

ภาคผนวกที่ 5

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

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| เอกสาร | 5-1 | เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศ |
| เอกสาร | 5-2 | เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียง |
| เอกสาร | 5-3 | เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำทิ้ง |

ตารางสรุปรายการเอกสารการสอบเทียบเครื่องมือตรวจวัดสิ่งแวดล้อม

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
คุณภาพอากาศ		
- TSP	- High Volume Air Sampler No. B01, B02, B18, B21, B22, B23, B31, B37	- Electronic Balance
- PM ₁₀	- High Volume PM-10 Air Sampler No. B02, B03, B10, B31, B32, B24, R01, R04,	- Electronic Balance
- CO	- CO Analyzer No. CO-B03, B04, B05, B13, B14, B15,	- CO Analyzer No. CO-B03, B04, B05, B13, B14, B15,
- NO ₂	- NO ₂ Analyzer No. NOX- B03, B05, B06, B09, B15, B16, B19	- NO ₂ Analyzer No. NOX- B03, B05, B06, B09, B15, B16, B19
- SO ₂	- Gas Sampler Box No. B01, B03, B08, B10, B56	- Spectrophotometer
	- Rotameter No. L-B01	
- THC	- Personal Pump SKC B02, B10, B04, B43, B88	- THC Analyzer No. B01
	- Rotameter No. L-B01	
ระดับเสียง		
- Leq 24 hr	- Acoustic Calibrator	-
- Lmax	- Sound Level Meter No. ACO-B03, B04, B22, B21, B30, B35, B34, B42	-
- ระดับเสียงรบกวน		
คุณภาพน้ำทิ้ง		
- pH	-	- pH Meter
- BOD ₅	-	- BOD Analyzer
- TDS	-	- Electronic Balance
- TSS	-	- Electronic Balance
- TKN	-	-
- Setteable Solids	-	- Electronic Balance
- Sulfide	-	- Electronic Balance
- Grease & Oil	-	- Electronic Balance
- Total Coliform Bacteria (TCB)	-	- Incubator
- Fecal Coliform Bacteria (FCB)	-	- Water Bath

เอกสารที่ 5-1

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศ



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, Chaluchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B01	B01	01/11/2022	$y = 1.277x - 6.403$	0.999
B02	B02	03/11/2022	$y = 1.083x + 3.505$	0.995
B03	B03	03/11/2022	$y = 1.143x - 1.010$	0.996
B04	B04	04/11/2022	$y = 1.206x - 3.858$	0.995
B05	B05	01/11/2022	$y = 1.317x - 8.733$	0.997
B06	B06	01/11/2022	$y = 1.268x - 5.920$	0.998
B07	B07	01/11/2022	$y = 1.228x - 6.265$	0.998
B08	B08	08/11/2022	$y = 1.160x - 3.496$	0.995
B09	B09	03/11/2022	$y = 1.245x - 5.341$	0.997
B10	B10	01/11/2022	$y = 1.097x + 1.837$	0.997
B11	B11	07/11/2022	$y = 1.153x - 2.164$	0.998
B12	B12	04/11/2022	$y = 1.201x - 3.884$	0.998
B13	B13	01/11/2022	$y = 1.266x - 6.916$	0.995
B14	B14	02/11/2022	$y = 1.269x - 6.120$	0.999
B15	B15	02/11/2022	$y = 1.149x - 1.829$	0.997
B16	B16	02/11/2022	$y = 1.212x - 4.259$	0.999
B17	B17	04/11/2022	$y = 1.172x - 2.143$	0.997
B18	B18	04/11/2022	$y = 1.321x - 9.418$	0.996
B19	B19	02/11/2022	$y = 1.356x - 11.184$	0.997
B20	B20	04/11/2022	$y = 1.310x - 8.682$	0.997
B21	B21	03/11/2022	$y = 1.156x - 2.174$	0.999
B22	B22	02/11/2022	$y = 1.288x - 8.740$	0.998
B23	B23	04/11/2022	$y = 1.247x - 5.764$	0.996
B24	B24	01/11/2022	$y = 1.161x - 2.123$	0.999
B25	B25	02/11/2022	$y = 1.025x + 3.341$	0.997
B26	B26	02/11/2022	$y = 1.234x - 6.128$	0.995
B27	B27	03/11/2022	$y = 1.220x - 5.822$	0.997
B28	B28	02/11/2022	$y = 1.253x - 6.605$	0.999
B29	B29	08/11/2022	$y = 1.311x - 8.876$	0.997
B30	B30	07/11/2022	$y = 1.264x - 7.252$	0.998
B31	B31	07/11/2022	$y = 1.215x - 4.628$	0.995
B32	B32	03/11/2022	$y = 1.258x - 6.433$	0.997
B33	B33	03/11/2022	$y = 1.329x - 7.779$	0.995
B34	B34	03/11/2022	$y = 1.267x - 7.491$	0.998

Calibrated by :

(Mr. Adul Dangkiom)

Approved by :

(Mr. Peera Detudom)



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 ³ /min)	R ²
B35	B35	03/11/2022	y = 1.306x-9.466	0.997
B36	B36	02/11/2022	y = 1.213x-5.932	0.996
B37	B37	01/11/2022	y = 1.253x-5.209	0.999
B38	B38	01/11/2022	y = 1.228x-5.530	0.995
B39	B39	01/11/2022	y = 1.319x-9.149	0.998
B40	B40	01/11/2022	y = 1.196x-4.045	0.999
B41	B41	07/11/2022	y = 1.179x-2.611	0.999
B42	B42	01/11/2022	y = 1.209x-3.713	0.995
B43	B43	02/11/2022	y = 1.187x-3.331	0.998
B44	B44	07/11/2022	y = 1.298x-8.171	0.996
R01	R01	02/11/2022	y = 1.289x-8.287	0.998
R02	R02	07/11/2022	y = 1.307x-10.165	0.999
R03	R03	03/11/2022	y = 1.259x-7.634	0.995
R04	R04	04/11/2022	y = 1.157x-2.287	0.995
R05	R05	03/11/2022	y = 1.273x-8.311	0.999
R06	R06	01/11/2022	y = 1.297x-8.271	0.999
R07	R07	02/11/2022	y = 1.071x+1.468	0.995
R08	R08	01/11/2022	y = 1.206x-5.068	0.997
R09	R09	01/11/2022	y = 1.252x-7.084	0.995
R10	R10	03/11/2022	y = 1.246x-5.817	0.999
R11	R11	03/11/2022	y = 1.117x-1.156	0.998
R12	R12	02/11/2022	y = 1.351x-12.068	0.996
R13	R13	03/11/2022	y = 1.118x-0.601	0.999
R14	R14	03/11/2022	y = 1.164x-2.415	0.996
R15	R15	03/11/2022	y = 1.134x-1.793	0.998
R16	R16	04/11/2022	y = 1.182x-4.717	0.996
R17	R17	07/11/2022	y = 1.218x-5.356	0.998
R18	R18	04/11/2022	y = 1.233x-5.977	0.996
R19	R19	07/11/2022	y = 1.277x-7.752	0.997
R20	R20	04/11/2022	y = 1.327x-10.628	0.997

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

✓ (Mr. Peera Detudom)



