

## เอกสารสอบเทียบความถูกต้องของเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

ลำดับที่ 1	คุณภาพอากาศในบรรยากาศ
ลำดับที่ 2	สารอินทรีย์ระเหยง่ายในบรรยากาศ
ลำดับที่ 3	ระดับเสียงในบรรยากาศ
ลำดับที่ 4	คุณภาพน้ำ
ลำดับที่ 5	คุณภาพตะกอนดิน

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
<b>1. คุณภาพอากาศในบรรยากาศ</b>		
- Total Suspended Particulate	- High Volume Air Sampler Blower No. B02, B09, B16, B22, B23, B24, R09, R11, R12, R13, R14, R15, R16, R17	- Digital Balance
- PM <sub>10</sub>	- High Volume PM-10 Air Sampler Blower No. B05, B06, B10, B17, B20, R04, R07, R09, R10, R15, R16, R17	- Digital Balance
- Nitrogen Dioxide (NO <sub>2</sub> )	- Serial No. 0926737614, 0926737612, CM13090047, 2617, 2284, 2286, 4465, 769, 2285, 4411, 4413, 4466, 4468, 252	- Serial No. 0926737614, 0926737612, CM13090047, 2617, 2284, 2286, 4465, 769, 2285, 4411, 4413, 4466, 4468, 252
- Sulfur dioxide (SO <sub>2</sub> )	- Serial No. 0926737611, 0926737608, 1310957747, 1749, 1847, 1846, 1003, 43C-59325-322, 43C-69604-364, 3490, 066, TRS1068, TRS1064, TRS1065	- Serial No. 0926737611, 0926737608, 1310957747, 1749, 1847, 1846, 1003, 43C-59325-322, 43C-69604-364, 3490, 066, TRS1068, TRS1064, TRS1065
<b>2. สารอินทรีย์ระเหยง่ายในบรรยากาศ</b>		
- Total VOC	- Personal pump SKC No. B02, B10, B12, B14, B18, B27, B40, B42, R02, R03, R04, R06, R08, R10, R12, R14, R17, R22, R24, R25, R28, R30, R32, R34, R36, R37, R40, R42, R43, R44, R45 - Rotameter No. L-R01, R02, R03	- VOC Analyzer No. B01, B02, R01, R02
- VOCs	- Mass Flow Meter	- GC/MS
<b>3. ระดับเสียง</b>		
- L <sub>eq</sub> 24 hr, L <sub>90</sub> และ L <sub>max</sub>	- Acoustic Calibrator - Sound Level Meter No. CR-B02, B03, B04, B05, B06, B07, B08, B09, B10 - Sound Level Meter No. ACO-C1-B03, B04, ACO-R02, R03, R06, R07, R08, R13, R17, R22, R35, R37, R42	-
<b>4. คุณภาพน้ำ</b>		
- BOD	-	- BOD Analyzer
- COD	-	- COD Reactor
- Total Dissolved Solids	-	- Digital Balance
- Total Suspended Solids	-	- Digital Balance
- pH	-	- pH Meter



ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)


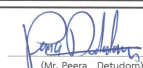
รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
<b>4.คุณภาพน้ำ (ต่อ)</b>		
- Cyanide	-	- Spectrophotometer
- Formaldehyde	-	- Spectrophotometer
- Phenol	-	- Spectrophotometer
- Oil & Grease	-	- Digital Balance
- Free Chlorine	-	- Spectrophotometer
- Temperature	-	- Thermometer
- Conductivity	-	- Conductivity Meter
- Color	-	- Spectrophotometer
- Salinity	-	- Conductivity Meter
- Nitrate	-	- Spectrophotometer
- Total Coliform Bacteria	-	- Incubator
- Fecal Coliform Bacteria	-	- Water Bath
- Total Organochlorine Pesticide	-	- GC/MS
- Mercury	-	- Atomic Absorption Spectrophotometer
- Selenium	-	- Atomic Absorption Spectrophotometer
- Cadmium	-	- Atomic Absorption Spectrophotometer
- Lead	-	- Atomic Absorption Spectrophotometer
- Arsenic	-	- Atomic Absorption Spectrophotometer
- Trivalent Chromium	-	- Spectrophotometer - Inductively Coupled Plasma Method
- Hexavalent Chromium	-	- Spectrophotometer
- Barium	-	- Atomic Absorption Spectrophotometer
- Nickel	-	- Atomic Absorption Spectrophotometer
- Copper	-	- Atomic Absorption Spectrophotometer
- Zinc	-	- Atomic Absorption Spectrophotometer
- Manganese	-	- Atomic Absorption Spectrophotometer
<b>5.คุณภาพตะกอนดิน</b>		
- Hexavalent Chromium	-	- Spectrophotometer
- Trivalent Chromium	-	- Spectrophotometer - Inductively Coupled Plasma
- Total Lead	-	- Inductively Coupled Plasma
- Lead	-	- Inductively Coupled Plasma
- Total Mercury	-	- Atomic Absorption Spectrophotometer
- Mercury	-	- Atomic Absorption Spectrophotometer
- Total Cadmium	-	- Inductively Coupled Plasma
- Cadmium	-	- Inductively Coupled Plasma
- Total Copper	-	- Inductively Coupled Plasma


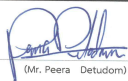
ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม

5.คุณภาพตะกอนดิน (ต่อ)		
- Copper	-	- Inductively Coupled Plasma
- Total Arsenic	-	- Atomic Absorption Spectrophotometer
- Arsenic	-	- Atomic Absorption Spectrophotometer
- Total Nickel	-	- Inductively Coupled Plasma
- Nickel	-	- Inductively Coupled Plasma
- Total Zinc	-	- Inductively Coupled Plasma
- Zinc	-	- Inductively Coupled Plasma
- Total Selenium	-	- Atomic Absorption Spectrophotometer
- Selenium	-	- Atomic Absorption Spectrophotometer
- Total Barium	-	- Inductively Coupled Plasma
- Barium	-	- Inductively Coupled Plasma



## ลำดับที่ 1



คุณภาพอากาศในบรรยากาศ

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 (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	05/02/2025	y = 1.190x-4.759	0.999
B02	B02	05/02/2025	y = 1.167x-1.802	0.999
B03	B03	03/02/2025	y = 1.142x-3.352	0.997
B04	B04	06/02/2025	y = 1.160x-3.139	0.998
B05	B05	06/02/2025	y = 1.155x-5.601	0.996
B06	B06	06/02/2025	y = 1.150x-1.476	0.999
B07	B07	03/02/2025	y = 1.143x-3.035	0.998
B08	B08	03/02/2025	y = 1.161x-4.459	0.999
B09	B09	05/02/2025	y = 1.177x-3.970	0.996
B10	B10	03/02/2025	y = 1.144x-2.471	0.998
B11	B11	03/02/2025	y = 1.195x-5.384	0.996
B12	B12	04/02/2025	y = 1.168x-4.228	0.998
B13	B13	04/02/2025	y = 1.165x-3.801	0.999
B14	B14	04/02/2025	y = 1.148x-3.248	0.996
B15	B15	04/02/2025	y = 1.173x-4.773	0.997
B16	B16	04/02/2025	y = 1.156x-4.042	0.998
B17	B17	06/02/2025	y = 1.140x-2.730	0.999
B18	B18	06/02/2025	y = 1.171x-4.178	0.999
B19	B19	06/02/2025	y = 1.151x-3.979	0.999
B20	B20	04/02/2025	y = 1.129x-1.255	0.999
B21	B21	04/02/2025	y = 1.132x-3.156	0.999
B22	B22	04/02/2025	y = 1.147x-2.649	0.997
B23	B23	03/02/2025	y = 1.158x-3.223	0.999
B24	B24	05/02/2025	y = 1.144x-3.476	0.997
B25	B25	03/02/2025	y = 1.071x+1.478	0.997
B26	B26	04/02/2025	y = 1.142x-4.263	0.999
B27	B27	04/02/2025	y = 1.175x-5.192	0.996
B28	B28	04/02/2025	y = 1.173x-5.127	0.999
B29	B29	04/02/2025	y = 1.145x-1.952	0.996
B30	B30	06/02/2025	y = 1.162x-3.062	0.999
B31	B31	03/02/2025	y = 1.182x-5.652	0.998
B32	B32	03/02/2025	y = 1.167x-3.993	0.999
B33	B33	05/02/2025	y = 1.168x-4.451	0.998
B34	B34	05/02/2025	y = 1.127x-3.203	0.999
Calibrated by :  (Mr. Adul Dangklom)		Approved by :  (Mr. Peera Detudom)		

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 (ft <sup>3</sup> /min)	R <sup>2</sup>
B35	B35	05/02/2025	y = 1.163x-3.579	0.997
B36	B36	05/02/2025	y = 1.130x-2.116	0.999
B37	B37	04/02/2025	y = 1.146x-2.265	0.996
B38	B38	04/02/2025	y = 1.156x-6.034	0.998
B39	B39	03/02/2025	y = 1.151x-3.366	0.998
B40	B40	03/02/2025	y = 1.174x-4.582	0.999
B41	B41	06/02/2025	y = 1.123x-1.633	0.997
B42	B42	03/02/2025	y = 1.149x-3.382	0.997
B43	B43	03/02/2025	y = 1.137x-2.074	0.997
B44	B44	03/02/2025	y = 1.155x-1.460	0.999
R01	R01	04/02/2025	y = 1.121x-3.007	0.999
R02	R02	03/02/2025	y = 1.159x-5.099	0.999
R03	R03	05/02/2025	y = 1.138x-2.774	0.998
R04	R04	05/02/2025	y = 1.118x-2.575	0.999
R05	R05	03/02/2025	y = 1.136x-1.720	0.998
R06	R06	05/02/2025	y = 1.154x-2.706	0.997
R07	R07	03/02/2025	y = 1.037x+1.361	0.999
R08	R08	03/02/2025	y = 1.146x-3.762	0.996
R09	R09	05/02/2025	y = 1.121x-2.360	0.997
R10	R10	05/02/2025	y = 1.180x-4.626	0.999
R11	R11	05/02/2025	y = 1.147x-3.861	0.996
R12	R12	03/02/2025	y = 1.128x-4.676	0.998
R13	R13	04/02/2025	y = 1.135x-4.055	0.999
R14	R14	04/02/2025	y = 1.153x-3.122	0.997
R15	R15	03/02/2025	y = 1.161x-5.223	0.998
R16	R16	03/02/2025	y = 1.187x-6.674	0.999
R17	R17	03/02/2025	y = 1.120x-1.730	0.999
R18	R18	03/02/2025	y = 1.146x-2.347	0.998
R19	R19	06/02/2025	y = 1.161x-5.195	0.999
R20	R20	06/02/2025	y = 1.134x-3.449	0.998
Calibrated by :  (Mr. Adul Dangklom)		Approved by :  (Mr. Peera Detudom)		

High Volume PM-10 Air Sampler Calibration Report				
Calibration Method : Multipoint Orifice Flow Transfer Standard		Model : TE 5025A	S/N : 3611	
Calibration Data				
High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	04/02/2025	y = 1.135x-1.122	0.996
B02	B02	04/02/2025	y = 1.140x-0.728	0.999
B03	B03	04/02/2025	y = 1.160x-3.702	0.998
B04	B04	05/02/2025	y = 1.154x-4.671	0.999
B05	B05	06/02/2025	y = 1.151x-2.705	0.998
B06	B06	03/02/2025	y = 1.114x-1.672	0.997
B07	B07	03/02/2025	y = 1.085x+0.543	0.996
B08	B08	04/02/2025	y = 1.149x-2.014	0.998
B09	B09	03/02/2025	y = 1.081x+0.344	0.997
B10	B10	03/02/2025	y = 1.094x-1.679	0.997
B11	B11	05/02/2025	y = 1.137x-0.690	0.997
B12	B12	03/02/2025	y = 1.094x-1.679	0.997
B13	B13	03/02/2025	y = 1.172x-3.186	0.998
B14	B14	05/02/2025	y = 1.160x-5.111	0.998
B15	B15	03/02/2025	y = 1.141x-2.637	0.998
B16	B16	04/02/2025	y = 1.106x+1.699	0.998
B17	B17	04/02/2025	y = 1.105x+1.676	0.998
B18	B18	04/02/2025	y = 1.176x-3.948	0.997
B19	B19	04/02/2025	y = 1.065x+0.997	0.998
B20	B20	04/02/2025	y = 1.163x-5.103	0.997
B21	B21	05/02/2025	y = 1.120x+0.250	0.999
B22	B22	06/02/2025	y = 1.152x-3.458	0.998
B23	B23	06/02/2025	y = 1.149x-3.696	0.999
B24	B24	03/02/2025	y = 1.109x-1.930	0.999
B25	B25	03/02/2025	y = 1.166x-4.876	0.998
B26	B26	05/02/2025	y = 1.118x-2.223	0.997
B27	B27	03/02/2025	y = 1.127x-3.668	0.999
B28	B28	04/02/2025	y = 1.112x-2.294	0.999
B29	B29	04/02/2025	y = 1.155x-4.309	0.997
B30	B30	04/02/2025	y = 1.136x-2.651	0.998
B31	B31	03/02/2025	y = 1.086x+2.828	0.999
B32	B32	04/02/2025	y = 1.099x-0.279	0.998
B33	B33	04/02/2025	y = 1.152x-4.474	0.997
B34	B34	04/02/2025	y = 1.149x-0.892	0.997

Calibrated by :  (Mr. Adul Dangklom)	Approved by :  (Mr. Peera Detudom)
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High Volume PM-10 Air Sampler Calibration Report				
Calibration Method : Multipoint Orifice Flow Transfer Standard		Model : TE 5025A	S/N : 3611	
Calibration Data				
High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
R01	R01	04/02/2025	y = 1.168x-5.536	0.996
R02	R02	04/02/2025	y = 1.116x-2.200	0.998
R03	R03	03/02/2025	y = 1.160x-5.911	0.997
R04	R04	03/02/2025	y = 1.129x-4.829	0.999
R05	R05	03/02/2025	y = 1.119x-3.825	0.998
R06	R06	05/02/2025	y = 1.125x-1.580	0.997
R07	R07	06/02/2025	y = 1.152x-2.503	0.997
R08	R08	03/02/2025	y = 1.114x-1.275	0.996
R09	R09	03/02/2025	y = 1.130x-4.187	0.999
R10	R10	05/02/2025	y = 1.151x-2.832	0.998
R11	R11	05/02/2025	y = 1.134x-2.692	0.997
R12	R12	05/02/2025	y = 1.158x-4.761	0.996
R13	R13	03/02/2025	y = 1.137x-3.435	0.999
R14	R14	03/02/2025	y = 1.126x-2.499	0.996
R15	R15	04/02/2025	y = 1.111x-3.285	0.999
R16	R16	04/02/2025	y = 1.124x-0.808	0.996
R17	R17	04/02/2025	y = 1.141x-3.412	0.999
R18	R18	03/02/2025	y = 1.115x-3.615	0.998
R19	R19	03/02/2025	y = 1.117x-0.234	0.996
R20	R20	06/02/2025	y = 1.146x-4.675	0.997
Calibrated by : 		Approved by : 		
(Mr. Adul Dangklom)		(Mr. Peera Detudom)		





CERTIFICATE No : 25M2254  
REFERENCE No : 76365-1

PAGE : 1 OF 2

### Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE  
MANUFACTURER : METTLER TOLEDO  
MODEL : XS105DU  
SERIAL No : 1126422905  
ID No : BA05/50  
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 : 07-Mar-25

APPROVED BY : PONGSAK J.

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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

F-G010 REV 03



CERTIFICATE No : 25M2254

PAGE : 2 OF 2

### Calibration Report

EQUIPMENT : DIGITAL BALANCE  
MANUFACTURER : METTLER TOLEDO  
ID No : BA05/50  
AIR PRESSURE : 1009mbar  $\pm$  1mbar  
AMBIENT TEMPERATURE : 24°C  $\pm$  1°C  
MODEL : XS105DU  
S/N : 1126422905  
RECEIVED DATE : 07-Mar-25  
CALIBRATION DATE : 07-Mar-25  
RELATIVE HUMIDITY : 54%RH  $\pm$  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	OK-1-151	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE 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)

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.00000	0.00000	0.000065
0.02	0.01999	0.00001	0.000065
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50002	-0.00002	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00000	0.00000	0.000070
20.00	20.00004	-0.00004	0.000078
50.00	50.00000	0.00000	0.00013
100.00	100.00001	-0.00001	0.00019
120.00	120.00002	-0.00002	0.00022

5. OFF CENTER LOADING ERROR

POINT	READING (g)
1	50.0000
2	50.0000
3	50.0000
4	50.0000
5	50.0000
OFF-CENTER LOADING	0.0000

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



F-G010 REV 03

### Q-SHE SOLUTIONS CO., LTD.

Job Number :	J092400007	Customer Name :	IRPC
Equipment :	AQMs Station.	Contact Name :	Khun Wirasak Khumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Ban Konnong Station	E-mail address/Fax :	wirasak.k@ipc.co.th
Working Date :	02 April 2025	Working Hour :	5 Hours.

#### Service Report

##### Working Scope:

Service station AQMs.

