

ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือ



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร กรุงเทพฯ 10600
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10600
Tel : (662) 939-1370-72 Fax : (662) 513-4221 E-mail : ssp@spscs.com, www.spscs.com

High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

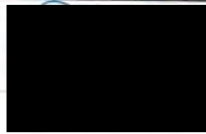
Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (l/min)	R ²
B35	B35	03/08/2023	y = 1.221x-4.116	0.995
B36	B36	03/08/2023	y = 1.247x-6.537	0.999
B37	B37	03/08/2023	y = 1.313x-6.352	0.997
B38	B38	03/08/2023	y = 1.279x-8.340	0.998
B39	B39	03/08/2023	y = 1.286x-6.520	0.999
B40	B40	03/08/2023	y = 1.241x-6.104	1.000
B41	B41	03/08/2023	y = 1.203x-4.249	0.999
B42	B42	03/08/2023	y = 1.296x-8.828	0.999
B43	B43	04/08/2023	y = 1.245x-5.710	0.997
B44	B44	04/08/2023	y = 1.262x-5.417	0.999
R01	R01	04/08/2023	y = 1.285x-8.953	0.999
R02	R02	04/08/2023	y = 1.268x-8.283	0.998
R03	R03	04/08/2023	y = 1.283x-9.563	0.999
R04	R04	04/08/2023	y = 1.234x-5.231	0.999
R05	R05	04/08/2023	y = 1.303x-10.505	0.999
R06	R06	04/08/2023	y = 1.267x-7.927	0.997
R07	R07	04/08/2023	y = 1.084x+0.577	0.999
R08	R08	04/08/2023	y = 1.304x-9.687	0.998
R09	R09	04/08/2023	y = 1.286x-8.387	0.998
R10	R10	03/08/2023	y = 1.241x-6.099	0.996
R11	R11	03/08/2023	y = 1.112x-1.473	0.998
R12	R12	03/08/2023	y = 1.250x-6.933	0.997
R13	R13	02/08/2023	y = 1.142x-2.480	0.998
R14	R14	02/08/2023	y = 1.205x-3.813	0.998
R15	R15	01/08/2023	y = 1.160x-3.518	0.999
R16	R16	01/08/2023	y = 1.229x-7.416	0.998
R17	R17	01/08/2023	y = 1.209x-4.808	0.998
R18	R18	01/08/2023	y = 1.257x-6.979	0.999
R19	R19	01/08/2023	y = 1.256x-7.676	0.996
R20	R20	01/08/2023	y = 1.279x-8.603	0.996

Calibrated by :



Approved by :



QUALITY CALIBRATION CO.,LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



CERTIFICATE No : 23M2441
REFERENCE No : 68471-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
SERIAL No : 1126422905
ID No : BA 05/50
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : ATSAWIN Y.
CALIBRATION DATE : 10-Mar-23

APPROVED BY :

ISSUED DATE : 16-Mar-23

RECEIVED DATE : 10-Mar-23

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.

**QUALITY CALIBRATION CO.,LTD.**

235 Petchkasem 63/2 Road, Laksong, Bangkai, Bangkok 10160

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www.qcalibration.com

CERTIFICATE No : 23M2441

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA 05/50 RECEIVED DATE : 10-Mar-23
AIR PRESSURE : 1010mbar ± 1mbar CALIBRATION DATE : 10-Mar-23
AMBIENT TEMPERATURE : 23° C ± 1° C RELATIVE HUMIDITY : 49 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-25

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (± g)
0.00	0.00000	0.00000	0.000039
0.02	0.02000	0.00000	0.000039
0.10	0.10000	0.00000	0.000039
0.20	0.20001	-0.00001	0.000040
0.50	0.50001	-0.00001	0.000040
1.00	1.00000	0.00000	0.000041
2.00	2.00003	-0.00003	0.000042
5.00	5.00001	-0.00001	0.000046
10.00	10.00003	-0.00003	0.000053
20.00	20.00005	-0.00005	0.000067
50.00	50.00001	-0.00001	0.00011
100.00	100.00001	-0.00001	0.00019
200.00	200.00001	-0.00001	0.00032

5. OFF CENTER LOADING ERROR

POINT	READING (g)
1	50.0000
2	50.0001
3	50.0000
4	50.0000
5	49.9999
OFF-CENTER LOADING	0.0001

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

**บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด****S.P.S. CONSULTING SERVICE CO., LTD.**

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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sales@spscon.com, www.spscon.com**Console Calibration Report**

Calibration Method

Critical Orifices

Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	DH _g (mmH ₂ O)
B01	1563	04/09/2023	0.997	50.11
B02	8002514	06/09/2023	1.002	49.25
B03	1503016	05/09/2023	0.998	50.44
B04	00006659	05/09/2023	1.004	49.37
B05	00007428	05/09/2023	0.996	49.77
R01	1561	06/09/2023	1.004	49.86
R02	8002513	08/09/2023	1.005	50.36
R03	1570	07/09/2023	0.997	49.55
R04	8002519	04/09/2023	1.004	49.69
R05	1503015	07/09/2023	0.999	50.08

Remark : Accept Value of y (test) is $0.97 < y < 1.03$

Accept Value of DH_g (test) is 46.7 ± 6.4 (mmH₂O)

Calibrated by :

Approved by :



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Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B03	S	0.99	02/08/2023	0.84	0.84
B04	S	0.99	02/08/2023	0.85	0.84
B05	S	0.99	02/08/2023	0.84	0.83
B07	S	0.99	02/08/2023	0.84	0.84
B08	S	0.99	03/08/2023	0.84	0.85
B09	S	0.99	01/08/2023	0.85	0.84
B11	S	0.99	04/08/2023	0.84	0.85
B16	S	0.99	02/08/2023	0.84	0.85
B18	S	0.99	02/08/2023	0.83	0.84
B19	S	0.99	01/08/2023	0.84	0.84
B21	S	0.99	03/08/2023	0.84	0.85
B24	S	0.99	03/08/2023	0.84	0.84
B27	S	0.99	02/08/2023	0.84	0.84
B30	S	0.99	01/08/2023	0.85	0.84
B31	S	0.99	03/08/2023	0.83	0.84
B33	S	0.99	03/08/2023	0.84	0.84
B35	S	0.99	01/08/2023	0.84	0.85

Remark : Accept value of Cp (test) is 0.84 ± 0.01

Calibrated by : _____	Approved by : _____
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Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	01/08/2023	0.85	0.84
B37	S	0.99	02/08/2023	0.84	0.84
B38	S	0.99	03/08/2023	0.84	0.83
B39	S	0.99	03/08/2023	0.84	0.84
B40	S	0.99	01/08/2023	0.85	0.84
B41	S	0.99	02/08/2023	0.84	0.85
B44	S	0.99	01/08/2023	0.84	0.84
B45	S	0.99	01/08/2023	0.85	0.84
B46	S	0.99	01/08/2023	0.84	0.85
B47	S	0.99	01/08/2023	0.84	0.84
B48	S	0.99	01/08/2023	0.84	0.85
B49	S	0.99	03/08/2023	0.85	0.84
B54	S	0.99	03/08/2023	0.83	0.84
B56	S	0.99	03/08/2023	0.84	0.85
B57	S	0.99	03/08/2023	0.84	0.83
B58	S	0.99	03/08/2023	0.85	0.84

Remark : Accept value of Cp (test) is 0.84 ± 0.01

Calibrated by : _____	Approved by : _____
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CALIBRATION LABORATORY Co.,LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VACUUM GAUGE
MANUFACTURER : HI-LIGHT
MODEL / TYPE : N/A
SERIAL NO. : N/A[64-220088-1]
CLID. NO. : 212301419
JOB CONTROL NO. : 230725081570

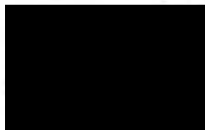
CUSTOMER : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24 ROAD., JOMPOL,
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 25 July 2023

DATE OF ISSUED : 31 July 2023

Report of calibration screening must not be taken in pari. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sittipong Pimdee
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
31 July 2023



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q23081570

F3-011-04/01-12

page 1 of 3



@clccalibration



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REPORT OF CALIBRATION

FOR

NOMENCLATURE : VACUUM GAUGE
MANUFACTURER : HI-LIGHT
MODEL / TYPE : N/A
SERIAL NO. : N/A[64-220088-1]
DATE OF CALIBRATION : 26 July 2023
DUE DATE OF CALIBRATION : 26 July 2024

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPPP-05 according to DKD-R 6-1 as calibration guidelines.