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S/N : 3611

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Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B01	B01	01/02/2023	$y = 1.278x - 5.652$	0.997
B02	B02	02/02/2023	$y = 1.147x + 0.663$	0.999
B03	B03	01/02/2023	$y = 1.123x - 0.622$	0.995
B04	B04	01/02/2023	$y = 1.229x - 4.835$	0.996
B05	B05	02/02/2023	$y = 1.280x - 6.358$	0.997
B06	B06	01/02/2023	$y = 1.251x - 5.438$	0.999
B07	B07	03/02/2023	$y = 1.165x - 3.515$	0.996
B08	B08	03/02/2023	$y = 1.269x - 7.559$	0.997
B09	B09	01/02/2023	$y = 1.198x - 2.843$	0.998
B10	B10	01/02/2023	$y = 1.128x + 0.785$	0.999
B11	B11	02/02/2023	$y = 1.138x - 1.752$	0.999
B12	B12	01/02/2023	$y = 1.195x - 4.080$	0.998
B13	B13	01/02/2023	$y = 1.254x - 5.913$	0.999
B14	B14	03/02/2023	$y = 1.291x - 7.822$	0.999
B15	B15	01/02/2023	$y = 1.149x - 1.829$	0.997
B16	B16	01/02/2023	$y = 1.287x - 7.502$	0.997
B17	B17	02/02/2023	$y = 1.207x - 4.147$	1.000
B18	B18	01/02/2023	$y = 1.277x - 7.238$	0.999
B19	B19	03/02/2023	$y = 1.243x - 6.520$	0.995
B20	B20	01/02/2023	$y = 1.267x - 7.055$	1.000
B21	B21	03/02/2023	$y = 1.141x - 1.101$	0.999
B22	B22	03/02/2023	$y = 1.221x - 5.534$	0.996
B23	B23	02/02/2023	$y = 1.197x - 4.328$	0.995
B24	B24	01/02/2023	$y = 1.159x - 2.269$	0.999
B25	B25	01/02/2023	$y = 1.050x + 2.684$	0.998
B26	B26	03/02/2023	$y = 1.253x - 6.203$	0.997
B27	B27	03/02/2023	$y = 1.220x - 5.822$	0.997
B28	B28	01/02/2023	$y = 1.251x - 6.762$	0.999
B29	B29	01/02/2023	$y = 1.201x - 3.793$	0.998
B30	B30	03/02/2023	$y = 1.242x - 6.540$	0.995
B31	B31	03/02/2023	$y = 1.255x - 6.608$	0.999
B32	B32	02/02/2023	$y = 1.249x - 6.292$	0.997
B33	B33	02/02/2023	$y = 1.260x - 5.168$	0.997
B34	B34	01/02/2023	$y = 1.272x - 7.454$	1.000

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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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 ³ /min)	R ²
B35	B35	01/02/2023	y = 1.194x-4.992	0.995
B36	B36	02/02/2023	y = 1.201x-3.946	0.997
B37	B37	02/02/2023	y = 1.284x-6.745	0.997
B38	B38	02/02/2023	y = 1.250x-6.733	0.998
B39	B39	01/02/2023	y = 1.268x-7.186	0.998
B40	B40	03/02/2023	y = 1.214x-4.324	0.998
B41	B41	03/02/2023	y = 1.176x-2.734	0.999
B42	B42	02/02/2023	y = 1.283x-8.167	0.997
B43	B43	02/02/2023	y = 1.197x-3.772	0.996
B44	B44	02/02/2023	y = 1.249x-7.038	0.995
R01	R01	01/02/2023	y = 1.287x-8.462	0.998
R02	R02	01/02/2023	y = 1.239x-6.678	0.998
R03	R03	03/02/2023	y = 1.254x-7.928	0.999
R04	R04	02/02/2023	y = 1.206x-3.694	0.999
R05	R05	02/02/2023	y = 1.237x-6.503	0.997
R06	R06	02/02/2023	y = 1.239x-4.541	0.995
R07	R07	03/02/2023	y = 1.060x+1.983	0.999
R08	R08	03/02/2023	y = 1.274x-8.050	0.998
R09	R09	02/02/2023	y = 1.280x-7.005	0.998
R10	R10	03/02/2023	y = 1.244x-5.980	1.000
R11	R11	03/02/2023	y = 1.097x-0.462	0.998
R12	R12	02/02/2023	y = 1.151x-2.727	0.995
R13	R13	02/02/2023	y = 1.134x-1.526	1.000
R14	R14	02/02/2023	y = 1.172x-2.510	0.999
R15	R15	01/02/2023	y = 1.131x-2.129	0.998
R16	R16	01/02/2023	y = 1.202x-5.830	0.998
R17	R17	01/02/2023	y = 1.182x-3.281	0.998
R18	R18	03/02/2023	y = 1.217x-5.060	0.999
R19	R19	03/02/2023	y = 1.228x-6.084	0.998
R20	R20	03/02/2023	y = 1.277x-9.434	0.997

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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

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 (l ³ /min)	R ²
B01	B01	02/11/2022	$y = 1.206x - 0.557$	0.998
B02	B02	02/11/2022	$y = 1.024x + 3.762$	0.999
B03	B03	02/11/2022	$y = 1.243x - 4.455$	0.998
B04	B04	03/11/2022	$y = 1.293x - 7.303$	0.997
B05	B05	03/11/2022	$y = 1.252x - 5.903$	0.999
B06	B06	04/11/2022	$y = 1.313x - 7.710$	0.997
B07	B07	02/11/2022	$y = 1.290x - 6.671$	0.999
B08	B08	04/11/2022	$y = 1.330x - 6.996$	0.999
B09	B09	04/11/2022	$y = 1.280x - 6.331$	0.995
B10	B10	02/11/2022	$y = 1.298x - 8.225$	0.997
B11	B11	04/11/2022	$y = 1.273x - 5.540$	0.995
B12	B12	04/11/2022	$y = 1.282x - 7.018$	0.996
B13	B13	01/11/2022	$y = 1.320x - 9.281$	0.998
B14	B14	02/11/2022	$y = 1.230x - 3.665$	0.998
B15	B15	02/11/2022	$y = 1.166x - 2.184$	0.997
B16	B16	01/11/2022	$y = 1.260x - 2.121$	0.998
B17	B17	04/11/2022	$y = 1.277x - 4.847$	0.998
B18	B18	01/11/2022	$y = 1.165x - 1.164$	0.999
B19	B19	02/11/2022	$y = 1.094x + 1.145$	0.999
B20	B20	02/11/2022	$y = 1.221x - 5.301$	0.997
B21	B21	01/11/2022	$y = 1.176x - 0.519$	0.999
B22	B22	02/11/2022	$y = 1.286x - 7.131$	0.998
B23	B23	03/11/2022	$y = 1.181x - 2.246$	0.999
B24	B24	03/11/2022	$y = 1.253x - 5.274$	0.995
B25	B25	04/11/2022	$y = 1.159x - 3.062$	0.996
B26	B26	03/11/2022	$y = 1.264x - 6.317$	0.998
B27	B27	03/11/2022	$y = 1.332x - 10.385$	0.996
B28	B28	03/11/2022	$y = 1.165x - 2.689$	0.998
B29	B29	03/11/2022	$y = 1.271x - 7.065$	0.996
B30	B30	01/11/2022	$y = 1.274x - 7.435$	0.996
B31	B31	01/11/2022	$y = 1.244x - 3.676$	0.999
B32	B32	01/11/2022	$y = 1.186x - 1.847$	0.999
B33	B33	04/11/2022	$y = 1.268x - 6.742$	0.996
B34	B34	01/11/2022	$y = 1.321x - 5.654$	0.998

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft^3/min)	R^2
R01	R01	02/11/2022	$y = 1.257x - 6.210$	0.998
R02	R02	07/11/2022	$y = 1.240x - 5.054$	0.996
R03	R03	03/11/2022	$y = 1.199x - 4.666$	0.996
R04	R04	04/11/2022	$y = 1.215x - 6.193$	0.999
R05	R05	04/11/2022	$y = 1.210x - 5.386$	0.998
R06	R06	02/11/2022	$y = 1.270x - 6.263$	0.995
R07	R07	07/11/2022	$y = 1.227x - 5.259$	0.998
R08	R08	03/11/2022	$y = 1.258x - 7.271$	0.998
R09	R09	07/11/2022	$y = 1.202x - 6.317$	0.999
R10	R10	03/11/2022	$y = 1.196x - 4.622$	0.997
R11	R11	02/11/2022	$y = 1.284x - 7.142$	0.996
R12	R12	02/11/2022	$y = 1.253x - 7.460$	0.996
R13	R13	04/11/2022	$y = 1.262x - 6.240$	0.998
R14	R14	04/11/2022	$y = 1.254x - 6.659$	0.999
R15	R15	03/11/2022	$y = 1.299x - 9.065$	0.998
R16	R16	09/11/2022	$y = 1.263x - 7.053$	0.995
R17	R17	07/11/2022	$y = 1.224x - 4.966$	0.997
R18	R18	07/11/2022	$y = 1.235x - 5.907$	0.999
R19	R19	03/11/2022	$y = 1.302x - 9.454$	0.995
R20	R20	04/11/2022	$y = 1.244x - 8.211$	0.999