##### Physical Checking:

- ตรวจสอบ Data logger พบว่าทำงานได้ปกติ
- ตรวจสอบ Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจสอบ Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจสอบ ผล Calibration พบว่าอยู่ในเกณฑ์ปกติ
- ตรวจสอบ Dilutor พบว่าทำงานได้ปกติ
- ตรวจสอบ เครื่องวัดฝุ่น PM-10 & PM-2.5 พบว่าทำงานได้ปกติ
- ตรวจสอบ เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจสอบ การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

##### Correction working:

Calibrate single-point of all analyzers.	Replace silica gel for dryer NO <sub>x</sub> Analyzer.
Replace sample filter 47 mm.	Drain water for pump of Zero Air.

##### Part Replacement:

- Sample filter 47 mm. 3 ea. (Part Support by IRPC)
- Silica gel. P/N: 6998 1/2 Bottle. (Part Support by IRPC)

##### Addition Recommended:

— End —

Serviced by :	ชีโรน มุขโรจน์	Serviced Date :	02 April 2025
Approved by :	(Signature)	Approved Date :	02 April 2025



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Website http://www.qshe.co.th E-mail-address: info@qshe.co.th

### Q-SHE SOLUTIONS CO., LTD.

NO-NO <sub>2</sub> -NO <sub>x</sub> Analyzer			
Equipment :	NO-NO <sub>2</sub> -NO <sub>x</sub> analyzer.	Model :	42i
Serial Number :	0926737614	Manufacturer :	Thermo Electron

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading				
NO reading	3.3	3.0	ppb	
NO <sub>x</sub> reading	8.5	11.9	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
NO BKG. PPB	30.9	34.5	ppb	0 to 60
NO <sub>x</sub> BKG. PPB	31.4	35.1	ppb	0 to 60
NO COEF.	1.003	1.119	-	1.0 $\pm$ 0.3
NO <sub>x</sub> COEF.	1.000	1.000	-	1.0 $\pm$ 0.3
NO <sub>2</sub> COEF.	1.000	1.000	-	1.0 $\pm$ 0.3
Instrument Controls				
Ozonator	On	On	On/Off	
PMT Supply	On	On	On/Off	
Auto/Manual Mode	NO/NO <sub>x</sub>	NO/NO <sub>x</sub>	NO/NO <sub>x</sub> , NO, NO <sub>x</sub>	
Baud Rate	9600	9600	bps	1200 to 9600
Temp Compensation	On	On	On/Off	
Pressure Compensation	Off	Off	On/Off	
Screen Contrast	40	40	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
Diagnostics				
Voltages				
Motherboard voltages:				
3.3 Supply	3.3	3.3	Vdc	3.3 $\pm$ 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 $\pm$ 1 Vdc
15.0 Supply	15.0	15.0	Vdc	15.0 $\pm$ 1 Vdc
24.0 Supply	23.8	23.8	Vdc	24.0 $\pm$ 1 Vdc
-3.3 Supply	-3.2	-3.2	Vdc	-3.3 $\pm$ 1 Vdc
Interface board voltages:				
PMT Supply	-1042.3	-1042.3	Vdc	-400 to -1200 Vdc
3.3 Supply	3.3	3.2	Vdc	3.3 $\pm$ 1 Vdc
5.0 Supply	4.9	4.9	Vdc	5.0 $\pm$ 1 Vdc
15.0 Supply	14.9	14.9	Vdc	15.0 $\pm$ 1 Vdc
P15.0 Supply	14.9	14.9	Vdc	15.0 $\pm$ 1 Vdc
24.0 Supply	23.8	23.8	Vdc	24.0 $\pm$ 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 $\pm$ 1 Vdc
Temperatures				
Internal	37.9	38.1	°C	15°C to 45°C
Chamber	46.6	46.5	°C	45°C $\pm$ 2 °C
Cooler	-2.7	-2.7	°C	(-3)°C $\pm$ 2 °C
Converter	326.8	326.3	°C	325°C $\pm$ 5 °C
Converter Set	325.0	325.0	°C	325°C
Pressure	255.3	254.7	mmHg	250 $\pm$ 100 mmHg
Flow	0.692	0.689	L/min	0.5 to 1.00 L/min

Note : NO<sub>x</sub> analyzer เป็นเครื่องของ micro1 ยกมาติดตั้งแทนหัวตรวจ



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SO <sub>2</sub> Analyzer				
Equipment :	Sulfur Dioxide analyzer.	Model :	43i	
Serial Number :	0926737611	Manufacturer :	Thermo Electron	
Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading	3.0	5.7	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	60	60	Sec	10 to 300 Sec
Calibration Factors				
SO <sub>2</sub> BKG PPB	24.2	26.1	ppb	0 to 60
SO <sub>2</sub> COEF	0.989	1.063	-	1.0 ± 0.3
Instrument Controls				
Temp Correction	On	On	On/Off	On
Pressure Correction	On	On	On/Off	On
Flash Lamp	On	On	On/Off	On
Communication setting				
Baud Rate	9600	9600	bps	9600 to 115000
Instrument ID	43	43		0 to 99
Screen Brightness	50	50	%	0 to 100
Service Mode	Off	Off	On/Off	Up to used
Diagnostics				
Voltages				
Motherboard voltages:				
3.3 Supply	3.3	3.3	Vdc	3.3 +/- 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 +/- 1 Vdc
15.0 Supply	15.1	15.1	Vdc	15.0 +/- 1 Vdc
24.0 Supply	23.7	23.7	Vdc	24.0 +/- 1 Vdc
-3.3 Supply	-3.1	-3.1	Vdc	- 3.3 +/- 1 Vdc
Interface board voltages:				
PMT Supply	-689.3	-689.3		
Flash Supply	914	915		
3.3 Supply	3.2	3.2	Vdc	3.3 +/- 1 Vd
5.0 Supply	5.0	5.0	Vdc	5.0 +/- 1 Vdc
15.0 Supply	14.7	14.7	Vdc	15.0 +/- 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 +/- 1 Vdc
24.0 Supply	23.4	23.4	Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal	34.5	34.5	°C	15°C to 45°C
Chamber	44.9	44.9	°C	45°C ± 2°C
Pressure	731.3	730.0	mmHg	750 ± 100 mmHg
Flow	0.409	0.409	L/min	0.5 to 1.00 L/min
Lamp intensity	90	90	%	40 – 100 %
Note :				



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Website http://www.qshe.co.th E-mail-address: info@qshe.co.th

SINGLE-POINT GAS CALIBRATION				
All analyzer.				
Equipment :	All analyzer.	Model :	42i, 43i , APHA-370	
Serial Number :	--	Manufacturer :	Thermo Electron,Horiba	
Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO <sub>2</sub> )	44.91	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	44.83	ppm	Model :	146i
Methane (CH <sub>4</sub> )	499.5	ppm	Serial number :	0926737588
Carbon Monoxide (CO)	4526	ppm		
Cylinder NO. :	CC457501			
Expiration Date :	13 Aug 2023			

BEFORE CALIBRATION RESULT							
PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	1.3	1.30	400.0	403.0	0.75	Valid
NO <sub>x</sub> (ppb)	0.0	1.5	1.50	400.0	409.0	2.25	Valid
SO <sub>2</sub> (ppb)	0.0	1.4	1.40	402.0	402.0	0.00	Valid
CH <sub>4</sub> (ppm)	0.0			4.000			
THC (ppm)	0.0			4.000			

AFTER CALIBRATION RESULT							
PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	1.3	1.30	400.0	399.0	-0.25	Valid
NO <sub>x</sub> (ppb)	0.0	1.5	1.50	400.0	400.0	0.00	Valid
SO <sub>2</sub> (ppb)	0.0	1.5	1.50	402.0	400.0	-0.50	Valid
CH <sub>4</sub> (ppm)	0.0			4.000			
THC (ppm)	0.0			4.000			

Note : CH4, THC off cal. เนื่องจาก zero air heater ชำรุด อยู่ในระหว่างดำเนินการซ่อม



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Website http://www.qshe.co.th E-mail-address: info@qshe.co.th


Job Number :	J092400007	Customer Name :	IRPC	
Equipment :	AQMs Station.	Contact Name :	Khun Wirasak Khumsuk	
Model :	AQMs Station.	Telephone Number :	081-803-0475	
Serial Number :	AQMs Station Micro#2	E-mail address/Fax. :	wirasak.k@irpc.co.th	
Working Date :	02 April 2025	Working Hour :	6 Hours	

Service Report	
<b>Working Scope:</b>	
รถเคลื่อนที่ AQMs micro#2 จัดตรวจวัดอากาศ อยู่ที่ โซนมะม่วง จึงได้เข้าทำการตรวจเช็ค	
<b>Physical Checking:</b>	
<ul style="list-style-type: none"><li>- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ</li><li>- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ</li><li>- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ</li><li>- ตรวจเช็ค ผล Calibration พบว่าอยู่ในเกณฑ์ปกติ</li><li>- ตรวจเช็ค Dilutor และ Zero Air พบว่าทำงานได้ปกติ</li><li>- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ</li><li>- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ</li><li>- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ</li><li>- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี</li></ul>	
<b>Correction working:</b>	
Replace silica gel for dryer NO <sub>x</sub> Analyzer.	Drain water for pump of Zero Air.
Replace sample filter 47 mm.	

<b>Part Replacement:</b>		
<ul style="list-style-type: none"><li>- Sample filter 47 mm.</li></ul>	4 ea.	(Part Support by IRPC)
<ul style="list-style-type: none"><li>- Silica gel.</li></ul>	P/N: 6998	1/2 Bottle. (Part Support by IRPC)

<b>Addition Recommended:</b>	
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– End –

Serviced by :	ชีโรน มุขโรจน์	Serviced Date :	02 April 2025
Approved by:		Approved Date :	02 April 2025



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Website http://www.qshe.co.th E-mail-address: info@qshe.co.th

NO-NO <sub>2</sub> -NO <sub>x</sub> Analyzer				
Equipment :	NO-NO <sub>2</sub> -NO <sub>x</sub> analyzer.	Model :	42i	
Serial Number :	0926737612	Manufacturer :	Thermo Electron	
Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading				
NO reading	5.4	5.3	ppb	
NO <sub>x</sub> reading	12.1	15.1	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
NO BKG. PPB	34.2	34.2	ppb	0 to 60
NO <sub>x</sub> BKG. PPB	34.1	34.1	ppb	0 to 60
NO COEF.	1.010	1.010	-	1.0 ± 0.3
NO <sub>x</sub> COEF.	1.000	1.000	-	1.0 ± 0.3
NO <sub>2</sub> COEF.	1.000	1.000	-	1.0 ± 0.3
Instrument Controls				
Ozonator	On	On		On/Off
PMT Supply	On	On		On/Off
Auto/Manual Mode	NO/NO <sub>x</sub>	NO/NO <sub>x</sub>		NO/NO <sub>x</sub> , NO, NO <sub>x</sub>
Baud Rate	9600	9600	bps	1200 to 9600
Temp Compensation	On	On	-	On/Off
Pressure Compensation	On	On	-	On/Off
Screen Contrast	35	35	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
Diagnostics				
Voltages				
Motherboard voltages:				
3.3 Supply	3.3	3.3	Vdc	3.3 ± 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 ± 1 Vdc
15.0 Supply	15.0	15.0	Vdc	15.0 ± 1 Vdc
24.0 Supply	24.1	24.1	Vdc	24.0 ± 1 Vdc
-3.3 Supply	-3.2	-3.2	Vdc	-3.3 ± 1 Vdc
Interface board voltages:				
PMT Supply	-904.7	-904.7	Vdc	-400 to -1200 Vdc
3.3 Supply	3.2	3.2	Vdc	3.3 ± 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 ± 1 Vdc
15.0 Supply	14.8	14.8	Vdc	15.0 ± 1 Vdc
P15.0 Supply	16.0	16.0	Vdc	15.0 ± 1 Vdc
24.0 Supply	24.0	24.0	Vdc	24.0 ± 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 ± 1 Vdc
Temperatures				
Internal	35.9	35.7	°C	15°C to 45°C
Chamber	49.9	49.8	°C	45°C ± 2 °C
Cooler	-2.9	-3.0	°C	(13 °C ± 2 °C
Converter	322.9	325.8	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
Pressure	271.8	278.9	mmHg	250 ± 100 mmHg
Flow	0.481	0.542	L/min	0.5 to 1.00 L/min
Note :				




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Website http://www.qshe.co.th E-mail-address: info@qshe.co.th

SO <sub>2</sub> Analyzer				
Equipment :	Sulfur Dioxide analyzer.	Model :	43i	
Serial Number :	0926737608	Manufacturer :	Thermo Electron	
Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading	4.5	4.4	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
SO <sub>2</sub> BKG PPB	26.2	23.8	ppb	0 to 60
SO <sub>2</sub> COEF	1.180	1.180	-	1.0 ± 0.3
Instrument Controls				
Temp Correction	On	On	On/Off	On
Pressure Correction	On	On	On/Off	On
Flash Lamp	On	On	On/Off	On
Communication setting				
Baud Rate	9600	9600	bps	9600 to 115000
Instrument ID	43	43	-	0 to 99
Screen Brightness	35	35	%	0 to 100
Service Mode	Off	Off	On/Off	Up to used
Diagnostics				
Voltages				
Motherboard voltages:				
3.3 Supply	3.3	3.3	Vdc	3.3 +/- 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 +/- 1 Vdc
15.0 Supply	15.0	15.0	Vdc	15.0 +/- 1 Vdc
24.0 Supply	23.9	23.9	Vdc	24.0 +/- 1 Vdc
-3.3 Supply	-3.2	-3.2	Vdc	- 3.3 +/- 1 Vdc
Interface board voltages:				
PMT Supply	-580.2	-580.2		
Flash Supply	1191	1192		
3.3 Supply	3.3	3.3	Vdc	3.3 +/- 1 Vd
5.0 Supply	4.9	4.9	Vdc	5.0 +/- 1 Vdc
15.0 Supply	15.0	15.0	Vdc	15.0 +/- 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 +/- 1 Vdc
24.0 Supply	23.8	23.8	Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal	34.2	34.6	°C	15°C to 45°C
Chamber	45.1	44.9	°C	45°C ± 2°C
Pressure	631.1	727.8	mmHg	750 ± 100 mmHg
Flow	0.411	0.445	L/min	0.5 to 1.00 L/min
Lamp Intensity	92	92	%	40 ~ 100 %
Note :				




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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

SINGLE-POINT GAS CALIBRATION							
NO <sub>x</sub> , SO <sub>2</sub> , CO analyzer.							
Equipment :	All analyzer.	Model :	42i, 43i , 48i				
Serial Number :	-	Manufacturer :	Thermo Electron,Horiba				
Standard gas concentration			Dilutor detail				
Sulfur Dioxide (SO <sub>2</sub> )	44.19	ppm	Manufacturer :	Thermo			
Nitric Oxide (NO)	45.94	ppm	Model :	146i			
Methane (CH <sub>4</sub> )	505.7	ppm	Serial number :	0926737584			
Carbon Monoxide (CO)	4526	ppm					
Cylinder NO. :	CC507740						
Expiration Date :	13 Aug 2023						
BEFORE CALIBRATION RESULT							
PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00						
NO <sub>x</sub> (ppb)	0.00						
SO <sub>2</sub> (ppb)	0.00						
CO (ppm)	0.00						
CH <sub>4</sub> (ppm)	0.00						
THC(ppm)	0.00						
AFTER CALIBRATION RESULT							
PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00			400.0			
NO <sub>x</sub> (ppb)	0.00			400.0			
SO <sub>2</sub> (ppb)	0.00			400.0			
CO (ppm)	0.00			40.4			
CH <sub>4</sub> (ppm)	0.00			4.00			
THC(ppm)	0.00			4.00			
Remark : ทำการ off auto cal ไปเจ้าหน้าที่รับทราบ(Pump zero air ชั่วครู่)							




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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

Job Number : J092400007				Customer Name : IRPC							
Equipment :	Micro Mobile AQMs	Contact Name :	Khun Wirasak Khumsuk								
Model :	Micro Mobile AQMs	Telephone Number :	081-803-0475								
Serial Number :	Micro Mobile3	E-mail address/Fax. :	<a href="mailto:wirasak.k@irpc.co.th">wirasak.k@irpc.co.th</a>								
Working Date :	12 April 2025	Working Hour :	4 Hours								
Service Report											
Working Scope:											
รถเคลื่อนที่ AQMs micro#3 หยดตรวจวัดอากาศ ปิดสถานี อยู่ที่ อำนวยหนองจอก จึงได้เข้าทำการตรวจเช็ค											
Physical Checking:											
<ul style="list-style-type: none"> <li>- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ</li> <li>- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ</li> <li>- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ</li> <li>- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ</li> <li>- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ</li> <li>- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ</li> <li>- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี</li> </ul>											
Correction working:											
<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>											
Part Replacement:											
Addition Recommended:											
-- End --											
Serviced by :	จิโนรส มุขโรจน์	Serviced Date :	12 April 2025								
Approved by:	(Signature)	Approved Date :	12 April 2025								



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โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8  
Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

