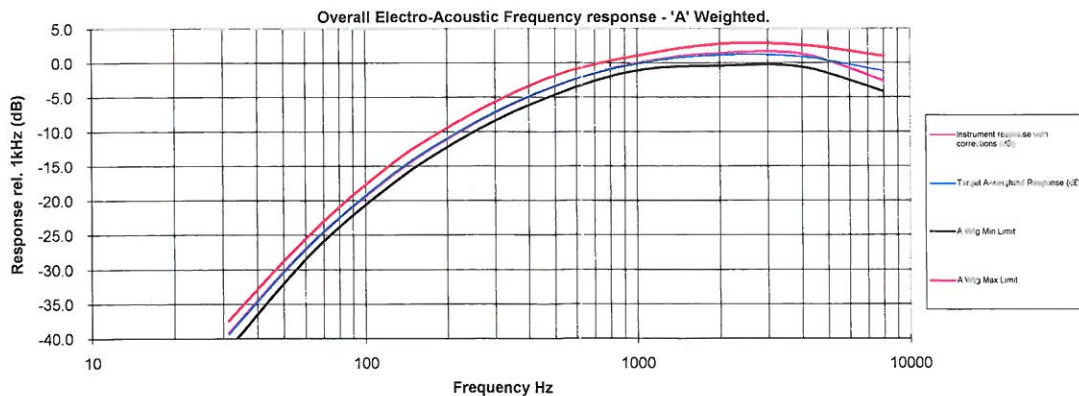
- Self Generated Noise Test
- Electrical Signal Test Of Frequency Weightings
- Frequency & Time Weightings At 1 kHz
- Level Linearity On The Reference Level Range
- Toneburst Response Test
- C-peak Sound Levels
- Overload Indication
- Acoustic Tests

- All Tests Pass
- All Tests Pass
- All Tests Pass
- All Tests Pass
- All Tests Pass
- All Tests Pass
- All Tests Pass
- All Tests Pass

**Combined Electro-Acoustic Frequency Response - A Weighted**

Combined Electro-Acoustic Frequency Response - A Weighted (IEC 61672-3:2006)

The following A-Weighted frequency response graph shows this instruments overall frequency response based upon the application of multi-frequency pressure field calibrations. The microphones Pressure to Free field correction coefficients are applied to pressure response. Reference level taken at 1kHz.



<p><b>Casella UK</b>                  Regent House, Wolsley Road,                  Kempston, Bedford                  MK42 7JY                  United Kingdom                  Tel: +44 (0) 1234 844100                  Fax: +44(0) 1234 841490                  E-mail: info@casellasolutions.com</p>	<p><b>Casella USA</b>                  415 Lawrence Bell Drive, Unit 4                  Buffalo, NY 14221, USA                  Toll Free (800) 366-2966                  Tel: +1 (716) 276 3040                  E-mail: info@casellausa.com</p>	<p><b>Casella India</b>                  Ideal Industries India Pvt.Ltd                  229-230, Spazedge, Tower -B Sohna Road,                  Sector-47, Gurgaon-122001, Haryana , India                  Tel: +91 124 4495100                  E-mail: casella.sales@ideal-industries.in</p>	<p><b>Casella China</b>                  Ideal Industries China                  Room 305, Building 1, No.1279, Chuangqiao                  Rd, Pudong New District,                  Shanghai, China                  Tel: +86-21-31263188                  Fax: +86-21-61015905                  Email: info@casellasolutions.cn</p>	<p><b>Casella Australia</b>                  Ideal Industries (Aust) PTY. LTD                  Unit 17, 35 Dunlop Rd, Mulgrave.                  Vic. 3170, Australia                  Email: australia@casellasolutions.com</p>
--	---	---	--	--

# FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,  
5 Lok Yi Street, Tai Lam,  
Tuen Mun, N.T.,  
Hong Kong.

Tel : +852 2450 8233  
Fax : +852 2450 6138  
E-mail : matlab@fugro.com  
Website : www.fugro.com

# MateriaLab

Report no.: 172379CA172109

Page 1 of 1

## CALIBRATION CERTIFICATE OF SOUND LEVEL METER

### Client Supplied Information

Client : MateriaLab Consultants Ltd.

Address : Room 723 & 725, 7/F., Block B Profit Industrial Building, 1-15 Kwai Fung Crescent, Kwai Chung, N.T.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Sound Level Meter  
Manufacturer : Casella

	Meter	Microphone	Preamplifier
Model No.	CL63X	CE-251	CEL-495
Serial No.	4637931	01993	003538

Equipment ID : N-13  
Next Calibration Date : 17-Sep-2018  
Specification Limit : EN 61672: 2003 Type 1

### Laboratory Information

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)

Equipment ID. : R-108-1

Date of Calibration : 18-Sep-2017 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of MateriaLab


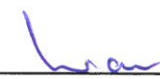
Method Used : By direct comparison

### Calibration Results :

Parameters	Mean Value (dB)	Specification Limit(dB)
A-weighting frequency response	4000Hz	1.4
	2000Hz	1.3
	1000Hz	0.0
	500Hz	-3.2
	250Hz	-8.8
	125Hz	-16.3
	63Hz	-26.3
	31.5Hz	-39.3
Differential level linearity	94dB-104dB	0.0
	104dB-114dB	0.0

### Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. For calibration: Reference range is 30-130dB, reference SPL is 94,104 & 114dB, frequency weighing is A,
4. The equipment does comply with EN 61672: 2003 Type 1 sound level meter for the above measurement.