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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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

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 ³ /min)	R ²
B01	B01	02/02/2023	y = 1.210x-0.261	0.997
B02	B02	02/02/2023	y = 1.046x+2.414	0.998
B03	B03	02/02/2023	y = 1.199x-4.047	0.996
B04	B04	02/02/2023	y = 1.288x-7.602	0.997
B05	B05	01/02/2023	y = 1.222x-4.886	1.000
B06	B06	01/02/2023	y = 1.210x-3.612	0.996
B07	B07	03/02/2023	y = 1.270x-6.088	0.999
B08	B08	01/02/2023	y = 1.277x-5.288	0.998
B09	B09	03/02/2023	y = 1.289x-6.478	0.999
B10	B10	03/02/2023	y = 1.266x-8.106	0.997
B11	B11	01/02/2023	y = 1.258x-6.917	0.995
B12	B12	02/02/2023	y = 1.192x-3.640	0.998
B13	B13	02/02/2023	y = 1.289x-7.913	0.998
B14	B14	02/02/2023	y = 1.250x-4.233	0.999
B15	B15	01/02/2023	y = 1.118x+0.802	0.999
B16	B16	03/02/2023	y = 1.297x-3.106	0.998
B17	B17	01/02/2023	y = 1.204x-4.477	0.996
B18	B18	02/02/2023	y = 1.176x-1.624	0.998
B19	B19	02/02/2023	y = 1.097x+1.230	0.999
B20	B20	03/02/2023	y = 1.188x-4.372	0.999
B21	B21	03/02/2023	y = 1.156x-0.146	0.996
B22	B22	03/02/2023	y = 1.269x-6.647	0.998
B23	B23	02/02/2023	y = 1.197x-2.685	1.000
B24	B24	02/02/2023	y = 1.251x-6.437	0.995
B25	B25	01/02/2023	y = 1.144x-2.851	0.997
B26	B26	01/02/2023	y = 1.249x-5.704	0.996
B27	B27	01/02/2023	y = 1.241x-5.428	0.997
B28	B28	01/02/2023	y = 1.198x-4.626	0.998
B29	B29	02/02/2023	y = 1.244x-7.658	0.997
B30	B30	02/02/2023	y = 1.246x-7.229	0.997
B31	B31	02/02/2023	y = 1.178x-0.243	0.995
B32	B32	03/02/2023	y = 1.201x-2.954	0.998
B33	B33	03/02/2023	y = 1.168x-1.341	0.997
B34	B34	01/02/2023	y = 1.237x-2.684	0.995

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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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

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 ³ /min)	R ²
R01	R01	01/02/2023	y = 1.253x-8.016	0.996
R02	R02	01/02/2023	y = 1.246x-5.052	0.998
R03	R03	02/02/2023	y = 1.239x-5.451	0.999
R04	R04	03/02/2023	y = 1.263x-8.320	0.999
R05	R05	03/02/2023	y = 1.193x-4.904	0.998
R06	R06	03/02/2023	y = 1.270x-7.534	0.995
R07	R07	03/02/2023	y = 1.244x-5.727	0.998
R08	R08	02/02/2023	y = 1.277x-7.820	0.998
R09	R09	02/02/2023	y = 1.183x-5.015	0.996
R10	R10	01/02/2023	y = 1.200x-4.576	0.999
R11	R11	01/02/2023	y = 1.225x-4.833	0.995
R12	R12	03/02/2023	y = 1.273x-8.109	0.998
R13	R13	01/02/2023	y = 1.281x-6.830	1.000
R14	R14	01/02/2023	y = 1.288x-7.622	0.999
R15	R15	02/02/2023	y = 1.282x-8.311	0.997
R16	R16	02/02/2023	y = 1.246x-5.817	0.995
R17	R17	03/02/2023	y = 1.263x-7.123	0.999
R18	R18	03/02/2023	y = 1.203x-5.483	0.999
R19	R19	01/02/2023	y = 1.204x-4.399	0.996
R20	R20	01/02/2023	y = 1.259x-8.655	0.997

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร 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					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	17 January 2023	BRAND :	API	MODEL :	200E
NO.	NOX-B06	SERIAL NO.	2286		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 04 August 2022			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: D636192
Certified Date	: 20 April 2022	Expired Date	: 20 April 2024	Cylinder Conc.	: 49.1 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	49	
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	1.009
NO _x Span	400	400.4	0.100	400.0	1.012
API Model 200E NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	504	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.1	mV	-20 - 150		
AZERO	93.9	mV	-20 - 150		
HVPS	671	V	420 - 900 constant		
RCELL TEMP	50.5	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.4	°C	7 ± 2		
MOLY TEMP	314.7	°C	315 ± 5		
RCELL PRESS	8.3	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 _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.009	-	1.0 ± 0.3		
NO _x Slope	1.012	-	1.0 ± 0.3		
NO Offset	1.6	mV	-20 to +150		
NO _x Offset	1.0	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by : _____

(Mr.Adul Dangklom)

Approved by : _____

y (Mr.Reera Detudom)



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

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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 17 January 2023

BRAND : API

MODEL : 200E

NO. NOX-B09

SERIAL NO. 4412

Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 04 August 2022

Serial No. : 911

Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : D636192

Certified Date : 20 April 2022

Expired Date : 20 April 2024

Cylinder Conc. : 49.1 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 49

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	-0.11	-	0	-
NO Span	400	399.9	-0.025	400.0	1.006
NO _x Span	400	400.2	0.050	400.0	1.010

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	507	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	102.9	mV	-20 - 150
AZERO	93.8	mV	-20 - 150
HVPS	670	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	314.9	°C	315 ± 5
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.006	-	1.0 ± 0.3
NO _x Slope	1.010	-	1.0 ± 0.3
NO Offset	1.2	mV	-20 to +150
NO _x 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 : _____

(Mr.Adul Dangklom)

Approved by : _____

(Mr.Peera Detudom)



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

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 February 2023	BRAND :	API	MODEL :	200E
NO.	NOX-B05	SERIAL NO.	2284		
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 04 August 2022			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Nitric Oxide (NO)			Cylinder No. : D636192		
Certified Date : 20 April 2022		Expired Date : 20 April 2024		Cylinder Conc. : 49.1 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
% RH 49					
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	399.9	-0.025	400.0	1.006
NO _x Span	400	400.2	0.050	400.0	1.009
API Model 200E NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	505	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.4	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	670	V	420 - 900 constant		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.4	°C	7 ± 2		
MOLY TEMP	314.9	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.006	-	1.0 ± 0.3		
NO _x Slope	1.009	-	1.0 ± 0.3		
NO Offset	1.2	mV	-20 to +150		
NO _x 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 : _____

(Mr.Adul Dangkom)

Approved by : _____

(Mr.Peera Detudom)



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7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol. Chatuchak, Bangkok 10900
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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 23 February 2023

BRAND : API

MODEL : 200E

NO. NOX-B05

SERIAL NO. 2284

Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 04 August 2022

Serial No. : 911

Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : D636192

Certified Date : 20 April 2022

Expired Date : 20 April 2024

Cylinder Conc. : 49.1 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.5 °C

% RH 49

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	-0.11	-	0	-
NO Span	400	399.9	-0.025	400.0	1.006
NO _x Span	400	400.2	0.050	400.0	1.009

