

## ภาคผนวกที่ 4

### เอกสารสอบเทียบความถูกต้องของเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

ลำดับที่ 1	คุณภาพอากาศในบรรยากาศ
ลำดับที่ 2	คุณภาพอากาศจากปล่อง
ลำดับที่ 3	ระดับเสียง
ลำดับที่ 4	คุณภาพน้ำจากระบบบำบัดน้ำเสีย

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
<b>1. คุณภาพอากาศในบรรยากาศ</b>		
TSP	High Volume Air Sampler Rec No. Blower No. B09, B14, B16, B22, B34, R07, R10, R12, R17, R18	Digital Balance
PM <sub>10</sub>	High Volume PM-10 Air Sampler Rec No. Blower No. B29, R02, R03, R04, R06, R10, R16	Digital Balance
SO <sub>2</sub>	Serial No. TRS1065, 0620617611, 1310957747, TRS1064, TRS1068, CM06280010, CM09540005,	Serial No. TRS1065, 0620617611, 1310957747, TRS1064, TRS1068, CM06280010, CM09540005
NO <sub>x</sub>	Serial No. 2368, 0620617608, CM13090047, 4466, 2285, 1170530044, CM09540006, 4468	Serial No. 2368, 0620617608, CM13090047, 4466, 2285, 1170530044, CM09540006, 4468
<b>2. คุณภาพอากาศจากปล่อง</b>		
Total Suspended Particulate	Console No. R04, R05 Pitot Tube No. B38	Digital Balance
Oxides of Nitrogen	Vacuum Gauge	Spectrophotometer
Sulfur Dioxide	Personal Pump SKC No. B04, B71, R34 Rotameter No. H-R01	-
Carbon Monoxide	Personal Pump SKC No. B52, B85, R38 Rotameter No. H-R01	CO Analyzer No. R01
<b>3. ระดับเสียงทั่วไป</b>		
L <sub>eq</sub> 5 min, L <sub>eq</sub> 1 hr, L <sub>eq</sub> 24 hr, L <sub>max</sub> , L <sub>90</sub> และ L <sub>dn</sub>	Acoustic Calibrator Sound Level Meter ACO-R22, R23	-
<b>4. ระดับเสียงในสถานประกอบการ</b>		
L <sub>eq</sub> 24 hr และ TWA	Acoustic Calibrator Sound Level Meter ACO-B18, B29, B33, B41 NMD-01, B02, B03, B04, B05, B06, B08, B09, B10, B11	-

ลำดับที่ 1

คุณภาพอากาศในบรรยากาศ



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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## High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

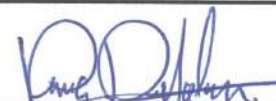
### Calibration Data

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	04/11/2024	y = 1.163x-2.904	0.998
B02	B02	04/11/2024	y = 1.132x+0.834	0.998
B03	B03	05/11/2024	y = 1.135x-2.920	0.999
B04	B04	01/11/2024	y = 1.183x-3.418	0.999
B05	B05	05/11/2024	y = 1.187x-5.657	0.999
B06	B06	05/11/2024	y = 1.143x-1.432	0.996
B07	B07	05/11/2024	y = 1.203x-6.640	0.998
B08	B08	01/11/2024	y = 1.151x-3.986	0.998
B09	B09	04/11/2024	y = 1.193x-5.144	0.998
B10	B10	05/11/2024	y = 1.172x-1.576	0.998
B11	B11	05/11/2024	y = 1.167x-3.909	0.997
B12	B12	06/11/2024	y = 1.159x-3.861	0.999
B13	B13	01/11/2024	y = 1.122x-2.328	0.998
B14	B14	01/11/2024	y = 1.177x-3.556	0.996
B15	B15	01/11/2024	y = 1.181x-3.355	0.999
B16	B16	06/11/2024	y = 1.182x-5.201	0.996
B17	B17	06/11/2024	y = 1.147x-1.345	0.998
B18	B18	01/11/2024	y = 1.180x-4.634	0.998
B19	B19	04/11/2024	y = 1.164x-4.313	0.997
B20	B20	04/11/2024	y = 1.161x-3.097	0.998
B21	B21	01/11/2024	y = 1.141x-3.592	0.997
B22	B22	05/11/2024	y = 1.182x-5.917	0.997
B23	B23	05/11/2024	y = 1.173x-3.417	0.997
B24	B24	05/11/2024	y = 1.077x-0.363	0.998
B25	B25	01/11/2024	y = 1.055x+2.460	0.999
B26	B26	01/11/2024	y = 1.120x-2.009	0.998
B27	B27	04/11/2024	y = 1.167x-4.826	0.999
B28	B28	04/11/2024	y = 1.196x-6.003	0.997
B29	B29	01/11/2024	y = 1.153x-1.833	0.997
B30	B30	04/11/2024	y = 1.155x-2.149	0.996
B31	B31	04/11/2024	y = 1.148x-3.317	0.998
B32	B32	05/11/2024	y = 1.124x-1.205	0.996
B33	B33	05/11/2024	y = 1.186x-3.999	0.996
B34	B34	01/11/2024	y = 1.147x-3.571	0.998

Calibrated by :

  
(Mr. Adul Dangklom)

Approved by :

  
(Mr. Peera Detudom)





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## 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	04/11/2024	y = 1.159x-2.093	0.999
B36	B36	04/11/2024	y = 1.167x-3.333	0.996
B37	B37	06/11/2024	y = 1.152x-2.051	0.997
B38	B38	04/11/2024	y = 1.144x-4.581	0.998
B39	B39	05/11/2024	y = 1.160x-3.397	0.997
B40	B40	01/11/2024	y = 1.168x-3.661	0.996
B41	B41	04/11/2024	y = 1.150x-2.581	0.999
B42	B42	04/11/2024	y = 1.177x-4.883	0.997
B43	B43	01/11/2024	y = 1.165x-3.033	0.998
B44	B44	05/11/2024	y = 1.173x-1.743	0.999
R01	R01	04/11/2024	y = 1.134x-3.385	0.998
R02	R02	04/11/2024	y = 1.173x-4.742	0.998
R03	R03	04/11/2024	y = 1.166x-4.405	0.998
R04	R04	01/11/2024	y = 1.133x-2.807	0.998
R05	R05	01/11/2024	y = 1.148x-2.112	0.997
R06	R06	01/11/2024	y = 1.196x-4.533	0.998
R07	R07	01/11/2024	y = 1.082x+0.340	0.999
R08	R08	01/11/2024	y = 1.112x-1.862	0.997
R09	R09	04/11/2024	y = 1.166x-3.534	0.997
R10	R10	04/11/2024	y = 1.191x-4.707	0.998
R11	R11	05/11/2024	y = 1.170x-4.815	0.997
R12	R12	05/11/2024	y = 1.138x-3.913	0.998
R13	R13	05/11/2024	y = 1.105x-2.238	0.998
R14	R14	06/11/2024	y = 1.183x-3.021	0.999
R15	R15	06/11/2024	y = 1.190x-5.879	0.999
R16	R16	06/11/2024	y = 1.137x-3.608	0.999
R17	R17	01/11/2024	y = 1.140x-2.475	0.998
R18	R18	01/11/2024	y = 1.142x-2.703	0.998
R19	R19	01/11/2024	y = 1.134x-4.199	0.999
R20	R20	04/11/2024	y = 1.147x-3.807	0.998

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(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>
B01	B01	01/11/2024	y = 1.151x-1.106	0.997
B02	B02	04/11/2024	y = 1.075x+1.368	0.999
B03	B03	04/11/2024	y = 1.172x-3.506	0.998
B04	B04	05/11/2024	y = 1.180x-5.127	0.999
B05	B05	01/11/2024	y = 1.177x-4.054	0.997
B06	B06	04/11/2024	y = 1.129x-2.114	0.996
B07	B07	04/11/2024	y = 1.152x-2.091	0.996
B08	B08	01/11/2024	y = 1.167x-2.006	0.998
B09	B09	01/11/2024	y = 1.174x-3.358	0.998
B10	B10	01/11/2024	y = 1.186x-4.531	0.999
B11	B11	04/11/2024	y = 1.169x-4.146	0.996
B12	B12	05/11/2024	y = 1.186x-4.531	0.999
B13	B13	04/11/2024	y = 1.133x-1.566	0.996
B14	B14	05/11/2024	y = 1.182x-4.388	0.998
B15	B15	01/11/2024	y = 1.130x-1.046	0.999
B16	B16	04/11/2024	y = 1.146x+0.731	0.996
B17	B17	04/11/2024	y = 1.179x-3.236	0.998
B18	B18	05/11/2024	y = 1.151x-1.687	0.999
B19	B19	05/11/2024	y = 1.121x-0.436	0.999
B20	B20	05/11/2024	y = 1.148x-3.271	0.999
B21	B21	01/11/2024	y = 1.134x+0.091	0.998
B22	B22	04/11/2024	y = 1.178x-3.448	0.997
B23	B23	01/11/2024	y = 1.154x-1.979	0.997
B24	B24	01/11/2024	y = 1.145x-1.926	0.998
B25	B25	06/11/2024	y = 1.159x-3.107	0.999
B26	B26	06/11/2024	y = 1.136x-2.099	0.997
B27	B27	04/11/2024	y = 1.174x-5.717	0.997
B28	B28	05/11/2024	y = 1.141x-2.949	0.996
B29	B29	05/11/2024	y = 1.180x-5.201	0.996
B30	B30	04/11/2024	y = 1.153x-3.408	0.997
B31	B31	04/11/2024	y = 1.181x+0.341	0.999
B32	B32	04/11/2024	y = 1.153x-1.684	0.996
B33	B33	01/11/2024	y = 1.142x-3.219	0.997
B34	B34	01/11/2024	y = 1.177x-1.129	0.996

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(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

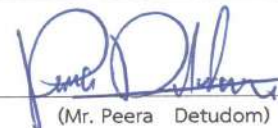
### Calibration Data

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	01/11/2024	y = 1.175x-5.215	0.998
R02	R02	01/11/2024	y = 1.157x-3.322	0.996
R03	R03	06/11/2024	y = 1.147x-4.899	0.998
R04	R04	06/11/2024	y = 1.158x-5.443	0.997
R05	R05	01/11/2024	y = 1.128x-3.926	0.997
R06	R06	01/11/2024	y = 1.135x-2.508	0.996
R07	R07	06/11/2024	y = 1.156x-2.437	0.996
R08	R08	06/11/2024	y = 1.163x-5.100	0.998
R09	R09	01/11/2024	y = 1.142x-4.291	0.996
R10	R10	01/11/2024	y = 1.184x-4.270	0.999
R11	R11	01/11/2024	y = 1.140x-1.292	0.997
R12	R12	01/11/2024	y = 1.182x-4.934	0.998
R13	R13	05/11/2024	y = 1.130x-1.455	0.997
R14	R14	04/11/2024	y = 1.177x-4.675	0.996
R15	R15	04/11/2024	y = 1.144x-4.059	0.998
R16	R16	01/11/2024	y = 1.163x-2.835	0.997
R17	R17	04/11/2024	y = 1.178x-3.580	0.996
R18	R18	04/11/2024	y = 1.136x-3.484	0.997
R19	R19	06/11/2024	y = 1.166x-4.037	0.996
R20	R20	06/11/2024	y = 1.152x-4.500	0.997

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

  
(Mr. Peera Detudom)



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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	01 December 2024	BRAND :	TELEDYNE	MODEL :	100E
NO.	SO <sub>2</sub> -R10	SERIAL NO.	TRS1065		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO <sub>2</sub> )			Cylinder No.	: A00814SK
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	399.8	-0.050	400.0	1.010
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	655	cc/min	650 ± 10%		
PMT	102.9	mV	-20-150 with Zero Air		
UV LAMP	3010.1	mV	1000-4900		
STR. LGT	61.7	PPB	<100		
DRK PMT	63	mV	-50 - 200		
DRK LMP	57.8	mV	-50 - 200		
HVPS	672	V	550-900 constant		
DCPS	2521	mV	2500 ± 200		
RCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.5	°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	1.010	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	22.2	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 :

Peer Detudom  
(Mr.Peera Detudom)





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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	01 December 2024	BRAND :	API	MODEL :	200A
NO.	NOX-B01	SERIAL NO.	2368		
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2024			Serial No. : 911		
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	%Dif	Analyzer Response	Slope
Zero	0	-0.11	-	0	-
NO Span	400	399.6	-0.100	400.0	1.003
NO <sub>x</sub> Span	400	399.8	-0.050	400.0	1.007
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	510	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	102.9	mV	-20 - 150		
AZERO	93.7	mV	-20 - 150		
HVPS	671	V	420 - 900 constant		
RCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.1	°C	8 - 48		
PMT TEMP	7.2	°C	7 ± 2		
MOLY TEMP	314.7	°C	315 ± 5		
RCELL 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>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	0.9	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 : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)

Job Number :	J092400007	Customer Name :	IRPC
Equipment :	AQMs Station.	Contact Name :	Khun Wirasak Khumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Technology Station	E-mail address/Fax. :	<a href="mailto:wirasak.k@irpc.co.th">wirasak.k@irpc.co.th</a>
Working Date :	23 November 2024	Working Hour :	6 Hours

## Service Report

Working Scope:

Service Station

Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค ผล Calibration พบว่าอยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Dilutor และ Zero Air พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 & PM-2.5 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค 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. 7 ea. (Part Support by IRPC)
- Silica gel. P/N: 6998 1/2 Bottle. (Part Support by IRPC)

Addition Recommended:

- NO<sub>x</sub> analyzer เป็นเครื่องของ สถานีกันหนอง ยกมาติดตั้งชั่วคราว
- Logger ยกกลับไปซ่อมที่ บ. PICO

-- End --

Serviced by :	เอกราช สะสีแสง	Serviced Date :	23 November 2024
Approved by:		Approved Date :	23 November 2024



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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 :	0620617608	Manufacturer :	Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
<b>Sample reading</b>				
NO reading	1.0	6.8	ppb	
NO <sub>x</sub> reading	5.2	18.4	ppb	
<b>Range</b>	500	500	ppb	50 to 1000 ppb
<b>Averaging Time</b>	30	30	Sec	10 to 300 Sec
<b>Calibration Factors</b>				
NO BKG. Ppb	37.5	37.4	ppb	0 to 60
NO <sub>x</sub> BKG. Ppb	37.4	37.3	ppb	0 to 60
NO COEF.	0.945	0.945	-	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
<b>Instrument Controls</b>				
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	40	40	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
<b>Diagnostics</b>				
<b>Voltages</b>				
<b>Motherboard voltages:</b>				
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	14.9	14.9	Vdc	15.0 ± 1 Vdc
24.0 Supply	23.7	23.7	Vdc	24.0 ± 1 Vdc
-3.3 Supply	-3.2	-3.2	Vdc	-3.3 ± 1 Vdc
<b>Interface board voltages:</b>				
PMT Supply	-1058.9	-1059.7	Vdc	-400 to -1200 Vdc
3.3 Supply	3.3	3.3	Vdc	3.3 ± 1 Vdc
5.0 Supply	4.9	4.9	Vdc	5.0 ± 1 Vdc
15.0 Supply	15.1	15.1	Vdc	15.0 ± 1 Vdc
P15.0 Supply	14.8	14.8	Vdc	15.0 ± 1 Vdc
24.0 Supply	23.4	23.4	Vdc	24.0 ± 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 ± 1 Vdc
<b>Temperatures</b>				
Internal	34.7	32.8	°C	15 °C to 45 °C
Chamber	50.1	49.9	°C	50°C ± 2 °C
Cooler	-3.0	-2.7	°C	(-)3 °C ± 2 °C
Converter	325.0	322.4	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
<b>Pressure</b>	298.5	284.2	mmHg	250 ± 100 mmHg
<b>Flow</b>	0.676	0.724	L/min	0.5 to 1.00 L/min

**Note :** เป็นเครื่องของสถานีกันหนอง ยกมาใช้ชั่วคราว



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SO<sub>2</sub> Analyzer

Equipment :	Sulfur Dioxide analyzer.	Model :	43i
Serial Number :	0620617611	Manufacturer :	Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading	2.9	5.1	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	52.5	52.6	ppb	0 to 60
SO <sub>2</sub> COEF	0.997	0.997	-	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	70	70	%	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	-588.7	-588.7		
Flash Supply	835	837		
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	23.6	23.6	Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal	34.2	33.6	°C	15°C to 45°C
Chamber	45.0	45.3	°C	45°C ± 2°C
Pressure	740.7	739.4	mmHg	750 ± 100 mmHg
Flow	0.478	0.477	L/min	0.5 to 1.00 L/min
Lamp intensity	47	47	%	40 – 100 %

Note :



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## SINGLE-POINT GAS CALIBRATION

All analyzer.