The calibration was performed by direct measurement with Document Process Calibrator and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Document Process Calibrator, Fluke Model 741B S/N. 8295020 with Pressure Module Model 700PD5 S/N. 89404505.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).
Certificate No. MP-0035-23, Due Date 02 February 2024.

UNCERTAINTY :

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k=2$. It has been evaluated according to the "Calibration of Pressure Gauges (DKD-R 6-1)" which provides a level of confidence approximately 95%.

Certificate No. Q23081570

F3-011-04/01-12

page 2 of 3



@clccalibration



CALIBRATION LABORATORY Co.,LTD.

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Tel: 02-578-0353-4 Fax: 02-578-2572 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The DUC was exercised by applying a known pressure from its zero to full scale 1 times. Then 2 series of known gauge pressure were applied. The STD reading were recorded and the means value were reported in the table below.

CALIBRATION DATA

CORRECTION OF PRESSURE

DUC Test point (inHg)	STD Reading (kPa)		Conversion to inHg		Correction (inHg)	
	Up	Down	Up	Down	Up	Down
0	0.00	0.00	0.0	0.0	0.0	0.0
-5	-15.07	-15.10	-4.5	-4.5	+0.5	+0.5
-10	-32.10	-32.13	-9.5	-9.5	+0.5	+0.5
-15	-49.20	-49.23	-14.5	-14.5	+0.5	+0.5
-20	-66.26	-66.26	-19.6	-19.6	+0.4	+0.4
-25	-83.30	-83.33	-24.6	-24.6	+0.4	+0.4
-30	-100.39	-100.39	-29.6	-29.6	+0.4	+0.4

Uncertainty of measurement ± 0.2 inHg

Transmitting fluid : Air.

Technical Note. Conversion factor 1 kPa ; 0.2953003 inHg

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 36 of 54

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q23081570

F3-011-04/01-12

page 3 of 3



clclcalibration



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Tel : (662) 939-4270-72 Fax : (662) 513-4221 E-mail : sales@spscon.com, www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 \pm 3 $^{\circ}$ C
Pressure : 1010 \pm 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3		y
B01	SKC	224-PCXR4	262101	03/07/2023	1.000	1.500	2.000	992	1.495	1.996	1.001x - 4.542	1.000
B02	SKC	224-PCXR4	626166	03/07/2023	1.000	1.500	2.000	1.002	1.504	1.999	1.009x - 20.101	0.999
B03	SKC	224-PCXR4	612968	10/07/2023	1.000	1.500	2.000	995	1.493	1.999	1.005x - 12.388	1.000
B04	SKC	224-PCXR4	602808	05/07/2023	1.000	1.500	2.000	999	1.501	1.992	0.998x - 0.040	1.000
B05	SKC	224-PCXR4	612693	03/07/2023	1.000	1.500	2.000	1.002	1.498	2.000	1.010x - 21.803	0.999
B06	SKC	224-PCXR4	262188	05/07/2023	1.000	1.500	2.000	994	1.506	2.004	1.011x - 20.611	1.000
B07	SKC	224-PCXR4	626262	10/07/2023	1.000	1.500	2.000	997	1.490	1.993	0.992x + 6.399	1.000
B08	SKC	224-PCXR4	626190	07/07/2023	1.000	1.500	2.000	1.002	1.498	2.005	1.013x - 26.473	0.999
B09	SKC	224-PCXR4	626479	05/07/2023	1.000	1.500	2.000	996	1.489	1.991	0.993x + 1.797	1.000
B10	SKC	224-PCXR4	091950	06/07/2023	1.000	1.500	2.000	991	1.501	1.999	1.017x - 36.764	0.999
B11	SKC	224-PCXR4	364315	10/07/2023	1.000	1.500	2.000	995	1.489	1.997	1.003x - 8.260	1.000
B12	SKC	224-PCXR4	034656	07/07/2023	1.000	1.500	2.000	1.002	1.501	2.003	1.004x + 7.152	1.000
B13	SKC	224-PCXR4	602073	05/07/2023	1.000	1.500	2.000	994	1.499	1.996	1.000x - 3.092	1.000
B14	SKC	224-PCXR4	626313	07/07/2023	1.000	1.500	2.000	998	1.491	1.987	0.991x + 8.312	1.000
B15	SKC	224-PCXR4	626474	07/07/2023	1.000	1.500	2.000	1.000	1.500	2.003	1.009x - 17.930	0.999
B16	SKC	224-PCXR4	626477	04/07/2023	1.000	1.500	2.000	993	1.502	1.999	1.014x - 31.373	0.999
B17	SKC	224-PCXR4	626860	04/07/2023	1.000	1.500	2.000	996	1.493	1.989	0.996x - 0.944	1.000
B18	SKC	224-PCXR4	691484	04/07/2023	1.000	1.500	2.000	1.002	1.499	1.999	1.008x - 17.894	0.999
B19	SKC	224-PCXR4	691599	06/07/2023	1.000	1.500	2.000	992	1.501	1.997	1.005x - 10.491	1.000
B20	SKC	224-PCXR4	691587	03/07/2023	1.000	1.500	2.000	990	1.502	1.998	1.009x - 21.898	1.000
B21	SKC	224-PCXR4	691531	10/07/2023	1.000	1.500	2.000	992	1.476	1.993	1.000x - 11.272	1.000
B22	SKC	224-PCXR4	691654	05/07/2023	1.000	1.500	2.000	1.002	1.500	2.002	1.011x - 21.141	0.999
B23	SKC	224-PCXR4	798393	10/07/2023	1.000	1.500	2.000	992	1.505	2.000	1.017x - 33.720	0.999
B24	SKC	224-PCXR4	626363	05/07/2023	1.000	1.500	2.000	999	1.501	1.997	1.003x - 8.933	1.000
B25	SKC	224-PCXR4	798489	10/07/2023	1.000	1.500	2.000	1.000	1.491	1.998	0.996x + 1.689	1.000
B26	SKC	224-PCXR4	798479	04/07/2023	1.000	1.500	2.000	999	1.498	1.991	0.993x + 6.351	1.000
B27	SKC	224-PCXR4	681673	10/07/2023	1.000	1.500	2.000	993	1.502	2.000	1.015x - 32.306	0.999
B28	SKC	224-PCXR4	681570	04/07/2023	1.000	1.500	2.000	1.002	1.498	1.999	1.005x - 12.188	1.000
B29	SKC	224-PCXR4	626472	04/07/2023	1.000	1.500	2.000	999	1.496	1.998	1.002x - 6.471	1.000
B30	SKC	224-PCXR4	691489	06/07/2023	1.000	1.500	2.000	1.002	1.508	2.004	1.002x - 7.722	0.999
B31	SKC	224-PCXR4	691509	10/07/2023	1.000	1.500	2.000	991	1.475	1.945	0.999x - 10.348	1.000
B32	SKC	224-PCXR4	091567	05/07/2023	1.000	1.500	2.000	990	1.501	1.998	1.011x - 24.321	1.000
B33	SKC	224-PCXR4	091756	05/07/2023	1.000	1.500	2.000	992	1.496	1.990	0.991x + 4.498	1.000
B34	SKC	224-PCXR4	612962	07/07/2023	1.000	1.500	2.000	1.001	1.499	2.000	1.006x - 14.460	0.999
B35	SKC	224-PCXR4	602882	05/07/2023	1.000	1.500	2.000	992	1.497	1.994	1.002x - 9.762	1.000
B36	SKC	224-PCXR4	626164	05/07/2023	1.000	1.500	2.000	998	1.496	1.999	1.000x - 6.056	1.000
B37	SKC	224-PCXR4	626256	03/07/2023	1.000	1.500	2.000	993	1.505	1.997	1.005x - 13.443	1.000
B38	SKC	224-PCXR4	626167	03/07/2023	1.000	1.500	2.000	996	1.496	1.996	1.001x - 3.347	1.000
B39	SKC	224-PCXR4	034637	10/07/2023	1.000	1.500	2.000	1.004	1.499	1.999	1.009x - 18.599	0.999
B40	SKC	224-PCXR4	798349	06/07/2023	1.000	1.500	2.000	993	1.504	1.997	1.013x - 29.094	0.999