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	505	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.4	mV	-20 - 150
AZERO	94.2	mV	-20 - 150
HVPS	670	V	420 - 900 constant
RCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	29.2	°C	8 - 48
PMT TEMP	7.4	°C	7 ± 2
MOLY TEMP	314.9	°C	315 ± 5
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.006	-	1.0 ± 0.3
NO _x Slope	1.009	-	1.0 ± 0.3
NO Offset	1.2	mV	-20 to +150
NO _x 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 : _____

(Mr.Adul Dangklom)

Approved by : _____

(Mr.Peera Detudom)



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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	18 March 2023	BRAND :	API	MODEL :	200A
NO.	NOX-B03	SERIAL NO.	2617		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 04 August 2022			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: D636192
Certified Date	: 20 April 2022	Expired Date	: 20 April 2024	Cylinder Conc.	: 49.1 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
% RH	49				
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	1.002
NO _x Span	400	399.8	-0.050	400.0	1.005
API Model 200A NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	503	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.3	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	674	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.0	°C	8 - 48		
PMT TEMP	7.3	°C	7 ± 2		
MOLY TEMP	314.9	°C	315 ± 5		
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.002	-	1.0 ± 0.3		
NO _x Slope	1.005	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO _x Offset	0.6	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by : _____

(Mr.Adul Dangklom)

Approved by : _____

(Mr.Peera Detudom)



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CALIBRATION REPORT						
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER						
DATE :	18 March 2023	BRAND :	API	MODEL :	200A	
NO.	NOX-B15	SERIAL NO.	213			
Calibrator (Dilution System)						
Brand	: API			Model	: 700	
Last Cal. Date	: 04 August 2022			Serial No.	: 911	
Reference Standard Gas						
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: D636192	
Certified Date	: 20 April 2022	Expired Date	: 20 April 2024	Cylinder Conc.	: 49.1 ppm	
CALIBRATING CONDITION						
Pressure	1011	mmbar	Temp.	24.5	°C	
% RH						49
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	1.009	
NO _x Span	400	400.2	0.050	400.0	1.012	
API Model 200A NO _x Analyzer Check List						
Test Values	Observed Value	Units	Nominal Range			
RANGE	500	PPB	500 standard			
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air			
SAMPLE FLOW	508	cc/min	500 ± 50			
OZONE FLOW	78	cc/min	80 ± 15			
PMT	102.9	mV	-20 - 150			
AZERO	93.7	mV	-20 - 150			
HVPS	671	V	420 - 900 constant			
RCELL TEMP	50.4	°C	50 ± 1			
BOX TEMP	29.2	°C	8 - 48			
PMT TEMP	7.1	°C	7 ± 2			
MOLY TEMP	315.2	°C	315 ± 5			
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant			
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant			
NO Span Conc	400	PPB	20 - 20,000			
NO _x Span Conc	400	PPB	20 - 20,000			
NO Slope	1.009	-	1.0 ± 0.3			
NO _x Slope	1.012	-	1.0 ± 0.3			
NO Offset	1.6	mV	-20 to +150			
NO _x Offset	1.0	mV	-20 to 150			
Stability at Zero	0.1	PPB	< 0.2			
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas			

Calibrated by : _____

(Mr.Adul Dangklom)

Approved by : _____

(Mr.Peera Detudom)



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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

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 24 April 2023

BRAND : API

MODEL : 200E

NO. NOX-B09

SERIAL NO. 4412

Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 04 August 2022

Serial No. : 911

Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : D636192

Certified Date : 20 April 2022

Expired Date : 20 April 2024

Cylinder Conc. : 49.1 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.5 °C

% RH 49

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	0.11	-	0	-
NO Span	400	400.1	0.025	400.0	1.009
NO _x Span	400	400.4	0.100	400.0	1.013

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	503	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.2	mV	-20 - 150
AZERO	94.0	mV	-20 - 150
HVPS	673	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.5	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	315.2	°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 _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.009	-	1.0 ± 0.3
NO _x Slope	1.013	-	1.0 ± 0.3
NO Offset	1.6	mV	-20 to +150
NO _x 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 : _____

(Mr.Adul Dangklom)

Approved by : _____

(Mr.Peera Detudom)



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 24 April 2023

BRAND : API

MODEL : 200E

NO. NOX-B16

SERIAL NO. 249

Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 04 August 2022

Serial No. : 911

Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : D636192

Certified Date : 20 April 2022

Expired Date : 20 April 2024

Cylinder Conc. : 49.1 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.5 °C

% RH 49

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	399.8	-0.050	400.0	1.006
NO _x Span	400	400.1	0.025	400.0	1.009

API Model 200E NO_x 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	103.1	mV	-20 - 150
AZERO	93.8	mV	-20 - 150
HVPS	671	V	420 - 900 constant
RCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.2	°C	8 - 48
PMT TEMP	7.4	°C	7 ± 2
MOLY TEMP	314.8	°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 _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.006	-	1.0 ± 0.3
NO _x Slope	1.009	-	1.0 ± 0.3
NO Offset	1.3	mV	-20 to +150
NO _x Offset	0.8	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by : _____

(Mr.Adul Dangklom)

Approved by : _____

V

(Mr.Peera Detudom)



NON-DISPERSIVE INFRARED CO ANALYZER

SERIAL NO.	3116
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Calibrator (Dilution System)

Serial No.	: 421
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Reference Standard Gas

Cylinder Conc.	: 4,570 PPM
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CALIBRATING CONDITION

% RH	49
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CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response
Zero	0	-0.10	-	0
CO Span	40.00	39.94	-0.150	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	4016.4	mV	2500-4800 mV
CO REFERENCE	3949.3	mV	2500-4800 mV
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air
SAMPLE PRESSURE	28.5	In-Hg-A	~2" < ambient absolute pressure
SAMPLE FLOW	808	cc/min	800 ± 10%
SAMPLE TEMPERATURE	48.5	°C	48 ± 4
BENCH TEMPERATURE	48.2	°C	48 ± 2
WHEEL TEMPERATURE	68.4	°C	68 ± 2
BOX TEMPERATURE	30.8	°C	Ambient temp + 7 ± 10
PHOTO-DRIVE	3028.5	mV	250 mV to 4750 mV
SLOPE	1.017	-	1.0 ± 0.3
OFFSET	0.2	-	0 ± 0.3

Approved by :

(M. AUM Dangkum)

✓ (Mr. Peera Detudom)



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CALIBRATION REPORT						
NON-DISPERSIVE INFRARED CO ANALYZER						
DATE :	17 January 2023	BRAND :	API	MODEL :	300E	
NO.	CO-B15	SERIAL NO.	226			
Calibrator (Dilution System)						
Brand	: API			Model	: 700	
Last Cal. Date	: 06 September 2022			Serial No.	: 421	
Reference Standard Gas						
Standard Gas	: Carbon Monoxide (CO)			Cylinder No.	: D196045	
Certified Date	: 16 April 2022	Expired Date	: 15 April 2024	Cylinder Conc.	: 4,570 PPM	
CALIBRATING CONDITION						
Pressure	1011	mmbar	Temp.	24.6	°C	
% RH						49
CALIBRATION SETTING						
Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM		
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response		
Zero	0	0.10	-	0		
CO Span	40.00	39.95	-0.125	40.00		
API Model 300E CO Analyzer Check list						
Parameter	Observed Value	Units	Nominal Range			
RANGE	50	PPM	0-1000 ppm			
STABILITY	0.10	PPM	< 1 ppm with zero air			
CO MEASURE	4015.3	mV	2500-4800 mV			
CO REFERENCE	3948.7	mV	2500-4800 mV			
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air			
SAMPLE PRESSURE	28.4	In-Hg-A	~2" < ambient absolute pressure			
SAMPLE FLOW	809	cc/min	800 ± 10%			
SAMPLE TEMPERATURE	48.4	°C	48 ± 4			
BENCH TEMPERATURE	48.1	°C	48 ± 2			
WHEEL TEMPERATURE	68.3	°C	68 ± 2			
BOX TEMPERATURE	30.6	°C	Ambient temp + 7 ± 10			
PHOTO-DRIVE	3031.2	mV	250 mV to 4750 mV			
SLOPE	1.017	-	1.0 ± 0.3			
OFFSET	0.2	-	0 ± 0.3			