NO-NO <sub>2</sub> -NO <sub>x</sub> Analyzer						
Equipment :	NO-NO <sub>2</sub> -NO <sub>x</sub> analyzer.	Model :	42i			
Serial Number :	CM13090047	Manufacturer :	Thermo			
Diagnostic test value						
Parameter	Observed value		Unit	Nominal range		
	Before	After				
Sample reading						
NO reading			ppb			
NO <sub>x</sub> reading			ppb			
Range			ppb	50 to 1000 ppb		
Averaging Time			Sec	10 to 300 Sec		
Calibration Factors						
NO BKG. ppb			ppb	0 to 60		
NO <sub>x</sub> BKG. ppb			ppb	0 to 60		
NO COEF.			-	1.0 ± 0.3		
NO <sub>x</sub> COEF.			-	1.0 ± 0.3		
NO <sub>2</sub> COEF.			-	1.0 ± 0.3		
Instrument Controls						
Ozonator			On/Off			
PMT Supply			On/Off			
Auto/Manual Mode			NO/NO <sub>x</sub> , NO, NO <sub>x</sub>			
Baud Rate			bps	1200 to 9600		
Temp Compensation			-	On/Off		
Pressure Compensation			-	On/Off		
Screen Contrast			%	0 to 100		
Service Mode			-	On/Off, Up to used		
Diagnostics						
Voltages						
Motherboard voltages:						
3.3 Supply			Vdc	3.3 ± 1 Vdc		
5.0 Supply			Vdc	5.0 ± 1 Vdc		
15.0 Supply			Vdc	15.0 ± 1 Vdc		
24.0 Supply			Vdc	24.0 ± 1 Vdc		
-3.3 Supply			Vdc	-3.3 ± 1 Vdc		
Interface board voltages:						
PMT Supply			Vdc	-400 to -1200 Vdc		
3.3 Supply			Vdc	3.3 ± 1 Vdc		
5.0 Supply			Vdc	5.0 ± 1 Vdc		
15.0 Supply			Vdc	15.0 ± 1 Vdc		
P15.0 Supply			Vdc	15.0 ± 1 Vdc		
24.0 Supply			Vdc	24.0 ± 1 Vdc		
-15.0 Supply			Vdc	-15.0 ± 1 Vdc		
Temperatures						
Internal			°C	15 °C to 45 °C		
Chamber			°C	50°C ± 2 °C		
Cooler			°C	(-)3 °C ± 2 °C		
Converter			°C	325 °C ± 5 °C		
Converter Set			°C	325 °C		
Pressure			mmHg	250 ± 100 mmHg		
Flow			L/min	0.5 to 1.00 L/min		
Note :						



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SO<sub>2</sub> Analyzer

Equipment :	Sulfur Dioxide analyzer.	Model :	43i
Serial Number :	1310957747	Manufacturer :	Thermo

Diagnostic test value			
Parameter	Observed value		Unit
	Before	After	
Sample reading			ppb
Range			ppb
Averaging Time			Sec
Calibration Factors			
SO <sub>2</sub> BKG. ppb			ppb
SO <sub>2</sub> COEF			-
Instrument Controls			
Temp Compensation			On/Off
Pressure Compensation			On/Off
Flash Lamp			On/Off
Communication setting			
Baud Rate			bps
Instrument ID			-
Screen Contrast			%
Service Mode			On/Off
Diagnostics			
Voltages			
Motherboard voltages:			
3.3 Supply			Vdc
5.0 Supply			Vdc
15.0 Supply			Vdc
24.0 Supply			Vdc
-3.3 Supply			Vdc
Interface board voltages:			
PMT Supply			
Flash Supply			
3.3 Supply			Vdc
5.0 Supply			Vdc
15.0 Supply			Vdc
-15.0 Supply			Vdc
24.0 Supply			Vdc
Temperatures			
Internal			°C
Chamber			°C
Pressure			mmHg
Flow			L/min
Lamp intensity			%
Note :	หน้าจอมีค มอ งไม่ชัดเจน		



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Website http://www.qshe.co.th E-mail-address: info@qshe.co.th

## SINGLE-POINT GAS CALIBRATION

NO<sub>x</sub> SO<sub>2</sub> CO Analyzer.

Equipment :	All analyzer.	Model :	42i, 43i, THC
Serial Number :	--	Manufacturer :	Thermo, Horiba

Standard gas concentration		Dilutor detail	
Sulfur Dioxide (SO <sub>2</sub> )	44.44 ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	45.84 ppm	Model :	146i
Methane (CH <sub>4</sub> )	506.7 ppm	Serial number :	1201351404
Carbon Monoxide (CO)	4513 ppm		
Cylinder NO. :	CC507818		
Expiration Date :	13 Aug 2023		

## BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00			400			
NO <sub>x</sub> (ppb)	0.00			400			
SO <sub>2</sub> (ppb)	0.00			400			
CH <sub>4</sub> (ppm)	0.00			4.43			
THC(ppm)	0.00			4.43			

## AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00			400			
NO <sub>x</sub> (ppb)	0.00			400			
SO <sub>2</sub> (ppb)	0.00			400			
CH <sub>4</sub> (ppm)	0.00			4.00			
THC(ppm)	0.00			4.00			

Remark:



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

CALIBRATION REPORT			
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER			
DATE :	20 April 2025	BRAND :	API
NO.	NOX-803	MODEL :	200A
		SERIAL NO.	2617
Calibrator (Dilution System)			
Brand :	Teledyne	Model :	700
Last Cal. Date :	29 October 2024	Serial No. :	421
Reference Standard Gas			
Standard Gas :	Nitric Oxide (NO)	Cylinder No. :	A00726SV
Certified Date :	05 January 2023	Expired Date :	05 January 2026
		Cylinder Conc. :	48.8 ppm
CALIBRATING CONDITION			
Pressure :	1011 mmbar	Temp. :	24.6 °C
		% RH :	50
CALIBRATION SETTING			
Span	Initial Reading (Before Adj.),PPB		
	Set Point	Expected Concentration	Analyzer Response
Zero	0	0.11	-
NO Span	400	400.1	0.025
NO <sub>2</sub> Span	400	400.3	0.075
API Model 200A NO <sub>x</sub> Analyzer Check List			
Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	511	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.3	mV	-20 - 150
AZERO	94.1	mV	-20 - 150
HVPS	674	V	420 - 900 constant
RCCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.0	°C	8 - 48
PMT TEMP	7.3	°C	7 ± 2
MOLY TEMP	314.8	°C	315 ± 5
RCCELL PRESS	8.2	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO <sub>2</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.009	-	1.0 ± 0.3
NO <sub>2</sub> Slope	1.012	-	1.0 ± 0.3
NO Offset	1.7	mV	-20 to +150
NO <sub>2</sub> Offset	1.0	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peer Detudom  
(Mr.Peer Detudom)



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CALIBRATION REPORT			
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER			
DATE :	20 April 2025	BRAND :	API
NO.	NOX-805	MODEL :	200E
		SERIAL NO.	2284
Calibrator (Dilution System)			
Brand :	Teledyne	Model :	700
Last Cal. Date :	29 October 2024	Serial No. :	421
Reference Standard Gas			
Standard Gas :	Nitric Oxide (NO)	Cylinder No. :	A00726SV
Certified Date :	05 January 2023	Expired Date :	05 January 2026
		Cylinder Conc. :	48.8 ppm
CALIBRATING CONDITION			
Pressure :	1011 mmbar	Temp. :	24.6 °C
		% RH :	50
CALIBRATION SETTING			
Span	Initial Reading (Before Adj.),PPB		
	Set Point	Expected Concentration	Analyzer Response
Zero	0	0.10	-
NO Span	400	399.8	-0.050
NO <sub>2</sub> Span	400	400.2	0.050
API Model 200E NO <sub>x</sub> Analyzer Check List			
Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	505	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.5	mV	-20 - 150
AZERO	94.2	mV	-20 - 150
HVPS	670	V	420 - 900 constant
RCCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	29.2	°C	8 - 48
PMT TEMP	7.0	°C	7 ± 2
MOLY TEMP	314.9	°C	315 ± 5
RCCELL PRESS	8.4	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO <sub>2</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.008	-	1.0 ± 0.3
NO <sub>2</sub> Slope	1.011	-	1.0 ± 0.3
NO Offset	1.4	mV	-20 to +150
NO <sub>2</sub> Offset	0.9	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peer Detudom  
(Mr.Peer Detudom)






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7 Soi Phaholyothin 24, Phaholyothin Rd., Jomol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4376-77, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	200E
NO.	NOX-806	SERIAL NO.	2286		
Calibrator (Dilution System)					
Brand :	Teledyne		Model :	700	
Last Cal. Date :	29 October 2024		Serial No. :	421	
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)		Cylinder No. :	A00726SV	
Certified Date :	05 January 2023		Expired Date :	05 January 2026	
Cylinder Conc. :	48.8 ppm				
CALIBRATING CONDITION					
Pressure :	1011	mmbar	Temp. :	24.6	°C
% RH :	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.005
NO <sub>2</sub> Span	400	399.9	-0.025	400.0	1.009
API Model 200E NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	508	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	102.9	mV	-20 - 150		
AZERO	93.6	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	314.7	°C	315 ± 5		
RCCELL PRESS	8.2	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>2</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.005	-	1.0 ± 0.3		
NO <sub>2</sub> Slope	1.009	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO <sub>2</sub> Offset	0.6	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		


Calibrated by :   
(Mr.Abul Dangklom)

Approved by :   
(Mr.Peera Detudom)



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Tel : (662) 939-4376-77, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	200E
NO.	NOX-810	SERIAL NO.	4465		
Calibrator (Dilution System)					
Brand :	Teledyne		Model :	700	
Last Cal. Date :	29 October 2024		Serial No. :	421	
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)		Cylinder No. :	A00726SV	
Certified Date :	05 January 2023		Expired Date :	05 January 2026	
Cylinder Conc. :	48.8 ppm				
CALIBRATING CONDITION					
Pressure :	1011	mmbar	Temp. :	24.6	°C
% RH :	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.006
NO <sub>2</sub> Span	400	400.1	0.025	400.0	1.009
API Model 200E NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	503	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.0	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCCELL TEMP	50.4	°C	50 ± 1		
BOX TEMP	29.1	°C	8 - 48		
PMT TEMP	7.3	°C	7 ± 2		
MOLY TEMP	314.7	°C	315 ± 5		
RCCELL PRESS	8.2	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>2</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.006	-	1.0 ± 0.3		
NO <sub>2</sub> Slope	1.009	-	1.0 ± 0.3		
NO Offset	1.1	mV	-20 to +150		
NO <sub>2</sub> Offset	0.7	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :   
(Mr.Abul Dangklom)

Approved by :   
(Mr.Peera Detudom)



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Tel : (662) 939-4376-77, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R01	SERIAL NO.	769		
Calibrator (Dilution System)					
Brand :	Teledyne		Model :	700E	
Last Cal. Date :	28 October 2024		Serial No. :	201-5	
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)		Cylinder No. :	A00726SV	
Certified Date :	05 January 2023		Expired Date :	05 January 2026	
Cylinder Conc. :	48.8 ppm				
CALIBRATING CONDITION					
Pressure :	1011	mmbar	Temp. :	24.6	°C
% RH :	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	400.2	0.050	400.0	1.010
NO <sub>2</sub> Span	400	400.3	0.075	400.0	1.013
API Model 200E NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	504	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.0	mV	-20 - 150		
AZERO	93.8	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	29.1	°C	8 - 48		
PMT TEMP	7.3	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>2</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.010	-	1.0 ± 0.3		
NO <sub>2</sub> Slope	1.013	-	1.0 ± 0.3		
NO Offset	1.8	mV	-20 to +150		
NO <sub>2</sub> Offset	1.1	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :   
(Mr.Abul Dangklom)

Approved by :   
(Mr.Peera Detudom)




บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R02	SERIAL NO.	2285		
Calibrator (Dilution System)					
Brand :	Teledyne		Model :	700E	
Last Cal. Date :	28 October 2024		Serial No. :	201-5	
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)		Cylinder No. :	A00726SV	
Certified Date :	05 January 2023		Expired Date :	05 January 2026	
Cylinder Conc. :	48.8 ppm				
CALIBRATING CONDITION					
Pressure :	1011	mmbar	Temp. :	24.6	°C
% RH :	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.007
NO <sub>2</sub> Span	400	400.2	0.050	400.0	1.011
API Model 200E NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	509	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.4	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	315.3	°C	315 ± 5		
RCCELL PRESS	8.2	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>2</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.007	-	1.0 ± 0.3		
NO <sub>2</sub> Slope	1.011	-	1.0 ± 0.3		
NO Offset	1.6	mV	-20 to +150		
NO <sub>2</sub> Offset	1.0	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :   
(Mr.Abul Dangklom)

Approved by :   
(Mr.Peera Detudom)


CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R04	SERIAL NO.	4411		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700E		
Last Cal. Date :	28 October 2024	Serial No. :	201-S		
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)	Cylinder No. :	A00726SV		
Certified Date :	05 January 2023	Expired Date :	05 January 2026	Cylinder Conc. :	48.8 ppm
CALIBRATING CONDITION					
Pressure :	1011 mmbar	Temp. :	24.6 °C	% RH :	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.5	-0.125	400.0	1.003
NO <sub>x</sub> Span	400	399.8	-0.050	400.0	1.007
API Model 200E NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	507	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	102.9	mV	-20 - 150		
AZERO	93.7	mV	-20 - 150		
HVPS	674	V	420 - 900 constant		
RCCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.3	°C	8 - 48		
PMT TEMP	7.4	°C	7 ± 2		
MOLY TEMP	315.1	°C	315 ± 5		
RCCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.003	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.007	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO <sub>x</sub> Offset	0.5	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :   
(Mr.Abul Dangkiom)

Approved by :   
(Mr.Peera Detudom)

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R05	SERIAL NO.	4413		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700E		
Last Cal. Date :	28 October 2024	Serial No. :	201-S		
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)	Cylinder No. :	A00726SV		
Certified Date :	05 January 2023	Expired Date :	05 January 2026	Cylinder Conc. :	48.8 ppm
CALIBRATING CONDITION					
Pressure :	1011 mmbar	Temp. :	24.6 °C	% RH :	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	0.11	-	0	-
NO Span	400	399.7	-0.075	400.0	1.006
NO <sub>x</sub> Span	400	400.2	0.050	400.0	1.009
API Model 200E NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	505	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.0	mV	-20 - 150		
AZERO	93.7	mV	-20 - 150		
HVPS	670	V	420 - 900 constant		
RCCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.5	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	314.8	°C	315 ± 5		
RCCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.006	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.009	-	1.0 ± 0.3		
NO Offset	1.2	mV	-20 to +150		
NO <sub>x</sub> Offset	0.7	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :   
(Mr.Abul Dangkiom)

Approved by :   
(Mr.Peera Detudom)

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R06	SERIAL NO.	4466		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700E		
Last Cal. Date :	28 October 2024	Serial No. :	201-S		
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)	Cylinder No. :	A00726SV		
Certified Date :	05 January 2023	Expired Date :	05 January 2026	Cylinder Conc. :	48.8 ppm
CALIBRATING CONDITION					
Pressure :	1011 mmbar	Temp. :	24.6 °C	% RH :	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.008
NO <sub>x</sub> Span	400	400.1	0.025	400.0	1.011
API Model 200E NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	506	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.3	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.3	°C	7 ± 2		
MOLY TEMP	314.9	°C	315 ± 5		
RCCELL PRESS	8.2	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.008	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.011	-	1.0 ± 0.3		
NO Offset	1.3	mV	-20 to +150		
NO <sub>x</sub> Offset	0.8	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :   
(Mr.Abul Dangkiom)

Approved by :   
(Mr.Peera Detudom)

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R07	SERIAL NO.	4468		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700E		
Last Cal. Date :	28 October 2024	Serial No. :	201-S		
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)	Cylinder No. :	A00726SV		
Certified Date :	05 January 2023	Expired Date :	05 January 2026	Cylinder Conc. :	48.8 ppm
CALIBRATING CONDITION					
Pressure :	1011 mmbar	Temp. :	24.6 °C	% RH :	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	400.1	0.025	400.0	1.009
NO <sub>x</sub> Span	400	400.3	0.075	400.0	1.013
API Model 200E NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	513	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.5	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	672	V	420 - 900 constant		
RCCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.4	°C	8 - 48		
PMT TEMP	7.2	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.009	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.013	-	1.0 ± 0.3		
NO Offset	1.6	mV	-20 to +150		
NO <sub>x</sub> Offset	1.1	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :   
(Mr.Abul Dangkiom)

Approved by :   
(Mr.Peera Detudom)



CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	200E
NO.	NOX-809	SERIAL NO.	252		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700E		
Last Cal. Date :	28 October 2024	Serial No. :	201-5		
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)	Cylinder No. :	A007265V		
Certified Date :	05 January 2023	Expired Date :	05 January 2026	Cylinder Conc. :	48.8 ppm
CALIBRATING CONDITION					
Pressure :	1011 mmbar	Temp. :	24.6 °C	% RH :	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.6	-0.100	400.0	1.005
NO <sub>2</sub> Span	400	399.8	-0.050	400.0	1.008
API Model 200E NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	503	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.1	mV	-20 - 150		
AZERO	93.9	mV	-20 - 150		
HVPS	675	V	420 - 900 constant		
RCCELL TEMP	50.5	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.4	°C	7 ± 2		
MOLY TEMP	315.1	°C	315 ± 5		
RCCELL PRESS	8.5	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>2</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.005	-	1.0 ± 0.3		
NO <sub>2</sub> Slope	1.008	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO <sub>2</sub> Offset	0.6	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)

CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	100A
NO.	SO <sub>2</sub> -801	SERIAL NO.	1749		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700		
Last Cal. Date :	29 October 2024	Serial No. :	421		
Reference Standard Gas					
Standard Gas :	Sulphur Dioxide (SO <sub>2</sub> )	Cylinder No. :	A008145K		
Certified Date :	21 June 2021	Expired Date :	21 June 2029	Cylinder Conc. :	49.8 ppm
CALIBRATING CONDITION					
Pressure :	1011 mmbar	Temp. :	24.6 °C	% RH :	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO <sub>2</sub> Span	400.0	400.2	0.050	400.0	1.011
API Model 100A SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.3	in-Hg	25-35		
SAMPLE FLOW	657	cc/min	650 ± 10%		
PMT	103.0	mV	-20-150 with Zero Air		
UV LAMP	5019.2	mV	1000-4900		
STR. LGT	61.6	PPB	<100		
DRK PMT	63.1	mV	-50 - 200		
DRK LMP	58.0	mV	-50 - 200		
HVPS	674	V	550-900 constant		
DCPS	2518	mV	2500 ± 200		
RCCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.0	°C	5-40		
PMT TEMP	7.5	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.011	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	21.9	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)

CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	100A
NO.	SO <sub>2</sub> -802	SERIAL NO.	1847		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700		
Last Cal. Date :	29 October 2024	Serial No. :	421		
Reference Standard Gas					
Standard Gas :	Sulphur Dioxide (SO <sub>2</sub> )	Cylinder No. :	A008145K		
Certified Date :	21 June 2021	Expired Date :	21 June 2029	Cylinder Conc. :	49.8 ppm
CALIBRATING CONDITION					
Pressure :	1011 mmbar	Temp. :	24.6 °C	% RH :	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO <sub>2</sub> Span	400.0	400.3	0.075	400.0	1.012
API Model 100A SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.5	in-Hg	25-35		
SAMPLE FLOW	654	cc/min	650 ± 10%		
PMT	103.2	mV	-20-150 with Zero Air		
UV LAMP	3030.7	mV	1000-4900		
STR. LGT	61.9	PPB	<100		
DRK PMT	63.5	mV	-50 - 200		
DRK LMP	58.2	mV	-50 - 200		
HVPS	671	V	550-900 constant		
DCPS	2521	mV	2500 ± 200		
RCCELL TEMP	50.4	°C	50 ± 1		
BOX TEMP	29.2	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.012	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	22.1	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)

CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	100A
NO.	SO <sub>2</sub> -803	SERIAL NO.	1846		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700		
Last Cal. Date :	29 October 2024	Serial No. :	421		
Reference Standard Gas					
Standard Gas :	Sulphur Dioxide (SO <sub>2</sub> )	Cylinder No. :	A008145K		
Certified Date :	21 June 2021	Expired Date :	21 June 2029	Cylinder Conc. :	49.8 ppm
CALIBRATING CONDITION					
Pressure :	1011 mmbar	Temp. :	24.6 °C	% RH :	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO <sub>2</sub> Span	400.0	399.8	-0.050	400.0	1.006
API Model 100A SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.4	in-Hg	25-35		
SAMPLE FLOW	656	cc/min	650 ± 10%		
PMT	102.9	mV	-20-150 with Zero Air		
UV LAMP	3015.4	mV	1000-4900		
STR. LGT	61.4	PPB	<100		
DRK PMT	62.9	mV	-50 - 200		
DRK LMP	57.6	mV	-50 - 200		
HVPS	670	V	550-900 constant		
DCPS	2517	mV	2500 ± 200		
RCCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.3	°C	5-40		
PMT TEMP	7.4	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.006	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	21.7	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)

CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	100A
NO.	SO <sub>2</sub> -808	SERIAL NO.	1003		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700		
Last Cal. Date :	29 October 2024	Serial No. :	421		
Reference Standard Gas					
Standard Gas :	Sulphur Dioxide (SO <sub>2</sub> )	Cylinder No. :	A008145K		
Certified Date :	21 June 2021	Expired Date :	21 June 2029	Cylinder Conc. :	49.8 ppm
CALIBRATING CONDITION					
Pressure :	1011 mmbar	Temp. :	24.6 °C	% RH :	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.) PPB			Final Reading (After Adj.) PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO <sub>2</sub> Span	400.0	399.7	-0.075	400.0	1.004
API Model 100A SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.7	In-Hg	25-35		
SAMPLE FLOW	653	cc/min	650 ± 10%		
PMT	103.5	mV	-20-150 with Zero Air		
UV LAMP	3047.1	mV	1000-4900		
STR. LGT	61.5	PPB	<100		
DRK PMT	62.9	mV	-50 - 200		
DRK LMP	57.7	mV	-50 - 200		
HVPS	673	V	550-900 constant		
DCPS	2525	mV	2500 ± 200		
RCCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.1	°C	5-40		
PMT TEMP	7.3	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.004	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	22.1	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)

CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 April 2025	BRAND :	Thermo	MODEL :	43C
NO.	SO <sub>2</sub> -809	SERIAL NO.	43C-59325-322		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700		
Last Cal. Date :	29 October 2024	Serial No. :	421		
Reference Standard Gas					
Standard Gas :	Sulphur Dioxide (SO <sub>2</sub> )	Cylinder No. :	A008145K		
Certified Date :	21 June 2021	Expired Date :	21 June 2029	Cylinder Conc. :	49.8 ppm
CALIBRATING CONDITION					
Pressure :	1011 mmbar	Temp. :	24.6 °C	% RH :	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.) PPB			Final Reading (After Adj.) PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO <sub>2</sub> Span	400.0	400.3	0.075	400.0	
INSTRUMENT STATUS					
CHAMBER TEMP	44.2 °C	FLOW	1.0 LPM		
PRESSURE	728.6 mm Hg				

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)

CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 April 2025	BRAND :	Thermo	MODEL :	43C
NO.	SO <sub>2</sub> -810	SERIAL NO.	43C-69604-364		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700		
Last Cal. Date :	29 October 2024	Serial No. :	421		
Reference Standard Gas					
Standard Gas :	Sulphur Dioxide (SO <sub>2</sub> )	Cylinder No. :	A008145K		
Certified Date :	21 June 2021	Expired Date :	21 June 2029	Cylinder Conc. :	49.8 ppm
CALIBRATING CONDITION					
Pressure :	1011 mmbar	Temp. :	24.6 °C	% RH :	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.) PPB			Final Reading (After Adj.) PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO <sub>2</sub> Span	400.0	400.2	0.050	400.0	
INSTRUMENT STATUS					
CHAMBER TEMP	44.5 °C	FLOW	1.0 LPM		
PRESSURE	728.7 mm Hg				

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)

CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	100E
NO.	SO <sub>2</sub> -805	SERIAL NO.	3490		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700E		
Last Cal. Date :	28 October 2024	Serial No. :	201-S		
Reference Standard Gas					
Standard Gas :	Sulphur Dioxide (SO <sub>2</sub> )	Cylinder No. :	A008145K		
Certified Date :	21 June 2021	Expired Date :	21 June 2029	Cylinder Conc. :	49.8 ppm
CALIBRATING CONDITION					
Pressure :	1011 mmbar	Temp. :	24.6 °C	% RH :	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.) PPB			Final Reading (After Adj.) PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO <sub>2</sub> Span	400.0	399.8	-0.050	400.0	1.007
API Model 100E SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.3	In-Hg	25-35		
SAMPLE FLOW	660	cc/min	650 ± 10%		
PMT	103.2	mV	-20-150 with Zero Air		
UV LAMP	3038.6	mV	1000-4900		
STR. LGT	61.5	PPB	<100		
DRK PMT	63.0	mV	-50 - 200		
DRK LMP	57.7	mV	-50 - 200		
HVPS	671	V	550-900 constant		
DCPS	2526	mV	2500 ± 200		
RCCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	29.3	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.007	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	21.6	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)





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Tel : (662) 519-4370-72, Fax : (662) 513-4221, E-mail : sales@spsc.com, www.spsc.com

CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 April 2025	BRAND :	API	MODEL :	100E
NO.	SO <sub>2</sub> -R06	SERIAL NO.	066		
Calibrator (Dilution System)					
Brand :	Teledyne		Model :	700E	
Last Cal. Date :	28 October 2024		Serial No. :	201-5	
Reference Standard Gas					
Standard Gas :	Sulphur Dioxide (SO <sub>2</sub> )		Cylinder No. :	A008145K	
Certified Date :	21 June 2021		Expired Date :	21 June 2029	
Cylinder Conc. : 49.8 ppm					
CALIBRATING CONDITION					
Pressure :	1011	mmbar	Temp. :	24.6	°C
% RH :	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO <sub>2</sub> Span	400.0	399.7	-0.075	400.0	1.008
API Model 100E SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.4	In-Hg	25-35		
SAMPLE FLOW	654	cc/min	650 ± 10%		
PMT	103.5	mV	-20-150 with Zero Air		
UV LAMP	3054.2	mV	1000-4900		
STR. LGT	61.9	PPB	<100		
DRK PMT	63.5	mV	-50 - 200		
DRK LMP	58.1	mV	-50 - 200		
HVPS	670	V	550-900 constant		
DCPS	2517	mV	2500 ± 200		
RCCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.0	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.008	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	21.6	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 April 2025	BRAND :	TELEDYNE	MODEL :	TML-60
NO.	SO <sub>2</sub> -R07	SERIAL NO.	TRS1068		
Calibrator (Dilution System)					
Brand :	Teledyne		Model :	700E	
Last Cal. Date :	28 October 2024		Serial No. :	201-5	
Reference Standard Gas					
Standard Gas :	Sulphur Dioxide (SO <sub>2</sub> )		Cylinder No. :	A008145K	
Certified Date :	21 June 2021		Expired Date :	21 June 2029	
Cylinder Conc. : 49.8 ppm					
CALIBRATING CONDITION					
Pressure :	1011	mmbar	Temp. :	24.6	°C
% RH :	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO <sub>2</sub> Span	400.0	399.6	-0.100	400.0	1.006
API Model TML-60 SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.3	In-Hg	25-35		
SAMPLE FLOW	657	cc/min	650 ± 10%		
PMT	103.2	mV	-20-150 with Zero Air		
UV LAMP	3036.3	mV	1000-4900		
STR. LGT	61.8	PPB	<100		
DRK PMT	63.4	mV	-50 - 200		
DRK LMP	58.0	mV	-50 - 200		
HVPS	673	V	550-900 constant		
DCPS	2529	mV	2500 ± 200		
RCCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.1	°C	5-40		
PMT TEMP	7.5	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.006	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	22.1	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 April 2025	BRAND :	TELEDYNE	MODEL :	TML-60
NO.	SO <sub>2</sub> -R08	SERIAL NO.	TRS1064		
Calibrator (Dilution System)					
Brand :	Teledyne		Model :	700E	
Last Cal. Date :	28 October 2024		Serial No. :	201-5	
Reference Standard Gas					
Standard Gas :	Sulphur Dioxide (SO <sub>2</sub> )		Cylinder No. :	A008145K	
Certified Date :	21 June 2021		Expired Date :	21 June 2029	
Cylinder Conc. : 49.8 ppm					
CALIBRATING CONDITION					
Pressure :	1011	mmbar	Temp. :	24.6	°C
% RH :	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO <sub>2</sub> Span	400.0	400.1	0.025	400.0	1.012
API Model TML-60 SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.7	In-Hg	25-35		
SAMPLE FLOW	653	cc/min	650 ± 10%		
PMT	103.0	mV	-20-150 with Zero Air		
UV LAMP	3021.8	mV	1000-4900		
STR. LGT	61.5	PPB	<100		
DRK PMT	62.9	mV	-50 - 200		
DRK LMP	57.6	mV	-50 - 200		
HVPS	669	V	550-900 constant		
DCPS	2520	mV	2500 ± 200		
RCCELL TEMP	50.4	°C	50 ± 1		
BOX TEMP	29.3	°C	5-40		
PMT TEMP	7.2	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.012	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	21.8	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 April 2025	BRAND :	TELEDYNE	MODEL :	100E
NO.	SO <sub>2</sub> -R10	SERIAL NO.	TRS1065		
Calibrator (Dilution System)					
Brand :	Teledyne		Model :	700E	
Last Cal. Date :	28 October 2024		Serial No. :	201-5	
Reference Standard Gas					
Standard Gas :	Sulphur Dioxide (SO <sub>2</sub> )		Cylinder No. :	A008145K	
Certified Date :	21 June 2021		Expired Date :	21 June 2029	
Cylinder Conc. : 49.8 ppm					
CALIBRATING CONDITION					
Pressure :	1011	mmbar	Temp. :	24.6	°C
% RH :	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO <sub>2</sub> Span	400.0	400.2	0.050	400.0	1.013
API Model 100E SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.6	In-Hg	25-35		
SAMPLE FLOW	660	cc/min	650 ± 10%		
PMT	103.1	mV	-20-150 with Zero Air		
UV LAMP	3030.9	mV	1000-4900		
STR. LGT	61.6	PPB	<100		
DRK PMT	63.0	mV	-50 - 200		
DRK LMP	57.8	mV	-50 - 200		
HVPS	675	V	550-900 constant		
DCPS	2527	mV	2500 ± 200		
RCCELL TEMP	50.5	°C	50 ± 1		
BOX TEMP	29.4	°C	5-40		
PMT TEMP	7.3	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.013	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	21.9	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)

## ลำดับที่ 2

สารอินทรีย์ระเหยง่ายในบรรยากาศ







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Tel : (662) 939-4370-72, Fax : (662) 513-4321, E-mail : sale@spscn.com, www.spscn.com

#### Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender S10-H

S/N : 136833

#### 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 <sup>2</sup>	
R60	SKC	224-PCX04	412753	03/04/2025	1,000	1,500	2,000	1,013	1,505	2,008	0.999x + 6.768		0.999	
R61	SKC	224-PCX04	426190	01/04/2025	1,000	1,500	2,000	1,004	1,504	2,009	1.005x - 4.137		1.000	
R62	SKC	224-PCX04	426463	02/04/2025	1,000	1,500	2,000	1,005	1,495	2,002	0.997x + 5.089		1.000	
R63	SKC	224-PCX04	426129	04/04/2025	1,000	1,500	2,000	1,004	1,504	2,008	1.013x - 15.436		1.000	
R64	SKC	224-PCX04	402753	02/04/2025	1,000	1,500	2,000	999	1,492	2,001	1.004x - 13.988		0.999	
R65	SKC	224-PCX04	426137	03/04/2025	1,000	1,500	2,000	1,001	1,501	1,996	0.994x + 9.247		1.000	

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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#### Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender S10-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 <sup>2</sup>		
L-R01	Dwyer	VFA-21	07/01/2025	50	100	200	49.9	100.4	200.8	0.992x + 0.961	1.000		
L-R02	Dwyer	VFA-21	06/01/2025	50	100	200	50.2	101.5	201.4	1.007x - 0.448	0.999		
L-R03	Dwyer	VFA-21	03/01/2025	50	100	200	50.4	99.7	201.2	1.003x - 0.234	1.000		
L-R04	Dwyer	VFA-21	03/01/2025	50	100	200	50.7	101.1	199.8	0.998x + 0.763	1.000		
L-R05	Dwyer	VFA-21	07/01/2025	50	100	200	49.9	101.4	202.3	1.004x - 0.092	0.999		
L-R06	Dwyer	VFA-21	06/01/2025	50	100	200	50.1	100.5	200.2	1.005x - 0.302	1.000		

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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#### Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender S10-H

S/N : 136164

Calibration Data													
Rotameter Data				Calibration Data									
No.	Brand	Model	Date	Flow Rate (m/min)						Value From Calibration Curve			
				Flow Rate (Reading)			Actual (Q std.)						
				1	2	3	1	2	3	y		R <sup>2</sup>	
L-R01	Dwyer	VFA-21	03/04/2025	50	100	200	50.7	101.0	199.3	0.995x + 1.197			
L-R02	Dwyer	VFA-21	03/04/2025	50	100	200	49.8	100.7	199.1	1.001x - 0.303			
L-R03	Dwyer	VFA-21	01/04/2025	50	100	200	50.1	101.2	200.9	1.005x - 0.447	0.999		
L-R04	Dwyer	VFA-21	04/04/2025	50	100	200	50.2	100.9	201.5	0.994x + 1.311			
L-R05	Dwyer	VFA-21	04/04/2025	50	100	200	50.4	100.7	201.6	0.999x + 0.781			
L-R06	Dwyer	VFA-21	03/04/2025	50	100	200	49.8	101.2	201.8	1.003x - 0.149	0.999		

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 แขวงพหลโยธิน เขตจตุจักร กรุงเทพฯ 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4321, E-mail : sale@spscn.com, www.spscn.com

#### Calibration Report Photo-Ionization Detector VOC Analyzer

Date : 06 January 2025

Brand : Mini RAE System

Model : Mini RAE 2000

No. : B01

Serial No. : 110-010174

#### Reference Standard Gas

Standard Gas : Isobutylene (C<sub>4</sub>H<sub>8</sub>)

Cylinder No. : 1496584

Certified Date : 24 June 2021

Expired Date : 7 January 2026

Cylinder Conc. : 100 ppm

#### Calibrating Condition

Pressure : 1011 mmbar

Temp. : 24.6 °C

% RH : 50

#### Calibration Setting

Span Set Point	Initial Reading (Before Adj.)			Final Reading (After Adj.)	
	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	
Zero (Fresh Air)	0	0.1	-	0	
VOC Span (Isobutylene)	100	99.8	-0.20	100	

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)





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Tel : (662) 639-4370-72 Fax : (662) 633-4321 E-mail : sales@sps.com www.sps.com