Calibrated by :

Approved by :



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Tel : (662) 939-4370-72 Fax : (662) 513-4221 E-mail : sales@spscon.com, www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 ± 3 °C
Pressure : 1010 ± 15 mmbar

Personal Pump Data				Calibration Data									
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve		
					Setting			Actual (Q std.)			y		
					1	2	3	1	2	3	y	r ²	
B41	SKC	224-PCXR4	612669	10/07/2023	1,000	1,500	2,000	998	1,495	1,989	0.995x + 1.833	1.000	
B42	SKC	224-PCXR4	626041	10/07/2023	1,000	1,500	2,000	1,003	1,496	1,989	0.985x + 18.950	1.000	
B43	SKC	224-PCXR4	034636	05/07/2023	1,000	1,500	2,000	999	1,500	1,990	0.990x + 11.352	1.000	
B44	SKC	224-PCXR4	529341	10/07/2023	1,000	1,500	2,000	1,001	1,500	2,000	1.003x - 8.128	1.000	
B45	SKC	224-PCXR4	529394	06/07/2023	1,000	1,500	2,000	998	1,500	1,985	0.988x + 13.443	1.000	
B46	SKC	224-PCXR4	566743	04/07/2023	1,000	1,500	2,000	994	1,504	2,000	1.006x - 14.882	1.000	
B47	SKC	224-PCXR4	566747	04/07/2023	1,000	1,500	2,000	1,001	1,500	2,002	1.012x - 24.217	0.999	
B48	SKC	224-PCXR4	566753	10/07/2023	1,000	1,500	2,000	999	1,491	1,996	1.002x - 11.236	1.000	
B49	SKC	224-PCXR4	566780	04/07/2023	1,000	1,500	2,000	1,002	1,501	2,004	1.012x - 23.640	0.999	
B50	SKC	224-PCXR4	500400	10/07/2023	1,000	1,500	2,000	1,000	1,506	2,000	0.997x + 1.566	1.000	
B51	SKC	224-PCXR4	500363	04/07/2023	1,000	1,500	2,000	993	1,502	1,998	1.010x - 25.405	0.999	
B52	SKC	224-PCXR4	093186	10/07/2023	1,000	1,500	2,000	993	1,494	1,990	0.995x + 0.992	1.000	
B53	SKC	224-PCXR4	707670	05/07/2023	1,000	1,500	2,000	1,001	1,499	2,000	1.007x - 16.304	0.999	
B54	SKC	224-PCXR4	509821	03/07/2023	1,000	1,500	2,000	992	1,500	2,000	1.017x - 35.039	0.999	
B55	SKC	224-PCXR4	510710	10/07/2023	1,000	1,500	2,000	995	1,493	1,990	0.993x + 2.638	1.000	
B56	SKC	224-PCXR4	511430	04/07/2023	1,000	1,500	2,000	1,001	1,498	1,999	1.004x - 9.108	1.000	
B57	SKC	224-PCXR4	510798	10/07/2023	1,000	1,500	2,000	996	1,490	1,997	1.005x - 13.675	1.000	
B58	SKC	224-PCXR4	509852	05/07/2023	1,000	1,500	2,000	999	1,497	1,997	1.006x - 19.133	0.999	
B59	SKC	224-PCXR4	509862	06/07/2023	1,000	1,500	2,000	995	1,501	1,993	1.001x - 5.136	1.000	
B60	SKC	224-PCXR4	512655	06/07/2023	1,000	1,500	2,000	1,001	1,498	2,013	1.017x - 25.680	1.000	
B61	SKC	224-PCXR4	503915	05/07/2023	1,000	1,500	2,000	992	1,488	1,997	1.004x - 13.766	1.000	
B62	SKC	224-PCXR4	505975	06/07/2023	1,000	1,500	2,000	998	1,493	1,994	0.996x + 0.183	1.000	
B63	SKC	224-PCXR4	511032	04/07/2023	1,000	1,500	2,000	989	1,499	1,998	1.010x - 24.150	1.000	
B64	SKC	224-PCXR4	508302	03/07/2023	1,000	1,500	2,000	997	1,491	1,987	0.990x + 8.811	1.000	
B65	SKC	224-PCXR4	508310	10/07/2023	1,000	1,500	2,000	1,011	1,489	2,000	0.998x + 0.263	0.999	
B66	SKC	224-PCXR4	509861	10/07/2023	1,000	1,500	2,000	1,001	1,489	1,990	0.987x + 13.691	1.000	
B67	SKC	224-PCXR4	506295	04/07/2023	1,000	1,500	2,000	994	1,506	2,009	1.012x - 20.281	1.000	
B68	SKC	224-PCXR4	505872	04/07/2023	1,000	1,500	2,000	1,001	1,489	1,996	0.994x + 3.757	1.000	
B69	SKC	224-PCXR4	508375	04/07/2023	1,000	1,500	2,000	1,001	1,498	1,998	1.008x - 19.635	0.999	
B70	SKC	224-PCXR4	510623	05/07/2023	1,000	1,500	2,000	991	1,502	1,994	1.001x - 5.451	1.000	
B71	SKC	224-PCXR4	508367	10/07/2023	1,000	1,500	2,000	991	1,504	2,000	1.016x - 35.155	0.999	
B72	SKC	224-PCXR4	505977	05/07/2023	1,000	1,500	2,000	1,000	1,498	1,992	0.992x + 7.080	1.000	
B73	SKC	224-PCXR4	512606	05/07/2023	1,000	1,500	2,000	1,000	1,499	2,002	1.000x + 7.240	0.999	
B74	SKC	224-PCXR4	505993	05/07/2023	1,000	1,500	2,000	995	1,495	1,992	0.996x - 2.446	1.000	
B75	SKC	224-PCXR4	509820	05/07/2023	1,000	1,500	2,000	995	1,495	1,989	0.995x + 1.829	1.000	
B76	SKC	224-PCXR4	509811	04/07/2023	1,000	1,500	2,000	992	1,497	1,997	1.005x - 14.428	1.000	
B77	SKC	224-PCXR4	508301	04/07/2023	1,000	1,500	2,000	999	1,499	2,001	1.008x - 21.556	0.999	
B78	SKC	224-PCXR4	510677	05/07/2023	1,000	1,500	2,000	994	1,502	1,997	1.012x - 28.449	0.999	
B79	SKC	224-PCXR4	510920	05/07/2023	1,000	1,500	2,000	993	1,492	1,992	1.000x - 5.853	1.000	

Calibrated by :

Approved by :



