

RECALIBRATION **DUE DATE:**

June 5, 2021

Pertificate d alibration

Calibration Certification Information

Cal. Date: June 5, 2020

Rootsmeter S/N: 438320

Ta: 295

°K

Operator: Jim Tisch

Pa: 748.0

mm Hg

Calibration Model #: TE-5025A

Calibrator S/N: 0988

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3610	3.2	2.00
2	3	4	1	0.9700	6.4	4.00
3	5	6	1	0.8630	7.9	5.00
4	7	8	1	0.8240	8.8	5.50
5	9	10	1	0.6800	12.9	8.00

	Data Tabulation						
Vstd	Qstd	$\sqrt{\Delta H \left(\frac{Pa}{Pstd}\right) \left(\frac{Tstd}{Ta}\right)}$		Qa	√∆H(Ta/Pa)		
(m3)	(x-axis)	(y-axis)	Va	(x-axis)	(y-axis)		
0.9900	0.7274	1.4101	0.9957	0.7316	0.8881		
0.9858	1.0162	1.9943	0.9914	1.0221	1.2560		
0.9838	1.1399	2.2296	0.9894	1.1465	1.4042		
0.9826	1.1924	2.3385	0.9882	1.1993	1.4728		
0.9771	1.4369	2.8203	0.9828	1.4452	1.7762		
March 1985	m=	1.98556		m=	1.24332		
QSTD[b=	-0.03069	QA	b=	-0.01933		
	r=	0.99996		r=	0.99996		

	Calculation	ıs	
Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va=	ΔVol((Pa-ΔP)/Pa)
Qstd= Vstd/∆Time		Qa= Va/ΔTime	
	For subsequent flow rat	e calculatio	ns:
Qstd=	$1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$	Qa=	$1/m\left(\left(\sqrt{\Delta H(Ta/Pa)}\right)-b\right)$

	Standard Conditions
Tstd:	298.15 °K
Pstd:	760 mm Hg
	Key
ΔH: calibrator	manometer reading (in H2O)
	er manometer reading (mm Hg)
Ta: actual abs	olute temperature (°K)
	ometric pressure (mm Hg)
b: intercept	
m: slope	

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

Tisch Environmental, Inc. 145 South Miami Avenue Village of Cleves, OH 45002

www.tisch-env.com

TOLL FREE: (877)263-7610

FAX: (513)467-9009

Total Suspended Particulates (TSP) Sampler Field Calibration Report

Station	Fanling Governm	nent Secondary	School (AM2)	Operator: Choi Wing Ho				
Date:	28-Oct-20	_		Next Due Date: 28-Dec-20				
Model No:	TE-5170			Verified Against: O.T.S 988				
Equipment No .:	A-001-74T				Expiration Date:	5-Jun-	21	
	XII		Ambient C	Condition				
Tempera	ture, Ta	299.0	Kelvin	Pressu	re, Pa	758.0	mmHg	
		Or	rifice Transfer Sta	ndard Informat	ion		-	
Equipme	ent No :	988	Slope, mc	1.98		Intercept, bc	-0.03069	
Last Calibra		5 Jun 2020					-0.03069	
Next Calibra		5 Jun 2021	r	nc x Qstd + bc =	= [H x (Pa/760)	$x (298/Ta)]^{1/2}$		
Tront Curror	ation Date.	3 Jun 2021				,		
****			Calibration of	TSP Sampler				
Calibration Point	H in. of water	[H x (Pa/76	60) x (298/Ta)] ^{1/2}	Qstd (m³/min) X - axis	W in. of oil	[ΔW x (Pa/760) x Y-ax		
1	6.8		2.60	1.32	5.4	2.32		
2	5.6		2.36	1.20	4.4	2.09		
3	4.5		2.11	1.08	3.2	1.78		
4	3.5		1.87	0.95	2.4	1.54		
5	2.6		1.61	0.83	1.7	1.30)	
By Linear Regr		X						
Slope, mw =		_		Intercept, bw =		-0.458	39	
Correlation C	oefficient* =	0.	.9986					
			Set Point C		- M			
			$td = 1.21 \text{ m}^3/\text{min}$ (4)	13 CFM)				
From the Regres	sion Equation, t	he "Y" value a	ccording to					
		m x	Qstd + b = [W x (I	Pa/760) x (298/T	(a)] ^{1/2}			
Therefore, S	Set Point W = (m x Qstd + b)	² x (760 / Pa) x (7	Ta / 298) =	4	.39		
*If Correlation C	Coefficient < 0.9	90, check and	recalibrate again.	· · · · · · · · · · · · · · · · · · ·				
Remarks:								
QC Reviewer:	WS C	HAN	Signature:	P	460	Date: 28 / 1	0/20	