Calibration Report					
Photo-Ionization Detector VOC Analyzer					
Date :	05 February 2025	Brand :	Mini RAE System	Model :	Mini RAE 3000
No.	R01	Serial No.	592-902403		
Reference Standard Gas					
Standard Gas :	Isobutylene (C <sub>4</sub> H <sub>8</sub> )	Cylinder No. :	1496584		
Certified Date :	24 June 2021	Expired Date :	7 January 2026		
Cylinder Conc. :	100 ppm				
Calibrating Condition					
Pressure	1011	mmbar	Temp.	24.5	°C
% RH	50				
Calibration Setting					
Span Set Point	Initial Reading (Before Adj.)			Final Reading (After Adj.)	
	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	
Zero (Fresh Air)	0	0.1	-	0	
VOC Span (Isobutylene)	100	99.8	-0.20	100	

Calibrated by : Adul Dangklom  
(Mr. Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)



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Tel : (662) 639-4370-72 Fax : (662) 633-4321 E-mail : sales@sps.com www.sps.com

Calibration Report					
Photo-Ionization Detector VOC Analyzer					
Date :	05 March 2025	Brand :	Mini RAE System	Model :	Mini RAE 3000
No.	R02	Serial No.	592-917802		
Reference Standard Gas					
Standard Gas :	Isobutylene (C <sub>4</sub> H <sub>8</sub> )	Cylinder No. :	1496584		
Certified Date :	24 June 2021	Expired Date :	7 January 2026		
Cylinder Conc. :	100 ppm				
Calibrating Condition					
Pressure	1011	mmbar	Temp.	24.5	°C
% RH	50				
Calibration Setting					
Span Set Point	Initial Reading (Before Adj.)			Final Reading (After Adj.)	
	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	
Zero (Fresh Air)	0	0.1	-	0	
VOC Span (Isobutylene)	100	99.7	-0.30	100	

Calibrated by : Adul Dangklom  
(Mr. Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)



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Tel : (662) 639-4370-72 Fax : (662) 633-4321 E-mail : sales@sps.com www.sps.com

Calibration Report					
Photo-Ionization Detector VOC Analyzer					
Date :	01 April 2025	Brand :	Mini RAE System	Model :	Mini RAE 3000
No.	R01	Serial No.	592-902403		
Reference Standard Gas					
Standard Gas :	Isobutylene (C <sub>4</sub> H <sub>8</sub> )	Cylinder No. :	1496584		
Certified Date :	24 June 2021	Expired Date :	7 January 2026		
Cylinder Conc. :	100 ppm				
Calibrating Condition					
Pressure	1011	mmbar	Temp.	24.6	°C
% RH	50				
Calibration Setting					
Span Set Point	Initial Reading (Before Adj.)			Final Reading (After Adj.)	
	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	
Zero (Fresh Air)	0	0.1	-	0	
VOC Span (Isobutylene)	100	99.7	-0.30	100	

Calibrated by : Adul Dangklom  
(Mr. Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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Tel : (662) 639-4370-72 Fax : (662) 633-4321 E-mail : sales@sps.com www.sps.com

Calibration Report					
Photo-Ionization Detector VOC Analyzer					
Date :	05 May 2025	Brand :	Honeywell RAE System	Model :	Mini RAE 3000
No.	R02	Serial No.	592-928287		
Reference Standard Gas					
Standard Gas :	Isobutylene (C <sub>4</sub> H <sub>8</sub> )	Cylinder No. :	1496584		
Certified Date :	24 June 2021	Expired Date :	7 January 2026		
Cylinder Conc. :	100 ppm				
Calibrating Condition					
Pressure	1011	mmbar	Temp.	24.6	°C
% RH	50				
Calibration Setting					
Span Set Point	Initial Reading (Before Adj.)			Final Reading (After Adj.)	
	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	
Zero (Fresh Air)	0	0.1	-	0	
VOC Span (Isobutylene)	100	99.8	-0.20	100	

Calibrated by : Adul Dangklom  
(Mr. Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)

**Calibration Report**  
Photo-Ionization Detector VOC Analyzer

Date: 04 June 2025 Brand: Mini RAE System Model: Mini RAE 3000  
No. R01 Serial No. 592-902403

Reference Standard Gas  
Standard Gas: Isobutylene (C<sub>4</sub>H<sub>8</sub>) Cylinder No.: 1496584  
Certified Date: 24 June 2021 Expired Date: 7 January 2026 Cylinder Conc.: 100 ppm

Calibrating Condition  
Pressure: 1011 mmbar Temp: 24.6 °C % RH: 50

Calibration Setting

Span Set Point	Initial Reading (Before Adj.)			Final Reading (After Adj.)	
	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	
Zero (Fresh Air)	0	0.1	-	0	
VOC Span (Isobutylene)	100	99.8	-0.20	100	

Calibrated by: Adul Dangklom  
(Mr. Adul Dangklom)

Approved by: Peera Detudom  
(Mr. Peera Detudom)



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD  
214 Bangwaek Rd. Bangpai Bangkok 10160  
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



## CALIBRATION CERTIFICATE

Page 1 of 4

Certificate No.: L202412119-0001

Date Issued: 13-Dec-24

**Customer**: S.P.S. CONSULTING SERVICE CO., LTD.  
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

**Equipment**: Mass Flow meter

**Manufacturer**: Dwyer  
**Model**: GMF-2101

**Serial No.**: -  
**ID No./Tag No.**: MF01/51

**Date Received**: 11-Dec-24  
**Date Calibrated**: 12-Dec-24

**Calibrated by**: Saruth Srichutikul

### Calibration Method or Calibration Procedure Used

In-house method: CP-34 by comparison against mass flow calibrator.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by: Sarayuth T.  
(Sarayuth Tochua)



Page 2 of 4

Certificate No.: L202412119-0001

**Ambient Temperature**: (25 ± 2)°C  
**Relative Humidity**: (50 ± 15)%RH  
**Capacity Range**: 17 ml/min  
**Calibration Media**: Air

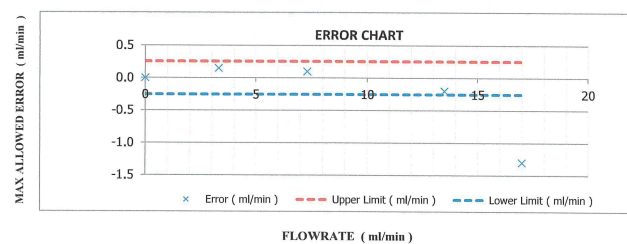
**Type**: Mass Flowmeter

**Unit Under Calibration Reference Condition**: Pressure 101.325 kPa(abs), 21 °C, Nitrogen

### Before Adjustment

Temperature (°C)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty (± ml/min)
24.00	100.46	0.00	0.000 *	0.000	0.063
24.10	100.62	3.30	3.149	0.151	0.13
24.10	100.78	7.30	7.2	0.10	0.14
24.20	101.07	13.50	13.7	-0.20	0.15
24.20	101.30	17.00	18.3	-1.30	0.19

Error = Unit Under Calibration - Standard



Page 3 of 4

Certificate No.: L202412119-0001

**Ambient Temperature**: (25 ± 2)°C  
**Relative Humidity**: (50 ± 15)%RH  
**Capacity Range**: 17 ml/min  
**Calibration Media**: Air

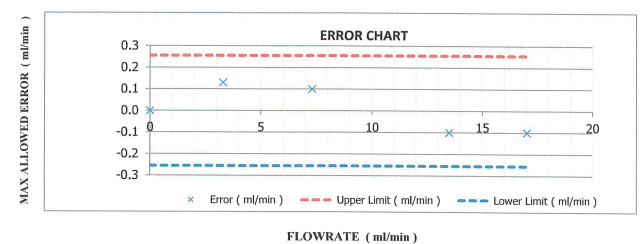
**Type**: Mass Flowmeter

**Unit Under Calibration Reference Condition**: Pressure 101.325 kPa(abs), 21 °C, Nitrogen

### After Adjustment

Temperature (°C)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty (± ml/min)
24.00	100.45	0.00	0.000 *	0.000	0.063
24.10	100.62	3.30	3.170	0.130	0.13
24.10	100.78	7.30	7.2	0.10	0.14
24.20	101.01	13.50	13.6	-0.10	0.15
24.00	101.19	17.00	17.1	-0.10	0.18

Error = Unit Under Calibration - Standard



Note : The actual flow rate is determined by the equation :

$$Q_{Meas} = Q_{Ref} \times \frac{P_{Ref}}{P_{Meas}} \times \frac{T_{Meas}}{T_{Ref}}$$

; Q = Flow rate  
; P = Absolute pressure  
; T = Absolute temperature  
; Subscript "Meas" = Measurement condition  
; Subscript "Ref" = Reference condition

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

#### Traceability of Certificate :

The International System of Units (SI) through

NIMT Certificate No. MW-0047-24,MW-0048-24 for Gas Flow meter Serial No. M5209179B/M5209179A, Due 03-Jul-25

End of Certificate

### GC Clarus 600/680 Preventive Maintenance (PM)

Company Name:	S.P.S. Consulting Service Co.,Ltd		
Address (Instrument Location):	7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900.		
Serial Number:	680S14042502	Service Tag:	N68APSSFXXMP
Customer Name (if applicable):	Ms.Naruecha	PM number :	1 of 2
Service Engineer Name:	Monchai Kitcharoenkeat	Service Order Number:	WO-
Date PM Performed: (DD-MMM-YYYY)	22-Feb-2025	Next PM Due Date: (DD-MMM-YYYY)	22-Aug-2025

Part Number	Release	Publication Date	
TH09370070	C	August 2016	

#### Scope

The purpose of this PM is to ensure the continued functionality of the Clarus 600 and Clarus 680 GC 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 #	Software Version	Configuration Notes
Clarus680	680S14042502	Totalchrom6.3.2	PSS, PSS, FID,
Clarus SQ8T	648N4050804	Turbomass 6.4	
AtomX	US14113002	Tekma AtomX	

### Parts Lists

Additional Tools Required for PM				
Part Number (if applicable)	Description	Quantity	Serial #	Calibration Due Date (MM/YY)
N/A				
Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A				

### 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.

- ☒ Check incoming AC line voltage for proper levels and grounding.  
L-N 220 Volt  
L-G 220 Volt  
N-G 0.33 Volt

\*Neutral to ground not more than 0.5 volts peak to peak

- ☒ Inspect all gas line filters and traps; Replace if necessary with customer supplied spares.

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen  
Moisture level ☒ Good ☐ Need to replace ☐ Other \_\_\_\_\_

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium  
Moisture level ☒ Good ☐ Need to replace ☐ Other \_\_\_\_\_

- ☒ Inspect the customer log book and make any appropriate PM entries.

- ☒ Leak check all fittings from the gas source to instrument.  
Gas leakage ☒ Pass ☐ Fail Comment \_\_\_\_\_

- ☒ Perform general inspection of system for cleanliness.

- ☒ Inspect for functional and clean electronic cooling and oven vent fans  
Electronic cooling fan ☒ Yes ☐ No  
Oven cooling fan ☒ Yes ☐ No

#### 2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.  
Oven temperature set point 150 °C ☒ Pass ☐ Fail

- ☐ Check sub-ambient option. (If installed).  
Oven temperature set point 5 °C ☐ Pass ☐ Fail

- ☒ Perform routine maintenance on detector/injector. Replace parts as necessary with customer supplied spares.

- ☒ Check flows, including split flows if applicable. Calibrate if necessary.  
Carrier flow Pass  
Split flow Pass
- ☒ Check detector gas flows and adjust if necessary.  
Detector flow Pass
- ☒ Autosampler installed ☒ Yes ☐ No  
Check autosampler sensor for wear and replace if necessary.  
Vial sensor Pass  
Door sensor Pass  
Tower sensor Pass  
Plunger sensor Pass  
Elevator sensor Pass
- ☒ Remove syringe, manually flush. Replace with customer supplied spare if necessary.
- ☒ Check firmware version. Upgrade to current levels if necessary.  
Firmware version 6.5
- ☒ Measure all accessible power supply voltages.  
5 Volt Pass  
+15 Volt Pass  
-15 Volt Pass  
24 Volt Pass
- ☒ Record all detector voltage signal.  
Detector Channel A 1.12 mV.  
Detector Channel B NA mV.

### 3. Diagnostics Tests:

- ☒ Run instrument diagnostics.  
BRAM Pass  
EPROM Pass
- ☒ Run Autosampler diagnostics.  
BRAM Pass  
EPROM Pass

### 4. 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.
- ☒ Update Logbook.

## Additional Comments

Additional Comments Regarding the PM

## Review

The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.	
This Clarus600/680 GC	Pass the preventive maintenance.
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative: Monchai Kitcharoenkeat	Date: 22-Feb-2025 (DD-MMM-YYYY)
Authorized Customer Representative: Ms.Naruecha	Date: 22-Feb-2025 (DD-MMM-YYYY)

ลำดับที่ 3

ระดับเสียงในบรรยากาศ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220 MTC No. EEL. BP. 45/0268

### CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co.,Ltd.  
Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.  
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

**Instrument Calibrated :**  
Description : Acoustic Calibrator  
Manufacturer : Cirrus Research plc  
Model : CR:515  
Serial No. : 92002  
**Ambient Environment**  
Temperature : (23 ± 3) °C  
Relative Humidity : (50 ± 15) %  
Ambient Pressure : (101.325 ± 1.500) kPa

**Standards used :**  
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.  
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.  
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.  
4. Digital Multimeter Agilent 34401A S/N MY44005560.  
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.  
6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.  
7. Condenser Microphone B&K 4180 S/N 288971.

**Calibration Procedure:** CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.  
This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 19 Feb. 2025  
Date of Calibration : 21 Feb. 2025

1 / 2

The results relate only to the items tested/calibrated or value assigned.  
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BLMTC.002 Rev.5

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(66) 08 3219 9460  
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

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196 Phahonyothin Road, Ladyao, Chatuchak,  
Bangkok 10900, Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
(66) 08 1889 6827



Noise R\_250/25

### Sound Level Meter Calibration Report

Acoustic Calibrator Data						
Brand	CIRRUS		Number	AC-CR01/63		
Model	CR515		Serial No.	92002		
Calibration Range	94 dB, 1000 Hz		Last Calibration	21 February 2025		
			Due Date	21 February 2026		
Calibration Data						
Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
CR-802	Cirrus	CR161B	G301157	20 April 2025	94.0	94.0
CR-803	Cirrus	CR161B	G301155	20 April 2025	94.0	94.0
CR-804	Cirrus	CR161B	G301404	20 April 2025	94.0	94.0
CR-805	Cirrus	CR161B	G301134	20 April 2025	94.1	94.0
CR-806	Cirrus	CR161B	G301151	20 April 2025	94.0	94.0
CR-807	Cirrus	CR161B	G301167	20 April 2025	94.0	94.0
CR-808	Cirrus	CR161B	G301397	20 April 2025	94.0	94.0
CR-809	Cirrus	CR161B	G301401	20 April 2025	94.1	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.98 ± 0.10 dB	

Calibrated by : Adul Dangklom  
(Mr. Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220 MTC No. EEL. BP. 45/0268

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20µPa at 1000 Hz

Acoustic Output in dB re 20µPa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

### 1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.98	-0.02	± 0.10	±0.40 dB

### 2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1000.1	0.1	± 1.5	±1.0%

### 3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.65	± 0.50	±3.0%

Note : 1. No adjustment.  
2. The calibrator pressure correction was not included.  
3. The microphone volume correction was not included.

Calibrated by : Mr. Weerachai Deechaiyao

Approved by : Mr. Weerachai Deechaiyao  
Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Feb. 2025  
Date of Issue : 24 Feb. 2025

End of Certificate

Ref : 2011268021900739002

2 / 2

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(66) 08 3219 9460  
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

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196 Phahonyothin Road, Ladyao, Chatuchak,  
Bangkok 10900, Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
(66) 08 1889 6827



Noise R\_279/25

### Sound Level Meter Calibration Report

Acoustic Calibrator Data						
Brand	CIRRUS		Number	AC-CR01/63		
Model	CR515		Serial No.	92002		
Calibration Range	94 dB, 1000 Hz		Last Calibration	21 February 2025		
			Due Date	21 February 2026		
Calibration Data						
Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
CR-802	Cirrus	CR161B	G301157	28 April 2025	94.0	94.0
CR-804	Cirrus	CR161B	G301404	28 April 2025	94.0	94.0
CR-805	Cirrus	CR161B	G301134	28 April 2025	94.1	94.0
CR-806	Cirrus	CR161B	G301151	28 April 2025	94.0	94.0
CR-807	Cirrus	CR161B	G301167	28 April 2025	94.0	94.0
CR-808	Cirrus	CR161B	G301397	28 April 2025	94.0	94.0
CR-809	Cirrus	CR161B	G301401	28 April 2025	94.0	94.0
CR-810	Cirrus	CR161B	G301407	28 April 2025	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.98 ± 0.10 dB	

Calibrated by : Adul Dangklom  
(Mr. Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

### CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co.,Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Ambient Environment

Description : Sound Calibrator

Temperature : (23 ± 3) °C

Manufacturer : ACO

Relative Humidity : (50 ± 15) %

Model : 2127

Ambient Pressure : (101.325 ± 1.500) kPa

Serial No. : 130006

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.