Equipment :	All analyzer.	Model :	42i, 43i , 48i , 49i , 410i, APHA-370
Serial Number :	--	Manufacturer :	Thermo, Horiba

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO <sub>2</sub> )	44.8	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	45.3	ppm	Model :	146i
Methane (CH <sub>4</sub> )	495	ppm	Serial number :	0630318396
Carbon Monoxide (CO)	4540	ppm		
Cylinder NO. :	D636101			
Expiration Date :	8 Sep 2026			

## BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0		0.00	400.0		-100.00	Valid
NO <sub>x</sub> (ppb)	0.0		0.00	400.0		-100.00	Valid
SO <sub>2</sub> (ppb)	0.0		0.00	400.0		-100.00	Valid
CO(ppm)	0.0		0.00	40.1		-100.00	Valid
O3(ppb)	0.0		0.00	400.0		-100.00	Valid
CH4(ppm)	0.0		0.00	4.50		-100.00	Valid
THC(ppm)	0.0		0.00	4.50		-100.00	Valid

## AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0		0.00	400.0		-100.00	Valid
NO <sub>x</sub> (ppb)	0.0		0.00	400.0		-100.00	Valid
SO <sub>2</sub> (ppb)	0.0		0.00	400.0		-100.00	Valid
CO(ppm)	0.0		0.00	40.1		-100.00	Valid
O3(ppb)	0.0		0.00	400.0		-100.00	Valid
CH4(ppm)	0.0		0.00	4.50		-100.00	Valid
THC(ppm)	0.0		0.00	4.50		-100.00	Valid

Remark : NO<sub>x</sub> เป็นเครื่องของสถานี กั้นหนอง ยกมาใช้ชั่วคราว ไม่มีการ cal. เนื่องจาก logger ยกกลับไปซ่อมที่ บ. PICO



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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 :	24 November 2024	Working Hour :	4 Hours

## Service Report

Working Scope:

รถเคลื่อนที่ AQMs micro#3 ปิดสถานี หยุดตรวจวัดอากาศ อยู่ที่ อนามัยหนองจอก จึงได้เข้าทำการตรวจเช็ค

Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

Correction working:


Part Replacement:

-

Addition Recommended:

-- End --

Serviced by :	ชินรอส มุขโรจน์	Serviced Date :	24 November 2024
Approved by:		Approved Date :	24 November 2024



บริษัท คิว-ชี โซลูชั่นส์ จำกัด

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NO-NO<sub>2</sub>-NO<sub>x</sub> AnalyzerEquipment : 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		
<b>Sample reading</b>				
NO reading			ppb	
NO <sub>x</sub> reading			ppb	
<b>Range</b>			ppb	50 to 1000 ppb
<b>Averaging Time</b>			Sec	10 to 300 Sec
<b>Calibration Factors</b>				
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
<b>Instrument Controls</b>				
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
<b>Diagnostics</b>				
<b>Voltages</b>				
<b>Motherboard voltages:</b>				
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
<b>Interface board voltages:</b>				
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
<b>Temperatures</b>				
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
<b>Pressure</b>			mmHg	250 ± 100 mmHg
<b>Flow</b>			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](mailto:info@qshe.co.th)

SO<sub>2</sub> Analyzer

Equipment : Sulfur Dioxide analyzer.

Model : 43i

Serial Number : 1310957747

Manufacturer : Thermo

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading			ppb	
Range			ppb	50 to 1000 ppb
Averaging Time			Sec	10 to 300 Sec
Calibration Factors				
SO <sub>2</sub> BKG. ppb			ppb	0 to 60
SO <sub>2</sub> COEF			-	1.0 ± 0.3
Instrument Controls				
Temp Compensation			On/Off	On
Pressure Compensation			On/Off	On
Flash Lamp			On/Off	On
Communication setting				
Baud Rate			bps	9600 to 115000
Instrument ID			-	0 to 99
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				
Flash Supply				
3.3 Supply			Vdc	3.3 +/- 1 Vd
5.0 Supply			Vdc	5.0 +/- 1 Vdc
15.0 Supply			Vdc	15.0 +/- 1 Vdc
-15.0 Supply			Vdc	-15.0 +/- 1 Vdc
24.0 Supply			Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal			°C	15°C to 45°C
Chamber			°C	45°C ± 2°C
Pressure			mmHg	750 ± 100 mmHg
Flow			L/min	0.5 to 1.00 L/min
Lamp intensity			%	40 – 100 %

Note : หน้าจอมีด มองไม่ชัดเจน



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## 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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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com www.spscon.com

CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	01 December 2024	BRAND :	TELEDYNE	MODEL :	TML-60
NO.	SO <sub>2</sub> -R08	SERIAL NO.	TRS1064		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO <sub>2</sub> )			Cylinder No.	: A00814SK
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	1.006
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.6	in-Hg	25-35		
SAMPLE FLOW	653	cc/min	650 ± 10%		
PMT	103.5	mV	-20-150 with Zero Air		
UV LAMP	3041.8	mV	1000-4900		
STR. LGT	61.7	PPB	<100		
DRK PMT	63.1	mV	-50 - 200		
DRK LMP	58.0	mV	-50 - 200		
HVPS	675	V	550-900 constant		
DCPS	2529	mV	2500 ± 200		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.0	°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	1.006	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	22.0	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

### CHEMILUMINESCENT NO / NO<sub>2</sub> / NO<sub>x</sub> ANALYZER

DATE : 01 December 2024

BRAND : API

MODEL : 200E

NO. NOX-R06

SERIAL NO. 4466

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2024

Serial No. : 911

#### 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 Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.004
NO <sub>x</sub> Span	400	399.9	-0.025	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	506	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.0	mV	-20 - 150
AZERO	93.6	mV	-20 - 150
HVPS	671	V	420 - 900 constant
RCELL TEMP	50.0	°C	50 ± 1
BOX TEMP	28.9	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	314.9	°C	315 ± 5
RCELL PRESS	8.4	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	1.001	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.004	-	1.0 ± 0.3
NO Offset	0.9	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 :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



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

CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	01 December 2024	BRAND :	TELEDYNE	MODEL :	TML-60
NO.	SO <sub>2</sub> -R07	SERIAL NO.	TRS1068		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO <sub>2</sub> )			Cylinder No.	: A00814SK
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	400.3	0.075	400.0	1.002
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	656	cc/min	650 ± 10%		
PMT	102.8	mV	-20-150 with Zero Air		
UV LAMP	2090.5	mV	1000-4900		
STR. LGT	60.9	PPB	<100		
DRK PMT	62.7	mV	-50 - 200		
DRK LMP	57.9	mV	-50 - 200		
HVPS	673	V	550-900 constant		
DCPS	2517	mV	2500 ± 200		
RCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.1	°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	1.002	-	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)





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 :	01 December 2024	BRAND :	API	MODEL :	200E
NO.	NOX-R02	SERIAL NO.	2285		
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2024			Serial No. : 911		
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	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.6	-0.100	400.0	1.005
NO <sub>x</sub> Span	400	399.9	-0.025	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	509	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.0	mV	-20 - 150		
AZERO	93.7	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCELL TEMP	50.4	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.0	°C	7 ± 2		
MOLY TEMP	315.3	°C	315 ± 5		
RCELL 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	1.005	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.008	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO <sub>x</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)

Job Number :	J092400007	Customer Name :	IRPC
Equipment :	AQMs Station.	Contact Name :	KhunWirasakKhumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Pluak Kate Station	E-mail address/Fax. :	<a href="mailto:wirasak.k@irpc.co.th">wirasak.k@irpc.co.th</a>
Working Date :	03 December 2024	Working Hour :	4 Hours

## Service Report

Working Scope:

Service Station

Physical Checking:

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

Correction working:

Calibrate single-point of all analyzers.	Drain water for pump of Zero Air.
Replace sample filter 47 mm.	Replace pump of CO analyzer.

Part Replacements:

- Sample Filter 47 mm. 6 ea. (Part support by IRPC)
- Pump of CO analyzer. 1 ea. (Part support by IRPC)

Addition Recommended:

- End -

Serviced by :	เอกราช สะสีแสง	Serviced Date	03 December 2024
Approved by:		Approved Date :	03 December 2024



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7/409 ซอยวิภาวดีรังสิต 36 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900

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 :	1170530044	Manufacturer :	Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading				
NO reading	47.8	1.0	ppb	
NO <sub>x</sub> reading	86.9	6.2	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
NO BKG. ppb	12.8	12.8	ppb	0 to 60
NO <sub>x</sub> BKG. ppb	12.4	12.5	ppb	0 to 60
NO COEF.	0.969	0.975	-	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	45	45	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
Diagnostics				
Voltages				
PMT Supply	-917.6	-917.6	Vdc	-400 to -1200 Vdc
5 Supply	4.9	4.9	Vdc	5.0 ± 1 Vdc
15 Supply	15.1	15.1	Vdc	15.0 ± 1 Vdc
-15 Supply	-14.8	-14.8	Vdc	-15.0 ± 1 Vdc
Temperatures				
Internal	32.9	33.6	°C	15 °C to 45 °C
Chamber	49.7	49.7	°C	50°C ± 2 °C
Cooler	-2.7	-2.8	°C	(-)3 °C ± 2 °C
Converter	325.3	326.0	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
Pressure	284.7	285.6	mmHg	250 ± 100 mmHg
Flow	0.659	0.653	L/min	0.5 to 1.00 L/min

Note :



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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)

SO<sub>2</sub> Analyzer

Equipment : Sulfur Dioxide analyzer.

Model : 43I-BZSAB

Serial Number : CM06280010

Manufacturer : Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading	1.9	0.9	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	22.5	22.6	ppb	0 to 60
SO <sub>2</sub> COEF	0.956	0.953	-	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	23.9	23.9	Vdc	24.0 +/- 1 Vdc
-3.3 Supply	-3.2	-3.2	Vdc	- 3.3 +/- 1 Vdc
Interface board voltages:				
PMT Supply	-602.0	-602.0		
Flash Supply	829	828		
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	14.7	14.7	Vdc	15.0 +/- 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 +/- 1 Vdc
24.0 Supply	23.9	23.9	Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal	33.7	34.6	°C	15°C to 45°C
Chamber	45.2	45.1	°C	45°C ± 2°C
Pressure	727.3	723.7	mmHg	750 ± 100 mmHg
Flow	0.624	0.624	L/min	0.5 to 1.00 L/min
Lamp intensity	91	91	%	40 – 100 %

Note :



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## SINGLE-POINT GAS CALIBRATION

All analyzer.

Equipment :	All analyzer.	Model :	42C, 43i , 48i, 49i
Serial Number :	0504710413,CM06280010, 1201351403,CM09040067	Manufacturer :	Thermo

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO <sub>2</sub> )	44.7	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	45.0	ppm	Model :	146C
Methane (CH <sub>4</sub> )	498	ppm	Serial number :	0504710414
Carbon oxide (CO)	4550	ppm		
Cylinder NO. :	A00931SK			
Expiration Date :	8 Sep 2026			

## BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00	1.0	1.00	400	399.0	-0.25	Valid
NO <sub>x</sub> (ppb)	0.00	1.6	1.60	400	403.0	0.75	Valid
SO <sub>2</sub> (ppb)	0.00	1.0	1.00	400	400.0	0.00	Valid
CO (ppm)	0.00	0.08	0.08	40.3	40.0	-0.74	Valid
O <sub>3</sub> (ppb)	0.00	1.0	1.00	400	399.0	-0.25	Valid
CH <sub>4</sub> (ppm)	0.00			5.00			
THC (ppm)	0.00			5.00			

## AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00	1.0	1.00	400	400.0	0.00	Valid
NO <sub>x</sub> (ppb)	0.00	1.9	1.90	400	403.0	0.75	Valid
SO <sub>2</sub> (ppb)	0.00	1.0	1.00	400	399.0	-0.25	Valid
CO (ppm)	0.00	0.10	0.10	40.3	40.3	0.00	Valid
O <sub>3</sub> (ppb)	0.00	1.0	1.00	400	397.0	-0.75	Valid
CH <sub>4</sub> (ppm)	0.00			5.00			
THC (ppm)	0.00			5.00			

Remark :



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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 :	AQMs Station.	Contact Name :	Khun Wirasak Khumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Technology Station	E-mail address/Fax. :	<a href="mailto:wirasak.k@irpc.co.th">wirasak.k@irpc.co.th</a>
Working Date :	07 December 2024	Working Hour :	6 Hours

## Service Report

Working Scope:

Service Station

Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค ผล Calibration พบว่าอยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Dilutor และ Zero Air พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 & PM-2.5 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค 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. 7 ea. (Part Support by IRPC)
- Silica gel. P/N: 6998 1/2 Bottle. (Part Support by IRPC)

Addition Recommended:

- NO<sub>x</sub> analyzer เป็นเครื่องของ สถานีกันหนอง ยกมาติดตั้งชั่วคราว
- Logger ยกกลับไปซ่อมที่ บ. PICO

-- End --

Serviced by :	เอกราช สะสีแสง	Serviced Date :	07 December 2024
Approved by:		Approved Date :	07 December 2024



บริษัท คิว-ซี โซลูชั่นส์ จำกัด

7/409 ซอยวิภาวดีรังสิต 36 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900

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 :	0620617608	Manufacturer :	Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
<b>Sample reading</b>				
NO reading	0.6	0.3	ppb	
NO <sub>x</sub> reading	1.8	3.3	ppb	
<b>Range</b>	500	500	ppb	50 to 1000 ppb
<b>Averaging Time</b>	30	30	Sec	10 to 300 Sec
<b>Calibration Factors</b>				
NO BKG. Ppb	31.3	32.0	ppb	0 to 60
NO <sub>x</sub> BKG. Ppb	31.6	31.5	ppb	0 to 60
NO COEF.	0.800	0.805	-	1.0 ± 0.3
NO <sub>x</sub> COEF.	0.972	0.995	-	1.0 ± 0.3
NO <sub>2</sub> COEF.	1.000	1.000	-	1.0 ± 0.3
<b>Instrument Controls</b>				
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	40	40	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
<b>Diagnostics</b>				
<b>Voltages</b>				
<b>Motherboard voltages:</b>				
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	14.9	14.9	Vdc	15.0 ± 1 Vdc
24.0 Supply	23.7	23.7	Vdc	24.0 ± 1 Vdc
-3.3 Supply	-3.2	-3.2	Vdc	-3.3 ± 1 Vdc
<b>Interface board voltages:</b>				
PMT Supply	-1058.9	-1055.9	Vdc	-400 to -1200 Vdc
3.3 Supply	3.3	3.3	Vdc	3.3 ± 1 Vdc
5.0 Supply	4.9	4.9	Vdc	5.0 ± 1 Vdc
15.0 Supply	15.1	15.1	Vdc	15.0 ± 1 Vdc
P15.0 Supply	14.8	14.8	Vdc	15.0 ± 1 Vdc
24.0 Supply	23.4	23.4	Vdc	24.0 ± 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 ± 1 Vdc
<b>Temperatures</b>				
Internal	34.5	34.4	°C	15 °C to 45 °C
Chamber	49.9	50.0	°C	50°C ± 2 °C
Cooler	-2.8	-2.7	°C	(-)3 °C ± 2 °C
Converter	326.6	322.1	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
<b>Pressure</b>	256.5	257.7	mmHg	250 ± 100 mmHg
<b>Flow</b>	0.755	0.773	L/min	0.5 to 1.00 L/min

**Note :** เป็นเครื่องของสถานีกันหนอง ยกมาใช้ชั่วคราว



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SO<sub>2</sub> Analyzer

Equipment :	Sulfur Dioxide analyzer.	Model :	43i
Serial Number :	0620617611	Manufacturer :	Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading	4.7	1.5	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	57.2	56.7	ppb	0 to 60
SO <sub>2</sub> COEF	1.060	1.035	-	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	70	70	%	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	-589.0	-589.0		
Flash Supply	838	837		
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	23.6	23.6	Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal	33.8	33.4	°C	15°C to 45°C
Chamber	45.0	45.2	°C	45°C ± 2°C
Pressure	734.3	735.2	mmHg	750 ± 100 mmHg
Flow	0.475	0.475	L/min	0.5 to 1.00 L/min
Lamp intensity	47	47	%	40 – 100 %

Note :



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โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8

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## SINGLE-POINT GAS CALIBRATION

All analyzer.