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 ± 3 °C
Pressure : 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R01	SKC	224-PCXR4	502467	06/07/2023	1,000	1,500	2,000	991	1,506	2,002	1.007x - 14.479	1.000
R02	SKC	224-PCXR4	626450	06/07/2023	1,000	2,000	3,000	997	1,497	1,988	0.988x + 12.256	1.000
R03	SKC	224-PCXR4	691592	06/07/2023	1,000	1,500	2,000	1,002	1,498	2,002	1.003x - 5.881	1.000
R04	SKC	224-PCXR4	691672	06/07/2023	1,000	1,500	2,000	995	1,491	1,994	0.997x - 2.717	1.000
R05	SKC	224-PCXR4	798470	06/07/2023	1,000	1,500	2,000	992	1,505	1,997	1.001x - 6.538	1.000
R06	SKC	224-PCXR4	798456	06/07/2023	1,000	1,500	2,000	994	1,497	1,993	0.994x - 0.976	1.000
R07	SKC	224-PCXR4	798480	04/07/2023	1,000	1,500	2,000	993	1,490	1,997	1.007x - 16.177	1.000
R08	SKC	224-PCXR4	883215	04/07/2023	1,000	1,500	2,000	1,010	1,499	2,003	0.989x + 11.332	0.999
R09	SKC	224-PCXR4	034650	04/07/2023	1,000	1,500	2,000	990	1,503	2,000	1.011x - 24.548	1.000
R10	SKC	224-PCXR4	091765	07/07/2023	1,000	1,500	2,000	996	1,509	1,992	0.996x + 0.299	1.000
R11	SKC	224-PCXR4	091763	07/07/2023	1,000	1,500	2,000	999	1,497	1,985	1.000x - 9.834	0.999
R12	SKC	224-PCXR4	091568	07/07/2023	1,000	1,500	2,000	995	1,499	1,998	1.001x - 6.774	1.000
R13	SKC	224-PCXR4	091638	07/07/2023	1,000	1,500	2,000	1,001	1,510	1,989	0.988x + 16.559	1.000
R14	SKC	224-PCXR4	091764	07/07/2023	1,000	1,500	2,000	993	1,501	1,997	1.013x - 30.102	0.999
R15	SKC	224-PCXR8	529457	07/07/2023	1,000	1,500	2,000	1,000	1,499	2,001	0.998x - 3.662	0.999
R16	SKC	224-PCXR8	529443	05/07/2023	1,000	1,500	2,000	997	1,494	1,992	0.992x + 2.530	1.000
R17	SKC	224-PCXR8	529445	05/07/2023	1,000	1,500	2,000	994	1,507	1,998	1.006x - 15.440	0.999
R18	SKC	224-PCXR8	566756	05/07/2023	1,000	1,500	2,000	990	1,496	1,996	1.000x + 6.873	1.000
R19	SKC	224-PCXR8	566802	05/07/2023	1,000	1,500	2,000	1,001	1,497	1,998	1.003x - 14.352	0.999
R20	SKC	224-PCXR8	529089	03/07/2023	1,000	1,500	2,000	990	1,499	2,001	1.019x - 39.318	0.999
R21	SKC	224-PCXR8	665728	03/07/2023	1,000	1,500	2,000	997	1,493	1,997	0.999x - 3.765	1.000
R22	SKC	224-PCXR8	707444	03/07/2023	1,000	1,500	2,000	1,002	1,511	2,001	1.000x - 2.666	0.999
R23	SKC	224-PCXR8	761067	05/07/2023	1,000	1,500	2,000	1,011	1,475	1,989	0.980x + 20.504	0.999
R24	SKC	224-PCXR8	707893	04/07/2023	1,000	1,500	2,000	995	1,507	1,998	1.007x - 16.619	0.999
R25	SKC	224-PCXR8	761052	04/07/2023	1,000	1,500	2,000	1,009	1,494	1,993	0.984x + 21.169	1.000
R26	SKC	224-PCXR8	707956	06/07/2023	1,000	1,500	2,000	1,011	1,499	2,004	1.001x - 3.674	0.999
R27	SKC	224-PCXR8	707388	06/07/2023	1,000	1,500	2,000	995	1,499	1,999	1.005x - 14.830	1.000
R28	SKC	224-PCXR8	707481	04/07/2023	1,000	1,500	2,000	1,003	1,499	2,000	1.001x - 11.858	0.999
R29	SKC	224-PCXR8	707402	04/07/2023	1,000	1,500	2,000	1,002	1,492	1,987	0.985x + 16.145	1.000
R30	SKC	224-PCXR8	093811	07/07/2023	1,000	1,500	2,000	999	1,492	1,991	0.994x + 4.391	1.000
R31	SKC	224-PCXR8	093183	04/07/2023	1,000	1,500	2,000	1,000	1,499	1,999	0.989x + 8.339	0.999
R32	SKC	224-PCXR8	671950	04/07/2023	1,000	1,500	2,000	997	1,499	1,991	0.995x + 4.048	1.000
R33	SKC	224-PCXR4	626254	04/07/2023	1,000	1,500	2,000	993	1,501	1,998	1.016x - 32.194	0.999
R34	SKC	224-PCXR4	626131	04/07/2023	1,000	1,500	2,000	1,001	1,498	2,002	1.006x - 12.316	1.000
R35	SKC	224-PCXR8	707460	07/07/2023	1,000	1,500	2,000	998	1,496	1,993	0.993x + 5.945	1.000
R36	SKC	224-PCXR8	707446	07/07/2023	1,000	1,500	2,000	1,003	1,497	1,999	1.008x - 18.814	0.999
R37	SKC	224-PCXR8	707432	07/07/2023	1,000	1,500	2,000	995	1,497	1,998	0.995x + 5.662	1.000
R38	SKC	224-PCXR8	707349	07/07/2023	1,000	1,500	2,000	996	1,498	1,999	1.002x - 7.662	1.000
R39	SKC	224-PCXR8	761095	04/07/2023	1,000	1,500	2,000	1,000	1,514	1,992	0.984x + 18.826	0.999



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Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
H-R01	Dwyer	VFB-65	05/07/2023	500	1,000	2,000	501.2	993.0	1978.7	0.9999x - 3.855	0.999
H-R02	Dwyer	VFB-65	05/07/2023	500	1,000	2,000	501.5	998.1	1988.7	1.0000x - 2.024	1.000
H-R03	Dwyer	VFB-65	04/07/2023	500	1,000	2,000	501.2	999.3	1995.7	0.9992x + 3.627	1.000
H-R04	Dwyer	VFB-65	10/07/2023	500	1,000	2,000	498.3	991.2	2014.5	1.0060x - 10.883	1.000
H-R05	Dwyer	VFB-65	05/07/2023	500	1,000	2,000	499.1	987.9	1988.7	1.0020x - 6.076	1.000
H-R06	Dwyer	VFB-65	06/07/2023	500	1,000	2,000	504.7	994.0	1980.6	0.9980x - 1.539	0.999

Calibrated by :

Approved by :



QUALITY CALIBRATION CO.,LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



CERTIFICATE No : 23M2441
REFERENCE No : 68471-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
SERIAL No : 1126422905
ID No : BA 05/50
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : ATSAWIN Y.
CALIBRATION DATE : 10-Mar-23
APPROVED BY :
ISSUED DATE : 16-Mar-23
RECEIVED DATE : 10-Mar-23

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.

**QUALITY CALIBRATION CO.,LTD.**

235 Petchkasem 63/2 Road, Laksong, Bangkai, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com

CERTIFICATE No : 23M2441

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA 05/50 RECEIVED DATE : 10-Mar-23
AIR PRESSURE : 1010mbar ± 1mbar CALIBRATION DATE : 10-Mar-23
AMBIENT TEMPERATURE : 23° C ± 1° C RELATIVE HUMIDITY : 49 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-25

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (± g)
0.00	0.00000	0.00000	0.000039
0.02	0.02000	0.00000	0.000039
0.10	0.10000	0.00000	0.000039
0.20	0.20001	-0.00001	0.000040
0.50	0.50001	-0.00001	0.000040
1.00	1.00000	0.00000	0.000041
2.00	2.00003	-0.00003	0.000042
5.00	5.00001	-0.00001	0.000046
10.00	10.00003	-0.00003	0.000053
20.00	20.00005	-0.00005	0.000067
50.00	50.00001	-0.00001	0.00011
100.00	100.00001	-0.00001	0.00019
200.00	200.00001	-0.00001	0.00032

5. OFF CENTER LOADING ERROR

POINT	READING (g)
1	50.0000
2	50.0001
3	50.0000
4	50.0000
5	49.9999
OFF-CENTER LOADING	0.0001

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

**SITHIPHORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY**

451-451/1 Sirinthorn Rd., Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com <http://www.sithiphorn.com>



NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. No. : SP23016

Pages 1 of 3

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER
Manufacturer : PERKINELMER
Model : LAMBDA 25
Serial No.: 501S14123010
ID No.: SP03/58
Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY

Condition As Found : GOOD

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD,
CHOMPHON, CHATUCHAR,
BANGKOK 10900, THAILAND.