7. Condenser Microphone B&K 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942:2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

1 / 2

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

Office/Laboratory  
668 Mu 2 Tambon Bangpooaim, Amphoe Muang Samutprakan,  
Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
(66) 08 3219 9440  
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office  
196 Phahonyothin Road, Ladyao, Chatuchak,  
Bangkok 10900, Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
(66) 08 1889 6827

FM.BLMTC.002 Rev.5



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel. (66) 025779036 Fax. (66) 025779009 E-mail : spps@spss.com, www.spss.com

Noise R\_251/125

### Sound Level Meter Calibration Report

#### Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	21 February 2025
		Due Date	21 February 2026

#### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R03	ACO	6236	00132031	20 April 2025	93.9	93.9
ACO-R06	ACO	6236	00152005	20 April 2025	93.9	93.9
ACO-R07	ACO	6236	00152080	20 April 2025	94.0	93.9
ACO-R08	ACO	6236	00152082	20 April 2025	94.0	93.9
ACO-R13	ACO	6236	00172041	20 April 2025	93.9	93.9
ACO-R17	ACO	6236	00172064	20 April 2025	93.9	93.9
ACO-R22	ACO	6236	00182010	20 April 2025	93.9	93.9
ACO-R42	ACO	6236	00192054	20 April 2025	94.0	93.9
ACO-C1-801	ACO	6238	00223038	20 April 2025	94.0	93.9
ACO-C1-802	ACO	6238	00223039	20 April 2025	93.9	93.9
ACO-C1-803	ACO	6238	00223040	20 April 2025	93.9	93.9
ACO-C1-804	ACO	6238	00223041	20 April 2025	93.9	93.9

Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR) 93.81 ± 0.10 dB

Calibrated by : Adul Danglom  
(Mr. Adul Danglom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20µPa at 1000 Hz

Acoustic Output in dB re 20µPa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

#### 1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.81	-0.19	± 0.10	±0.40 dB

#### 2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	± 1.5	±1.0%

#### 3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.95	± 0.50	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr. Weerachai Deechaiyae)

Approved by :

(Mr. Peera Detudom)

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Ref : 2011268021900739001

End of Certificate

2 / 2

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9036  
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Office/Laboratory  
668 Mu 2 Tambon Bangpooaim, Amphoe Muang Samutprakan,  
Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
(66) 08 3219 9440  
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office  
196 Phahonyothin Road, Ladyao, Chatuchak,  
Bangkok 10900, Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
(66) 08 1889 6827

FM.BLMTC.002 Rev.5



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S.P.S. CONSULTING SERVICE CO., LTD.  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel. (66) 025779036 Fax. (66) 025779009 E-mail : spps@spss.com, www.spss.com

Noise R\_278/25

### Sound Level Meter Calibration Report

#### Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	21 February 2025
		Due Date	21 February 2026

#### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R15	ACO	6236	00172062	28 April 2025	93.9	93.9
ACO-R22	ACO	6236	00182010	28 April 2025	93.9	93.9
ACO-R31	ACO	6236	00192043	28 April 2025	94.0	93.9
ACO-R34	ACO	6236	00192046	28 April 2025	94.0	93.9
ACO-C1-801	ACO	6238	00223038	28 April 2025	93.9	93.9
ACO-C1-802	ACO	6238	00223039	28 April 2025	93.9	93.9
ACO-C1-803	ACO	6238	00223040	28 April 2025	93.9	93.9
ACO-C1-804	ACO	6238	00223041	28 April 2025	93.9	93.9

Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR) 93.81 ± 0.10 dB

Calibrated by : Adul Danglom  
(Mr. Adul Danglom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)

Noise R\_279-1/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	21 February 2025
		Due Date	21 February 2026


Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R02	ACO	6236	00132029	28 April 2025	93.9	93.9
ACO-R06	ACO	6236	00152005	28 April 2025	94.0	93.9
ACO-R35	ACO	6236	00192047	28 April 2025	93.9	93.9
ACO-R37	ACO	6236	00192049	28 April 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

  
(Mr. Adul Dangklom)

Approved by :

  
(Mr. Peera Detudom)



ลำดับที่ 4

คุณภาพน้ำ



CERT.No.: HS-W015C

Harikul Science Co.,Ltd.  
694 Soi Ratchadaniwet 24, Pracharatbamphen,  
Samsaenok, Huaihwang, Bangkok 10310  
Tel: 0-2274-2456 Fax: 0-2274-2443  
Email: info@harikul.com www.harikul.com

Certificate of Calibration

Calibration Date : 18 Mar 25

Submitted by : S.P.S CONSULTING SERVICE CO.,LTD

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

Model : YSI 5000  
S/N : 15B100751  
Probe : YSI 5010  
S/N : 22D100097  
ID NO. : -  
Air Temp ref : S/N. F8065C26  
Barometric ref : S/N. F8065C26  
Water Temp ref : -  
ID NO. : HS001  
Technician : Kittipong M.

Avg Room Temp : 20 °C

Avg Water Temp : 20 °C

Air Pressure : 760.00 mmHg

Salinity : 0 ppt

## Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.08	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.08	(PASS)	-
Measurement 4 (mg/l)	9.07	(PASS)	-
Measurement 5 (mg/l)	9.07	(PASS)	-
Measurement 6 (mg/l)	9.07	(PASS)	-
Measurement 7 (mg/l)	9.07	(PASS)	-
Measurement 8 (mg/l)	9.07	(PASS)	-
Measurement 9 (mg/l)	9.07	(PASS)	-
Measurement 10 (mg/l)	9.07	(PASS)	-

Mean Measurement	9.07	mg/l	-
Inaccuracy	0.02	mg/l	-

Overall Status (PASS)

## Manufacturer Specification

Accuracy = +/- 0.02 mg/l

- 1) This certificate is issued based on the result that are found as shown on date and place of test only.
- 2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
- 3) This result shall not be used for advertising purpose.

Technician Signature

(Kittipong Maekwong)

Laboratory Manager

(Natenapha Pisatkhunon)



QUALITY CALIBRATION CO., LTD.

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

CERTIFICATE No : 25T0520  
REFERENCE No : 75853-1

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200

SERIAL No : 15110C0497

ID No : DRB 05/59

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 : CHAICHARN CH.

CALIBRATION DATE : 27-Jan-25

APPROVED BY : PONGSAK J.

ISSUED DATE : 27-Jan-25

RECEIVED DATE : 15-Jan-25

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



F-G010 REV : 03



QUALITY CALIBRATION CO., LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkok, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 25T0520

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : COD REACTOR  
MANUFACTURER : HACH  
ID NUMBER : DRB 05/59  
RECEIVED DATE : 15-Jan-25  
AMBIENT TEMPERATURE : 23° C ± 1° C

MODEL : DRB 200  
SERIAL NUMBER : 15110C0497  
CALIBRATION DATE : 27-Jan-25  
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

## CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON POINTS AND LOCATED AS THE PICTURE.
2. REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER WITH TC TYPE K  
HYDRA 2635A  
6635300  
2476468  
26-Jun-25
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE 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 QUALITY CALIBRATION CO., LTD.

## RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

13	14	15
10	11	12
7	8	9
4	5	6
1	2	3
BLOCK No.1 FRONT		

13	14	15
10	11	12
7	8	9
4	5	6
1	2	3
BLOCK No.2 FRONT		

Block No.	1	2
Calibration Point (°C)	150	150
Controller temperature (°C)	144	144
Indicating Temperature	144	144
Measured Temperature (°C) at Spread Locations	1	150.01
	2	150.69
	3	150.40
	4	150.22
	5	150.27
	6	150.51
	7	150.24
	8	150.20
	9	150.14
	10	149.70
	11	149.58
	12	149.46
	13	148.77
	14	148.99
	15	149.02
Uncertainty of Measurement (± °C)		0.87

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

NOTE 3 : 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



F-G010 REV : 03



QUALITY CALIBRATION CO., LTD.

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



CERTIFICATE No : 25M2256  
REFERENCE No : 76365-3

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

ID No : BA09/61

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 : 07-Mar-25

APPROVED BY : PONGSAK J.

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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



F-G010 REV 03





CERTIFICATE No : 25M2256

PAGE : 2 OF 2

### Calibration Report

EQUIPMENT : DIGITAL BALANCE  
MANUFACTURER : SARTORIUS  
ID No : BA09/61  
AIR PRESSURE : 1009mbar ± 1mbar  
AMBIENT TEMPERATURE : 24° C ± 1° C  
MODEL : BSA2245-CW  
S/N : 36591843  
RECEIVED DATE : 07-Mar-25  
CALIBRATION DATE : 07-Mar-25  
RELATIVE HUMIDITY : 52 %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	OK-1-151	C02250116	28-Jun-25
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE 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)

**RESULT OF CALIBRATION** :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000071 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (± g)
0.00	0.0000	0.0000	0.00012
0.10	0.1000	0.0000	0.00012
0.20	0.2000	0.0000	0.00012
0.50	0.5000	0.0000	0.00012
1.00	1.0000	0.0000	0.00012
2.00	2.0000	0.0000	0.00012
5.00	5.0000	0.0000	0.00012
10.00	10.0000	0.0000	0.00012
20.00	20.0001	-0.0001	0.00012
50.00	50.0000	0.0000	0.00014
100.00	100.0001	-0.0001	0.00019
200.00	200.0001	-0.0001	0.00032

#### 5. OFF CENTER LOADING ERROR

POINT	READING (g)
1	100.0000
2	100.0000
3	100.0000
4	100.0000
5	100.0000
OFF-CENTER LOADING	0.0000

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



F-G010 REV 03



CERTIFICATE No : 24E6416  
REFERENCE No : 73694-1

PAGE : 1 OF 3

### Certificate of Calibration

EQUIPMENT : pH METER  
MANUFACTURER : HANNA  
MODEL : HI 3512  
SERIAL No : TH118035  
ID No : pH 04/56  
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 : 27-Jun-24

APPROVED BY : PONGSAK J.

ISSUED DATE : 27-Jun-24

RECEIVED DATE : 24-Jun-24

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

F-G010 REV 03



CERTIFICATE No : 24E6416

PAGE : 2 OF 3

### Calibration Report

EQUIPMENT : pH METER  
MANUFACTURER : HANNA  
ID No : pH 04/56  
RECEIVED DATE : 24-Jun-24  
AMBIENT TEMPERATURE : 23° C ± 3° C  
MODEL : HI 3512  
SERIAL NUMBER : TH118035  
CALIBRATION DATE : 27-Jun-24  
RELATIVE HUMIDITY : 50 % RH ± 10 % RH

#### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD BASED ON WL-TQ-062 AND WL-TQ-063. THE DISPLAY UNIT WAS TESTED BY GENERATING STANDARD VOLTAGE TO THE UNIT AND READING THE VALUE COMPARED WITH THE CALCULATED VALUE. THE DISPLAY AND ELECTRODE WAS CALIBRATED BY USING STANDARD pH BUFFER.

#### 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No/ LOT No	CERTIFICATE No	DUE DATE
1) pH STANDARD SOLUTION	00651-06	CC784945	4880-14413915	24-Aug-25
2) pH STANDARD SOLUTION	00651-08	CC785578	4881-14430633	31-Aug-25
3) pH STANDARD SOLUTION	00651-10	CC787086	4882-14483317	21-Sep-25
4) PROCESS CALIBRATOR	CA150	9156079	24E1251	09-Apr-25
5) BATH	260014	1247 48074	23T9014	13-Sep-24
6) THERMOMETER WITH PROBE	421504	55000379	23T9623	13-Sep-24

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

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

5. THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-

- NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

#### RESULT OF CALIBRATION : ADJUSTMENT

##### 1. DISPLAY UNIT ONLY

SLOPE FACTOR k = 2.303 RT/F = 59 mV/pH

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UUC READING (pH)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11	414.8	-0.69	-0.115	0.15	2.00
354.95	355.5	-0.55	0.884	0.15	2.00
295.80	296.4	-0.60	1.885	0.15	2.00
236.64	237.1	-0.46	2.886	0.15	2.00
177.48	178.0	-0.52	3.887	0.15	2.00
118.32	118.8	-0.48	4.887	0.15	2.00
59.16	59.6	-0.44	5.887	0.15	2.00
0.00	0.4	-0.40	6.888	0.15	2.00
-59.16	-58.7	-0.46	8.101	0.15	2.00
-118.32	-117.9	-0.42	9.345	0.15	2.00
-177.48	-177.4	-0.08	10.589	0.15	2.00
-236.64	-236.4	-0.24	11.834	0.15	2.00
-295.80	-294.5	-1.30	13.077	0.15	2.00
-354.95	-354.7	-0.25	14.322	0.15	2.00
-414.11	-413.9	-0.21	15.565	0.15	2.00

END OF CALIBRATION REPORT PAGE 2 OF 3

F-G010 REV 03



CERTIFICATE No : 24E6416

PAGE : 3 OF 3

### Calibration Report

#### RESULT OF CALIBRATION (CONTINUE) :

##### 2. DISPLAY UNIT WITH pH ELECTRODE S/N: 09081C6M

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (± pH)	COVERAGE FACTOR k
4.015	4.011	0.004	3.905	0.012	2.00
7.003	7.003	0.000	6.972	0.012	2.00
10.009	10.014	-0.005	9.570	0.014	2.00

##### 3. DISPLAY UNIT WITH TEMPERATURE

STANDARD READING (°C)	UUC READING (°C)	CORRECTION (°C)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (± °C)	COVERAGE FACTOR k
25.004	25.0	0.004	---	0.0085	2.00

##### 4. PERCENT SLOPE 100%

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT

F-G010 REV 03



Cert. No. : SP24020  
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, CHATUCHAK,  
BANGKOK 10900, THAILAND.

Location : WET CHEMISTRY LABORATORY IV

Ambient Temperature : ( 28.1 ± 5 ) °C  
Relative Humidity : ( 47.2 ± 25 ) %

Received Date : 27 AUGUST 2024  
Calibration Date : 27 AUGUST 2024  
Date of Issue : 27 AUGUST 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petchur*  
( Thanakul Petchurai )

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.

Cert. No. : SP24020  
Job No. : VC67SP0013  
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	1.0550	0.0033	0.0029	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0029	2.00
		29381	0.5	0.5416	0.5431	0.0015	0.0030	2.00
	546.1	29360	1.0	0.9821	0.9820	-0.0001	0.0028	2.00
		29914	0.7	0.6961	0.6958	-0.0003	0.0028	2.00
		29381	0.5	0.5073	0.5080	0.0007	0.0029	2.00
	590.0	29360	1.0	1.0222	1.0210	-0.0012	0.0028	2.00
		29914	0.7	0.7237	0.7221	-0.0016	0.0029	2.00
		29381	0.5	0.5361	0.5361	0.0000	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9745	-0.0008	0.0028	2.00
		29914	0.7	0.6910	0.6900	-0.0010	0.0029	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	0.2418	-0.0004	0.0101	2.00	
		40	0.4866	0.4852	-0.0014	0.0115	2.00	
		60	0.7414	0.7389	-0.0025	0.0067	2.00	
		80	0.9858	0.9842	-0.0016	0.0093	2.00	
		100	1.2442	1.2414	-0.0028	0.0086	2.00	

UUC\* = Unit Under Calibration

## Condition of this result of calibration : Spectrophotometer PERKINELMER Model Lambda 25 S/N 501S14123010

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)
0.0117	3.8659

\*\*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

*T. Petchur*Cert. No. : SP24020  
Job No. : VC67SP0013  
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-IN2N3N	13877	106918	03/11/2024
Potassium dichromate solutions	RM-0204060810	14204	106902	02/11/2024
Potassium Iodide solution	-	KI-0701-001	CI-0185-24	14/05/2026

## 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 ± (nm)	k Factor
RM-HL	278.13	278.3	0.17	0.16	2.00
	361.25	361.4	0.15	0.16	2.00
	467.82	467.7	-0.12	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.4	-0.10	0.16	2.00
RM-DL	740.09	739.9	-0.19	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC\* = Unit Under Calibration

*T. Petchur*

## Certificate of Calibration

Certificate No. : 68-400046-2

Page : 1 of 2

## Submitted by :

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

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

## Equipment :

Liquid in Glass Thermometer

Manufacturer : SK

Model : N/A

Range : 0 °C to 100 °C

Resolution : 1 °C

Serial No. : N/A

Immersion : Total

ID No. : TM21/59

## Environment :

Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

Date of Received : 21 January 2025

Date of Calibration : 24 January 2025

Date of Issue : 24 January 2025

Calibrated by : Chortip Samchusri

## Calibration Method :

This instrument was calibrated by In-house method comparison technique CAL-M4001 based on ASTM E77-07 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

## Reference Standard Instruments :

This certification is traceable to the International System of Units

## 1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400001	TT-0023-24	16 Feb 2026	National Institute of Metrology-Thailand (NIMT)

## 2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400003	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)
400004	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)

Approved by :

( Permon Chanpu )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co., Ltd.



## Certificate of Calibration

Certificate No. : 68-400046-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Ice point check : UUC\* reading 0 °C Standard reading 0.4429 °C

Standard Reading ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ± °C )
20.4801	20	0.5	0.31

## Remark

UUC : Unit Under Calibration

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%

- o O o -

CAL-F0031-03



## CERTIFICATE OF CALIBRATION

## FOR

NOMENCLATURE : CONDUCTIVITY METER  
 MANUFACTURER : METTLER TOLEDO  
 MODEL / TYPE : SEVEN COMPACT S230  
 SERIAL NO. : C141708983/5821320179[CD 05/65]  
 CLID. NO. : 272300452  
 JOB CONTROL NO. : 250204013412  
 CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

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

DATE OF RECEIVED : 04 February 2025

DATE OF ISSUED : 06 February 2025

The report of calibration shall not be reproduced except in full without approval of the calibration Laboratory Co., Ltd.