Equipment :	All analyzer.	Model :	42i, 43i , 48i , 49i , 410i, APHA-370
Serial Number :	--	Manufacturer :	Thermo, Horiba

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO <sub>2</sub> )	44.8	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	45.3	ppm	Model :	146i
Methane (CH <sub>4</sub> )	495	ppm	Serial number :	0630318396
Carbon Monoxide (CO)	4540	ppm		
Cylinder NO. :	D636101			
Expiration Date :	8 Sep 2026			

## BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	1.40	1.40	400.0	397.0	-0.75	Valid
NO <sub>x</sub> (ppb)	0.0	0.10	0.10	400.0	394.0	-1.50	Valid
SO <sub>2</sub> (ppb)	0.0	2.40	2.40	400.0	413.0	3.25	Valid
CO(ppm)	0.0	0.10	0.10	40.1	40.3	0.50	Valid
O3(ppb)	0.0	0.90	0.90	400.0	397.0	-0.75	Valid
CH4(ppm)	0.0		0.00	4.50		-100.00	Valid
THC(ppm)	0.0		0.00	4.50		-100.00	Valid

## AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	0.50	0.50	400.0	400.0	0.00	Valid
NO <sub>x</sub> (ppb)	0.0	1.80	1.80	400.0	404.0	1.00	Valid
SO <sub>2</sub> (ppb)	0.0	0.90	0.90	400.0	402.0	0.50	Valid
CO(ppm)	0.0	0.1	0.10	40.1	40.1	0.00	Valid
O3(ppb)	0.0	0.30	0.30	400.0	399.0	-0.25	Valid
CH4(ppm)	0.0	0.01	0.01	4.50	4.50	0.00	Valid
THC(ppm)	0.0	0.01	0.01	4.50	4.50	0.00	Valid

Remark :



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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 :	11 December 2024	Working Hour :	4 Hours

## Service Report

Working Scope:

รถเคลื่อนที่ AQMs micro#3 ปิดสถานี หยุดตรวจวัดอากาศ อยู่ที่ อนามัยหนองจอก จึงได้เข้าทำการตรวจเช็ค

Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

Correction working:


Replace silica gel for dryer NO <sub>x</sub> Analyzer.	Drain water for pump of Zero Air.
Replace sample filter 47 mm.	

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 :	ชินรส มุขโรจน์	Serviced Date :	11 December 2024
Approved by:		Approved Date :	11 December 2024



บริษัท คิว-ซี โซลูชันส์ จำกัด

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NO-NO<sub>2</sub>-NO<sub>x</sub> AnalyzerEquipment : 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		
<b>Sample reading</b>				
NO reading	4.4	4.1	ppb	
NO <sub>x</sub> reading	7.2	5.4	ppb	
<b>Range</b>	500	500	ppb	50 to 1000 ppb
<b>Averaging Time</b>	60	60	Sec	10 to 300 Sec
<b>Calibration Factors</b>				
NO BKG. ppb	12.4	12.4	ppb	0 to 60
NO <sub>x</sub> BKG. ppb	11.2	11.2	ppb	0 to 60
NO COEF.	0.948	0.948	-	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
<b>Instrument Controls</b>				
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	55	55	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
<b>Diagnostics</b>				
<b>Voltages</b>				
<b>Motherboard voltages:</b>				
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	14.9	14.9	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
<b>Interface board voltages:</b>				
PMT Supply	-905.3	-905.3	Vdc	-400 to -1200 Vdc
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	14.9	14.9	Vdc	15.0 ± 1 Vdc
P15.0 Supply	15.2	15.2	Vdc	15.0 ± 1 Vdc
24.0 Supply	23.3	23.3	Vdc	24.0 ± 1 Vdc
-15.0 Supply	-15.2	-15.2	Vdc	-15.0 ± 1 Vdc
<b>Temperatures</b>				
Internal	27.9	28.4	°C	15 °C to 45 °C
Chamber	49.9	49.9	°C	50°C ± 2 °C
Cooler	-2.7	-2.8	°C	(-)3 °C ± 2 °C
Converter	325.5	323.4	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
<b>Pressure</b>	271.0	276.7	mmHg	250 ± 100 mmHg
<b>Flow</b>	0.639	0.631	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	Nominal range
	Before	After		
Sample reading	5.4	6.5	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	54.0	54.1	ppb	0 to 60
SO <sub>2</sub> COEF	0.977	0.977	-	1.0 ± 0.3
Instrument Controls				
Temp Compensation	On	On	On/Off	On
Pressure Compensation	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 Contrast	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	-684.5	-684.5		
Flash Supply	894	894		
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	14.7	14.7	Vdc	15.0 +/- 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 +/- 1 Vdc
24.0 Supply	23.2	23.2	Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal	32.6	32.8	°C	15°C to 45°C
Chamber	45.0	45.1	°C	45°C ± 2°C
Pressure	382.6	783.1	mmHg	750 ± 100 mmHg
Flow	0.523	0.523	L/min	0.5 to 1.00 L/min
Lamp intensity	90	90	%	40 – 100 %

Note :



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## 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: off auto cal เนื่องจาก pump zero air ชำรุด



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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 :	AQMs Station.	Contact Name :	Khun Wirasak Khumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Ban Lang Station	E-mail address/Fax. :	<a href="mailto:wirasak.k@irpc.co.th">wirasak.k@irpc.co.th</a>
	03 December 2024	Working Hour :	6 Hours

## Service Report

Working Scope:

Service Station

Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค ผล Calibration พบว่าอยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Dilutor และ Zero Air พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค 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.
Replace diaphragm pump of CO analyzer.	


Part Replacement:

- Sample filter 47 mm. 5 ea. (Part Support by IRPC)
- Silica gel. P/N: 6998 1/2 Bottle. (Part Support by IRPC)
- Diaphragm pump of CO analyzer. 1 ea. (Part Support by IRPC)

Addition Recommended:

- Zero air นำมาจาก Micro#1 มาติดตั้งใช้งานชั่วคราว

-- End --

Serviced by :	เอกราช สะสีแสง	Serviced Date :	03 December 2024
Approved by:		Approved Date :	03 December 2024



บริษัท คิว-ซี โซลูชั่นส์ จำกัด

7/409 ซอยวิภาวดีรังสิต 36 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900

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> AnalyzerEquipment : NO-NO<sub>2</sub>-NO<sub>x</sub> analyzer.

Model : 42i

Serial Number : CM9540006

Manufacturer : Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
<b>Sample reading</b>				
NO reading	1.5	0.6	ppb	
NO <sub>x</sub> reading	8.5	2.9	ppb	
<b>Range</b>	500	500	ppb	50 to 1000 ppb
<b>Averaging Time</b>	60	60	Sec	10 to 300 Sec
<b>Calibration Factors</b>				
NO BKG. ppb	41.3	43.1	ppb	0 to 60
NO <sub>x</sub> BKG. ppb	40.2	42.3	ppb	0 to 60
NO COEF.	1.238	1.031	-	1.0 ± 0.3
NO <sub>x</sub> COEF.	0.986	1.000	-	1.0 ± 0.3
NO <sub>2</sub> COEF.	1.000	1.000	-	1.0 ± 0.3
<b>Instrument Controls</b>				
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	45	45	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
<b>Diagnostics</b>				
<b>Voltages</b>				
<b>Motherboard voltages:</b>				
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	15.3	15.3	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
<b>Interface board voltages:</b>				
PMT Supply	-1055.6	-1055.6	Vdc	-400 to -1200 Vdc
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
P15.0 Supply	15.1	15.1	Vdc	15.0 ± 1 Vdc
24.0 Supply	23.9	23.9	Vdc	24.0 ± 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 ± 1 Vdc
<b>Temperatures</b>				
Internal	39.1	38.4	°C	15 °C to 45 °C
Chamber	41.3	41.2	°C	50°C ± 2 °C
Cooler	-2.9	-2.8	°C	(-)3 °C ± 2 °C
Converter	325.3	324.5	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
<b>Pressure</b>	279.4	278.8	mmHg	250 ± 100 mmHg
<b>Flow</b>	0.572	0.574	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 :	CM09540005	Manufacturer :	Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading	2.6	1.0	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	29.9	27.9	ppb	0 to 60
SO <sub>2</sub> COEF	0.992	0.925	-	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	45	45	%	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	23.9	23.9	Vdc	24.0 +/- 1 Vdc
-3.3 Supply	-3.2	-3.2	Vdc	- 3.3 +/- 1 Vdc
Interface board voltages:				
PMT Supply	-717.4	-717.4		
Flash Supply	902	903		
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	14.7	14.7	Vdc	15.0 +/- 1 Vdc
-15.0 Supply	-14.9	-14.9	Vdc	-15.0 +/- 1 Vdc
24.0 Supply	23.8	23.8	Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal	37.5	37.2	°C	15°C to 45°C
Chamber	45.2	45.4	°C	50°C ± 2°C
Pressure	730.8	731.1	mmHg	750 ± 100 mmHg
Flow	0.528	0.542	L/min	0.5 to 1.00 L/min
Lamp intensity	91	92	%	40 – 100 %

Note :



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## SINGLE-POINT GAS CALIBRATION

All analyzer.

Equipment :	All analyzer.	Model :	42i, 43i, 49i, 48i, APHA-370
Serial Number :	--	Manufacturer :	Thermo, Horiba

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO <sub>2</sub> )	44.7	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	43.7	ppm	Model :	146i
Methane (CH <sub>4</sub> )	499	ppm	Serial number :	CM09350122
Carbon Monoxide (CO)	4560	ppm		
Cylinder NO. :	D519488			
Expiration Date :	8 Sep 2026			

## BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	1.0	1.0	400	396	-1.0	valid
NO <sub>x</sub> (ppb)	0.0	0.0	0.0	400	399	-0.3	valid
SO <sub>2</sub> (ppb)	0.0	0.9	0.9	403	400	-0.7	valid
CO (ppm)	0.0	0.2	0.2	40.1	40.0	-0.2	valid
O <sub>3</sub> (ppb)	0.0	1.0	1.0	400	396	-1.0	valid
CH <sub>4</sub> (ppm)	0.0			4.00			
THC (ppm)	0.0			4.00			

## AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	1.0	1.0	400	399	-0.3	valid
NO <sub>x</sub> (ppb)	0.0	1.0	1.0	400	401	0.3	valid
SO <sub>2</sub> (ppb)	0.0	1.1	1.1	403	402	-0.2	valid
CO (ppm)	0.0	0.1	0.1	40.1	40.0	-0.2	valid
O <sub>3</sub> (ppb)	0.0	1.0	1.0	400	403	0.8	valid
CH <sub>4</sub> (ppm)	0.0	0.01	0.010	4.00	4.00	0.0	valid
THC (ppm)	0.0	0.01	0.010	4.00	4.00	0.0	valid

Remark : Percent Error per point must be less than  $\pm 5\%$ 

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บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chulachak, Bangkok 10900  
Tel : (662) 939-4370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com www.spscon.com

CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	12 December 2024	BRAND :	TELEDYNE	MODEL :	TML-60
NO.	SO <sub>2</sub> -R08	SERIAL NO.	TRS1064		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO <sub>2</sub> )			Cylinder No.	: A00814SK
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	1.008
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	28.6	in-Hg	25-35		
SAMPLE FLOW	660	cc/min	650 ± 10%		
PMT	103.5	mV	-20-150 with Zero Air		
UV LAMP	3041.5	mV	1000-4900		
STR. LGT	61.7	PPB	<100		
DRK PMT	63.2	mV	-50 - 200		
DRK LMP	57.9	mV	-50 - 200		
HVPS	674	V	550-900 constant		
DCPS	2525	mV	2500 ± 200		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.8	°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	1.008	-	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)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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Tel : (662) 939-4370-72, 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 :	12 December 2024	BRAND :	API	MODEL :	200E	
NO.	NOX-R07	SERIAL NO.	4468			
Calibrator (Dilution System)						
Brand : API			Model : 700			
Last Cal. Date : 05 August 2024			Serial No. : 911			
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	%Dif	Analyzer Response	Slope	
Zero	0	0.10	-	0	-	
NO Span	400	400.1	0.025	400.0	1.010	
NO <sub>x</sub> Span	400	400.2	0.050	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	511	cc/min	500 ± 50			
OZONE FLOW	79	cc/min	80 ± 15			
PMT	103.2	mV	-20 - 150			
AZERO	94.0	mV	-20 - 150			
HVPS	669	V	420 - 900 constant			
RCELL TEMP	50.1	°C	50 ± 1			
BOX TEMP	29.2	°C	8 - 48			
PMT TEMP	7.3	°C	7 ± 2			
MOLY TEMP	314.7	°C	315 ± 5			
RCELL 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	1.010	-	1.0 ± 0.3			
NO <sub>x</sub> Slope	1.013	-	1.0 ± 0.3			
NO Offset	1.5	mV	-20 to +150			
NO <sub>x</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 :

Peera Detudom  
(Mr.Peera Detudom)



CERTIFICATE No : 24M2227

REFERENCE No : 72448-1

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** : 08-Mar-24

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 14-Mar-24

**RECEIVED DATE** : 08-Mar-24





CERTIFICATE No : 24M2227

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA05/50 RECEIVED DATE : 08-Mar-24  
AIR PRESSURE : 1010mbar  $\pm$  1mbar CALIBRATION DATE : 08-Mar-24  
AMBIENT TEMPERATURE : 25°C  $\pm$  1°C RELATIVE HUMIDITY : 53 %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	QK-I-151	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

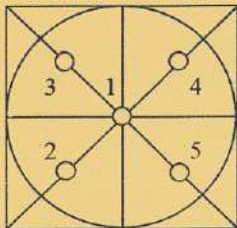
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 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	0.02001	-0.00001	0.000065
0.10	0.10002	-0.00002	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	9.99994	0.00006	0.000070
20.00	20.00008	-0.00008	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	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

ลำดับที่ 2

คุณภาพอากาศจากปล่อง



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## Console Calibration Report

Calibration Method

Critical Orifices

### Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	$\Delta H_{\text{g}}$ (mmH <sub>2</sub> O)
B01	1563	03/12/2024	0.999	49.77
B02	8002514	02/12/2024	0.997	49.92
B03	1503016	04/12/2024	0.996	49.68
B04	00006659	02/12/2024	0.998	49.59
B05	00007428	04/12/2024	0.996	49.73
R01	1561	05/12/2024	0.999	49.88
R02	8002513	03/12/2024	0.996	49.65
R03	1570	02/12/2024	1.002	50.04
R04	8002519	03/12/2024	0.997	49.45
R05	1503015	04/12/2024	1.003	49.98

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

Accept Value of  $\Delta H_{\text{g}}$  (test) is  $46.7 \pm 6.4$  (mmH<sub>2</sub>O)

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 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

## Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

### Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	04/11/2024	0.84	0.84
B37	S	0.99	04/11/2024	0.84	0.84
B38	S	0.99	04/11/2024	0.85	0.84
B39	S	0.99	05/11/2024	0.84	0.84
B40	S	0.99	05/11/2024	0.84	0.83
B41	S	0.99	01/11/2024	0.85	0.84
B44	S	0.99	01/11/2024	0.84	0.84
B45	S	0.99	04/11/2024	0.84	0.84
B46	S	0.99	05/11/2024	0.85	0.84
B47	S	0.99	05/11/2024	0.84	0.84
B48	S	0.99	05/11/2024	0.84	0.83
B49	S	0.99	05/11/2024	0.84	0.84
B54	S	0.99	05/11/2024	0.85	0.84
B56	S	0.99	05/11/2024	0.84	0.83
B57	S	0.99	01/11/2024	0.84	0.85
B58	S	0.99	01/11/2024	0.83	0.84

Remark : Accept value of Cp (test) is  $0.84 \pm 0.01$

Calibrated by

:

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :



(Mr. Peera Detudom)



## CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : VACUUM GAUGE  
MANUFACTURER : HI-LIGHT  
MODEL / TYPE : N/A  
SERIAL NO. : N/A[64-220066-2]  
CLID. NO. : 212201113  
JOB CONTROL NO. : 240730078440  
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 : 30 July 2024

DATE OF ISSUED : 02 August 2024

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

Calibrated By : Sittipong Pimdee  
Calibration Engineer

Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
02 August 2024



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. Q24078440

F3-011-05/12-23

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@clccalibration

## REPORT OF CALIBRATION

### FOR

NOMENCLATURE	:	VACUUM GAUGE
MANUFACTURER	:	HI-LIGHT
MODEL / TYPE	:	N/A
SERIAL NO.	:	N/A[64-220066-2]
DATE OF CALIBRATION	:	31 July 2024
DUE DATE OF CALIBRATION	:	31 July 2025

---

#### ENVIRONMENT CONDITIONS :

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

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

#### PROCEDURE USED :

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

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

#### REFERENCE STANDARD USED :

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

#### TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).  
Certificate No. MP-0040-24, Due Date 08 February 2025.

#### UNCERTAINTY :

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

Certificate No. Q24078440

F3-011-05/12-23

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**CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

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

## CALIBRATION DATA

### **CORRECTION OF PRESSURE**

DUC Test point ( inHg )	STD Reading ( kPa )		Conversion to inHg		Correction ( inHg )	
	Up	Down	Up	Down	Up	Down
0	0.000	0.000	0.0	0.0	0.0	0.0
-5	-16.591	-16.930	-4.9	-5.0	+0.1	0.0
-10	-33.521	-33.521	-9.9	-9.9	+0.1	+0.1
-15	-50.113	-50.113	-14.8	-14.8	+0.2	+0.2
-20	-66.704	-67.043	-19.7	-19.8	+0.3	+0.2
-25	-83.634	-83.973	-24.7	-24.8	+0.3	+0.2
-30	-100.564	-100.564	-29.7	-29.7	+0.3	+0.3

Uncertainty of measurement  $\pm 0.2$  inHg

Transmitting fluid : Air.