EQUIPMENT CALIBRATION RECORD

Type:			-	Laser Du	ıst Moni	tor		
	facturer/Brand:			SIBATA				
Model				LD-3				
	ment No.: tivity Adjustment	Scale Setting	A.005.07a 1e Setting: 557 CPM					
Ochlan	ivity Adjustille III	ocale oetting	· _	337 GF1	71	***		
Opera	itor:	Mike Shek (MSKM)						
Standa	rd Equipment			10.00				
	1.000							
Equip			cht & Pa					
Venue			ort (Pui \	ing Seco	ndary So	chool)		
Model			1400AB	450400				
Serial	No:	Control	-	AB21989		1/ 1050		
Loct C	Calibratian Data*:	Sensor	-	00C1436	9803	K _o : <u>12500</u>)	
Lasi C	Calibration Date*:	1 May :	2020					
*Remar	ks: Recommend	ed interval for	r hardwar	e calibra	tion is 1 y	year		
Calibra	tion Result		<u> </u>					
	civity Adjustment civity Adjustment	_			,	and the second s	PM PM	
Hour	Date	Time	9	Amb	ient	Concentration ¹	Total	Count/
	(dd-mm-yy)			Cond	dition	(mg/m ³)	Count ²	Minute ³
	2.50 N			Temp	R.H.	Y-axis		X-axis
				(°C)	(%)			
1	02-05-20	09:15 -	10:15	26.7	77	0.04836	1945	32.42
2	02-05-20	10:15 -	11:15	26.7	77	0.05134	2056	34.27
3	02-05-20	11:15 -	12:15	26.8	77	0.05331	2130	35.50
4	02-05-20	12:15 -	13:15	26.8	77	0.05535	2214	36.90
Note:	Total Count Count/minut	was logged b te was calcula	y Laser I	Dust Mon	itor	ashnick TEOM®		
By Line	ar Regression of							
	(K-factor):		0.0015					
	ation coefficient:		0.9976					
validit	y of Calibration F	kecord:z	2 May 202	21				
Remark	s:						4	
				- 10.50 · · · · · · · · · · · · · · · · · · ·	h /	<i>(</i>		
QC Re	eviewer: YW F	ung	Signat	ure:	1/	Dat	e: 04 Ma	y 2020

EQUIPMENT CALIBRATION RECORD

Model Equipi	facturer/Brand: No.: ment No.: tivity Adjustment	Scale Set	ting:	Laser Do SIBATA LD-3 A.005.09 797 CPI)a	itor		
Opera	itor:		Mike Shek (MSKM)					
Standa	rd Equipment	211 2103						
	e: No.: No: Calibration Date*:	Cyb Ser Cor Sen 1 M	sor: 12 ay 2020	Ying Seco 3 40AB2198 200C1436	99803 59803	K₀: _12500		
*Remar	ks: Recommend	ed interva	I for hardwa	are calibra	tion is 1	year		
Calibra	tion Result							
	ivity Adjustment ivity Adjustment					797 CF		
Hour	Date (dd-mm-yy)	Т	ime	The state of the s	oient dition R.H. (%)	Concentration ¹ (mg/m ³) Y-axis	Total Count ²	Count/ Minute ³ X-axis
1	02-05-20	09:45	- 10:45		77	0.04884	1956	32.60
2	02-05-20	10:45	- 11:45		77	0.05157	2070	34.50
3	02-05-20	11:45	- 12:45		77	0.05355	2158	35.97
4	02-05-20	12:45	- 13:45		77	0.05593	2241	37.35
Slope Correl	2. Total Count 3. Count/minut ar Regression of (K-factor): ation coefficient: y of Calibration F	was logge e was cal Y or X	ed by Laser	Dust Mor (Total Cou	itor	ashnick TEOM®		
validit	y or Cambration i	vecora.	2 May 2	021				
Remark	s:							
QC Re	eviewer: <u>YW F</u>	ung	Sign	ature:	n/	Date	e: <u>04 Ma</u>	y 2020_



香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

Certificate No.:

20CA0330 01

Page:

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Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer:

B & K

Type/Model No.: Serial/Equipment No.: 4231 3006428

Adaptors used:

Item submitted by

Curstomer:

AECOM

Address of Customer:

-

Request No.:

-

Date of receipt:

30-Mar-2020

[N.0040]7

Date of test:

31-Mar-2020

Reference equipment used in the calibration

Description: Lab standard microphone Preamplifier Measuring amplifier Signal generator	Model:	Serial No.	Expiry Date:	Traceable to:
	B&K 4180	2341427	03-May-2020	SCL
	B&K 2673	2239857	17-May-2020	CEPREI
	B&K 2610	2346941	05-Jun-2020	CEPREI
	DS 360	33873	10-May-2020	CEPREI
Digital multi-meter	34401A	US36087050	08-May-2020	CEPREI
Audio analyzer	8903B	GB41300350	13-May-2020	CEPREI
Universal counter	53132A	MY40003662	10-May-2020	CEPREI

Ambient conditions

Temperature:

22 ± 1 °C

Relative humidity: Air pressure: 55 ± 10 % 1005 ± 5 hPa

Test specifications

- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B
 and the lab calibration procedure SMTP004-CA-156.
- 2. The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.