Location : ORGANIC LABORATORY IV

Ambient Temperature : (25.0 ± 5) °C
Relative Humidity : (48.4 ± 25) %

Received Date : 30 AUGUST 2023
Calibration Date : 30 AUGUST 2023
Date of Issue : 31 AUGUST 2023

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Continuation of Calibration Certificate

Cert. No. : SP23016
Job No. : VC66SP0014
Pages : 2 of 3

Calibration Method :

This instrument was calibrated by using on-site calibration procedure In-house method : CP-SP-01
The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution, Photometric accuracy by using absorbance standard filter and absorbance standard solution
The calibration procedure used was based on ASTM E275-01, ASTM E925-02

Condition of this result of calibration :

1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	106864	01/11/2024
Didymium liquid	RM-DL	28912	106905	02/11/2024
Neutral density filter	RM-1N2N3N	13877	106918	03/11/2024
Potassium dichromate solutions	RM-0204060810	14204	106902	02/11/2024
Potassium Iodide solution	-	KI-0701-001	CI-0090-22	08/04/2024

2. This result of calibration was found accurate as shown on date and place of calibration only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology, NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty \pm (nm)	k Factor
RM-HL	278.13	278.3	0.17	0.16	2.00
	361.25	361.3	0.05	0.16	2.00
	467.82	468.0	0.18	0.16	2.00
	536.56	536.6	0.04	0.16	2.00
	640.50	640.4	-0.10	0.16	2.00
RM-DL	740.09	740.0	-0.09	0.16	2.00
	864.94	865.0	0.06	0.16	2.00

UUC* = Unit Under Calibration

Continuation of Calibration Certificate

Cert. No. : SP23016
Job No. : VC66SP0014
Pages : 3 of 3

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0517	1.0564	0.0047	0.0031	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0032	2.00
		29381	0.5	0.5416	0.5429	0.0013	0.0032	2.00
	546.1	29360	1.0	0.9821	0.9849	0.0028	0.0030	2.00
		29914	0.7	0.6961	0.6961	0.0000	0.0030	2.00
		29381	0.5	0.5073	0.5073	0.0000	0.0030	2.00
	590.0	29360	1.0	1.0222	1.0244	0.0022	0.0030	2.00
		29914	0.7	0.7237	0.7234	-0.0003	0.0030	2.00
		29381	0.5	0.5361	0.5360	-0.0001	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9775	0.0022	0.0030	2.00
		29914	0.7	0.6910	0.6910	0.0000	0.0030	2.00
		29381	0.5	0.5211	0.5210	-0.0001	0.0032	2.00
Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor	
RM-0204060810	235.0	20	0.2422	0.2462	0.0040	0.0101	2.00	
		40	0.4866	0.4900	0.0034	0.0115	2.00	
		60	0.7414	0.7390	-0.0024	0.0068	2.00	
		80	0.9858	0.9871	0.0013	0.0093	2.00	
		100	1.2442	1.2480	0.0038	0.0087	2.00	

UUC* = Unit Under Calibration

Condition of this result of calibration : Spectrophotometer PERKINELMER Model Lambda 25 S/N 501S141230

Resolution of Wavelength Mode 0.1 nm

Resolution of Photometric Mode 0.0001 A

Parameter Setting

Measurement Mode Wavelength, Absorbance

Wavelength Scan 1100 nm-190 nm

Scanning Speed 7.5 nm/min

Data Pitch 0.1 nm

Band width(Wavelength) 1.0 nm

Band width(Vis) 1.0 nm

Band width(Uv) 1.0 nm

Stray Light** UUC* Reading at 220 nm	
Transmission T(%)	Absorbance(A)
0.0111	3.9564

**Specific Acceptance :

Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A

**Stray light not TISI Accredited

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95%

End of Calibration Certificate



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10000
7 Soi Phaholyothin 24, Phaholyothin Rd., Jomprai, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sales@spscon.com, www.spscon.com

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	03 October 2023	Brand :	API	Model :	300E
No.	CO-R01	Serial No.	704		
Calibrator (Dilution System)					
Brand :	API	Model :	700		
Last Cal. Date :	08 August 2023	Serial No. :	911		
Reference Standard Gas					
Standard Gas :	Carbon Monoxide (CO)	Cylinder No. :	D196045		
Certified Date :	16 April 2022	Expired Date :	15 April 2024	Cylinder Conc. :	4,570 ppm
Calibrating Condition					
Pressure	1011 mmbar	Temp.	24.5 °C	% RH	49
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	
Zero	0	0.10	-	0	
CO Span	40.00	40.11	0.275	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	± 1 ppm With Zero Air		
CO Measure	4015.1	mV	2500-4800 mV		
CO Reference	3947.8	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.6	In-Hg-A	~2"± Ambient Absolute Pressure		
Sample Flow	806	CC/Min	800 ± 10%		
Sample Temperature	48.4	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.4	°C	68 ± 2		
Box Temperature	30.6	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3041.6	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :



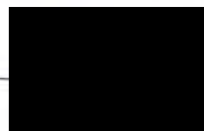
Approved by :



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10000
7 Soi Phaholyothin 24, Phaholyothin Rd., Jomprai, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sales@spscon.com, www.spscon.com

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	03 October 2023	Brand :	API	Model :	300E
No.	CO-R02	Serial No.	171-S		
Calibrator (Dilution System)					
Brand :	API	Model :	700		
Last Cal. Date :	08 August 2023	Serial No. :	911		
Reference Standard Gas					
Standard Gas :	Carbon Monoxide (CO)	Cylinder No. :	D196045		
Certified Date :	16 April 2022	Expired Date :	15 April 2024	Cylinder Conc. :	4,570 ppm
Calibrating Condition					
Pressure	1011 mmbar	Temp.	24.5 °C	% RH	49
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	
Zero	0	0.10	-	0	
CO Span	40.00	39.90	-0.250	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	± 1 ppm With Zero Air		
CO Measure	4015.9	mV	2500-4800 mV		
CO Reference	3948.7	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.4	In-Hg-A	~2"± Ambient Absolute Pressure		
Sample Flow	813	CC/Min	800 ± 10%		
Sample Temperature	48.2	°C	48 ± 4		
Bench Temperature	48.0	°C	48 ± 2		
Wheel Temperature	68.5	°C	68 ± 2		
Box Temperature	30.7	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3039.4	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :



Approved by :





WO-01981290/2023

MAINTENANCE AND TEST CERTIFICATE MODEL
OPTIMA 5300DV

Customer : <u>S.P.S.Consulting Service Co.,Ltd</u>	Date Tested: <u>July 6, 2023</u>
Address : <u>7 Soi Phaholyothin 24</u>	Recommendation Recertification
<u>Paholyothin Road</u>	Period <u>6</u> Months
<u>Jompol Chatuchak, Bangkok 1090</u>	Recertification Due: <u>January 6, 2024</u>
User Name: <u>K.Phenpha Viphashtawat</u>	Date Last Certified: <u>January 11, 2023</u>
Phone: <u>083-9269252</u>	Visit Number: <u>1 of 2</u>
Fax: <u>02-513-4221</u>	PerkinElmer Phone: <u>02-719-6420 ext 206</u>
	PerkinElmer Fax: <u>02-318-5597</u>

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
MODEL	SERIAL NUMBER	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
<u>IPV Methods</u>		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>October 30, 2023</u>
<u>Wavecal Solution</u>	<u>N058-2152</u>	<u>September 30, 2023</u>
<u>VIS Wavecal solution</u>	<u>N930-2946</u>	<u>August 30, 2023</u>
<u>Instrument Cal. STD4</u>	<u>N930-0221</u>	<u>November 30, 2023</u>
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		

Page 1 of 4



WO-01981290/2023

MAINTENANCE AND TEST CERTIFICATE MODEL
OPTIMA 5300DV

SERIAL NUMBER <u>077C7042401</u>	DATE TESTED <u>July 6, 2023</u>
---	--

- MECHANICAL CHECKS**
 - A. Inspect and clean all fans and filters. ☐
 - B. Inspect and replace as necessary, all torch components including the RF coil. ☐
 - C. Inspect all tubing for sign of clacking or leaking. ☐
 - D. Adjust water and gas pressure regulator settings. ☐
 - E. Inspect and leak check pneumatics drawers. ☐
 - F. Clean the exterior of the instrument. ☐
- OPTICAL CHECKS**
 - A. Inspect and clean all optical components. ☐
 - B. As required, check and replace all purgefilters. ☐
 - C. Recheck optical alignment. ☐
- COOLING SYSTEM CHECKS**
 - A. Perform preventive maintenance on chiller. ☐
 - B. Flush out the chiller every year. ☐
- PERFORMANCE CHECKS**
 - A. Torch View Alignment. ☐
 - B. Wavelength Calibration. ☐