Technical Note. Conversion factor 1 kPa ; 0.2953003 inHg

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 43 of 67

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

**### End of Certificate ###**

Certificate No. Q24078440

F3-011-05/12-23

page 3 of 3







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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B01	SKC	224-PCXR4	262101	03/10/2024	1,000	1,500	2,000	1,006	1,505	2,012	1.013x - 17.267	0.999
B02	SKC	224-PCXR4	626166	03/10/2024	1,000	1,500	2,000	998	1,500	1,995	1.000x - 2.067	1.000
B03	SKC	224-PCXR4	612968	02/10/2024	1,000	1,500	2,000	1,005	1,494	2,006	0.998x + 4.721	0.999
B04	SKC	224-PCXR4	602804	03/10/2024	1,000	1,500	2,000	996	1,511	2,007	1.012x - 19.485	0.999
B05	SKC	224-PCXR4	612693	02/10/2024	1,000	1,500	2,000	1,005	1,504	2,008	1.004x - 4.306	1.000
B06	SKC	224-PCXR4	262188	02/10/2024	1,000	1,500	2,000	1,013	1,505	2,008	0.996x + 6.748	0.999
B07	SKC	224-PCXR4	626262	02/10/2024	1,000	1,500	2,000	1,005	1,506	2,010	1.011x - 12.753	1.000
B08	SKC	224-PCXR4	626100	03/10/2024	1,000	1,500	2,000	1,000	1,498	1,993	0.995x + 5.105	1.000
B09	SKC	224-PCXR4	626479	02/10/2024	1,000	1,500	2,000	1,005	1,494	2,002	0.996x + 5.969	1.000
B10	SKC	224-PCXR4	091950	02/10/2024	1,000	1,500	2,000	1,004	1,504	2,008	1.011x - 15.436	1.000
B11	SKC	224-PCXR8	564315	03/10/2024	1,000	1,500	2,000	1,010	1,497	2,001	0.993x + 10.007	1.000
B12	SKC	224-PCXR4	034656	04/10/2024	1,000	1,500	2,000	998	1,507	2,005	1.013x - 22.552	0.999
B13	SKC	224-PCXR4	602073	03/10/2024	1,000	1,500	2,000	1,001	1,494	2,000	0.998x + 1.307	1.000
B14	SKC	224-PCXR4	626313	03/10/2024	1,000	1,500	2,000	1,014	1,504	2,013	0.999x + 8.699	1.000
B15	SKC	224-PCXR4	626474	03/10/2024	1,000	1,500	2,000	1,006	1,513	2,008	1.002x - 0.788	0.999
B16	SKC	224-PCXR4	626477	03/10/2024	1,000	1,500	2,000	1,001	1,514	2,009	1.009x - 11.678	1.000
B17	SKC	224-PCXR4	626860	02/10/2024	1,000	1,500	2,000	1,018	1,513	2,013	0.997x + 11.094	0.999
B18	SKC	224-PCXR4	691484	02/10/2024	1,000	1,500	2,000	999	1,498	1,999	1.000x + 0.668	1.000
B19	SKC	224-PCXR4	691599	03/10/2024	1,000	1,500	2,000	1,000	1,508	2,007	1.004x - 5.189	1.000
B20	SKC	224-PCXR4	691587	03/10/2024	1,000	1,500	2,000	997	1,514	2,005	1.010x - 12.129	1.000
B21	SKC	224-PCXR4	691531	04/10/2024	1,000	1,500	2,000	996	1,499	2,000	1.001x - 1.875	1.000
B22	SKC	224-PCXR4	691654	03/10/2024	1,000	1,500	2,000	999	1,508	2,006	1.008x - 13.641	1.000
B23	SKC	224-PCXR4	798393	03/10/2024	1,000	1,500	2,000	1,001	1,494	1,995	0.996x + 3.954	1.000
B24	SKC	224-PCXR4	626363	02/10/2024	1,000	1,500	2,000	999	1,492	2,003	1.001x - 3.994	1.000
B25	SKC	224-PCXR4	798489	03/10/2024	1,000	1,500	2,000	1,001	1,501	1,995	0.993x + 10.846	1.000
B26	SKC	224-PCXR4	798479	03/10/2024	1,000	1,500	2,000	996	1,507	2,004	1.007x - 13.888	1.000
B27	SKC	224-PCXR4	691673	03/10/2024	1,000	1,500	2,000	1,006	1,505	2,009	1.010x - 14.064	0.999
B28	SKC	224-PCXR4	691570	03/10/2024	1,000	1,500	2,000	996	1,510	2,008	1.012x - 19.941	0.999
B29	SKC	224-PCXR4	626472	03/10/2024	1,000	1,500	2,000	1,005	1,502	2,005	1.006x - 9.763	1.000
B30	SKC	224-PCXR4	691489	03/10/2024	1,000	1,500	2,000	1,004	1,501	2,008	1.009x - 13.737	1.000
B31	SKC	224-PCXR4	691509	03/10/2024	1,000	1,500	2,000	1,012	1,497	1,997	0.990x + 14.932	1.000
B32	SKC	224-PCXR4	091567	03/10/2024	1,000	1,500	2,000	1,010	1,510	2,008	1.003x - 3.978	0.999
B33	SKC	224-PCXR4	091756	02/10/2024	1,000	1,500	2,000	998	1,512	2,005	1.007x - 10.478	1.000
B34	SKC	224-PCXR4	612962	02/10/2024	1,000	1,500	2,000	999	1,504	2,000	1.001x - 0.963	1.000
B35	SKC	224-PCXR4	602682	02/10/2024	1,000	1,500	2,000	1,004	1,498	2,002	0.996x + 5.501	1.000
B36	SKC	224-PCXR4	626164	02/10/2024	1,000	1,500	2,000	1,008	1,507	2,004	1.000x + 2.331	1.000
B37	SKC	224-PCXR4	626256	04/10/2024	1,000	1,500	2,000	1,008	1,505	2,008	1.002x - 2.423	1.000
B38	SKC	224-PCXR4	626167	04/10/2024	1,000	1,500	2,000	997	1,499	1,998	1.001x - 2.994	1.000
B39	SKC	224-PCXR4	034637	04/10/2024	1,000	1,500	2,000	998	1,504	1,999	1.004x - 8.599	1.000
B40	SKC	224-PCXR4	798349	04/10/2024	1,000	1,500	2,000	1,001	1,500	1,994	0.999x - 2.619	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B41	SKC	224-PCXR4	612669	02/10/2024	1,000	1,500	2,000	1,010	1,497	2,001	0.994x + 9.527	1.000
B42	SKC	224-PCXR4	626041	04/10/2024	1,000	1,500	2,000	998	1,507	2,005	1.009x - 14.416	0.999
B43	SKC	224-PCXR4	034636	03/10/2024	1,000	1,500	2,000	1,005	1,494	2,001	0.995x + 6.369	1.000
B44	SKC	224-PCXR8	529341	03/10/2024	1,000	1,500	2,000	1,010	1,494	2,000	0.990x + 14.704	1.000
B45	SKC	224-PCXR8	529594	02/10/2024	1,000	1,500	2,000	1,014	1,504	2,010	0.997x + 11.890	1.000
B46	SKC	224-PCXR8	566743	04/10/2024	1,000	1,500	2,000	1,006	1,514	2,009	1.002x - 1.391	0.999
B47	SKC	224-PCXR8	566747	02/10/2024	1,000	1,500	2,000	1,000	1,513	2,009	1.009x - 11.714	1.000
B48	SKC	224-PCXR8	566753	04/10/2024	1,000	1,500	2,000	1,020	1,513	2,012	0.995x + 15.140	0.999
B49	SKC	224-PCXR8	566780	04/10/2024	1,000	1,500	2,000	999	1,498	2,000	1.000x + 0.144	1.000
B50	SKC	224-PCXR8	500400	04/10/2024	1,000	1,500	2,000	1,000	1,508	2,006	1.004x - 5.541	1.000
B51	SKC	224-PCXR8	500363	04/10/2024	1,000	1,500	2,000	996	1,506	2,005	1.007x - 10.582	1.000
B52	SKC	224-PCXR8	093186	03/10/2024	1,000	1,500	2,000	998	1,509	2,003	1.006x - 10.386	1.000
B53	SKC	224-PCXR8	707670	03/10/2024	1,000	1,500	2,000	1,000	1,493	1,996	0.994x + 4.977	0.999
B54	SKC	224-PCXR3	509821	02/10/2024	1,000	1,500	2,000	1,001	1,493	2,008	1.006x - 9.295	1.000
B55	SKC	224-PCXR3	510710	04/10/2024	1,000	1,500	2,000	999	1,508	2,004	1.005x - 8.519	1.000
B56	SKC	224-PCXR3	511450	03/10/2024	1,000	1,500	2,000	1,003	1,502	2,012	1.008x - 10.418	1.000
B57	SKC	224-PCXR3	510798	02/10/2024	1,000	1,500	2,000	997	1,503	2,005	1.009x - 15.639	1.000
B58	SKC	224-PCXR3	509852	02/10/2024	1,000	1,500	2,000	1,016	1,517	2,008	0.994x + 13.453	0.999
B59	SKC	224-PCXR3	509862	04/10/2024	1,000	1,500	2,000	999	1,511	2,010	1.010x - 14.912	0.999
B60	SKC	224-PCXR3	512655	02/10/2024	1,000	1,500	2,000	1,009	1,514	1,996	0.992x + 12.737	0.999
B61	SKC	224-PCXR3	503915	04/10/2024	1,000	1,500	2,000	1,005	1,503	2,006	1.011x - 15.735	0.999
B62	SKC	224-PCXR3	505975	03/10/2024	1,000	1,500	2,000	1,006	1,513	2,008	1.002x - 0.788	0.999
B63	SKC	224-PCXR3	511432	02/10/2024	1,000	1,500	2,000	1,020	1,513	2,013	0.995x + 14.152	0.999
B64	SKC	224-PCXR3	508302	04/10/2024	1,000	1,500	2,000	1,000	1,508	2,007	1.004x - 5.189	1.000
B65	SKC	224-PCXR3	508310	02/10/2024	1,000	1,500	2,000	997	1,514	2,005	1.006x - 7.652	1.000
B66	SKC	224-PCXR3	509861	04/10/2024	1,000	1,500	2,000	996	1,499	2,003	1.009x - 13.421	1.000
B67	SKC	224-PCXR3	506295	03/10/2024	1,000	1,500	2,000	998	1,510	2,004	1.010x - 17.666	0.999
B68	SKC	224-PCXR3	505872	03/10/2024	1,000	1,500	2,000	998	1,494	1,997	0.996x + 2.043	1.000
B69	SKC	224-PCXR3	508375	04/10/2024	1,000	1,500	2,000	996	1,499	2,003	1.004x - 4.961	1.000
B70	SKC	224-PCXR3	510623	03/10/2024	1,000	1,500	2,000	1,002	1,504	2,000	1.002x - 1.959	1.000
B71	SKC	224-PCXR3	508367	03/10/2024	1,000	1,500	2,000	996	1,503	1,999	1.003x - 5.913	1.000
B72	SKC	224-PCXR3	505977	04/10/2024	1,000	1,500	2,000	997	1,499	1,996	0.998x - 0.140	1.000
B73	SKC	224-PCXR3	512606	02/10/2024	1,000	1,500	2,000	1,005	1,504	2,007	1.008x - 11.262	1.000
B74	SKC	224-PCXR3	505993	03/10/2024	1,000	1,500	2,000	998	1,504	2,002	1.005x - 10.110	1.000
B75	SKC	224-PCXR3	509820	02/10/2024	1,000	1,500	2,000	1,004	1,503	2,007	1.009x - 12.679	1.000
B76	SKC	224-PCXR3	509811	04/10/2024	1,000	1,500	2,000	1,005	1,493	2,003	0.997x + 5.309	1.000
B77	SKC	224-PCXR3	508301	02/10/2024	1,000	1,500	2,000	998	1,495	2,002	1.002x - 3.498	1.000
B78	SKC	224-PCXR3	510677	03/10/2024	1,000	1,500	2,000	1,015	1,505	2,010	1.003x - 0.420	0.999
B79	SKC	224-PCXR3	510920	04/10/2024	1,000	1,500	2,000	999	1,493	2,004	1.008x - 14.332	1.000

Calibrated by :

Adul Dangkhom  
(Mr. Adul Dangkhom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B80	SKC	224-PCXR3	504569	03/10/2024	1,000	1,500	2,000	998	1,507	2,003	1.007x - 12.517	1.000
B81	SKC	224-PCXR3	503480	03/10/2024	1,000	1,500	2,000	997	1,496	1,997	1.001x - 3.994	1.000
B82	SKC	224-PCXR3	505673	03/10/2024	1,000	1,500	2,000	1,005	1,503	2,006	1.001x - 1.851	0.999
B83	SKC	224-PCXR3	510785	02/10/2024	1,000	1,500	2,000	1,001	1,505	2,000	0.999x + 0.108	1.000
B84	SKC	224-PCXR3	508333	02/10/2024	1,000	1,500	2,000	1,003	1,504	1,999	1.001x - 1.315	1.000
B85	SKC	224-PCXR3	505757	02/10/2024	1,000	1,500	2,000	1,003	1,506	2,001	1.003x - 1.855	1.000
B86	SKC	224-PCXR3	512625	04/10/2024	1,000	1,500	2,000	1,000	1,501	1,998	1.000x - 1.111	1.000
B87	SKC	224-PCXR3	504324	04/10/2024	1,000	1,500	2,000	999	1,509	2,007	1.009x - 15.683	0.999
B88	SKC	224-PCXR3	508307	04/10/2024	1,000	1,500	2,000	999	1,500	1,996	0.996x + 4.825	1.000
B89	SKC	224-PCXR3	509860	04/10/2024	1,000	1,500	2,000	1,002	1,503	2,006	1.008x - 10.170	1.000
B90	SKC	224-PCXR3	508366	02/10/2024	1,000	1,500	2,000	999	1,506	2,003	1.000x - 0.612	1.000
B91	SKC	224-PCXR3	510919	02/10/2024	1,000	1,500	2,000	1,011	1,504	2,001	0.991x + 17.894	1.000
B92	SKC	224-PCXR3	510987	03/10/2024	1,000	1,500	2,000	1,004	1,505	2,008	1.008x - 10.210	1.000
B93	SKC	224-PCXR3	509845	03/10/2024	1,000	1,500	2,000	1,005	1,505	2,005	1.005x - 5.793	1.000
B94	SKC	224-PCXR8	A127871	03/10/2024	1,000	1,500	2,000	1,003	1,503	2,001	1.003x - 3.458	1.000
B95	SKC	224-PCXR8	A127921	01/10/2024	1,000	1,500	2,000	998	1,506	2,006	1.008x - 11.706	1.000
B96	SKC	224-PCXR8	A127942	01/10/2024	1,000	1,500	2,000	1,003	1,502	2,000	0.999x + 2.679	1.000
B97	SKC	224-PCXR8	A127955	01/10/2024	1,000	1,500	2,000	1,004	1,505	2,008	1.010x - 12.557	1.000
B98	SKC	224-PCXR8	A127956	01/10/2024	1,000	1,500	2,000	998	1,497	2,001	1.004x - 8.311	1.000