Checked by :  Date : 19-9-2017 Certified by :  Date : 20-9-2017  
CA-R-297 (22/07/2009) Chan Chun Wai (Manager)

\*\* End of Report \*\*

# FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,  
5 Lok Yi Street, Tai Lam,  
Tuen Mun, N.T.,  
Hong Kong.

Tel : +852 2450 8233  
Fax : +852 2450 6138  
E-mail : matlab@fugro.com  
Website : www.fugro.com

# MaterialLab

Report no.: 172379CA171674(1)

Page 1 of 1

## CALIBRATION CERTIFICATE OF SOUND CALIBRATOR

### Client Supplied Information

Client : MaterialLab Consultants Ltd.

Address : Room 723 & 725, 7F., Block B Profit Industrial Building, 1-15 Kwai Fung Crescent, Kwai Chung, N.T.

Project : Calibration Services

### Details of Unit Under Test, UUT

Description : Sound Calibrator  
Manufacturer : Caselia (Model no. CEL-120/1)  
Serial No. : 0255083  
Next Calibration Date : 30-Jul-2018  
Specification Limit :  $\pm 0.5$ dB

### Laboratory Information

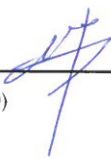

Description : Reference Sound Level Meter  
Equipment ID. : R-119-1  
Date of Calibration : 31-Jul-2017 Ambient Temperature : 21 °C  
Calibration Location : Calibration Laboratory of MaterialLab  
Method Used : By direct comparison

### Calibration Results :

Parameters (Setting of UUT)	Mean Value (error of measurement)	Specification Limit (dB)
94dB	0.1 dB	$\pm 0.5$ dB
114dB	0.1 dB	

### Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. The equipment does comply with the specification limit.

Checked by :  Date : 28-2017 Certified by :  Date : 4-8-2017  
CA-R-297 (22/07/2009) Kwok Chi Wa (Assistant Manager)

\*\* End of Report \*\*



Certificate of  
Conformance and Calibration for

**CEL-120 Acoustic Calibrator**

Applicable Standards : IEC 60942: 2003 & ANSI S1.40: 2006

CEL-120/1 Class 1


CEL-120/2 Class 2

Serial No: 1677126

Firmware: 04

Temperature: 22.8 °C Pressure: 1010.8 mb %RH 51.8

Frequency = 1.00kHz ± 2Hz T.H.D. = < 1%	Calibration Level
SPL @ 114.0dB Setting	<u>114.01</u> dB
SPL @ 94.0dB Setting (CEL-120/1 only)	<u>93.96</u> dB/N.A

Engineer :-  Date :- 14 JUN 2017

Company test equipment and acoustic working standards, used for conformance testing, are subject to periodic calibration, traceable to UK national standards, in accordance with the company's ISO9001 Quality System.

**DECLARATION OF CONFORMITY**

This certificate confirms that the instrument specified above has been produced and tested to comply with the manufacturer's published specifications and the relevant European Community CE directives.

Casella CEL ( U.K. ),  
Regent House, Wolsley Road, Kempston, Bedford. MK42 7JY  
Phone: +44 (0) 1234 844100 Fax: +44 (0) 1234 841490  
E-mail: info@casellacel.com  
Web: www.casellameasurement.com

# FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,  
5 Lok Yi Street, Tai Lam,  
Tuen Mun, N.T.,  
Hong Kong.

Tel : +852 2450 8233  
Fax : +852 2450 6138  
E-mail : matlab@fugro.com  
Website : www.fugro.com

# MaterialLab

Report No. : 161966CA171055

Page 1 of 1

## CALIBRATION CERTIFICATE OF ANEMOMETER

### Client Supplied Information

Client : MaterialLab Consultants Ltd.

Project : Calibration Services

### Details of Unit Under Test, UUT

Description : Anemometer

Manufacturer : Benetech

Model No. : GM816

Serial No. : 13372555

Equipment ID. : N/A

Next Calibration Date : 09-May-2018

### Laboratory Information

Details of Reference Equipment –

Description : Reference Anemometer

Equipment ID. : R-101-4

Date of Calibration : 10-May-2017 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of MaterialLab

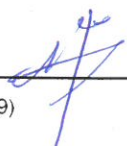

Method Used : By direct Comparison

### Calibration Results :

Reference Reading (m/s)	UUT Reading (m/s)	Error (m/s)
2.00	2.0	0.0
3.98	3.9	-0.1
5.98	5.4	-0.6
8.01	7.0	-1.0
10.01	8.8	-1.2

### Remark :

1. The equipment being used in this calibration is traceable to recognized National Standards.

Checked by :  Date : 12-5-2017 Certified by :  Date : 12-5-2017  
CA-R-297 (22/07/2009) Chan Chun Wai (Manager)

\*\* End of Report \*\*