Calibrated By : Sukgaseem Sechanart  
 Wenick Inchaisri  
 Calibration Engineer



Approved By : Mongkol Yotsoontorn  
 Authorized Signatory  
 06 February 2025

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. Q25013412

F3-011-05/12-23

page 1 of 4



@clccalibration



## REPORT OF CALIBRATION

## FOR

NOMENCLATURE : CONDUCTIVITY METER  
 MANUFACTURER : METTLER TOLEDO  
 MODEL / TYPE : SEVEN COMPACT S230  
 SERIAL NO. : C141708983/5821320179[CD 05/65]  
 DATE OF CALIBRATION : 05 February 2025

## ENVIRONMENT CONDITIONS :

Temperature :  $(25 \pm 2.5) ^\circ\text{C}$  Relative Humidity :  $(50 \pm 15) \% \text{ RH}$

## PROCEDURE USED :

This instrument [ Conductivity Meter ] was calibrated under procedure No. WI-305-130.

The calibration was performed by direct measurement with Certified Reference Material (CRM) and Reference Material (RM).

This instrument [Temperature] was calibrated by comparison with Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

## REFERENCE STANDARD USED :

1. Conductivity Solution , Hanna Product Code HI 7033L Lot Number 7830.
2. Potassium Chloride Solution ( nominal 1.41 mS/cm )
3. Potassium Chloride Solution ( nominal 12.8 mS/cm )
4. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
5. Precision Thermometer, ASL Model F201 S/N. 016168/09.
6. IPRT, ASL Model T100-250-ID S/N. PO106346-1-13.

Certificate No. Q25013412

F3-011-05/12-23

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@clccalibration



## TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through Hanna instruments. Certificate No. 20F21 , Due Date June 2025 .
2. The measurements are traceable to International System of Units (SI) , through Sigma-Aldrich Canada Co. Certificate No. HC30595403 , Due Date 31 January 2026 .
3. The measurements are traceable to International System of Units (SI) , through Sigma-Aldrich Canada Co. Certificate No. HC20111554 , Due Date 30 September 2025.
4. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co , Ltd. Certificate No. Q24120999, Due Date 26 November 2025.
5. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 0424/67, Due Date 21 February 2025.
6. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand). Certificate No. TT-0035-24, Due Date 01 March 2025.

## UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 % . It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25013412

F3-011-05/12-23

page 3 of 4



@clccalibration





# 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



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD.  
214 Bangwak Rd. Bangpai Bangkai Bangkok 10160  
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



## CALIBRATION CERTIFICATE

Certificate No. : S2024090374-0003  
Date Issued : 23-Sep-24

Customer : S.P.S. CONSULTING SERVICE CO., LTD.  
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment : Incubator  
Manufacturer : BINDER  
Model : BD 115  
Serial No. : 12-16967  
ID No./Tag No. : IN 05/56  
Date Received : 16-Sep-24  
Date Calibrated : 16-Sep-24  
Calibrated by : Anusak Songliam

Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by:

Sorayuth T.  
(Sarayuth Tochua)



Page 1 of 2

Certificate No. Q25013412

F3-011-05/12-23

page 4 of 4



Certificate No. : S2024090374-0003

Environment : Ambient Temperature : Start record 23.7 °C, Stop record 23.5 °C  
Relative Humidity : Start record 54.6 %RH, Stop record 54.4 %RH

Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
35	35.0	35.0	0.04	0.21	0.38
41.5	41.5	41.5	0.07	0.19	0.30

Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	Uncertainty <sup>4</sup> (°C)
35	34.81	35.12	34.93	34.92	35.02	34.82	34.92	35.13	34.98	0.23
41.5	41.31	41.49	41.33	41.34	41.41	41.31	41.52	41.32	41.46	0.23

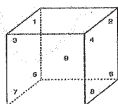
Decision Rule with Guard Band

Calibration Temperature (°C)	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	MPE (°C)
35	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	0.5
41.5	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	0.5

Pass =  $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$  MPE = Maximum Permissible Error  
Fail =  $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. 0



Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202407373-0005 for Temperature Indicator with Sensor Serial No. US37020317, Due 31-Jan-25

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

End of Certificate

Page 2 of 2



## QUALITY CALIBRATION CO., LTD.

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



CERTIFICATE No : 25T2261  
REFERENCE No : 76365-8

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
MODEL : WNB29  
SERIAL No : L614.0123  
ID No : WB 05/58  
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 : SUCHART S.  
CALIBRATION DATE : 07-Mar-25

APPROVED BY : PONGSUK J.

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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



F-G010 REV : 03



# 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 : 25T2261

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
ID NUMBER : WB 05/58  
RECEIVED DATE : 07-Mar-25  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
MODEL : WNB29  
SERIAL NUMBER : L614.0123  
CALIBRATION DATE : 07-Mar-25  
RELATIVE HUMIDITY : 51 %RH ± 10 % RH

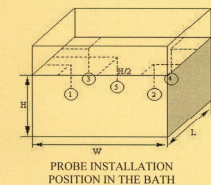
### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.

2. REFERENCE STANDARD INSTRUMENTS :-

1) DATA LOGGER WITH RTD  
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE 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 QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



### GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 0.6  
Overall Variation of Line Voltage (V) : 12  
Instrument Condition : Normal  
Bath Inner Size (W\*L\*H) : 60\*40\*10 cm

### BATH PERFORMANCE

Calibration Point (°C)	Temperature (°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
50.0	50.2	0.06	0.05	0.03	0.16
60.0	60.2	0.06	0.08	0.04	0.17

### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	#1	#2	#3	#4	Ref. 5	Uncertainty (± °C)
50.2	50.2	49.84	49.88	49.86	49.88	49.89	0.15
60.2	60.2	59.83	59.84	59.85	59.86	59.91	0.16

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE BATH.  
NOTE 2 : 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

F-G010 REV. 03



## GC Clarus 600/680 Preventive Maintenance (PM)

Company Name:	S.P.S. Consulting Service Co.,Ltd		
Address (Instrument Location):	7 Soi Phaholyothin 24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900.		
Serial Number:	680S14042502	Service Tag:	N68APSSFXXMP
Customer Name (if applicable):	Ms. Naruecha	PM number:	1 of 2
Service Engineer Name:	Monchai Kitcharoenkeat	Service Order Number:	WO-
Date PM Performed: (DD-MMM-YYYY)	22-Feb-2025	Next PM Due Date: (DD-MMM-YYYY)	22-Aug-2025

Part Number	Release	Publication Date	PerkinElmer
TH09370070	C	August 2016	

### Scope

The purpose of this PM is to ensure the continued functionality of the Clarus 600 and Clarus 680 GC 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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## GC Clarus600/680 Preventive Maintenance (PM)

Page 1



## Component List

Component / Specific Model	Serial #	Software Version	Configuration Notes
Clarus680	680S14042502	Totalchrom 6.3.2	PSS, PSS, FID,
Clarus SQ8T	648N4050804	Turbomass 6.4	
AtomX	US14113002	Tekma AtomX	

## Parts Lists

Additional Tools Required for PM				
Part Number (if applicable)	Description	Quantity	Serial #	Calibration Due Date (MM/YY)
N/A				
Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A				



## 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.

✓ Check incoming AC line voltage for proper levels and grounding.  
L-N 220 Volt  
L-G 220 Volt  
N-G 0.33 Volt

\*Neutral to ground not more than 0.5 volts peak to peak

✓ Inspect all gas line filters and traps; Replace if necessary with customer supplied spares.

Carrier gas: ☒ Helium ☐ Nitrogen ☐ Hydrogen  
Moisture level: ☒ Good ☐ Need to replace ☐ Other

Detector gas: ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium  
Moisture level: ☒ Good ☐ Need to replace ☐ Other

✓ Inspect the customer log book and make any appropriate PM entries.

✓ Leak check all fittings from the gas source to instrument.  
Gas leakage: ☒ Pass ☐ Fail Comment

✓ Perform general inspection of system for cleanliness.

✓ Inspect for functional and clean electronic cooling and oven vent fans  
Electronic cooling fan: ☒ Yes ☐ No  
Oven cooling fan: ☒ Yes ☐ No

### 2. Electronic :

✓ Check oven temperature. Calibrate if necessary.  
Oven temperature set point 150 °C: ☒ Pass ☐ Fail

✓ Check sub-ambient option. (If installed).  
Oven temperature set point 5 °C: ☐ Pass ☐ Fail

✓ Perform routine maintenance on detector/injector. Replace parts as necessary with customer supplied spares.

## GC Clarus600/680 Preventive Maintenance (PM)

Page 2

## GC Clarus600/680 Preventive Maintenance (PM)

Page 3

- ☒ Check flows, including split flows if applicable. Calibrate if necessary.  
Carrier flow Pass  
Split flow Pass
- ☒ Check detector gas flows and adjust if necessary.  
Detector flow Pass
- ☒ Autosampler installed ☒ Yes ☐ No  
Check autosampler sensor for wear and replace if necessary.  
Vial sensor Pass  
Door sensor Pass  
Tower sensor Pass  
Plunger sensor Pass  
Elevator sensor Pass
- ☒ Remove syringe, manually flush. Replace with customer supplied spare if necessary.
- ☒ Check firmware version. Upgrade to current levels if necessary.  
Firmware version 6.5
- ☒ Measure all accessible power supply voltages.  
5 Volt Pass  
+15 Volt Pass  
-15 Volt Pass  
24 Volt Pass
- ☒ Record all detector voltage signal.  
Detector Channel A 1.12 mV.  
Detector Channel B NA mV.

### 3. Diagnostics Tests:

- ☒ Run instrument diagnostics.  
☒ BRAM Pass  
☒ EPROM Pass
- ☒ Run Autosampler diagnostics.  
☒ BRAM Pass  
☒ EPROM Pass

### 4. 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.  
☒ Update Logbook.

## Additional Comments

### Additional Comments Regarding the PM

## Review

The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.

This Clarus600/680 GC Pass the preventive maintenance.

### Review of Preventive Maintenance:

Authorized PerkinElmer Representative: Monchai Kitcharoenkeat	Date: 22-Feb-2025 (DD-MM-YYYY)
Authorized Customer Representative: Ms.Naruecha	Date: 22-Feb-2025 (DD-MM-YYYY)

## MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

### ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

#### PinAAcle 900T

Customer : S.P.S.Consulting Service Co.,Ltd	Date Tested: January 6, 2025
Address : 7 Soi Phaholyothin 24	Recommendation Recertification
Phaholyothin Road	Period 6 Months
Jompol Chatuchak, Bangkok 10900	Recertification Due: July 6, 2025
User Name: K.Phenpha Vipasthawatt	Date Last Certified: July 4, 2024
Phone: 083-9269252	Visit Number: 1 OF 2
Email:	PerkinElmer Phone: 02-719-6420 ext 204
	PerkinElmer Fax: 02-318-5597

CONFIGURATION TESTED		
MODEL	SERIAL NUMBER	SOFTWARE
PinAAcle 900T	PTCS14111103	Wiblab V5.1
AS 900		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Copper	N9300183	APR 30 2025
GFAAS Mixed standard	N9300244	FEB 28 2025
MG0-042	N101-3000	
MG2-045	N101-3002	

## MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

### ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

#### PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	January 6, 2025
<b>1. INSTRUMENT CHECKS</b>			
A. The Mirror and Lenses Condition			OK
B. Grating Condition			OK
C. Replace or Clean Dust Filter			OK
D. Cleaning the Contact Cylinders			OK
E. Cleaning the Furnace Windows			OK
F. Cleaning the Burner Head			OK
G. Cleaning the Nebulizer			OK
H. Cleaning the Drain System			OK
<b>2. AUTOSAMPLE CHECK</b>			
A. Sampling and Arm			OK
B. Sampling & Rinse Pump			OK
C. Sample Position & Clean			OK
<b>3. COOLING SYSTEM CHECKS</b>			
A. Clean and Change Distill water			OK
B. Thermosensor			OK
<b>4. FIAS CHECKS</b>			
A. Pump and 5 Port Valve			N/A
B. Chemifold and Tubing			N/A
C. Power Supply			N/A
D. Flow meter and Gas system			N/A



# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	January 6, 2025
PARAMETER	SPECIFICATION	ACTUAL VAULE	
<b>A. Flame Mode Tests</b>			
1. Detector-Linearity with Barium (553.55 nm)			
Neutral Density Filter 0.2 :	0.2042 Abs. ± 5%	0.2029 Abs.	
Neutral Density Filter 1.0 :	0.9798 Abs. ± 5%	1.0137 Abs.	
2. Baseline Noise at 1 Abs with Barium (553.55 nm) (at an integration time of 0.5 seconds and 99 replicates)	SD ≤ 0.010 Abs.	0.0016 Abs.	
3. AA Baseline with Copper (Cu 324.75 nm) (at an integration time of 0.5 seconds and 99 replicates)	SD ≤ 0.001 Abs.	0.0002 Abs.	
4. D <sub>2</sub> Background Compensation (Copper 324.75 nm) with Neutral Density Filter 1.0	Absorbance ≤ 0.010 Abs	0.0020 Abs.	
5. AA-BG Baseline Noise with Copper (324.75 nm) (at an integration time of 2.0 seconds and 99 replicates)	SD ≤ 0.005 Abs.	0.0002 Abs.	
6. AA-BG Baseline Noise with Arsenic (193.70 nm) (at an integration time of 2.0 seconds and 99 replicates)	SD ≤ 0.005 Abs.	0.0007 Abs.	

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PerkinElmer Scientific (Thailand) Co., Ltd.  
290 Soi Soonvijai 4, Bangkok, Huay Kwang, Bangkok 10310 Head Office

# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	January 6, 2025
PARAMETER	SPECIFICATION	ACTUAL VAULE	
7. Flame Interlock Shutdown	Shutdown correct?	<input checked="" type="checkbox"/>	
8. Flame Sensitivity with Copper (324.75 nm) (5 mg/L Cu Standard a read time of 10 seconds 10 replicates, standard burner and Stainless steel nebulizer)	Sensitivity ≥ 0.250 Abs.	0.3115 Abs.	
(2 mg/L Cu Standard a read time of 10 seconds 10 replicates, standard burner and High sensitivity nebulizer)	Sensitivity ≥ 0.250 Abs.	N/A Abs.	

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PerkinElmer Scientific (Thailand) Co., Ltd.  
290 Soi Soonvijai 4, Bangkok, Huay Kwang, Bangkok 10310 Head Office

# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	January 6, 2025
PARAMETER	SPECIFICATION	ACTUAL VAULE	
<b>B. THGA Tests</b>			
1. Furnace Gas Flows			
Internal Flow	250 ± 25 mL/min	250 mL/min	
External Flow	100 ± 10 mL/min	100 mL/min	
2. Chromium Baseline Noise (357.87 nm) (measure 5 furnace dry firings without any sample)	Baseline ≤ 0.005 Int.Abs	0.0012	
	SD ≤ 0.005 Int.Abs	0.0002 Int.Abs.	
3. Chromium Characteristic Mass(m <sub>0</sub> ) and Precition (357.87 nm) (measure 5 furnace firing using 20 ul sample injections of 10 ug/L Cr standard)	m0 Results ≤ 7.0 pg/0.0044A-s	5.4 pg/0.0044A-s	
	Precision ≤ 2.0%	1.15 %	
4. Copper Characteristic Mass(m <sub>0</sub> ) and Zeeman Ratio (324.75 nm) (measure 5 furnace firing using 20 ul sample injections of 25 ug/L Cu standard)	m0 Results ≤ 16.5 pg/0.0044A-s	14.4 pg/0.0044A-s	
	Zeeman Ratio 0.52 ± 0.04	0.542	

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PerkinElmer Scientific (Thailand) Co., Ltd.  
290 Soi Soonvijai 4, Bangkok, Huay Kwang, Bangkok 10310 Head Office

# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	January 6, 2025
<b>Remarks :</b>			
- Neutral Density Filter refer to data sheet			
- Zeeman Ratio = $\frac{\text{Atomic Signal(peak area)}}{\text{Atomic Signal(peak area)+Background Signal(peak area)}}$			
= 0.1635/0.1635+0.1378			
0.542			
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 standrd terms and condition of sale, including warranty terms.			
<b>Service Department PerkinElmer Ltd.</b>			
Customer Service Engineer: <u>วิภาณ พรหมลุดา</u>			
( Wiphan Promlumda )			
Service Engineer			

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PerkinElmer Scientific (Thailand) Co., Ltd.  
290 Soi Soonvijai 4, Bangkok, Huay Kwang, Bangkok 10310 Head Office



WO-02612424/2024

**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

Customer : S.P.S.Consulting Service Co.,Ltd	Date Tested: January 6, 2025
Address : 7 Soi Phaholyothin 24	Recommendation Recertification
Paholyothin Road	Period 6 Months
Jompol Chatuchak, Bangkok 1090	Recertification Due: July 6, 2025
User Name: K.Phenpha Vipasthawatt	Date Last Certified: July 4, 2024
Phone: 083-9269252	Visit Number: 2 of 2
Fax: 02-513-4221	PerkinElmer Phone: 02-719-6420 ext 206
	PerkinElmer Fax: 02-318-5597

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
MODEL	SERIAL NUMBER	
OPTIMA 5300DV	077C7042401	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
IPV Methods		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Multielement Standard	N069-1579	December 30, 2025
Wavecal Solution	N058-2152	April 30, 2025
VIS Wavecal solution	N930-2946	December 30, 2025
Instrument Cal. STD4	N930-0221	August 30, 2025
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
2 % HNO3		
10 % HNO3		