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 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
R01	SKC	224-PCXR4	602467	03/10/2024	1,000	1,500	2,000	1,005	1,505	2,008	1.006x - 6.472	1.000
R02	SKC	224-PCXR4	626450	04/10/2024	1,000	2,000	3,000	1,003	1,503	2,006	1.009x - 16.691	0.999
R03	SKC	224-PCXR4	691592	03/10/2024	1,000	1,500	2,000	996	1,506	2,006	1.008x - 13.145	1.000
R04	SKC	224-PCXR4	691672	02/10/2024	1,000	1,500	2,000	1,003	1,502	2,000	0.995x + 7.476	1.000
R05	SKC	224-PCXR4	798470	02/10/2024	1,000	1,500	2,000	1,004	1,505	2,008	1.005x - 7.440	1.000
R06	SKC	224-PCXR4	798456	04/10/2024	1,000	1,500	2,000	1,003	1,506	2,001	1.003x - 1.855	1.000
R07	SKC	224-PCXR4	798480	03/10/2024	1,000	1,500	2,000	995	1,501	1,997	1.002x - 6.149	1.000
R08	SKC	224-PCXR4	883215	04/10/2024	1,000	1,500	2,000	995	1,509	2,004	1.011x - 20.001	0.999
R09	SKC	224-PCXR4	034650	02/10/2024	1,000	1,500	2,000	996	1,500	1,997	1.000x - 1.051	1.000
R10	SKC	224-PCXR4	091765	03/10/2024	1,000	1,500	2,000	1,002	1,503	2,006	1.007x - 9.531	1.000
R11	SKC	224-PCXR4	091763	03/10/2024	1,000	1,500	2,000	999	1,506	2,001	1.010x - 20.761	0.999
R12	SKC	224-PCXR4	091568	03/10/2024	1,000	1,500	2,000	1,012	1,504	2,001	0.990x + 19.294	1.000
R13	SKC	224-PCXR4	091638	04/10/2024	1,000	1,500	2,000	1,004	1,505	2,008	1.008x - 10.210	1.000
R14	SKC	224-PCXR4	091764	03/10/2024	1,000	1,500	2,000	998	1,498	1,997	0.999x + 0.148	1.000
R15	SKC	224-PCXR8	529457	03/10/2024	1,000	1,500	2,000	1,003	1,497	2,000	0.996x + 5.377	1.000
R16	SKC	224-PCXR8	529643	04/10/2024	1,000	1,500	2,000	996	1,505	2,006	1.012x - 19.118	1.000
R17	SKC	224-PCXR8	529645	04/10/2024	1,000	1,500	2,000	1,004	1,503	2,006	1.002x - 3.334	1.000
R18	SKC	224-PCXR8	566756	04/10/2024	1,000	1,500	2,000	997	1,504	1,998	1.001x - 3.462	1.000
R19	SKC	224-PCXR8	566802	03/10/2024	1,000	1,500	2,000	1,005	1,504	2,007	1.004x - 4.118	1.000
R20	SKC	224-PCXR8	529089	01/10/2024	1,000	1,500	2,000	999	1,493	2,006	1.005x - 8.571	1.000
R21	SKC	224-PCXR8	665728	03/10/2024	1,000	1,500	2,000	1,004	1,503	1,996	0.993x + 9.763	1.000
R22	SKC	224-PCXR8	707444	04/10/2024	1,000	1,500	2,000	999	1,504	2,000	1.001x - 0.963	1.000
R23	SKC	224-PCXR8	761067	04/10/2024	1,000	1,500	2,000	1,004	1,498	2,002	0.996x + 5.501	1.000
R24	SKC	224-PCXR8	707893	04/10/2024	1,000	1,500	2,000	997	1,495	2,003	1.006x - 11.110	1.000
R25	SKC	224-PCXR8	761052	04/10/2024	1,000	1,500	2,000	1,016	1,507	2,003	0.992x + 15.204	1.000
R26	SKC	224-PCXR8	707956	04/10/2024	1,000	1,500	2,000	1,002	1,499	2,002	1.001x - 0.028	1.000
R27	SKC	224-PCXR8	707398	01/10/2024	1,000	1,500	2,000	1,008	1,505	2,008	1.006x - 6.261	1.000
R28	SKC	224-PCXR8	707481	03/10/2024	1,000	1,500	2,000	1,005	1,505	2,004	0.999x + 1.175	1.000
R29	SKC	224-PCXR8	707402	01/10/2024	1,000	1,500	2,000	1,001	1,500	1,996	1.001x - 4.617	1.000
R30	SKC	224-PCXR8	093811	03/10/2024	1,000	1,500	2,000	1,000	1,506	1,998	0.998x + 6.228	1.000
R31	SKC	224-PCXR8	093183	04/10/2024	1,000	1,500	2,000	1,005	1,502	1,999	1.006x - 13.357	0.999
R32	SKC	224-PCXR8	671950	03/10/2024	1,000	1,500	2,000	996	1,504	2,004	1.008x - 14.572	1.000
R33	SKC	224-PCXR4	626254	03/10/2024	1,000	1,500	2,000	1,005	1,503	2,008	1.007x - 9.639	1.000
R34	SKC	224-PCXR4	626131	04/10/2024	1,000	1,500	2,000	996	1,495	2,001	1.002x - 5.649	1.000
R35	SKC	224-PCXR8	707460	03/10/2024	1,000	1,500	2,000	999	1,498	1,999	0.997x + 2.375	1.000
R36	SKC	224-PCXR8	707446	04/10/2024	1,000	1,500	2,000	1,000	1,495	1,997	0.995x + 4.558	1.000
R37	SKC	224-PCXR8	707432	04/10/2024	1,000	1,500	2,000	994	1,502	1,996	1.000x - 2.818	1.000
R38	SKC	224-PCXR8	707349	04/10/2024	1,000	1,500	2,000	997	1,507	2,004	1.005x - 6.648	1.000
R39	SKC	224-PCXR8	761095	04/10/2024	1,000	1,500	2,000	1,000	1,496	1,997	0.999x + 0.856	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R <sup>2</sup>
H-R01	Dwyer	VFB-65	03/10/2024	500	1,000	2,000	500.9	1000.8	1994.3	1.003x + 0.055	1.000
H-R02	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	500.1	998.9	1992.4	1.002x - 3.472	0.999
H-R03	Dwyer	VFB-65	02/10/2024	500	1,000	2,000	501.6	999.3	2001.6	0.994x + 6.383	1.000
H-R04	Dwyer	VFB-65	03/10/2024	500	1,000	2,000	503.3	999.8	1993.2	1.001x - 1.914	0.999
H-R05	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	500.2	1002.6	2000.4	1.002x - 0.160	1.000
H-R06	Dwyer	VFB-65	02/10/2024	500	1,000	2,000	503.1	1002.8	1999.6	0.999x + 5.589	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





CERTIFICATE No : 24M2227

REFERENCE No : 72448-1

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** : 08-Mar-24

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 14-Mar-24

**RECEIVED DATE** : 08-Mar-24





CERTIFICATE No : 24M2227

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA05/50 RECEIVED DATE : 08-Mar-24  
AIR PRESSURE : 1010mbar  $\pm$  1mbar CALIBRATION DATE : 08-Mar-24  
AMBIENT TEMPERATURE : 25°C  $\pm$  1°C RELATIVE HUMIDITY : 53 %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	QK-I-151	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

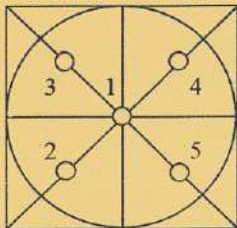
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 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	0.02001	-0.00001	0.000065
0.10	0.10002	-0.00002	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	9.99994	0.00006	0.000070
20.00	20.00008	-0.00008	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	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



**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 :**

  
( Thanakul Petchurai )

# SITHIPORN ASSOCIATES CO., LTD.

## CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Banglumru, Bangplud, Bangkok, 10700 Thailand  
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN  
associates



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-1N2N3N	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

*G. Petch*

# SITHIPORN ASSOCIATES CO., LTD.

## CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangplud, Bangkok, 10700 Thailand  
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN  
associates



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  $\leq$  1.0 T(%), Absorbance  $\geq$  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. Ketch*





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	04 November 2024	Brand :	API	Model :	300E
No.	CO-R01			Serial No.	704
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2024			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D711839		
Certified Date : 14 March 2024		Expired Date : 14 March 2032		Cylinder Conc. : 4,580 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.5 °C		% RH : 50	
Calibration Setting					
Span		Initial Reading (Before Adj.), PPM		Final Reading (After Adj.), PPM	
Set Point		Expected Concentration	Analyzer Response	%Dif	Analyzer Response
Zero		0	0.11	-	0
CO Span		40.00	40.10	0.250	40.00
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4016.6	mV	2500-4800 mV		
CO Reference	3948.3	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.6	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	804	CC/Min	800 ± 10%		
Sample Temperature	48.5	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.3	°C	68 ± 2		
Box Temperature	30.8	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3037.5	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)

ลำดับที่ 3

ระดับเสียง

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

## 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 : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

**Ambient Environment**

Temperature :  $(23 + 3) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \%$

Ambient Pressure :  $(101.325 \pm 1.500) \text{ kPa}$

**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 Keithley 2015-P S/N4106495.
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** : 22 Feb. 2024

**Date of Calibration** : 4 Mar. 2024

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.BL.MTC.002 Rev.4

**Head Office**

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

**Office/Laboratory**

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

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 20 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ Pa, 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 2
1/2 inch Bruel&Kjaer 4180	93.85	-0.15	$\pm 0.10$	$\pm 0.75$ dB

2. Frequency


Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	$\pm 1.5$	$\pm 2.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.65	$\pm 0.50$	$\pm 4.0\%$

- 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. Prawate Kluaypa)  
Director

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Date of Calibration : 4 Mar. 2024

Date of Issue : 5 Mar. 2024

Ref : 2011267022200795001

End of Certificate

2 / 2

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

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FM.BL.MTC.002 Rev.4

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Fax. (66) 0 2323 9165  
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Thailand  
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Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0647

MTC No. EEL. BP. 41/0967

## 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 :  $(23 \pm 3) ^\circ\text{C}$

Manufacturer : SVANTEK

Relative Humidity :  $(50 \pm 15) \%$

Model : SV34

Ambient Pressure :  $(101.325 \pm 1.500) \text{ kPa}$

Serial No. : 33139

- 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 2633526.

**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 : 17 Sep. 2024

Date of Calibration : 25 Sep. 2024

1 / 2

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

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FM.BL.MTC.002 Rev.5

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(66) 08 3219 9440  
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#### Office

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



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0647

MTC No. EEL. BP. 41/0967

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 = 114 dB re 20 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ Pa, 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 2
1/2 inch Bruel&Kjaer 4180	113.56	-0.44	$\pm 0.10$	$\pm 0.75$ dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1000.0	0.0	$\pm 1.5$	$\pm 2.0\%$

3. Total Distortion


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	0.27	$\pm 0.50$	$\pm 4.0\%$

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. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 25 Sep. 2024

Date of Issue : 26 Sep. 2024

Ref : 2011267091703412007

End of Certificate

2 / 2

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

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FM.BL.MTC.002 Rev.5

Head Office

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(66) 08 3219 9440  
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

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(66) 08 1889 6827



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Tel : (662) 939-0370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com, www.spscon.com

Noise R\_441/24

### 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	04 March 2024
		Due Date	04 March 2025

#### Calibration Data

Sound Level Meter Data				Calibration Data	
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]
					Before Adjustment      After Adjustment
ACO-B41	ACO	6236	00192032	14 July 2024	93.9                      93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB

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

Noise Dose R\_441/24

## Noise Dose Meter Calibration Report

### Acoustic Calibrator Data

Brand	SVANTEK	Number	SV 01/60
Model	SV34	Serial No.	33137
Calibration Range	114 dB, 1000 Hz	Last Calibration	22 August 2023
		Due Date	22 August 2024

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
NMD-B01	SVANTEK	SV-104IS	80840	14 July 2024	113.5	113.5
NMD-B02	SVANTEK	SV-104IS	80842	14 July 2024	113.6	113.5
NMD-B03	SVANTEK	SV-104IS	80852	14 July 2024	113.5	113.5
NMD-B04	SVANTEK	SV-104IS	80854	14 July 2024	113.5	113.5
NMD-B05	SVANTEK	SV-104IS	80856	14 July 2024	113.5	113.5
NMD-B08	SVANTEK	SV-104IS	80818	14 July 2024	113.5	113.5
NMD-B09	SVANTEK	SV-104IS	80829	14 July 2024	113.6	113.5
NMD-B10	SVANTEK	SV-104IS	80830	14 July 2024	113.5	113.5
NMD-B11	SVANTEK	SV-104IS	80831	14 July 2024	113.5	113.5
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					113.53± 0.10 dB	

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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Noise R\_701/24

## 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	04 March 2024
		Due Date	04 March 2025

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B18	ACO	6236	00172048	17 November 2024	93.9	93.9
ACO-B29	ACO	6236	00182011	17 November 2024	93.9	93.9
ACO-B33	ACO	6236	00182015	17 November 2024	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB	

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

Noise Dose R\_701-1/24

## Noise Dose Meter Calibration Report

### Acoustic Calibrator Data

Brand	SVANTEK	Number	SV 01/60
Model	SV34	Serial No.	33137
Calibration Range	114 dB, 1000 Hz	Last Calibration	06 August 2024
		Due Date	06 August 2025

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
NMD-B01	SVANTEK	SV-104IS	80840	17 November 2024	113.5	113.5
NMD-B02	SVANTEK	SV-104IS	80842	17 November 2024	113.6	113.5
NMD-B03	SVANTEK	SV-104IS	80852	17 November 2024	113.5	113.5
NMD-B04	SVANTEK	SV-104IS	80854	17 November 2024	113.5	113.5
NMD-B05	SVANTEK	SV-104IS	80856	17 November 2024	113.6	113.5
NMD-B06	SVANTEK	SV-104IS	80816	17 November 2024	113.5	113.5
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					113.50± 0.10 dB	

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

Noise R\_761/24

## 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	04 March 2024
		Due Date	04 March 2025

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R22	ACO	6236	00182010	01 December 2024	93.9	93.9
ACO-R23	ACO	6236	00192035	01 December 2024	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB	

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom )

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



ลำดับที่ 4

คุณภาพน้ำจากระบบบำบัดน้ำเสีย



# IRPC PUBLIC COMPANY LIMITED METROLOGY CENTER

299 Moo 5, Sukhumvit Road, Amphor Muang, Rayong, 21000 THAILAND  
Tel. 0-3861-1333, 0-3861-3571-80 Ext. 4441, 4444 Fax. 0-3861-2812-3, 0-3889-8830



## Certificate of Calibration

Reference : 30217692

Certificate No. : CL1-M245008

Issued by : Mass Laboratory

Page : 1 of 4

Object.	:	Electronic Balance
Manufacturer.	:	Sartorius
Ident. No.	:	EN-01-006
Model / Type.	:	TE214S / Single range
Serial No.	:	SWB25909250
Customer.	:	ALEX/ALPO (ENV) 299 Moo 5, Sukhumvit Road, Tumbon Chenong Nern, Amphor Muang, Rayong, 21000
Date of Received.	:	25 January 2024
Date of Calibration.	:	25 January 2024
Place of Calibration	:	2nd Floor, Ethelene Building.

*The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%*

Date of Issued.

Approved by.

Calibrated by.

26 January 2024

( Taweesak Promsorn )

Head of the calibration laboratory

( Chakrit Cheepnurat )

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Continuation of Calibration Certificate No. : CL1-M245008

Page : 2 of 4

<b>Object</b>	:	Electronic Balance
<b>Manufacturer</b>	:	Sartorius
<b>Identification No.</b>	:	EN-01-006
<b>Model / Type</b>	:	TE214S / Single range
<b>Serial No.</b>	:	SWB25909250
<b>Calibration Range</b>	:	0 g to 200 g
<b>Accuracy</b>	:	N/A
<b>Division / Resolution</b>	:	0.0001 g
<b>Condition of Object</b>	:	In Condition

**ENVIRONMENT CONDITIONS :**

Air Temperature	:	24.3 °C ± 0.2 °C
Relative Humidity	:	48.0 % ± 1.1 %
Atmospheric Pressure	:	1015.0 mbar ± 0.2 mbar

**MEASUREMENT METHOD :**

- The balance is calibrated using the procedure according to the instruction manual number S10325200-2212. calibration method is based on UKAS Lab 14 Edition 6.
- For multi-interval or multiple range instruments where intervals or ranges are switched automatically these measurements may only be required on one such interval / range.
- Balance calibration is performed by comparing the conventional mass values of the reference weights with the readings on the balance display.

**TRACEABILITY :**

<b>Instrument</b>	<b>Model</b>	<b>Serial No.</b>	<b>Certificate No.</b>	<b>Due date</b>
1. Standard weight Set 1 mg to 1 kg	Class F1	15891	CL1-M232036	15-May-25

Note : This reference standard is traceable to SI Unit through the IRPC Metrology Center.

**UNCERTAINTY OF MEASUREMENTS :**

The uncertainty stated is the expanded uncertainty which results from multiplying the standard uncertainty by the coverage factor ( $k = 2$ ), It has been determined according to "M3003 the Expression of Uncertainty and Confidence in Measurement" This mean the value of the measured lies within the assigned range of values with a probability of approximately 95%.



**MEASUREMENT RESULTS :**

Balance Serial No. : SWB25909250

Range Capacity : 0 g to 220 g

Resolution : 0.0001 g

A 'Zero-Tracking' facility of Weighing machines.