Calibrated by : _____
(Mr.Adul Dangklom)

Approved by : _____
(Mr.Peera Detudom)



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CALIBRATION REPORT

NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 23 February 2023

BRAND : API

MODEL : 300E

NO. CO-B03

SERIAL NO. 3019

Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 06 September 2022

Serial No. : 421

Reference Standard Gas

Standard Gas : Carbon Monoxide (CO)

Cylinder No. : D196045

Certified Date : 16 April 2022

Expired Date : 15 April 2024

Cylinder Conc. : 4,570 PPM

CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.5 °C

% RH 49

CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response
Zero	0	0.10	-	0
CO Span	40.00	39.96	-0.100	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	4013.5	mV	2500-4800 mV
CO REFERENCE	3947.4	mV	2500-4800 mV
MEASURE/REFERENCE RATIO	1.179	-	1.1-1.3 w/zero air
SAMPLE PRESSURE	28.4	In-Hg-A	~2" < ambient absolute pressure
SAMPLE FLOW	806	cc/min	800 ± 10%
SAMPLE TEMPERATURE	48.2	°C	48 ± 4
BENCH TEMPERATURE	48.1	°C	48 ± 2
WHEEL TEMPERATURE	68.4	°C	68 ± 2
BOX TEMPERATURE	30.9	°C	Ambient temp + 7 ± 10
PHOTO-DRIVE	3040.7	mV	250 mV to 4750 mV
SLOPE	1.017	-	1.0 ± 0.3
OFFSET	0.2	-	0 ± 0.3

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT

NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 23 February 2023

BRAND : API

MODEL : 300E

NO. CO-B13

SERIAL NO. 176

Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 06 September 2022

Serial No. : 421

Reference Standard Gas

Standard Gas : Carbon Monoxide (CO)

Cylinder No. : D196045

Certified Date : 16 April 2022

Expired Date : 15 April 2024

Cylinder Conc. : 4,570 PPM

CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.5 °C

% RH 49

CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response
Zero	0	-0.10	-	0
CO Span	40.00	39.92	-0.200	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	4014.6	mV	2500-4800 mV
CO REFERENCE	3949.7	mV	2500-4800 mV
MEASURE/REFERENCE RATIO	1.179	-	1.1-1.3 w/zero air
SAMPLE PRESSURE	28.5	In-Hg-A	~2" < ambient absolute pressure
SAMPLE FLOW	803	cc/min	800 ± 10%
SAMPLE TEMPERATURE	48.2	°C	48 ± 4
BENCH TEMPERATURE	48.0	°C	48 ± 2
WHEEL TEMPERATURE	68.3	°C	68 ± 2
BOX TEMPERATURE	30.7	°C	Ambient temp + 7 ± 10
PHOTO-DRIVE	3036.2	mV	250 mV to 4750 mV
SLOPE	1.016	-	1.0 ± 0.3
OFFSET	0.2	-	0 ± 0.3

Calibrated by : —

(Mr.Adul Dangklom)

Approved by : —

(Mr.Peera Detudom)



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CALIBRATION REPORT					
NON-DISPERSIVE INFRARED CO ANALYZER					
DATE :	18 March 2023	BRAND :	API	MODEL :	300E
NO.	CO-B03			SERIAL NO.	3019
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 06 September 2022			Serial No.	: 421
Reference Standard Gas					
Standard Gas	: Carbon Monoxide (CO)			Cylinder No.	: D196045
Certified Date	: 16 April 2022	Expired Date	: 15 April 2024	Cylinder Conc.	: 4,570 PPM
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	49	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.10	-	0	
CO Span	40.00	39.96	-0.100	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	4013.5	mV	2500-4800 mV		
CO REFERENCE	3947.1	mV	2500-4800 mV		
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air		
SAMPLE PRESSURE	28.5	In-Hg-A	~2" < ambient absolute pressure		
SAMPLE FLOW	808	cc/min	800 ± 10%		
SAMPLE TEMPERATURE	48.2	°C	48 ± 4		
BENCH TEMPERATURE	48.1	°C	48 ± 2		
WHEEL TEMPERATURE	68.4	°C	68 ± 2		
BOX TEMPERATURE	30.8	°C	Ambient temp + 7 ± 10		
PHOTO-DRIVE	3045.1	mV	250 mV to 4750 mV		
SLOPE	1.017	-	1.0 ± 0.3		
OFFSET	0.2	-	0 ± 0.3		

Calibrated by : _____
(Mr.Adul Dangklom)

Approved by : _____
(Mr.Peera Detudom)



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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
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CALIBRATION REPORT					
NON-DISPERSIVE INFRARED CO ANALYZER					
DATE :	18 March 2023	BRAND :	API	MODEL :	300E
NO.	CO-B04			SERIAL NO.	3089
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 06 September 2022			Serial No.	: 421
Reference Standard Gas					
Standard Gas	: Carbon Monoxide (CO)			Cylinder No.	: D196045
Certified Date	: 16 April 2022	Expired Date	: 15 April 2024	Cylinder Conc.	: 4,570 PPM
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	49	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.10	-	0	
CO Span	40.00	39.94	-0.150	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	4014.5	mV	2500-4800 mV		
CO REFERENCE	3948.7	mV	2500-4800 mV		
MEASURE/REFERENCE RATIO	1.179	-	1.1-1.3 w/zero air		
SAMPLE PRESSURE	28.6	In-Hg-A	~2" < ambient absolute pressure		
SAMPLE FLOW	810	cc/min	800 ± 10%		
SAMPLE TEMPERATURE	48.4	°C	48 ± 4		
BENCH TEMPERATURE	48.2	°C	48 ± 2		
WHEEL TEMPERATURE	68.3	°C	68 ± 2		
BOX TEMPERATURE	30.7	°C	Ambient temp + 7 ± 10		
PHOTO-DRIVE	3024.6	mV	250 mV to 4750 mV		
SLOPE	1.017	-	1.0 ± 0.3		
OFFSET	0.2	-	0 ± 0.3		

Calibrated by : _____
(Mr.Adul Dangklom)

Approved by : _____
(Mr.Peera Detudom)



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CALIBRATION REPORT							
NON-DISPERSIVE INFRARED CO ANALYZER							
DATE :	24 April 2023	BRAND :	API	MODEL :	300E		
NO.	CO-B05	SERIAL NO.	3116				
Calibrator (Dilution System)							
Brand	: API			Model	: 700		
Last Cal. Date	: 06 September 2022			Serial No.	: 421		
Reference Standard Gas							
Standard Gas	: Carbon Monoxide (CO)			Cylinder No.	: D196045		
Certified Date	: 16 April 2022	Expired Date	: 15 April 2024	Cylinder Conc.	: 4,570 PPM		
CALIBRATING CONDITION							
Pressure	1011	mmbar	Temp.	24.5	°C	% RH	49
CALIBRATION SETTING							
Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM			
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response			
Zero	0	0.10	-	0			
CO Span	40.00	39.92	-0.200	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	4016.8	mV	2500-4800 mV				
CO REFERENCE	3948.4	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	809	cc/min	800 ± 10%				
SAMPLE TEMPERATURE	48.5	°C	48 ± 4				
BENCH TEMPERATURE	48.2	°C	48 ± 2				
WHEEL TEMPERATURE	68.4	°C	68 ± 2				
BOX TEMPERATURE	30.9	°C	Ambient temp + 7 ± 10				
PHOTO-DRIVE	3035.5	mV	250 mV to 4750 mV				
SLOPE	1.017	-	1.0 ± 0.3				
OFFSET	0.2	-	0 ± 0.3				