Page 2 of 4



MAINTENANCE AND TEST CERTIFICATE MODEL

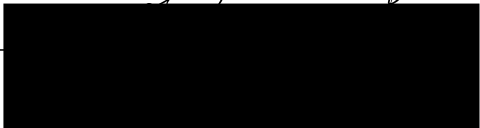
OPTIMA 5300DV

SERIAL NUMBER : 077C7042401		DATE TESTED : July 6, 2023	
PARAMETER	SPECIFICATION	FINAL VALUE	
Spectral Resolution : UV	As 193.696 nm	≤ 0.007	0.00534
	Ni 231.604 nm	≤ 0.008	0.00682
	Ni 341.476 nm	≤ 0.012	0.00794
Spectral Resolution : VIS	La 408.672 nm	≤ 0.020	0.01613
	Ba 455.403 nm	≤ 0.025	0.02282
Precision	As 193.656 nm	% RSD < 1.0	0.23 %
	Zn 213.856 nm	% RSD < 1.0	0.09 %
	Mn 257.610 nm	% RSD < 1.0	0.58 %
	La 379.478 nm	% RSD < 1.0	0.38 %
	Ba 455.403 nm	% RSD < 1.0	0.42 %
	Ba 493.408 nm	% RSD < 1.0	0.41 %
Detection Limits : Axial	Tl 190.080 nm	3(sd)	2.37 ppb
	As 193.696 nm	3(sd)	6.78 ppb
	Pb 220.353 nm	3(sd)	0.82 ppb
Detection Limits : Radial	As 193.696 nm	3(sd)	23.56 ppb
	Zn 213.856 nm	3(sd)	2.85 ppb
	Mn 257.610 nm	3(sd)	3.66 ppb
	La 379.478 nm	3(sd)	5.10 ppb
	Ba 455.403 nm	3(sd)	0.12 ppb
	Ba 493.408 nm	3(sd)	1.17 ppb
BEC : Axial (IB X 500)/(IS-IB)	Cd 226.502 nm	≤ 150 ppb	117.07
BEC : Radial (IB X 1000)/(IS-IB)	Mn 257.610 nm	≤ 45 ppb	22.09




MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER	077C7042401	DATE TESTED	July 6, 2023
Remarks :			
Commissioning follow as commissioning performance sheets.			
This is to certify that the above tests have been performed and the configuration tested			
<input checked="" type="checkbox"/> meets		<input type="checkbox"/> does not meet	
the PerkinElmer Specifications listed on this certificate.			
This certificate does not modify PerkinElmer's standard terms and condition of sale, including warranty terms.			
Service Department PerkinElmer Ltd.			
Authorized Representative:			

PinAAcle 900T Preventive Maintenance (PM)

Company Name:	SPS Consulting Service Co., Ltd.		
Address (Instrument Location):	7 Soi Phaholyothin 24, Phaholyothin Rd. Jompol, Bangkok, 10900		
Serial Number:	PTCS14111103	PM Number:	2/2
Customer Name (if applicable):	K. Phenpha	Telephone Number:	083-926-9252
Customer Support Engineer Name:	K. Duang	Service Order Number:	WO-02419478
Date PM Performed: (DD-MMM-YYYY)	29-Jun-2023	Next PM Due Date: (DD-MMM-YYYY)	29-Dec-2023
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	
09370143 Rev.9	A	January 2018	

Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900T by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.
The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
AS900	AS91514B1002	Winlab32

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	N/A
B3002013	THGA Contact Cylinders	N/A
B3141064	Glycerol for THGA Cooling	N/A
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	N/A
N9301714	Replacement Acetylene Filter Cartridge	N/A
TH001022	Replacement Air Filter Cartridge	N/A

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	26-87CUI1	30-Jan-2024
N9300244	GFAAS Mixed Standard	AR	56-21CRY1	30-Jun-2023

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO ₃	250 ml.	AR	AR

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	MG0-252
N1013002	1.0A Neutral density filter	1	MG2-358
B3100652 Or N9307029	Electronic Flow Meter	1	NA
B0505495	Test Jig	1	NA
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190
N3050119	Cr Lumina HCL	1	091911-020150

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas and water lines for leaks and/or wear. Replace if needed. Thoroughly inspect all quick connects. Replace the Y connector, P/N 09921079, if needed.
- ☒ Clean exterior of the instrument.

3.1 Flame Technique

- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

3.2 THGA Technique

- ☒ Inspect the pole pieces and clean where the pole pieces contact the furnace. Replace the pole piece p-rings as needed, P/N's B0501018 & B0501250. Grease the O-rings as needed with Apiezon L grease, P/N 09905148
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function.
- ☒ Verify the operation of the GFTV Camera for proper operation and viewing alignment in the furnace camera Tube View window. Align if needed.
- ☒ Check the operation of the Halogen Light ASSY for the GFTV Camera. Replace if needed.
- ☒ Check the water level/quality in the recirculation (if applicable). Add distilled water if necessary.
- ☒ Check the cooling system fluid flow rate with the FCS In-Line Flow Meter for proper levels if needed. Refer to SDB# COSY008.STN

- ✓ Perform Cooling System maintenance if needed per SDB# COSY005.STN.
- ✓ Check auto sampler operation.
- ✓ Perform an auto sampler check valve test as described in the Service Manual.
- ✓ Lubricate the spindles of the auto sampler pumps and all moving parts of the tray mechanics as described in the Service Manual.
- ✓ Inspect the auto sampler sampling capillary as described in the Service Manual. Replace if necessary.

4. Electrical:

- ✓ Inspect PC boards. Clean if necessary.
- ✓ Carefully check all internal and external cable connections.
- ✓ Check instrument firmware revisions upgrade to current levels (if necessary)
- ✓ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ✓ Inspect and clean the sample compartment windows, if needed.
- ✓ Inspect and clean the furnace windows, if needed.
- ✓ Inspect and clean the GFTV camera lens, if needed.
- ✓ Inspect optics. Clean or replace if necessary,

6. Gasses:

- ✓ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ✓ Verify that the air filter element is dry. Replace if necessary.

7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests [Flame]:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9798	0.9877	Passed
0.2 A ND Filter	± 5% from Cert.	0.2042	0.1985	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0016	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0001	Passed

8.4 D₂ Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0044	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0001	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0013	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	NA	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3421	Passed

9. After PM Performance tests [THGA]:

9.1 Furnace Gas Flows

Description: Ensures the flow rates are within specification.

Parameter	Specification	Test Results	Pass/Fail
Internal Flow Rate	250 mL/min \pm 25 mL/min	255	Passed
External Flow Rate	100 mL/min \pm 10 mL/min	105	Passed

9.2 Chromium Baseline Noise

Description: Signal to noise check.

Parameter	Specification	Results	Pass/Fail
Baseline Noise	≤ 0.005 Abs.	0.0005	Passed
Standard Deviation	≤ 0.005	0.0004	Passed

9.3 Chromium Characteristic Mass and Precision

Description: Calculate the characteristic mass using the characteristic mass tool and precision from the integrated absorbance values.

Parameter	Specification	Results	Pass/Fail
Cr m_0 Results	≤ 7.0 pg/0.0044 A-s	5.8	Passed
Precision	≤ 2.0 %	1.18	Passed

9.4 Copper Characteristic Mass and Zeeman Ratio

Description: Calculate the characteristic mass using the characteristic mass tool and check the Zeeman Ratio.

Parameter	Specification	Results	Pass/Fail
Cu m_0 Result	≤ 16.5 pg/0.0044 A-s	13.6	Passed
Zeeman Ratio	0.52 ± 0.04	0.52	Passed

10. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM


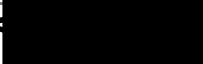
$$\begin{aligned} \text{Zeeman Ratio} &= \frac{\text{Atomic Signal (Peak area)}}{\text{Atomic Signal (Peak area)} + \text{Background Signal (Peak area)}} \\ &= \frac{0.1614}{0.1614 + 0.1448} \\ &= 0.52 \end{aligned}$$

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900T have been completed.

This PinAAcle 900T Passes ☒ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:		Date: 06-Jun-2023 (DD-MMM-YYYY)
Authorized Customer Representative:		Date: 06-Jun-2023 (DD-MMM-YYYY)



Certificate of Calibration

Aquion : Anion (ID#894)

This certificate is to verify that instrument below are calibrated
by Archemica Lab Co.,Ltd.