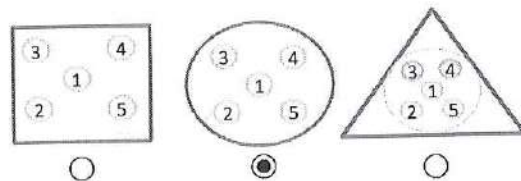
☐ Enable. ☐ Disabled. ☒ N/A. (No Application)
☐ Without adjustment.☐ Adjustment by internal calibration of Balance.☒ Adjustment using external weight.**1. Repeatability.**

Test Weight : 200 g

Measurement	Displayed value (g)
1	200.0000
2	199.9999
3	199.9999
4	200.0000
5	200.0000
6	199.9999
7	199.9999
8	200.0000
9	199.9999
10	199.9999
Average	199.9999
SD	0.000052

**2. Eccentric or Off-centre loading.**

Test Weight : 100 g



Load position	Displayed value (g)	Difference off-center (g)
1	100.0002	0.0000
2	99.9999	0.0003
3	100.0006	-0.0004
4	100.0005	-0.0003
5	100.0000	0.0002
Maximum difference off-Center		-0.0004

**3. Effect of tare and/or balancing mechanism**

Weight used for tare weight : 100 g

Nominal value (g)	Conventional mass (g)	Displayed value. (g)	Correction value. (g)
20	19.99992	20.0000	-0.0001
40	39.99985	39.9999	-0.0001
60	59.99994	60.0000	-0.0001
80	79.99986	79.9999	0.0000
100	100.00011	100.0002	-0.0001

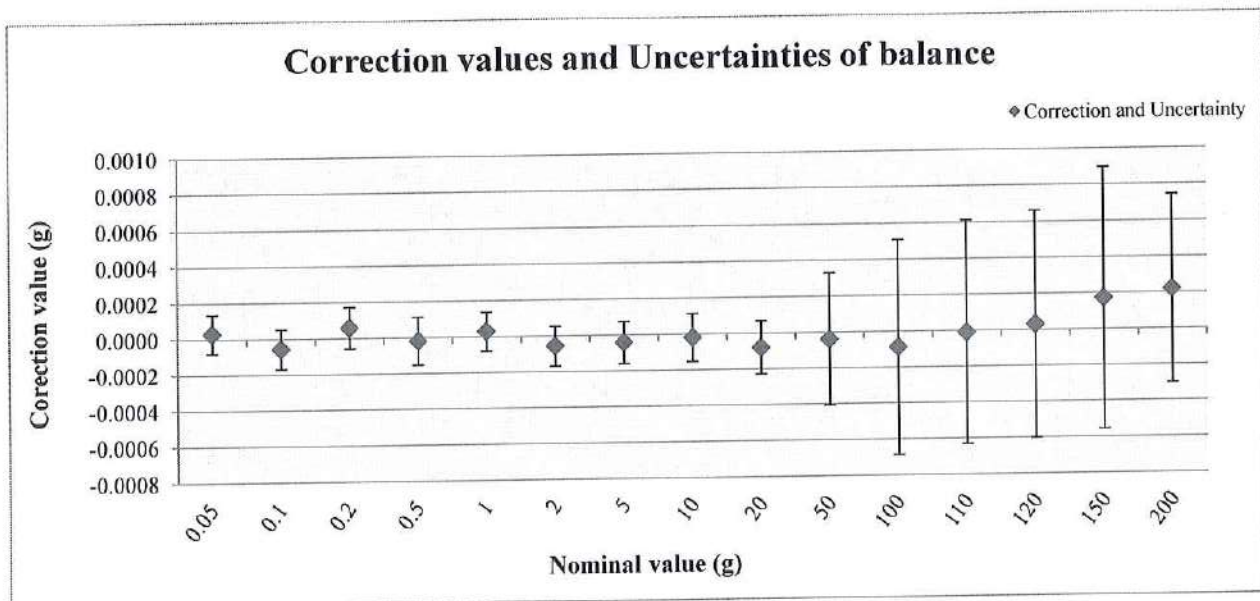




**MEASUREMENT RESULTS :****4. Error of indication from nominal or conventional mass value.**

Nominal value (g)	Conventional Mass (g)	Displayed value (g)	Correction value (g)	Uncertainty $k = 2$ $\pm$ (g)
0.05	0.050027	0.0500	0.0000	0.00011
0.1	0.100041	0.1001	-0.0001	0.00011
0.2	0.199956	0.1999	0.0001	0.00012
0.5	0.49988	0.4999	0.0000	0.00013
1	1.00003	1.0000	0.0000	0.00011
2	2.00004	2.0001	-0.0001	0.00011
5	4.99996	5.0000	0.0000	0.00012
10	9.99988	9.9999	0.0000	0.00013
20	19.99992	20.0000	-0.0001	0.00015
50	50.00006	50.0001	0.0000	0.00037
100	100.00011	100.0002	-0.0001	0.00060
110	109.99999	110.0000	0.0000	0.00062
120	120.00003	120.0000	0.0000	0.00063
150	150.00017	150.0000	0.0002	0.00073
200	199.99982	199.9996	0.0002	0.00052

The graphs of correction values and uncertainties are shown as follows.



Remark : This result of calibration was found accurate as shown on date, place and stated object of calibration only.

\*\*\* End of report \*\*\*

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**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)**  
**CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES**


534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

**Cert.No.:** 23TW121

**Page.:** 1 of 2

## Certificate of Testing

Equipment :	DO Meter
Manufacturer :	WTW
Model :	Oxi7310
Serial No. :	18020813
ID No. :	-
Received Date :	25 May 2023
Test Date :	26 May 2023
Reference :	2305-0831DC-1
Submitted by :	IRPC Public Company Limited 299 Moo.5, Sukhumvit Road, T.Cherngnern, A.Muang, Rayong 21000
Laboratory Condition :	Temperature ( $25 \pm 5$ ) °C Humidity ( $50 \pm 20$ ) %
Test Procedure :	In - house method : CP-CH9 by Comparison Technique with Azide Modification Method
Tested by :	Walalak Sirithean
Approved by :	 Approved Signatory
<input checked="" type="checkbox"/> Malee Butkruea <input type="checkbox"/> Saithip Meangmai <input type="checkbox"/> Warakorn Lernagtrakul	
Issue Date :	29 May 2023



Cert.No.: 23TW121

Page.: 2 of 2

**Condition of this result of calibration**

1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Burette	-	130BU10	23CG1172	22 Mar 2025
2) Balance	1126143764	140RC004	22MM50	20 Sep 2023

2. Standard Material :-

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

**Result :** Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 21460008

<b>Titration Method (Azide Modification Method) (mg/L)</b>	<b>DO Meter Reading (mg/L)</b>	<b>Standard Deviation (mg/L)</b>
8.14	8.13	0.0084

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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Malu

a 1164064

# Calibration Certificate

<b>Equipment:</b>	COD Reactor	<b>Job No.:</b>	KSMT2400611
<b>Model:</b>	Digital PREP Cube	<b>Received Date:</b>	23 April 2024
<b>Serial No.(or ID):</b>	CBB0412050122 ( EN-05-001 )	<b>Issued Date:</b>	26 April 2024
<b>Manufacturer:</b>	SCP SCIENCE	<b>Page:</b>	1 of 5
<b>Covers:</b>	None		
<b>Condition:</b>	In Condition		

**Customer**

IRPC PUBLIC CO., LTD.

299 Moo 5, Sukhumvit Road, Tambol Choengneon, Amphur Muang, Rayong 21000 Thailand

**Calibration Place**

IRPC PUBLIC CO., LTD. ( Gc Lab )

299 Moo 5, Sukhumvit Road, Tambol Choengneon, Amphur Muang, Rayong 21000 Thailand

**Calibration Date**

23 April 2024

**Environment Condition**

Temperature: 26.5 °C ± 0.4 °C

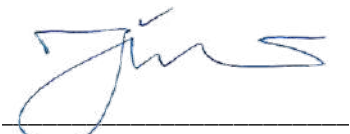
Humidity: 63.8 %RH ± 2.6 %RH

**The Method used**In-house method, based on Direct Measurement with  
Standard Thermometer**Traceability**This certificate is traceable to the SI Units maintained by  
National Institute of Metrology (NIMT), Thailand through  
Quality Reborn Co.,Ltd.Certificate No. QR23-1906

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ( $k=2$ ) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of SCIMET Co., Ltd.



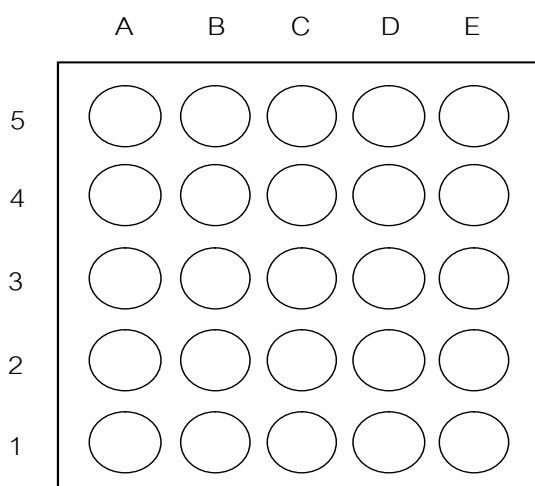
(Mr. Hattapong Pumnil)

Person in charge



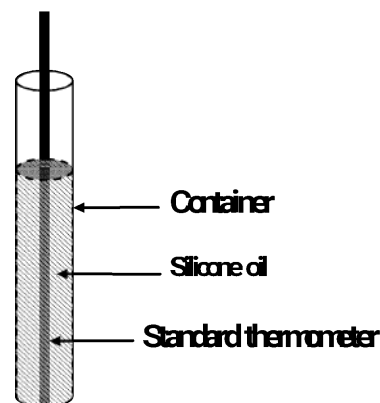
(Mr. Thalerngkeat Pongngam)

Authorized signatory



Top view

Location of standard



Sample test

## Standard Installation Locations

The standard thermometer touches the lower end of the boring

## Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the unit under calibration.

**Measured Temperature:** The average reading of standards at any positions or location.

**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

**Calibration Results:****Pre-Calibration**

Locations heating Block:	Desired (°C)	Setting (°C)	Unit Under Calibration (°C)
Single	150.0	150.0	150.0

Location heating Block:	Measured Temperature (°C)	Correction (°C)
A1	147.37	2.63
A2	147.40	2.60
A3	148.13	1.87
A4	147.71	2.29
A5	147.07	2.93
B1	148.00	2.00
B2	147.93	2.07
B3	148.71	1.29
B4	147.58	2.42
B5	147.95	2.05
C1	148.06	1.94
C2	149.39	0.61
C3	148.22	1.78
C4	150.69	-0.69
C5	147.79	2.21
D1	147.79	2.21
D2	148.40	1.60
D3	149.02	0.98
D4	148.86	1.14
D5	147.33	2.67
E1	146.89	3.11
E2	148.10	1.90
E3	147.89	2.11
E4	148.46	1.54
E5	147.84	2.16



## Calibration Results:

### Without Adjustment

Measured temperature at the spread locations:

Locations heating Block:	Setting (°C)	Unit Under Calibration (°C)
Single	152.0	152.0

Location heating Block:	Measured Temperature (°C)	Correction (°C)	Uncertainty (± °C)
A1	149.27	-0.73	0.26
A2	149.68	-0.32	0.27
A3	149.64	-0.36	0.27
A4	150.03	0.03	0.27
A5	149.09	-0.91	0.26
B1	150.52	0.52	0.27
B2	150.33	0.33	0.28
B3	151.10	1.10	0.27
B4	149.73	-0.27	0.28
B5	149.83	-0.17	0.27
C1	149.82	-0.18	0.27
C2	151.55	1.55	0.27
C3	150.44	0.44	0.29
C4	150.42	0.42	0.28
C5	149.52	-0.48	0.27
D1	149.42	-0.58	0.29
D2	150.02	0.02	0.26
D3	150.27	0.27	0.27
D4	150.10	0.10	0.27
D5	148.98	-1.02	0.29
E1	149.56	-0.44	0.28
E2	149.36	-0.64	0.26
E3	149.54	-0.46	0.27
E4	149.88	-0.12	0.27
E5	148.57	-1.43	0.29

**Characterization of the unit under calibration:**

Locations heating Block	Desired	Unit Under Calibration (°C)		Measured Temperature (°C)
	(°C)	Setting	Reading	Stability (±°C)
Single	150.0	152.0	152.0	0.13

**The End of Certificate**

## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSMT2400611

ชนิดเครื่องมือ: COD Reactor

รุ่น: Digital PREP Cube

หมายเลขเครื่อง: CBB0412050122 ( EN-05-001 )

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
23 Apr 2024			23 Apr 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. สภาพ Hole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพฝาปิด	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

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Mr. Hattapong Pumnil

Service Engineer



# Certificate of Calibration

<b>Equipment:</b>	Hot Air Oven	<b>Certificate No.:</b>	C31231895
<b>Model:</b>	UF 55	<b>Issued Date:</b>	07 September 2023
<b>Serial No.(or ID):</b>	B216.2858 ( EN-05-033 )	<b>Job No.:</b>	WO-00004496
<b>Manufacturer:</b>	Memmert	<b>Page:</b>	1 of 3
<b>Condition:</b>	In Condition	<b>Ventilation Valve:</b>	Closed
<b>Shelves(pc.):</b>	1		

**Customer:** IRPC PUBLIC CO., LTD.  
299 Moo 5, Sukhumvit Road, Tambol Choengneon,  
Amphur Muang, Rayong 21000 Thailand

**Environment Condition:**

Temperature:	23 °C	±	1.1 °C
Humidity:	57 %RH	±	3.8 %RH
Voltage:	218 VAC	±	7.5 VAC

**Calibration Place:** IRPC PUBLIC CO., LTD. ( Envi Lab Instrument Room )  
299 Moo 5, Sukhumvit Road, Tambol Choengneon,  
Amphur Muang, Rayong 21000 Thailand

**Calibration By:** Mr. Nattapat Rungrueang  
**Calibration Date:** 05 September 2023  
**The Method used:** In house method, CAL-WI-16, base on TLAS-G20  
**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10230019



(Mr. Nattapat Rungrueang)

Person in charge



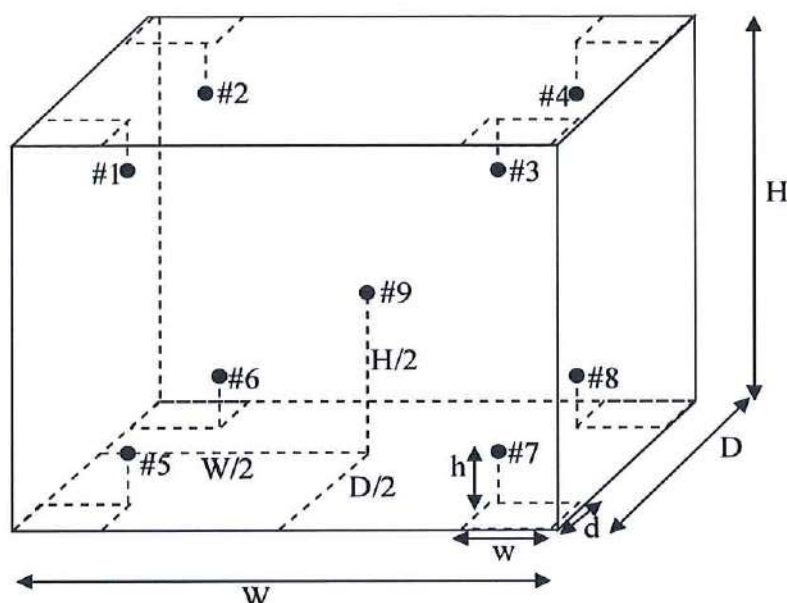
(Mr. Udon Srichana)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.



### Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber:  $W = 40$  (cm)  $D = 33$  (cm)  $H = 40$  (cm)

Standard Locations (#1, #2, #3, #4):  $w = 5$  (cm)  $d = 5$  (cm)  $h = 5$  (cm)

Standard Locations (#5, #6, #7, #8):  $w = 5$  (cm)  $d = 5$  (cm)  $h = 5$  (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	301	302	303	304	305	306	307	308	309

### Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.