Calibrated by : _____

(Mr.Adul Dangklom)

Approved by : _____

(Mr.Peerat Deudom)



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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 :	24 April 2023	BRAND :	API	MODEL :	300EU		
NO.	CO-B14	SERIAL NO.	131				
Calibrator (Dilution System)							
Brand : API			Model : 700				
Last Cal. Date : 06 September 2022			Serial No. : 421				
Reference Standard Gas							
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D196045				
Certified Date : 16 April 2022		Expired Date : 15 April 2024		Cylinder Conc. : 4,570 PPM			
CALIBRATING CONDITION							
Pressure	1011	mmbar	Temp.	24.5	°C	% RH	49
CALIBRATION SETTING							
Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM			
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response			
Zero	0	0.11	-	0			
CO Span	40.00	39.94	-0.150	40.00			
API Model 300EU 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	4017.4	mV	2500-4800 mV				
CO REFERENCE	3949.2	mV	2500-4800 mV				
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air				
SAMPLE PRESSURE	28.5	In-Hg-A	~2" < ambient absolute pressure				
SAMPLE FLOW	807	cc/min	800 ± 10%				
SAMPLE TEMPERATURE	48.3	°C	48 ± 4				
BENCH TEMPERATURE	48.0	°C	48 ± 2				
WHEEL TEMPERATURE	68.2	°C	68 ± 2				
BOX TEMPERATURE	30.8	°C	Ambient temp + 7 ± 10				
PHOTO-DRIVE	3039.1	mV	250 mV to 4750 mV				
SLOPE	1.017	-	1.0 ± 0.3				
OFFSET	0.2	-	0 ± 0.3				

Calibrated by : _____
(Mr.Adul Dangklom)

Approved by : _____
(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 $^{\circ}\text{C}$
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 ²
B01	SKC	224-PCXR4	262101	03/01/2023	1,000	1,500	2,000	993	1,497	1,998	1.003x - 5.584	1.000
B02	SKC	224-PCXR4	626166	03/01/2023	1,000	1,500	2,000	1,003	1,505	2,001	1.009x - 19.667	0.999
B03	SKC	224-PCXR4	612968	03/01/2023	1,000	1,500	2,000	996	1,494	2,000	1.006x - 12.109	1.000
B04	SKC	224-PCXR4	602804	04/01/2023	1,000	1,500	2,000	1,000	1,502	1,995	1.000x - 0.893	1.000
B05	SKC	224-PCXR4	612693	04/01/2023	1,000	1,500	2,000	1,003	1,500	2,003	1.012x - 22.224	0.999
B06	SKC	224-PCXR4	262188	03/01/2023	1,000	1,500	2,000	995	1,508	2,005	1.011x - 20.273	1.000
B07	SKC	224-PCXR4	626262	03/01/2023	1,000	1,500	2,000	998	1,492	1,995	0.993x + 6.086	1.000
B08	SKC	224-PCXR4	626100	03/01/2023	1,000	1,500	2,000	1,003	1,500	2,003	1.012x - 23.308	0.999
B09	SKC	224-PCXR4	626479	03/01/2023	1,000	1,500	2,000	996	1,490	1,994	0.995x + 1.117	1.000
B10	SKC	224-PCXR4	091950	03/01/2023	1,000	1,500	2,000	992	1,503	2,001	1.018x - 36.582	0.999
B11	SKC	224-PCXR8	564315	05/01/2023	1,000	1,500	2,000	996	1,490	1,999	1.003x - 8.256	1.000
B12	SKC	224-PCXR4	034656	05/01/2023	1,000	1,500	2,000	1,003	1,503	2,003	1.010x - 19.324	0.999
B13	SKC	224-PCXR4	602073	05/01/2023	1,000	1,500	2,000	995	1,500	1,998	1.001x - 3.474	1.000
B14	SKC	224-PCXR4	626313	04/01/2023	1,000	1,500	2,000	999	1,491	1,988	0.992x + 6.844	1.000
B15	SKC	224-PCXR4	626474	04/01/2023	1,000	1,500	2,000	1,001	1,502	2,005	1.014x - 25.558	0.999
B16	SKC	224-PCXR4	626477	04/01/2023	1,000	1,500	2,000	994	1,504	2,001	1.015x - 31.345	0.999
B17	SKC	224-PCXR4	626860	04/01/2023	1,000	1,500	2,000	997	1,494	1,991	0.997x - 0.359	1.000
B18	SKC	224-PCXR4	691484	04/01/2023	1,000	1,500	2,000	1,003	1,500	2,001	1.008x - 17.589	0.999
B19	SKC	224-PCXR4	691599	03/01/2023	1,000	1,500	2,000	993	1,503	1,999	1.007x - 11.574	1.000
B20	SKC	224-PCXR4	691587	03/01/2023	1,000	1,500	2,000	992	1,504	1,999	1.015x - 32.235	0.999
B21	SKC	224-PCXR4	691531	03/01/2023	1,000	1,500	2,000	993	1,499	1,994	1.001x - 7.107	1.000
B22	SKC	224-PCXR4	691654	05/01/2023	1,000	1,500	2,000	1,003	1,501	2,003	1.011x - 21.107	0.999
B23	SKC	224-PCXR4	798393	05/01/2023	1,000	1,500	2,000	992	1,507	2,002	1.018x - 34.883	0.999
B24	SKC	224-PCXR4	626363	05/01/2023	1,000	1,500	2,000	1,000	1,502	2,000	1.011x - 22.387	0.999
B25	SKC	224-PCXR4	798489	05/01/2023	1,000	1,500	2,000	1,001	1,492	2,001	0.998x + 1.101	1.000
B26	SKC	224-PCXR4	798479	05/01/2023	1,000	1,500	2,000	999	1,500	1,993	0.996x + 4.008	1.000
B27	SKC	224-PCXR4	691673	04/01/2023	1,000	1,500	2,000	994	1,503	2,002	1.016x - 32.071	0.999
B28	SKC	224-PCXR4	691570	04/01/2023	1,000	1,500	2,000	1,002	1,500	2,002	1.012x - 22.515	0.999
B29	SKC	224-PCXR4	626472	04/01/2023	1,000	1,500	2,000	1,000	1,496	1,998	1.001x - 4.942	1.000
B30	SKC	224-PCXR4	691489	03/01/2023	1,000	1,500	2,000	1,004	1,510	2,004	1.008x - 12.460	0.999
B31	SKC	224-PCXR4	691509	03/01/2023	1,000	1,500	2,000	992	1,497	1,998	1.006x - 12.711	1.000
B32	SKC	224-PCXR4	091567	05/01/2023	1,000	1,500	2,000	991	1,504	2,001	1.016x - 32.322	0.999
B33	SKC	224-PCXR4	091756	05/01/2023	1,000	1,500	2,000	993	1,497	1,991	0.997x - 0.004	1.000
B34	SKC	224-PCXR4	612962	05/01/2023	1,000	1,500	2,000	1,002	1,501	2,002	1.007x - 14.195	1.000
B35	SKC	224-PCXR4	602682	05/01/2023	1,000	1,500	2,000	993	1,498	1,995	1.002x - 8.448	1.000
B36	SKC	224-PCXR4	626164	03/01/2023	1,000	1,500	2,000	999	1,496	1,999	1.001x - 5.424	1.000
B37	SKC	224-PCXR4	626256	03/01/2023	1,000	1,500	2,000	994	1,506	1,999	1.013x - 27.815	0.999
B38	SKC	224-PCXR4	626167	03/01/2023	1,000	1,500	2,000	997	1,496	1,996	0.999x - 0.997	1.000
B39	SKC	224-PCXR4	034637	03/01/2023	1,000	1,500	2,000	1,005	1,501	2,001	1.010x - 18.618	0.999
B40	SKC	224-PCXR4	798349	05/01/2023	1,000	1,500	2,000	994	1,506	1,999	1.014x - 29.602	0.999