AQUION S/N : 190840059


AS-DV S/N : 190915235

for
S.P.S. Consulting Service Co., Ltd.

ARCHEMICA LAB
บริษัท อาร์เคมีกา แล็บ จำกัด
ARCHEMICA LAB CO., LTD.

Operator Signature

Date : Jul 3, 2023

()
Applications Chemist

PETRO-INSTRUMENTS CORP., LTD.

7/409 Soi Vibhavadi-Rangsit 36, Vibhavadi-Rangsit Rd., Chatuchak, Chatuchak Bangkok 10900 Thailand
Tel. : (+66) 2939 5711 (12 Lines), (+66) 2513 2333 (12 Lines), Fax. : (+66) 939 4207, (+66) 2939 4207
Website : <http://www.pico.co.th> email-address: pico@pico.co.th , service@pico.co.th

DOC. NUMBER CMV-S23-0034

SERVICE REPORT

REPORT DATE June 21, 2023

EQUIPMENT: Multi Water Quality Checker, U-5000G	SERIAL NUMBER / TAG NUMBER RAAGSEN3	BRAND / MANUFACTURER HORIBA
CUSTOMER NAME: IRPC PUBLIC COMPANY LIMITED	LACATION: rayong	JOB NUMBER / REQUESTED NUMBER JID2300281-002

SCOPE OF WORK / REASON FOR VISIT

Repair and Calibration

FOUND FAILURE & CORRECTIVE ACTION DETAILS

1. ตรวจเช็คสภาพเครื่อง **Multi Water Quality Checker**
 - Meter Model: U-5000G S/N: RAAGSEN3 สามารถใช้งานได้ปกติ
 - Probe Model: U-53 S/N: V39CGM6U พบว่า **Sensor Turbidity** ไม่สามารถใช้งานได้
 - Sensor pH,COND,ORP,DO ใช้งานได้ปกติ
2. ทำการ **Cleaning sensor ทุก parameter**
 - เติม Internal Solution (KCl) ใน Reference sensor
3. ปรับเทียบ **Auto Calibration ด้วย Buffer pH 4**
 - พบว่าสามารถปรับเทียบค่าผ่าน คือ pH , COND, ORP, Temp, DO and Depth
4. ปรับเทียบ **Manual Calibration 2 จุด (zero , span)**
 - พบว่าสามารถปรับเทียบค่าผ่าน คือ pH , COND,ORP, Temp, DO and Depth

สรุป : เครื่อง Multi Water Quality Checker Meter Model: U-5000G S/N: RAAGSEN3 และ

Sensor Model: U-53 S/N: V39CGM6U สามารถใช้งานได้ตามปกติ ยกเว้น Sensor Turbidity

WORK CONCLUSION

<input checked="" type="checkbox"/> COMPLETED		<input type="checkbox"/> IN COMPLETED	PARTS REPLACEMENT			
<input checked="" type="checkbox"/> CHARGE	<input type="checkbox"/> NO CHARGE		PARTS NAME		P/N	QTY.
<input checked="" type="checkbox"/> Service Fee	<input type="checkbox"/> Project Warranty		<input type="checkbox"/> Take to Office			
<input type="checkbox"/> Travelling	<input type="checkbox"/> Service Warranty		<input type="checkbox"/> Wait for Parts			
<input type="checkbox"/> Spare Parts	<input type="checkbox"/> Spare Parts Warranty		<input type="checkbox"/> In Progress			
<input type="checkbox"/> Other	<input type="checkbox"/> Service Contract	<input type="checkbox"/> Other				

TIME SPENT (HOURS)

YEAR	2023							TOTAL HOURS	TRAVELING DETAILS		
MONTH	6									TRAVEL BY	-
DATE	21									FROM	-
SERVICE TIME	4						4			TO	-
OVERTIME	-						-			TOTAL ROUND TRIP	-
TRAVELING TIME	-						-			DISTANCE (KM.)	-
TOTAL HOURS	4						4				

SERVICE CREW

NAME	NAME
1. Chamaiporn Vongchalee	3.
2.	4.

CUSTOMER'S NAME	CUSTOMER'S SIGNATURE	DATE
-----------------	----------------------	------



63/14-15, 67/35-36, Soi Petchkasem7, 7/1, Petchkasem Rd,

Wattthapra, Bangkokyai, Bangkok 10600 Thailand.

Tel.: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranalee.com

CALIBRATION REPORT

Calibration No: WQM-01102023

Page 1 of 2 pages

MEASUREMENT ITEM	: Multi parameter Water Quality Meter
MANUFACTURER	: HORIBA
MODEL/TYPE	: Display: U-5000G : Probe: U-53
SERIAL NUMBER	: Display: RAAISSN3 : Probe: V39CGM6U
ID No.	: -
CUSTOMER	: IRPC Public Company Limited 555/2, Energy Complex, Building B, 10th Floor, Vibhavadi Rangsit Road, Chatuchak, Bangkok 10900

MEASUREMENT DATE : Oct 25, 2023
ISSUED DATE : Oct 25, 2023

ENVIRONMENTAL CONDITIONS:

The measurement was carried out in an ambient temperature of $(25 \pm 3)^\circ\text{C}$, relative humidity of $(50 \pm 15)\%$, and atmospheric pressure of (1008.8 ± 0.5) hPa.

MEASUREMENT METHOD:

1. The Water Quality meter, Unit Under Calibration (UUC) was calibrated by automatic calibration mode for Conductivity, Turbidity and Dissolved Oxygen (DO) by comparison method with pH 4.01 standard buffer solution.
2. Manual calibration mode was used for calibrated a multi-point pH by comparison with standard buffer solution pH 4.01, 7.00, 10.01. Temperature was calibrated by comparison method with standard digital thermometer in temperature source.

REFERENCE STANDARD EQUIPMENT:

Equipment:	Model	Serial/Lot No.	Due date.
1. pH 4.01 standard buffer solution	500-4	S0323/01	Jan 16, 2025
2. pH 7.00 standard buffer solution	500-7	S5022/01	Dec 03, 2024
3. pH 10.01 standard buffer solution	500-10	S5022/01	Dec 16, 2024
4. Standard Temperature Probe	STS-100 A500	667682-09	Mar 28, 2024
5. Digital Temperature Indicator	DTI-1000-A MK II	671407-00591	July 22, 2023
6. Refrigerated calibration bath	PD15RCAL-A12C	1B1670656	Jan 17, 2024



Calibrated by

- ☐ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol
☒ Miss Ruangrumpai Phoommit

Approved Signator

Mr. Parinya Booncharoen
Calibration Department Manager

THIS CALIBRATION REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.



63/14-15, 67/35-36, Soi Petchkasem7, 7/1, Petchkasem Rd,
Wattthapra, Bangkokyai, Bangkok 10600 Thailand,
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Continuation of Calibration Report Number

Calibration No: WQM-01102023

Page 2 of 2 pages

MEASUREMENT RESULTS:

☒ With Adjustment

☐ Without Adjustment

Table 1: Results of automatic calibration of Conductivity, Turbidity and DO by pH 4.01 standard buffer solution are reported in the table below.

Expected Conductivity (mS/cm)	UUC* _{Reading} (before) (mS/cm)	UUC* _{Reading} (after) (mS/cm)	Error (mS/cm)
4.49	5.13	4.54	0.05

Expected Turbidity (NTU)	UUC* _{Reading} (before) (NTU)	UUC* _{Reading} (after) (NTU)	Error (NTU)
0.0	0.00	0.00	0.00

Expected DO concentration (mg/L)	UUC* _{Reading} (before) (mg/L)	UUC* _{Reading} (after) (mg/L)	Error (mg/L)
8.92	10.38	8.74	-0.18

Table 2: Results of Manual calibration of pH and Temperature are reported in the table below.

Standard buffer solution (pH)	UUC* _{Reading} (before) (pH)	UUC* _{Reading} (after) (pH)	Error (pH)
4.01	3.61	3.97	-0.04
7.00	7.38	7.15	0.15
10.01	9.52	10.18	0.17

Standard Temperature Reading (°C)	UUC* _{Reading} (before) (°C)	UUC* _{Reading} (after) (°C)	Error (°C)
25.043	22.78	24.99	-0.05

UUC* Unit Under Calibration

Notes: 1. The Unit under calibration was warmed up for 30 minute prior to the calibration being performed.