Feng Jungi

Approved Signatory:

Date:

31-Mar-2020

c Company Chop:

Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

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Form No CARP156-1/Issue 1/Rev D/01/03/2007



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CERTIFICATE OF CALIBRATION

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20CA0330 01

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1, Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

Г	0.4.40.40		
Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.00	94.21	0.10

2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz

STF = 0.011 dB

Estimated expanded uncertainty

0.005 dB

3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz

Actual Frequency = 1000.0 Hz

Estimated expanded uncertainty

0.1 Hz

Coverage factor k = 2.2

4, Total Noise and Distortion

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz

TND = 0.3 %

Estimated expanded uncertainty

0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

Calibrated by:

End

Checked by

Date:

31-Mar-2020

calibrated on a schedule to maintain the required accuracy level.

Date:

Shek Kwong Tat 31-Mar-2020

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are

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Form No.CARP156-2/Issue 1/Rev.C/01/05/2005



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CERTIFICATE OF CALIBRATION

Certificate No.:

20CA0318 01

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Item tested

Description: Manufacturer: Sound Level Meter (Type 1) B & K

Microphone B & K Preamp B & K

Type/Model No.:

2250-L 2681366

4950 2665582 ZC0032 17190

Serial/Equipment No.: Adaptors used:

200130

N.011.01

_

Item submitted by

Customer Name:

AECOM ASIA CO LTD

Address of Customer:

-

Request No.: Date of receipt:

18-Mar-2020

Date of test:

19-Mar-2020

Reference equipment used in the calibration

Description:

Model: Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator

B&K 4226

2288444

23-Aug-2020

CIGISMEC

Signal generator

DS 360

33873

10-May-2020

CEPREI

Ambient conditions

Temperature:

22 ± 1 °C

Relative humidity:

55 ± 10 %

Air pressure:

1005 ± 5 hPa

Test specifications

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- 3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Jungi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

19-Mar-2020

Company Chop:

SENGINEGE SENGINE COMPANY OF THE SENGINE COM

Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

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Form No.CARP152-1/Issue 1/Rev.C/01/02/2007



綜合試驗有限公司

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CERTIFICATE OF CALIBRATION

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Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances,

Test:	Subtest:	Status:	Expanded	Coverage
1651.	Sublest.	Status.	Uncertanity (dB)	Factor
Self-generated noise	Α	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

			Expanded	Coverage
Test:	Subtest	Status	Uncertanity (dB)	Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

3, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated

Calibrated by:

Date:

Fung Chi Yip 19-Mar-2020

Checked by:

19-Mar-2020

Shek Kwong Tal Date:

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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Form No CARP152-2/Issue 1/Rev.C/01/02/2007



港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

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CERTIFICATE OF CALIBRATION

Certificate No.:

20CA0302 01

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Item tested

Description: Manufacturer:

Adaptors used:

Sound Level Meter (Type 1) **B&K**

Microphone B&K 4950

Pream **B&K**

Type/Model No.: Serial/Equipment No.:

2270 2644597

2879980

ZC0032 29398

Item submitted by

Customer Name:

AECOM ASIA CO LTD

Address of Customer:

Request No.

02-Mar-2020

Date of receipt:

Date of test:

03-Mar-2020

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226 Serial No.

Expiry Date:

Traceable to:

Signal generator

DS 360

2288444 33873

23-Aug-2020 10-May-2020 CIGISMEC CEPREI

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity:

55 ± 10 % 1005 ± 5 hPa

Air pressure:

Test specifications

The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152

2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of +20%

3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Feng Junqi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

03-Mar-2020

Company Chop:

The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

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CERTIFICATE OF CALIBRATION

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1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Uncertanity (dB) / Coverage Facto
Self-generated noise	A	Pass	0.3
	C	Pass	1.0 2.1
	Lin	Pass	2.0 2.2
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3
	Reference SPL on all other ranges	Pass	0.3
	2 dB below upper limit of each range	Pass	0.3
	2 dB above lower limit of each range	Pass	0.3
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3
Frequency weightings	A	Pass	0.3
	С	Pass	0.3
	Lin	Pass	0.3
Time weightings	Single Burst Fast	Pass	0.3
	Single Burst Slow	Pass	0.3
Peak response	Single 100µs rectangular pulse	Pass	0.3
R.M.S. accuracy	Crest factor of 3	Pass	0.3
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3
	Repeated at frequency of 100 Hz	Pass	0.3
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3
	1 ms burst duty factor 1/104 at 4kHz	Pass	0.3
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4
Overload indication	SPL	Pass	0.3
	Leq	Pass	0.4

2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Uncertanity (dB) / Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3
	Weighting A at 8000 Hz	Pass	0.5

3, Response to associated sound calibrator

N/A

The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is assumed unless explicitly stated.

Calibrated by:

Date:

- End

Checked by

Shek Kwong Tat

03-Mar-2020

Fung Chi Yip

Date: 03-Mar-2020

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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