**Measured Temperature:** The average reading of standards at any positions or location.

**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.



## Calibration Results:

### Before adjustment

Setting:            Indicating:    #1:    #2:    #3:    #4:    #5:    #6:    #7:    #8:    #9:

104.0            104.0        104.59 103.96 104.44 104.40 104.16 104.06 103.92 104.65 104.37

### After adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	104.13	0.13	0.39
#2	103.50	-0.50	0.39
#3	104.00	0.00	0.39
#4	103.96	-0.04	0.39
#5	103.70	-0.30	0.39
#6	103.59	-0.41	0.39
#7	103.45	-0.55	0.39
#8	104.25	0.25	0.39
#9	103.89	-0.11	0.39

### Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.0	104.13	103.50	104.00	103.96	103.70	103.59	103.45	104.25	103.89	0.39

### Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.63	0.17	1.03

Note: \* Maximum uncertainty of the each position

## The End of Certificate

## Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

### Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ( $w = 0$ ), Specific Risk < 50% PFA.
- ☒ Choice B Non-binary statement with guard band ( $w = 1 U$ ), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
- ☐ Choice C Customer defined, Customers may define arbitrary multiple of  $r$  to have applied as guard band ( $w = r U$ ) .  
; PFA – Probability of False Accept



(Mr. Udon Srichana)

Authorized signatory

## After adjustment

**Desired Temperature : 104.0°C Tolerances : 1.0 °C**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	104.13	0.13	0.39	1.0	Pass
#2	103.50	-0.50	0.39	1.0	Pass
#3	104.00	0.00	0.39	1.0	Pass
#4	103.96	-0.04	0.39	1.0	Pass
#5	103.70	-0.30	0.39	1.0	Pass
#6	103.59	-0.41	0.39	1.0	Pass
#7	103.45	-0.55	0.39	1.0	Pass
#8	104.25	0.25	0.39	1.0	Pass
#9	103.89	-0.11	0.39	1.0	Pass

Correction\* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

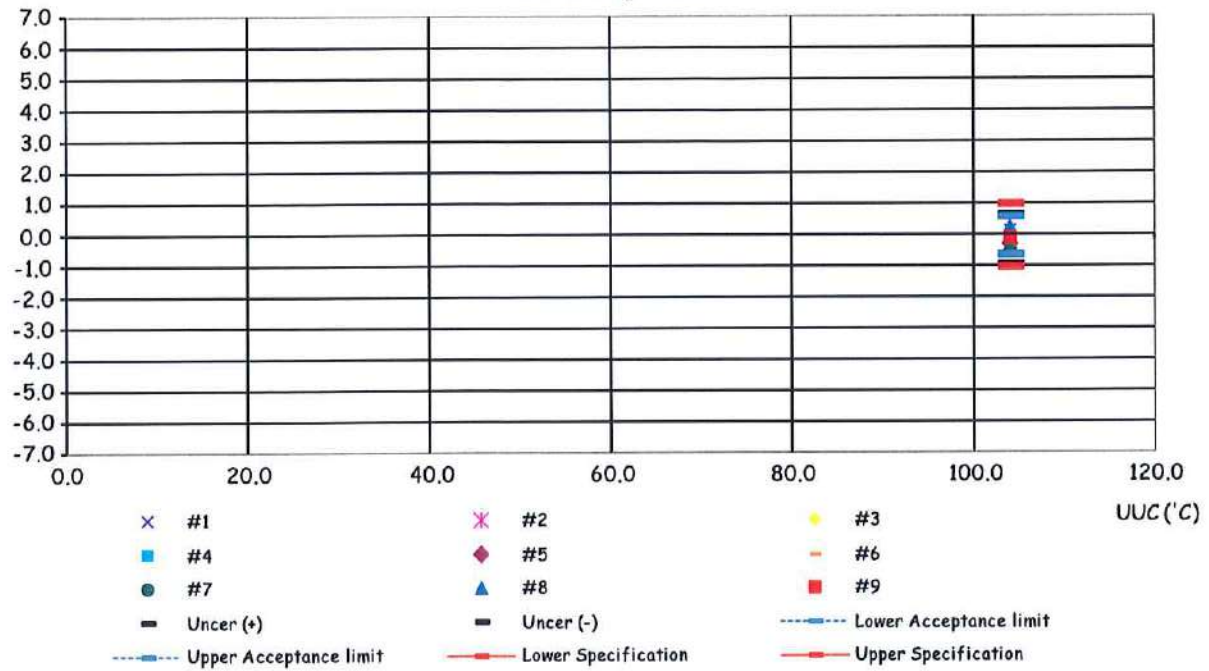
## The End of Statements of Conformity

# Corr\_Distribution & Max\_Measurement Uncertainty

Job\_No. WO-00004496

Correction ('C)

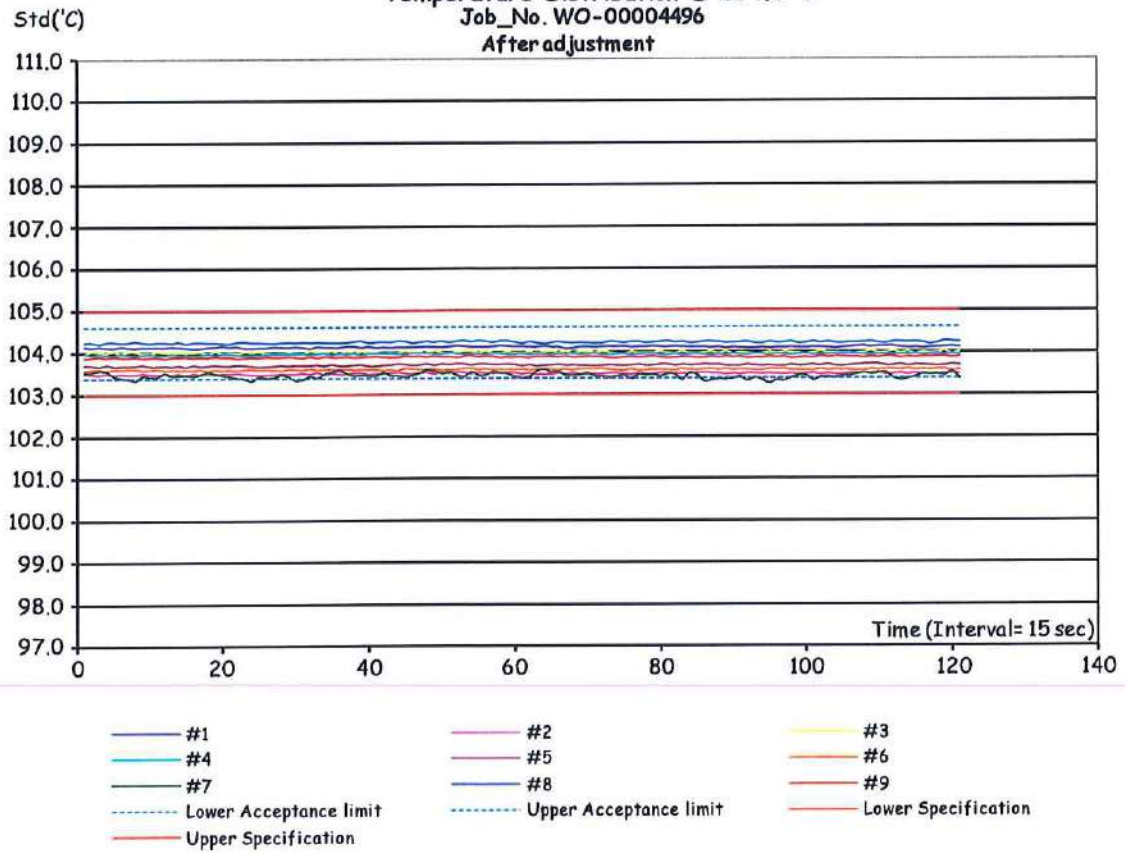
After adjustment



## Temperature Distribution @ 104.0°C

Job\_No. WO-00004496

After adjustment





## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00004496

ชนิดเครื่องมือ: Hot Air Oven

รุ่น: UF 55

หมายเลขเครื่อง: B216.2858 ( EN-05-033 )

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
05 Sep 2023			05 Sep 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
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<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความชื้น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Nattapat Rungrueang

Service Engineer



# Certificate of Calibration

<b>Equipment:</b>	Hot Air Oven	<b>Certificate No.:</b>	C31231896
<b>Model:</b>	UF 55	<b>Issued Date:</b>	07 September 2023
<b>Serial No.(or ID):</b>	B216.3478 ( EN-05-034 )	<b>Job No.:</b>	WO-00004496
<b>Manufacturer:</b>	Memmert	<b>Page:</b>	1 of 4
<b>Condition:</b>	In Condition	<b>Ventilation Valve:</b>	Closed
<b>Shelves(pc.):</b>	1		

**Customer:** IRPC PUBLIC CO., LTD.  
299 Moo 5, Sukhumvit Road, Tambol Choengneon,  
Amphur Muang, Rayong 21000 Thailand

**Environment Condition:**

Temperature:	24 °C	±	1.0 °C
Humidity:	57 %RH	±	3.8 %RH
Voltage:	218 VAC	±	7.5 VAC

**Calibration Place:** IRPC PUBLIC CO., LTD. ( Envi Lab Instrument Room )  
299 Moo 5, Sukhumvit Road, Tambol Choengneon,  
Amphur Muang, Rayong 21000 Thailand

**Calibration By:** Mr. Nattapat Rungrueang  
**Calibration Date:** 05 September 2023  
**The Method used:** In house method, CAL-WI-16, base on TLAS-G20  
**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10230019



(Mr. Nattapat Rungrueang)

Person in charge



(Mr. Udon Srichana)

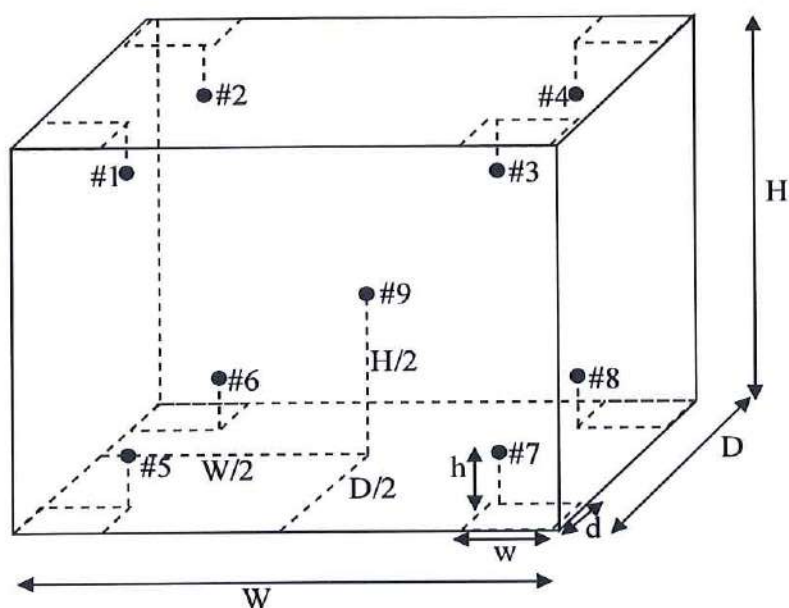
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.





### Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber:  $W = 40$  (cm)  $D = 33$  (cm)  $H = 40$  (cm)

Standard Locations (#1, #2, #3, #4):  $w = 5$  (cm)  $d = 5$  (cm)  $h = 5$  (cm)

Standard Locations (#5, #6, #7, #8):  $w = 5$  (cm)  $d = 5$  (cm)  $h = 5$  (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	101	102	103	104	105	106	107	108	109

### Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.

**Measured Temperature:** The average reading of standards at any positions or location.

**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

## Calibration Results:

### Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	104.29	0.29	0.39
#2	103.75	-0.25	0.39
#3	104.01	0.01	0.39
#4	104.15	0.15	0.39
#5	104.12	0.12	0.39
#6	103.79	-0.21	0.40
#7	103.65	-0.35	0.39
#8	104.06	0.06	0.39
#9	104.24	0.24	0.39

### Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.0	104.29	103.75	104.01	104.15	104.12	103.79	103.65	104.06	104.24	0.40

### Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.65	0.08	0.77

Note: \* Maximum uncertainty of the each position

**Without adjustment (Cont.)**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	180.38	0.38	0.44
#2	179.01	-0.99	0.45
#3	179.85	-0.15	0.47
#4	180.14	0.14	0.44
#5	179.98	-0.02	0.47
#6	179.35	-0.65	0.48
#7	179.06	-0.94	0.47
#8	179.86	-0.14	0.46
#9	180.27	0.27	0.45

**Temperature Distribution**

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180.0	180.0	180.0	180.38	179.01	179.85	180.14	179.98	179.35	179.06	179.86	180.27	0.48

**Chamber Characterization**

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.32	0.13	1.53

Note: \* Maximum uncertainty of the each position

**The End of Certificate**



## Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

### Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ( $w = 0$ ), Specific Risk < 50% PFA.
- ☒ Choice B Non-binary statement with guard band ( $w = 1 U$ ), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
- ☐ Choice C Customer defined, Customers may define arbitrary multiple of  $r$  to have applied as guard band ( $w = r U$ ).  
; PFA – Probability of False Accept



(Mr. Udon Srichana)

Authorized signatory

## Without adjustment

Desired Temperature : 104.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	104.29	0.29	0.39	1.0	Pass
#2	103.75	-0.25	0.39	1.0	Pass
#3	104.01	0.01	0.39	1.0	Pass
#4	104.15	0.15	0.39	1.0	Pass
#5	104.12	0.12	0.39	1.0	Pass
#6	103.79	-0.21	0.40	1.0	Pass
#7	103.65	-0.35	0.39	1.0	Pass
#8	104.06	0.06	0.39	1.0	Pass
#9	104.24	0.24	0.39	1.0	Pass

Correction\* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.



**Statements of conformity:(Cont.)**
**Without adjustment (Cont.)**

Desired Temperature : 180.0°C Tolerances : 2.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	180.38	0.38	0.44	2.0	Pass
#2	179.01	-0.99	0.45	2.0	Pass
#3	179.85	-0.15	0.47	2.0	Pass
#4	180.14	0.14	0.44	2.0	Pass
#5	179.98	-0.02	0.47	2.0	Pass
#6	179.35	-0.65	0.48	2.0	Pass
#7	179.06	-0.94	0.47	2.0	Pass
#8	179.86	-0.14	0.46	2.0	Pass
#9	180.27	0.27	0.45	2.0	Pass

Correction\* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

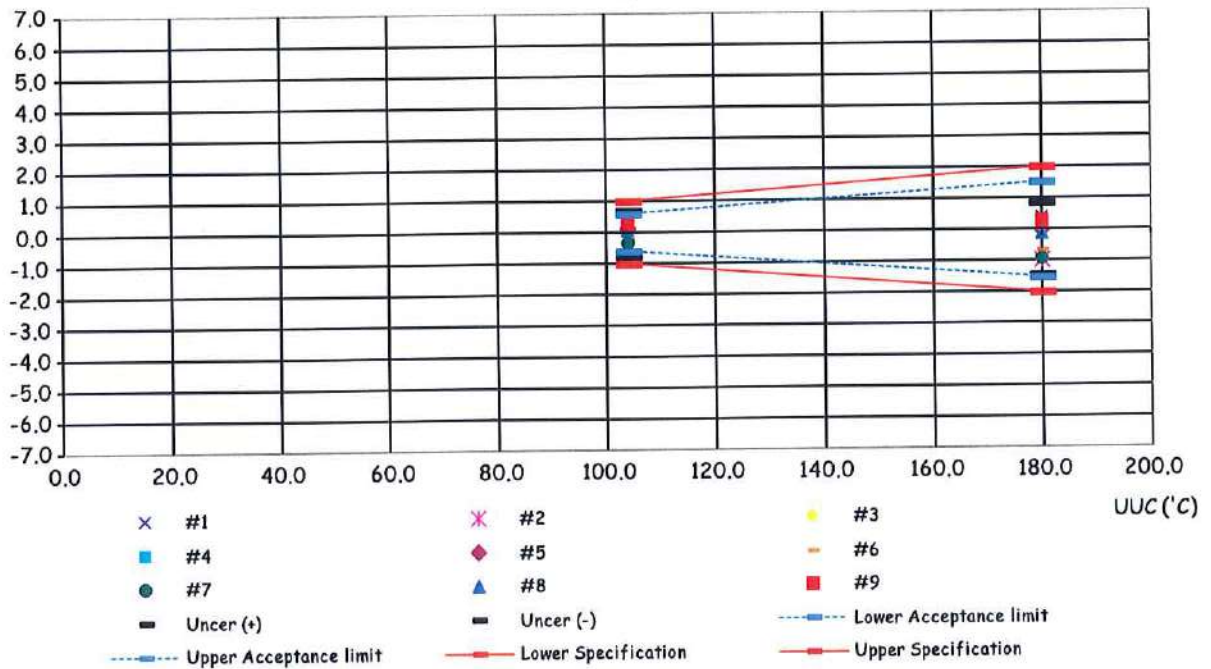
**The End of Statements of Conformity**

# Corr\_Distribution & Max\_Measurement Uncertainty

Job\_No. WO-00004496

Without adjustment

Correction ('C)