2. The report is valid only to the item calibrated on date and place of calibration.

End of Calibration Report



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,

Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20230386EA

Operation No.: CP2023100007

Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: RION

Model/Type: NL-42 (Meter), UC-52 (Microphone), NH-24 (Preamplifier)

Serial No.: 00546401 (Meter), 152917 (Microphone), 46612 (Preamplifier)

ID No.: -

Customer: IRPC Public Company Limited.

Address: 299 Moo 5, Sukhumvit Rd., Tumbon Chungnern,
Amphor Muang, Rayong 21000

Received Date: 24 October 2023

Calibrated Date: 6 - 8 November 2023

Issued Date: 9 November 2023

Calibrated by: Ms. Juntaporn Kunhakom

Approved by: _____



This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

Certificate No.: CP20230386EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: RION
Model/Type: NL-42 (Meter), UC-52 (Microphone), NH-24 (Preamplifier)
Serial No.: 00546401 (Meter), 152917 (Microphone), 46612 (Preamplifier)
ID No.: -
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1006-23	7 June 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20230040EA	26 June 2024
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20220223EA	14 November 2023
5) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P230024	20 March 2024
6) Pressure humidity and Temperature Transmitter	PTU301	F0640003	CD20230196EA	23 July 2024
			CL1-P230032	4 April 2024
			CD20230197EA	23 July 2024
7) Performance Audio Analyzer	U8903B	MY56510003	CB20230038EA	14 February 2024
			CK20230072EA	13 September 2024

2. This result of calibration was found accurate as shown on date and place of calibration only.

3. This certification is traceable to the international system of unit maintained at :-

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
94.1	94.1	0.0	±1.0

Note : Absolute sensitivity was established by the use of the Sound Calibrator RION Type NC-74 S/N : 34904949.

Certificate No.: CP20230386EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
14.5

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	9.9
C-weighting	15.9
Z-weighting	21.9

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

Meter free-field acoustic response at a level of 84 dB.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.3	0.2	0.4	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-3.3	-3.4	-3.4	±5.0

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	-0.1	0.0	±2.0
125	0.0	-0.1	0.0	±1.5
250	-0.1	-0.1	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.1	0.1	0.0	±5.0

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

Certificate No.: CP20230386EA

Calibration Report

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.3

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	109.0	0.0	±1.1
114.0	114.0	0.0	±1.1
119.0	119.0	0.0	±1.1
124.0	124.0	0.0	±1.1
129.0	129.0	0.0	±1.1
130.0	130.0	0.0	±1.1
131.0	131.0	0.0	±1.1
132.0	132.0	0.0	±1.1
133.0	133.0	0.0	±1.1
134.0	134.0	0.0	±1.1
135.0	135.0	0.0	±1.1
136.0	136.0	0.0	±1.1
137.0	137.0	0.0	±1.1

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1

Certificate No.: CP20230386EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower (Cont.)

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	33.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	126.0	0.0	±1.0
	2	109.0	0.0	+1.0 ; -2.5
	0.25	99.9	-0.1	+1.5 ; -5.0
Slow	200	119.6	0.0	±1.0
	2	100.0	0.0	+1.0 ; -5.0
	0.25	90.9	-0.1	+1.5 ; -5.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	125.4	125.2	-0.2	±3.0
Positive half cycle	124.4	124.1	-0.3	±2.0
Negative half cycle	124.4	124.1	-0.3	±2.0

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
139.5	139.5	0.0	±1.5

Certificate No.: CP20230386EA

Calibration Report

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	129.0	129.0	0.0	±0.3

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

- Remarks:
1. The acceptance limit is for the deviated value.
 2. Acceptance limits was IEC61672-3:2013 Class 2.
 3. The coverage factor $k = 2.00$

-- End of Report --

Certificate No.: CP20230387EA

Operation No.: CP2023100008

Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: RION

Model/Type: NL-52 (Meter), UC-59 (Microphone), NH-25 (Preamplifier)

Serial No.: 00632063 (Meter), 05230 (Microphone), 32091 (Preamplifier)

ID No.: -

Customer: IRPC Public Company Limited.

Address: 299 Moo 5, Sukhumvit Rd., Tumbon Chungnern, Amphor Muang, Rayong 21000

Received Date: 24 October 2023

Calibrated Date: 6 - 8 November 2023

Issued Date: 9 November 2023

Calibrated by: Ms. Juntaporn Kunhakom

Approved by: _____

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Certificate No.: CP20230387EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: RION
Model/Type: NL-52 (Meter), UC-59 (Microphone), NH-25 (Preamplifier)
Serial No.: 00632063 (Meter), 05230 (Microphone), 32091 (Preamplifier)
ID No.: -
Ambient Temperature: $(23 \pm 2) ^\circ\text{C}$
Relative Humidity: $(50 \pm 15) \%$
Pressure: $(101.3 \pm 1.5) \text{ kPa}$

Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1006-23	7 June 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20230040EA	26 June 2024
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20220223EA	14 November 2023
5) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P230024 CD20230196EA	20 March 2024 23 July 2024
6) Pressure humidity and Temperature Transmitter	PTU301	F0640003	CL1-P230032 CD20230197EA	4 April 2024 23 July 2024
7) Performance Audio Analyzer	U8903B	MY56510003	CB20230038EA CK20230072EA	14 February 2024 13 September 2024

2. This result of calibration was found accurate as shown on date and place of calibration only.

3. This certification is traceable to the international system of unit maintained at :-

- Reference standards instrument for Acoustic function
 - National Institute of Metrology (Thailand)
- Reference standards instrument for Electrical function
 - National Institute of Metrology (Thailand)
 - Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
94.1	94.1	0.0	± 0.7

Note : Absolute sensitivity was established by the use of the Sound Calibrator RION Type NC-74 S/N : 34904949.

Certificate No.: CP20230387EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
15.7

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	10.4
C-weighting	15.7
Z-weighting	20.4

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

Meter free-field acoustic response at a level of 84 dB.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.3	0.2	0.3	± 1.0
1000	0.0	0.0	0.0	± 0.7
8000	-0.6	-0.6	-0.7	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.0	0.0	± 1.0
125	0.0	-0.1	0.0	± 1.0
250	0.0	0.0	-0.1	± 1.0
500	0.0	0.0	-0.1	± 1.0
1000	0.0	0.0	0.0	± 0.7
2000	0.0	0.1	0.0	± 1.0
4000	0.0	0.0	0.0	± 1.0
8000	0.0	0.1	0.0	+1.5; -2.5
16000	-1.4	-1.3	0.0	+2.5; -16.0

Certificate No.: CP20230387EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
130.0	130.0	0.0	±0.8
131.0	131.0	0.0	±0.8
132.0	132.0	0.0	±0.8
133.0	133.0	0.0	±0.8
134.0	134.0	0.0	±0.8
135.0	135.0	0.0	±0.8
136.0	136.0	0.0	±0.8
137.0	137.0	0.0	±0.8

Certificate No.: CP20230387EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	33.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	126.0	0.0	±0.5
	2	109.0	0.0	+1.0 ; -1.5
	0.25	99.9	-0.1	+1.0 ; -3.0
Slow	200	119.6	0.0	±0.5
	2	100.0	0.0	+1.0 ; -3.0
	0.25	120.0	0.0	±0.5
LAE	200	100.0	0.0	+1.0 ; -1.5
	2	100.0	0.0	+1.0 ; -1.5
	0.25	90.9	-0.1	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	125.4	125.2	-0.2	±2.0
Positive half cycle	124.4	124.1	-0.3	±1.0
Negative half cycle	124.4	124.1	-0.3	±1.0

Certificate No.: CP20230387EA

Calibration Report

Function : 10. Overload Indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
139.5	139.5	0.0	±1.5

Function : 11. High-Level Stability

High-Level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	129.0	129.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks:

1. The acceptance limit is for the deviated value.
2. Acceptance limits was IEC61672-3:2013 Class 1.
3. The coverage factor $k = 2.00$

-- End of Report --