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PerkinElmer Scientific (Thailand) Co., Ltd.  
290 Soi Soonvijai 4, Bangkok, Huay Kwang, Bangkok 10310 Head Office

WO-02612424/2024

**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

SERIAL NUMBER	077C7042401	DATE TESTED	January 6, 2025
<b>1. MECHANICAL CHECKS</b>			
A. Inspect and clean all fans and filters.			<input type="checkbox"/> OK
B. Inspect and replace as necessary, all torch components including the RF coil.			<input type="checkbox"/> OK
C. Inspect all tubing for sign of clacking or leaking.			<input type="checkbox"/> OK
D. Adjust water and gas pressure regulator settings.			<input type="checkbox"/> OK
E. Inspect and leak check pneumatics drawers.			<input type="checkbox"/> OK
F. Clean the exterior of the instrument.			<input type="checkbox"/> OK
<b>2. OPTICAL CHECKS</b>			
A. Inspect and clean all optical components.			<input type="checkbox"/> OK
B. As required, check and replace all purgefilters.			<input type="checkbox"/> OK
C. Recheck optical alignment.			<input type="checkbox"/> OK
<b>3. COOLING SYSTEM CHECKS</b>			
A. Perform preventive maintenance on chiller.			<input type="checkbox"/> OK
B. Flush out the chiller every year.			<input type="checkbox"/> N/A
<b>4. PERFORMANCE CHECKS</b>			
A. Torch View Alignment.			<input type="checkbox"/> OK
B. Wavelength Calibration.			<input type="checkbox"/> OK

Page 2 of 4

PerkinElmer Scientific (Thailand) Co., Ltd.  
290 Soi Soonvijai 4, Bangkok, Huay Kwang, Bangkok 10310 Head Office**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

SERIAL NUMBER : 077C7042401		DATE TESTED : January 6, 2025	
PARAMETER	SPECIFICATION	FINAL VALUE	
Spectral Resolution : UV	As 193.696 nm	≤ 0.007	0.00519
	Ni 231.604 nm	≤ 0.008	0.00667
	Ni 341.476 nm	≤ 0.012	0.00757
Spectral Resolution : VIS	La 408.672 nm	≤ 0.020	0.01621
	Ba 455.403 nm	≤ 0.025	0.02183
Precision	As 193.656 nm	% RSD < 1.0	0.51 %
	Zn 213.856 nm	% RSD < 1.0	0.48 %
	Mn 257.610 nm	% RSD < 1.0	0.03 %
	La 379.478 nm	% RSD < 1.0	0.05 %
	Ba 455.403 nm	% RSD < 1.0	0.07 %
	Ba 493.408 nm	% RSD < 1.0	0.04 %
Detection Limits : Axial	Ti 190.080 nm	3(sd)	10.65 ppb
	As 193.696 nm	3(sd)	2.48 ppb
	Pb 220.353 nm	3(sd)	3.09 ppb
Detection Limits : Radial	As 193.696 nm	3(sd)	12.41 ppb
	Zn 213.856 nm	3(sd)	0.91 ppb
	Mn 257.610 nm	3(sd)	0.13 ppb
	La 379.478 nm	3(sd)	4.74 ppb
	Ba 455.403 nm	3(sd)	0.10 ppb
	Ba 493.408 nm	3(sd)	0.18 ppb
BEC : Axial (IB X 500)(IS-IB)	Cd 226.502 nm	≤ 150 ppb	14.22
BEC : Radial (IB X 1000)(IS-IB)	Mn 257.610 nm	≤ 45 ppb	6.14

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PerkinElmer Scientific (Thailand) Co., Ltd.  
290 Soi Soonvijai 4, Bangkok, Huay Kwang, Bangkok 10310 Head Office

WO-02612424/2024

**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

SERIAL NUMBER	077C7042401	DATE TESTED	January 6, 2025
<b>Remarks :</b>			
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.			
<b>Service Department PerkinElmer Ltd.</b>			
Authorized Representative: <i>Wiphan Promlumda</i>			
( Wiphan Promlumda )			
Service Engineer			

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PerkinElmer Scientific (Thailand) Co., Ltd.  
290 Soi Soonvijai 4, Bangkok, Huay Kwang, Bangkok 10310 Head Office

ลำดับที่ 5

คุณภาพตะกอนดิน

Cert. No. : SP24020  
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, CHATUCHAK,  
BANGKOK 10900, THAILAND.

Location : WET CHEMISTRY LABORATORY IV

Ambient Temperature : ( 28.1 ± 5 ) °C  
Relative Humidity : ( 47.2 ± 25 ) %

Received Date : 27 AUGUST 2024  
Calibration Date : 27 AUGUST 2024  
Date of Issue : 27 AUGUST 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petchurai*  
( Thanakul Petchurai )

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.

Cert. No. : SP24020  
Job No. : VC67SP0013  
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	1.0550	0.0033	0.0029	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0029	2.00
		29381	0.5	0.5416	0.5431	0.0015	0.0030	2.00
	546.1	29360	1.0	0.9821	0.9820	-0.0001	0.0028	2.00
		29914	0.7	0.6961	0.6958	-0.0003	0.0028	2.00
		29381	0.5	0.5073	0.5080	0.0007	0.0029	2.00
	590.0	29360	1.0	1.0222	1.0210	-0.0012	0.0028	2.00
		29914	0.7	0.7237	0.7221	-0.0016	0.0029	2.00
		29381	0.5	0.5361	0.5361	0.0000	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9745	-0.0008	0.0028	2.00
		29914	0.7	0.6910	0.6900	-0.0010	0.0029	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	0.2418	-0.0004	0.0101	2.00	
		40	0.4866	0.4852	-0.0014	0.0115	2.00	
		60	0.7414	0.7389	-0.0025	0.0067	2.00	
		80	0.9858	0.9842	-0.0016	0.0093	2.00	
		100	1.2442	1.2414	-0.0028	0.0086	2.00	

UUC\* = Unit Under Calibration

Condition of this result of calibration : Spectrophotometer PERKINELMER Model Lambda 25 S/N 501S14123010

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)
0.0117	3.8659

\*\*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

Cert. No. : SP24020  
Job No. : VC67SP0013  
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-IN2N3N	13877	106918	03/11/2024
Potassium dichromate solutions	RM-0204060810	14204	106902	02/11/2024
Potassium Iodide solution	-	KI-0701-001	CI-0185-24	14/05/2026

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 ± (nm)	k Factor
RM-HL	278.13	278.3	0.17	0.16	2.00
	361.25	361.4	0.15	0.16	2.00
	467.82	467.7	-0.12	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.4	-0.10	0.16	2.00
RM-DL	740.09	739.9	-0.19	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC\* = Unit Under Calibration

*T. Petchurai*MAINTENANCE AND TEST CERTIFICATE MODEL  
OPTIMA 5300DV

Customer : S.P.S. Consulting Service Co., Ltd	Date Tested: January 6, 2025
Address : 7 Soi Phaholyothin 24	Recommendation Recertification
Paholyothin Road	Period 6 Months
Jompol Chatuchak, Bangkok 1090	Recertification Due: July 6, 2025
User Name: K.Phenpha Vipasthawatt	Date Last Certified: July 4, 2024
Phone: 083-9269252	Visit Number: 2 of 2
Fax: 02-513-4221	PerkinElmer Phone: 02-719-6420 ext 206
	PerkinElmer Fax: 02-318-5597

CONFIGURATION TESTED	SERIAL NUMBER	ACCESSORIES/COMPONENT NOT INCLUDED
MODEL OPTIMA 5300DV	077C7042401	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
IPV Methods		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Multielement Standard	N069-1579	December 30, 2025
Wavecal Solution	N058-2152	April 30, 2025
VIS Wavecal solution	N930-2946	December 30, 2025
Instrument Cal. STD4	N930-0221	August 30, 2025
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
2 % HNO3		
10 % HNO3		

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**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

SERIAL NUMBER	077C7042401	DATE TESTED	January 6, 2025
<b>1. MECHANICAL CHECKS</b>			
A. Inspect and clean all fans and filters.			<input type="checkbox"/> OK
B. Inspect and replace as necessary, all torch components including the RF coil.			<input type="checkbox"/> OK
C. Inspect all tubing for sign of clacking or leaking.			<input type="checkbox"/> OK
D. Adjust water and gas pressure regulator settings.			<input type="checkbox"/> OK
E. Inspect and leak check pneumatics drawers.			<input type="checkbox"/> OK
F. Clean the exterior of the instrument.			<input type="checkbox"/> OK
<b>2. OPTICAL CHECKS</b>			
A. Inspect and clean all optical components.			<input type="checkbox"/> OK
B. As required, check and replace all purgefilters.			<input type="checkbox"/> OK
C. Recheck optical alignment.			<input type="checkbox"/> OK
<b>3. COOLING SYSTEM CHECKS</b>			
A. Perform preventive maintenance on chiller.			<input type="checkbox"/> OK
B. Flush out the chiller every year.			<input type="checkbox"/> N/A
<b>4. PERFORMANCE CHECKS</b>			
A. Torch View Alignment.			<input type="checkbox"/> OK
B. Wavelength Calibration.			<input type="checkbox"/> OK

**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

SERIAL NUMBER	077C7042401	DATE TESTED	January 6, 2025
PARAMETER	SPECIFICATION	FINAL VALUE	
Spectral Resolution : UV	As 193.696 nm ≤ 0.007	0.00519	
	Ni 231.604 nm ≤ 0.008	0.00667	
	Ni 341.476 nm ≤ 0.012	0.00757	
Spectral Resolution : VIS	La 408.672 nm ≤ 0.020	0.01621	
	Ba 455.403 nm ≤ 0.025	0.02183	
Precision			
	As 193.656 nm % RSD < 1.0	0.51	%
	Zn 213.856 nm % RSD < 1.0	0.48	%
	Mn 257.610 nm % RSD < 1.0	0.03	%
	La 379.478 nm % RSD < 1.0	0.05	%
	Ba 455.403 nm % RSD < 1.0	0.07	%
	Ba 493.408 nm % RSD < 1.0	0.04	%
Detection Limits : Axial			
	Tl 190.080 nm 3(sd)	10.65	ppb
	As 193.696 nm 3(sd)	2.48	ppb
	Pb 220.353 nm 3(sd)	3.09	ppb
Detection Limits : Radial			
	As 193.696 nm 3(sd)	12.41	ppb
	Zn 213.856 nm 3(sd)	0.91	ppb
	Mn 257.610 nm 3(sd)	0.13	ppb
	La 379.478 nm 3(sd)	4.74	ppb
	Ba 455.403 nm 3(sd)	0.10	ppb
	Ba 493.408 nm 3(sd)	0.18	ppb
BEC : Axial (IB X 500)(IS-IB)	Cd 226.502 nm ≤ 150 ppb	14.22	
BEC : Radial (IB X 1000)(IS-IB)	Mn 257.610 nm ≤ 45 ppb	6.14	

**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

SERIAL NUMBER	077C7042401	DATE TESTED	January 6, 2025
<b>Remarks :</b>			
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.			
<b>Service Department PerkinElmer Ltd.</b>			
Authorized Representative: <u>Wiphon Promlumda</u>			
( Wiphon Promlumda )			
Service Engineer			

**MAINTENANCE REPORT AND CALIBRATION CERTIFICATE**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**PinAAcle 900T**

Customer :	S.P.S.Consulting Service Co.,Ltd	Date Tested:	January 6, 2025
		Recommendation Recertification	
Address :	7 Soi Phaholyothin 24	Period	6 Months
Paholyothin Road		Recertification Due:	July 6, 2025
Jompol Chatuchak, Bangkok 10900		Date Last Certified:	July 4, 2024
User Name:	K.Phenpha Vipasthawatt	Visit Number:	1 OF 2
Phone:	083-9269252	PerkinElmer Phone:	02-719-6420 ext 204
Email:		PerkinElmer Fax:	02-318-5597

<b>CONFIGURATION TESTED</b>		
MODEL	SERIAL NUMBER	SOFTWARE
PinAAcle 900T	PTCS14111103	Wiblab V5.1
AS 900		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Copper	N9300183	APR 30 2025
GFAAS Mixed standard	N9300244	FEB 28 2025
MG0-042	N101-3000	
MG2-045	N101-3002	

# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	January 6, 2025
<b>1. INSTRUMENT CHECKS</b>			
A. The Mirror and Lenses Condition			<input type="checkbox"/>
B. Grating Condition			<input type="checkbox"/>
C. Replace or Clean Dust Filter			<input type="checkbox"/>
D. Cleaning the Contact Cylinders			<input type="checkbox"/>
E. Cleaning the Furnace Windows			<input type="checkbox"/>
F. Cleaning the Burner Head			<input type="checkbox"/>
G. Cleaning the Nebulizer			<input type="checkbox"/>
H. Cleaning the Drain System			<input type="checkbox"/>
<b>2. AUTOSAMPLE CHECK</b>			
A. Sampling and Arm			<input type="checkbox"/>
B. Sampling & Rinse Pump			<input type="checkbox"/>
C. Sample Position & Clean			<input type="checkbox"/>
<b>3. COOLING SYSTEM CHECKS</b>			
A. Clean and Change Distill water			<input type="checkbox"/>
B. Thermosensor			<input type="checkbox"/>
<b>4. FIAS CHECKS</b>			
A. Pump and 5 Port Valve			<input type="checkbox"/>
B. Chemifold and Tubing			<input type="checkbox"/>
C. Power Supply			<input type="checkbox"/>
D. Flow meter and Gas system			<input type="checkbox"/>

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# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	January 6, 2025
PARAMETER	SPECIFICATION	ACTUAL VAULE	
<b>A. Flame Mode Tests</b>			
1. Detector-Linearity with Barium (553.55 nm)			
Neutral Density Filter 0.2 :	0.2042 Abs. $\pm 5\%$	0.2029	Abs.
Neutral Density Filter 1.0 :	0.9798 Abs. $\pm 5\%$	1.0137	Abs.
2. Baseline Noise at 1 Abs with Barium (553.55 nm)			
(at an integration time of 0.5 seconds and 99 replicates)	SD $\leq 0.010$ Abs.	0.0016	Abs.
3. AA Baseline with Copper (Cu 324.75 nm)			
(at an integration time of 0.5 seconds and 99 replicates)	SD $\leq 0.001$ Abs.	0.0002	Abs.
4. D <sub>2</sub> Background Compensation (Copper 324.75 nm)			
with Neutral Density Filter 1.0	Absorbance $\leq 0.010$ Abs	0.0020	Abs.
5. AA-BG Baseline Noise with Copper (324.75 nm)			
(at an integration time of 2.0 seconds and 99 replicates)	SD $\leq 0.005$ Abs.	0.0002	Abs.
6. AA-BG Baseline Noise with Arsenic (193.70 nm)			
(at an integration time of 2.0 seconds and 99 replicates)	SD $\leq 0.005$ Abs.	0.0007	Abs.

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# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	January 6, 2025
PARAMETER	SPECIFICATION	ACTUAL VAULE	
7. Flame Interlock Shutdown	Shutdown correct?	<input type="checkbox"/>	
8. Flame Sensitivity with Copper (324.75 nm)			
(5 mg/L Cu Standard a read time of 10 seconds			
10 replicates, standard burner and Stainless steel nebulizer)	Sensitivity $\geq 0.250$ Abs.	0.3115	Abs.
(2 mg/L Cu Standard a read time of 10 seconds			
10 replicates, standard burner and High sensitivity nebulizer)	Sensitivity $\geq 0.250$ Abs.	N/A	Abs.

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# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	January 6, 2025
PARAMETER	SPECIFICATION	ACTUAL VAULE	
<b>B. THGA Tests</b>			
1. Furnace Gas Flows			
Internal Flow	250 $\pm$ 25 mL/min	250	mL/min
External Flow	100 $\pm$ 10 mL/min	100	mL/min
2. Chromium Baseline Noise (357.87 nm)			
(measure 5 furnace dry firings without any sample)	Baseline $\leq 0.005$ Int.Abs	0.0012	
	SD $\leq 0.005$ Int.Abs	0.0002	Int.Abs.
3. Chromium Characteristic Mass( $m_0$ ) and Precision (357.87 nm)			
(measure 5 furnace firing using 20 ul sample injections of 10 ug/L Cr standard)	m0 Results $\leq 7.0$ pg/0.0044A-s	5.4	pg/0.0044A-s
	Precision $\leq 2.0\%$	1.15	%
4. Copper Characteristic Mass( $m_0$ ) and Zeeman Ratio (324.75 nm)			
(measure 5 furnace firing using 20 ul sample injections of 25 ug/L Cu standard)	m0 Results $\leq 16.5$ pg/0.0044A-s	14.4	pg/0.0044A-s
	Zeeman Ratio $0.52 \pm 0.04$	0.542	

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## MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER PTCS14111103 DATE TESTED January 6, 2025

Remarks :

- Neutral Density Filter refer to data sheet

- Zeeman Ratio = Atomic Signal(peak area)

Atomic Signal(peak area)+Background Signal(peak area)

= 0.1635/0.1635+0.1378

0.542

This is to certify that the above tests have been performed and the configuration tested



meets



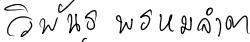
does not meet

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.**

Customer Service Engineer:



( Wiphan Promlunda )

Service Engineer