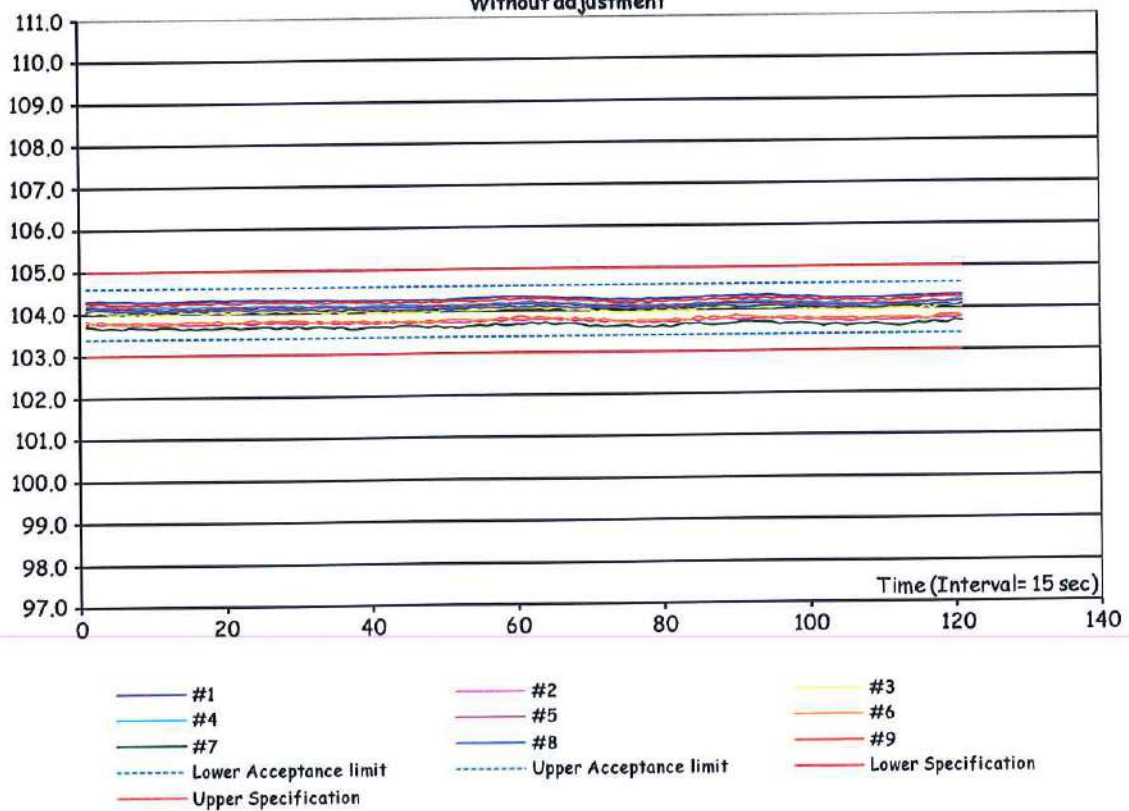


## Temperature Distribution @ 104.0°C

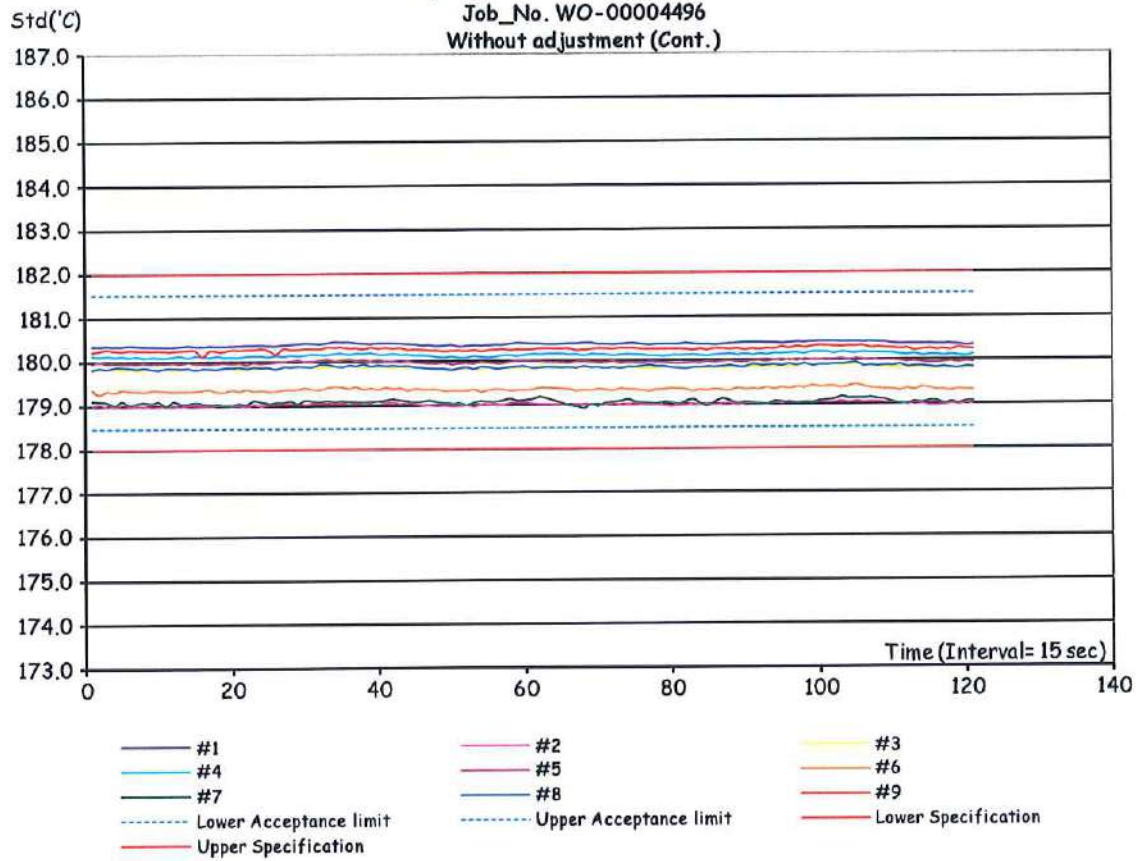
Job\_No. WO-00004496

Without adjustment

Std('C)



Without adjustment (Cont.)



## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00004496

ชนิดเครื่องมือ: Hot Air Oven

รุ่น: UF 55

หมายเลขเครื่อง: B216.3478 ( EN-05-034 )

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
05 Sep 2023			05 Sep 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความชื้น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Nattapat Rungruang

Service Engineer





บริษัท ไออาร์พีซี จำกัด (มหาชน)  
IRPC Public Company Limited

**IRPC PUBLIC COMPANY LIMITED**  
**METROLOGY CENTER**

299 Moo 5, Sukhumvit Road, Amphor Muang, Rayong, 21000 THAILAND  
Tel. 0-3861-1333, 0-3861-3571-80 Ext. 4441, 4444 Fax. 0-3861-2812-3, 0-3889-8830

## Certificate of Calibration

Reference : 30217680  
Issued by : Temperature Laboratory

Certificate No. : CL1-T249004  
Page : 1 of 3

Object : Incrurator  
Manufacturer : N/A  
Ident. No. : 201000001002  
Model / Type : UNE 400  
Serial No. : 40328062  
Customer : ALEX  
IRPC Public Company Limited  
299 Moo 5, Sukhumvit Road, Amphor Muang, Rayong, 21000  
Date of Received : 29 January 2024  
Date of Calibration : 29 January 2024  
Place of Calibration : QC1 Building (2nd floor)

*The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%*

Issued Date

Approved by

Calibrated by

31 January 2024

( Taweesak Promsorn )  
Head of the calibration laboratory

( Daorueng Seeda )

*This calibration certificate may not be reproduced other than in full except with the permission of the IRPC Public Company Limited.*

Continuation of Calibration Certificate No. : CL1-T249004

Page : 2 of 3

**Object** : Incubator  
**Manufacturer** : N/A  
**Identification No.** : 201000001002  
**Model / Type** : UNE 400  
**Serial No.** : 40328062  
**Calibration Range** : 20 °C  
**Accuracy** :  $\pm 1$  °C  
**Division** : 1 °C  
**Condition of Object** : Used Item

#### ENVIRONMENT CONDITIONS :

Temperature : 25 °C to 25.3 °C  
Relative Humidity : 53 % RH to 55 % RH

#### MEASUREMENT METHOD :

The calibration was performed by using Instruction manual no. 10325200-2306 in-house method based on TLAS-G20.

#### TRACEABILITY :

Instrument	Model	Serial No.	Certificate No.	Due date
Temp. Indicator With Sensor	ALMEM05690-2	A12010009/PT100-009	CL1-T236015	24-Apr-24
Temp. Indicator With Sensor	ALMEM05690-2	A12010009/PT100-001	CL1-T236016	24-Apr-24
Temp. Indicator With Sensor	ALMEM05690-2	A12010009/PT100-002	CL1-T236017	24-Apr-24
Temp. Indicator With Sensor	ALMEM05690-2	A12010009/PT100-003	CL1-T236018	24-Apr-24
Temp. Indicator With Sensor	ALMEM05690-2	A12010009/PT100-004	CL1-T236019	24-Apr-24
Temp. Indicator With Sensor	ALMEM05690-2	A12010009/PT100-005	CL1-T236020	24-Apr-24
Temp. Indicator With Sensor	ALMEM05690-2	A12010009/PT100-006	CL1-T236021	24-Apr-24
Temp. Indicator With Sensor	ALMEM05690-2	A12010009/PT100-007	CL1-T236022	24-Apr-24
Temp. Indicator With Sensor	ALMEM05690-2	A12010009/PT100-008	CL1-T236023	24-Apr-24

Note :

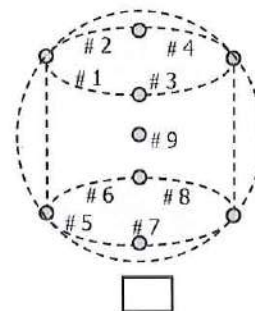
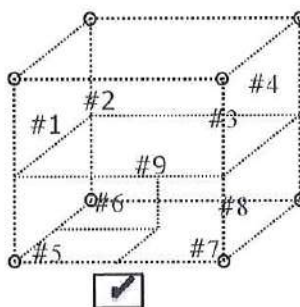
This reference standard is traceable to SI Unit through to Metrology Center IRPC Public Company Limited.

#### UNCERTAINTY OF MEASUREMENTS :

The uncertainty stated is the expanded uncertainty which results from multiplying the standard uncertainty by the coverage factor  $k = 2$ , It has been determined according to " EA - 4/02 the Expression of the Uncertainty of Measurement in Calibration" This mean the value of the measured lies within the assigned range of values with a probability of 95%.

**MEASUREMENT RESULTS :**

Sensor Installation  
Rectangular or  
Cubical Shape



Correction of temperature distribution

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	#9	
20	19.7	19.8	20.9	19.7	20.3	20.0	19.9	20.0	19.6	1.3

Correction of temperature average at spread locations

Setting Temperature (°C)	Indicating Temperature (°C)	STD. Reading (°C)	Correction (°C)	Uncertainty (±°C)
20	20	20.0	-0.02	1.3

Chamber Characterization Result

Setting Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (°C)	Temperature Uniformity (°C)	Overall Variation (°C)
20	20	0.42	0.38	1.3

Remark : This result of calibration was found accurate as shown on date, place and stated object of calibration only.

\*\*\* End of report \*\*\*

28.

Certificate No. C08240042

## Calibration Certificate

Equipment:	pH METER	Job No.:	KSMT2400619
Model:	HQ40d	Received Date:	23 April 2024
Serial No.(or ID):	130500088588 (L09-AT-SP003-A2)	Issued Date:	05 May 2024
Manufacturer:	Hach	Page:	1 of 3
Condition:	In Condition		

### Customer

IRPC PUBLIC CO., LTD.  
299 Moo 5, Sukhumvit Road, Tambol Choengneon, Amphur Muang, Rayong 21000 Thailand

### Calibration Place

IRPC PUBLIC CO., LTD.(Gc Lab)  
299 Moo 5, Sukhumvit Road, Tambol Choengneon, Amphur Muang, Rayong 21000 Thailand

### Calibration Date

23 April 2024

### Environment Condition

Temperature: 26.2 °C ± 0.1 °C  
Humidity: 65.9 %RH ± 0.8 %RH

### The Method used

In-house method, WI08, based on ASTM E 70-07

### Traceability

This certificate is traceable to SI Units, Sample Test is assured through primary measurement method Harned cell, through CPAchem Ltd. (ISO17034) Certificate No. 938374, 938376, 938375, pH Scale and Temperature test are traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA20230443EA, through Quality Reborn CO.,Ltd Certificate No.QR23-1169



(Mr. Dumrong Boonsopon)

Person in charge



(Mr. Thalerngkeat Pongngam)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ( $k=2$ ) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of SCIMET Co., Ltd.



## Calibration Results:

### pH Scale

Input (mV)	pH Meter Reading			Uncertainty of Measurement (mV)	Coverage Factor ( <i>k</i> )
	(mV)	Error (mV)	(pH)		
414.12	414.0	-0.12	0.011	0.065	2.00
354.96	354.9	-0.06	1.010	0.065	2.00
295.80	295.7	-0.10	2.008	0.065	2.00
236.64	236.6	-0.04	3.006	0.065	2.00
177.48	177.5	0.02	4.005	0.065	2.00
118.32	118.3	-0.02	5.003	0.065	2.00
59.16	59.1	-0.06	6.002	0.065	2.00
0.00	0.0	0.00	7.000	0.065	2.00
-59.16	-59.2	-0.04	7.999	0.065	2.00
-118.32	-118.3	0.02	8.997	0.065	2.00
-177.48	-177.5	-0.02	9.995	0.065	2.00
-236.64	-236.6	0.04	10.994	0.065	2.00
-295.80	-295.8	0.00	11.992	0.065	2.00
-354.96	-354.9	0.06	12.990	0.065	2.00
-414.12	-414.1	0.02	13.989	0.065	2.00

### Electrode Test Results\*

The three-point calibration using three standard buffer solutions; pH 4.008 , pH 6.985 and pH 9.997

The practical slope of the pH electrode; 58.33 (mV/pH), 98.60%

The zero point of the pH electrode; 6.86 (pH)

### Sample Test Results

Electrode Serial No.: 232822613909

Model: PHC201

Manufacturer: Hach

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor ( <i>k</i> )
4.008	4.017	0.009	0.0046	2.00
6.985	6.997	0.012	0.0085	2.00
9.997	9.994	-0.003	0.0073	2.00

### Temperature Electrode

#### Dimension of Probe;

Length : 120 mm  
Diameter : 12 mm  
Immersion Depth : 80 mm

STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty of Measurement (±°C)	Coverage Factor ( <i>k</i> )
24.98	25.1	-0.12	0.20	2.00

\* Calibration Marked for Electrode Test" Not TISI Accredited " in this Certificate have been included for completeness.

**The End of Certificate**

## Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The error of temperature determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, ASTM E 70-07. Therefore, those parameters have not been assessed separately.

### Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ( $w = 0$ ), Specific Risk  $< 50\%$  PFA  
☒ Choice B Non-binary statement with guard band ( $w = 1 U$ ), Specific Risk  $< 2.5\%$  PFA  
☐ Choice C Customer defined, Customers may define arbitrary multiple of  $r$  to have applied as guard band ( $w = r U$ ) .  
; PFA – Probability of False Accept



(Mr. Thalerngkeat Pongngam)  
Authorized signatory

## pH Scale

Tolerance : 1 mV

Input (mV)	pH Meter Reading			Guard Band (w) (mV)	Tolerance (mV)	Conformity
	(mV)	Error (mV)	(pH)			
414.12	414.0	-0.12	0.011	0.065	1.0	Pass
354.96	354.9	-0.06	1.010	0.065	1.0	Pass
295.80	295.7	-0.10	2.008	0.065	1.0	Pass
236.64	236.6	-0.04	3.006	0.065	1.0	Pass
177.48	177.5	0.02	4.005	0.065	1.0	Pass
118.32	118.3	-0.02	5.003	0.065	1.0	Pass
59.16	59.1	-0.06	6.002	0.065	1.0	Pass
0.00	0.0	0.00	7.000	0.065	1.0	Pass
-59.16	-59.2	-0.04	7.999	0.065	1.0	Pass
-118.32	-118.3	0.02	8.997	0.065	1.0	Pass
-177.48	-177.5	-0.02	9.995	0.065	1.0	Pass
-236.64	-236.6	0.04	10.994	0.065	1.0	Pass
-295.80	-295.8	0.00	11.992	0.065	1.0	Pass
-354.96	-354.9	0.06	12.990	0.065	1.0	Pass
-414.12	-414.1	0.02	13.989	0.065	1.0	Pass

## Sample Test

Tolerance : 0.05 pH

The three-point calibration using three standard buffer solutions; pH 4.008 , pH 6.985 and pH 9.997

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Guard band (w) (pH)	Tolerance (pH)	Conformity
4.008	4.017	0.009	0.0046	0.050	Pass
6.985	6.997	0.012	0.0085	0.050	Pass
9.997	9.994	-0.003	0.0073	0.050	Pass

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

## The End of Statements of Conformity



## ใบตรวจสอบสภาพเครื่อง pH Meter

เลขที่ใบงาน: KSMT2400619

ชนิดเครื่องมือ: pH METER

รุ่น: HQ40d

หมายเลขเครื่อง: 130500088588

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
23 Apr 2024			23 Apr 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด ( ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด – เปิด เครื่อง (On-Off Swicth)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. อิเล็กโทรด ( Electrode and Connection Cable )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สายอิเล็กโทรด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ระดับสารละลายใน Electrode (Level KCl )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	-

เพิ่มเติม/ข้อแนะนำ :

Mr. Dumrong Boonsopon  
Service Engineer