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(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 °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 ²
B41	SKC	224-PCXR4	612669	05/01/2023	1,000	1,500	2,000	998	1,497	1,990	0.997x + 0.718	1.000
B42	SKC	224-PCXR4	626041	05/01/2023	1,000	1,500	2,000	1,004	1,498	1,991	0.986x + 18.291	1.000
B43	SKC	224-PCXR4	034636	05/01/2023	1,000	1,500	2,000	1,000	1,501	1,992	0.991x + 11.882	1.000
B44	SKC	224-PCXR8	529341	06/01/2023	1,000	1,500	2,000	1,002	1,502	2,002	1.005x - 9.213	1.000
B45	SKC	224-PCXR8	529594	06/01/2023	1,000	1,500	2,000	999	1,501	1,989	0.991x + 11.184	1.000
B46	SKC	224-PCXR8	566743	06/01/2023	1,000	1,500	2,000	995	1,504	2,002	1.014x - 30.571	0.999
B47	SKC	224-PCXR8	566747	06/01/2023	1,000	1,500	2,000	1,002	1,502	2,004	1.013x - 24.601	0.999
B48	SKC	224-PCXR8	566753	04/01/2023	1,000	1,500	2,000	1,000	1,494	1,998	0.998x + 0.319	1.000
B49	SKC	224-PCXR8	566780	04/01/2023	1,000	1,500	2,000	1,003	1,502	2,006	1.013x - 23.982	0.999
B50	SKC	224-PCXR8	500400	04/01/2023	1,000	1,500	2,000	1,001	1,496	2,002	1.001x - 3.538	1.000
B51	SKC	224-PCXR8	500363	04/01/2023	1,000	1,500	2,000	996	1,504	1,999	1.011x - 25.031	0.999
B52	SKC	224-PCXR8	093186	04/01/2023	1,000	1,500	2,000	995	1,496	1,994	0.997x - 0.602	1.000
B53	SKC	224-PCXR8	707670	03/01/2023	1,000	1,500	2,000	1,002	1,500	2,002	1.008x - 15.403	0.999
B54	SKC	224-PCXR3	509821	03/01/2023	1,000	1,500	2,000	993	1,502	2,001	1.017x - 34.237	0.999
B55	SKC	224-PCXR3	510710	03/01/2023	1,000	1,500	2,000	999	1,494	1,994	0.997x - 0.989	1.000
B56	SKC	224-PCXR3	511450	03/01/2023	1,000	1,500	2,000	1,002	1,500	2,001	1.004x - 8.081	1.000
B57	SKC	224-PCXR3	510798	06/01/2023	1,000	1,500	2,000	997	1,492	1,998	1.000x - 2.680	1.000
B58	SKC	224-PCXR3	509852	06/01/2023	1,000	1,500	2,000	1,000	1,498	1,999	1.007x - 18.953	0.999
B59	SKC	224-PCXR3	509862	06/01/2023	1,000	1,500	2,000	996	1,503	1,994	0.997x + 3.235	1.000
B60	SKC	224-PCXR3	512655	06/01/2023	1,000	1,500	2,000	1,002	1,500	2,003	1.006x - 11.407	1.000
B61	SKC	224-PCXR3	503915	06/01/2023	1,000	1,500	2,000	994	1,489	1,998	1.004x - 12.623	1.000
B62	SKC	224-PCXR3	505975	06/01/2023	1,000	1,500	2,000	999	1,494	1,996	0.997x + 0.343	1.000
B63	SKC	224-PCXR3	511432	03/01/2023	1,000	1,500	2,000	991	1,501	1,999	1.016x - 34.624	0.999
B64	SKC	224-PCXR3	508302	03/01/2023	1,000	1,500	2,000	997	1,492	1,989	0.992x + 6.226	1.000
B65	SKC	224-PCXR3	508310	03/01/2023	1,000	1,500	2,000	1,002	1,500	2,003	1.007x - 13.936	1.000
B66	SKC	224-PCXR3	509861	03/01/2023	1,000	1,500	2,000	1,002	1,491	1,991	0.987x + 14.183	1.000
B67	SKC	224-PCXR3	506295	04/01/2023	1,000	1,500	2,000	993	1,508	2,004	1.009x - 15.555	1.000
B68	SKC	224-PCXR3	505872	04/01/2023	1,000	1,500	2,000	1,002	1,490	1,997	0.995x + 3.841	1.000
B69	SKC	224-PCXR3	508375	04/01/2023	1,000	1,500	2,000	1,002	1,499	2,000	1.010x - 20.772	0.999
B70	SKC	224-PCXR3	510623	05/01/2023	1,000	1,500	2,000	992	1,503	1,997	1.002x - 5.855	1.000
B71	SKC	224-PCXR3	508367	05/01/2023	1,000	1,500	2,000	992	1,506	2,002	1.017x - 34.791	0.999
B72	SKC	224-PCXR3	505977	05/01/2023	1,000	1,500	2,000	1,001	1,498	1,993	0.991x + 8.962	1.000
B73	SKC	224-PCXR3	512606	05/01/2023	1,000	1,500	2,000	1,002	1,501	2,005	1.009x - 14.785	1.000
B74	SKC	224-PCXR3	505993	05/01/2023	1,000	1,500	2,000	996	1,495	1,994	1.000x - 6.916	1.000
B75	SKC	224-PCXR3	509820	04/01/2023	1,000	1,500	2,000	995	1,498	1,990	0.996x + 1.791	1.000
B76	SKC	224-PCXR3	509811	04/01/2023	1,000	1,500	2,000	993	1,498	1,998	1.006x - 14.322	1.000
B77	SKC	224-PCXR3	508301	04/01/2023	1,000	1,500	2,000	1,000	1,501	2,003	1.014x - 26.603	0.999
B78	SKC	224-PCXR3	510677	04/01/2023	1,000	1,500	2,000	995	1,503	1,999	1.013x - 28.158	0.999
B79	SKC	224-PCXR3	510920	03/01/2023	1,000	1,500	2,000	994	1,493	1,994	0.999x - 4.184	1.000

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(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 $^{\circ}\text{C}$
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 ²
B80	SKC	224-PCXR3	504569	03/01/2023	1,000	1,500	2,000	1,002	1,499	2,002	1.012x - 24.026	0.999
B81	SKC	224-PCXR3	503480	03/01/2023	1,000	1,500	2,000	996	1,499	2,000	1.014x - 30.524	0.999
B82	SKC	224-PCXR3	505673	06/01/2023	1,000	1,500	2,000	994	1,498	1,996	1.001x - 5.943	1.000
B83	SKC	224-PCXR3	510785	06/01/2023	1,000	1,500	2,000	1,010	1,499	2,002	1.004x - 10.466	0.999
B84	SKC	224-PCXR3	508333	06/01/2023	1,000	1,500	2,000	997	1,495	1,991	0.996x + 1.260	1.000
B85	SKC	224-PCXR3	505757	06/01/2023	1,000	1,500	2,000	994	1,502	1,998	1.005x - 13.844	1.000
B86	SKC	224-PCXR3	512625	03/01/2023	1,000	1,500	2,000	1,013	1,503	2,004	1.001x - 0.726	0.999
B87	SKC	224-PCXR3	504324	03/01/2023	1,000	1,500	2,000	998	1,496	2,000	1.000x - 1.109	1.000
B88	SKC	224-PCXR3	508307	03/01/2023	1,000	1,500	2,000	996	1,498	1,994	0.996x + 1.532	1.000
B89	SKC	224-PCXR3	509860	04/01/2023	1,000	1,500	2,000	1,000	1,499	2,003	1.008x - 15.156	1.000
B90	SKC	224-PCXR3	508366	04/01/2023	1,000	1,500	2,000	993	1,508	1,999	1.006x - 12.512	1.000
B91	SKC	224-PCXR3	510919	04/01/2023	1,000	1,500	2,000	1,000	1,498	1,996	0.990x + 8.719	1.000
B92	SKC	224-PCXR3	510987	04/01/2023	1,000	1,500	2,000	1,002	1,501	1,999	1.000x + 0.299	1.000
B93	SKC	224-PCXR3	509845	04/01/2023	1,000	1,500	2,000	995	1,496	2,004	1.009x - 16.979	1.000
B94	SKC	224-PCXR8	A127871	03/01/2023	1,000	1,500	2,000	1,000	1,500	2,002	1.007x - 19.105	0.999
B95	SKC	224-PCXR8	A127921	03/01/2023	1,000	1,500	2,000	993	1,502	2,001	1.015x - 30.898	0.999
B96	SKC	224-PCXR8	A127942	03/01/2023	1,000	1,500	2,000	998	1,498	1,995	0.998x - 1.485	1.000
B97	SKC	224-PCXR8	A127955	03/01/2023	1,000	1,500	2,000	1,003	1,501	2,003	1.011x - 20.356	0.999
B98	SKC	224-PCXR8	A127956	03/01/2023	1,000	1,500	2,000	996	1,498	1,997	1.003x - 7.473	1.000

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(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	R²
B01	SKC	224-PCXR4	262101	04/04/2023	1,000	1,500	2,000	994	1,498	2,003	1.005x - 7.897	1.000
B02	SKC	224-PCXR4	626166	04/04/2023	1,000	1,500	2,000	1,004	1,503	2,003	1.010x - 19.866	0.999
B03	SKC	224-PCXR4	612968	07/04/2023	1,000	1,500	2,000	995	1,496	2,001	1.007x - 13.664	1.000
B04	SKC	224-PCXR4	602804	05/04/2023	1,000	1,500	2,000	998	1,499	1,994	0.999x - 1.611	1.000
B05	SKC	224-PCXR4	612693	07/04/2023	1,000	1,500	2,000	1,002	1,501	2,004	1.014x - 24.856	0.999
B06	SKC	224-PCXR4	262188	07/04/2023	1,000	1,500	2,000	994	1,509	2,006	1.012x - 21.589	0.999
B07	SKC	224-PCXR4	626262	04/04/2023	1,000	1,500	2,000	997	1,490	1,996	0.994x + 3.454	1.000
B08	SKC	224-PCXR4	626100	04/04/2023	1,000	1,500	2,000	1,001	1,499	2,005	1.015x - 27.137	0.999
B09	SKC	224-PCXR4	626479	05/04/2023	1,000	1,500	2,000	997	1,492	1,994	0.994x + 2.385	1.000
B10	SKC	224-PCXR4	091950	03/04/2023	1,000	1,500	2,000	993	1,504	2,005	1.013x - 23.779	1.000
B11	SKC	224-PCXR8	564315	10/04/2023	1,000	1,500	2,000	995	1,492	1,998	1.002x - 7.259	1.000
B12	SKC	224-PCXR4	034656	04/04/2023	1,000	1,500	2,000	1,002	1,504	2,001	1.009x - 17.609	0.999
B13	SKC	224-PCXR4	602073	04/04/2023	1,000	1,500	2,000	997	1,501	2,000	1.004x - 7.622	1.000
B14	SKC	224-PCXR4	626313	03/04/2023	1,000	1,500	2,000	997	1,492	1,991	0.996x + 1.699	1.000
B15	SKC	224-PCXR4	626474	07/04/2023	1,000	1,500	2,000	1,003	1,503	2,006	1.013x - 23.245	0.999
B16	SKC	224-PCXR4	626477	03/04/2023	1,000	1,500	2,000	995	1,506	2,003	1.011x - 22.132	0.999
B17	SKC	224-PCXR4	626860	04/04/2023	1,000	1,500	2,000	996	1,493	1,993	1.000x - 4.627	1.000
B18	SKC	224-PCXR4	691484	04/04/2023	1,000	1,500	2,000	1,001	1,496	2,002	1.010x - 21.179	0.999
B19	SKC	224-PCXR4	691599	04/04/2023	1,000	1,500	2,000	994	1,504	2,000	1.006x - 10.498	1.000
B20	SKC	224-PCXR4	691587	03/04/2023	1,000	1,500	2,000	991	1,502	2,000	1.016x - 35.102	0.999
B21	SKC	224-PCXR4	691531	04/04/2023	1,000	1,500	2,000	994	1,501	1,995	1.001x - 5.153	1.000
B22	SKC	224-PCXR4	691654	07/04/2023	1,000	1,500	2,000	1,000	1,502	2,004	1.014x - 25.574	0.999
B23	SKC	224-PCXR4	798393	05/04/2023	1,000	1,500	2,000	990	1,508	2,004	1.013x - 23.994	1.000
B24	SKC	224-PCXR4	626363	03/04/2023	1,000	1,500	2,000	1,002	1,503	1,999	1.009x - 18.837	0.999
B25	SKC	224-PCXR4	798489	07/04/2023	1,000	1,500	2,000	1,002	1,494	2,000	0.997x + 3.494	1.000
B26	SKC	224-PCXR4	798479	07/04/2023	1,000	1,500	2,000	1,001	1,501	1,994	0.995x + 5.564	1.000
B27	SKC	224-PCXR4	691673	04/04/2023	1,000	1,500	2,000	995	1,505	2,004	1.013x - 25.091	0.999
B28	SKC	224-PCXR4	691570	04/04/2023	1,000	1,500	2,000	1,003	1,501	2,001	1.010x - 19.922	0.999
B29	SKC	224-PCXR4	626472	05/04/2023	1,000	1,500	2,000	1,001	1,498	2,000	0.999x - 1.831	1.000
B30	SKC	224-PCXR4	691489	04/04/2023	1,000	1,500	2,000	1,002	1,507	2,003	1.009x - 13.936	0.999
B31	SKC	224-PCXR4	691509	07/04/2023	1,000	1,500	2,000	994	1,496	1,997	1.004x - 9.680	1.000
B32	SKC	224-PCXR4	091567	10/04/2023	1,000	1,500	2,000	992	1,506	2,001	1.013x - 25.542	0.999
B33	SKC	224-PCXR4	091756	05/04/2023	1,000	1,500	2,000	993	1,498	1,992	0.998x - 1.121	1.000
B34	SKC	224-PCXR4	612962	07/04/2023	1,000	1,500	2,000	1,002	1,503	2,003	1.008x - 14.753	0.999
B35	SKC	224-PCXR4	602682	05/04/2023	1,000	1,500	2,000	991	1,497	1,996	1.003x - 11.598	1.000
B36	SKC	224-PCXR4	626164	05/04/2023	1,000	1,500	2,000	997	1,495	1,998	1.002x - 8.097	1.000
B37	SKC	224-PCXR4	626256	07/04/2023	1,000	1,500	2,000	993	1,505	1,996	1.012x - 27.161	0.999
B38	SKC	224-PCXR4	626167	07/04/2023	1,000	1,500	2,000	998	1,493	1,997	1.003x - 8.615	1.000
B39	SKC	224-PCXR4	034637	10/04/2023	1,000	1,500	2,000	1,003	1,500	2,003	1.013x - 23.125	0.999
B40	SKC	224-PCXR4	798349	07/04/2023	1,000	1,500	2,000	993	1,507	1,998	1.015x - 30.204	0.999

Calibrated by :

(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

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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 ²
B41	SKC	224-PCXR4	612669	07/04/2023	1,000	1,500	2,000	997	1,496	1,991	0.998x - 1.396	1.000
B42	SKC	224-PCXR4	626041	10/04/2023	1,000	1,500	2,000	1,006	1,496	1,992	0.988x + 14.223	1.000
B43	SKC	224-PCXR4	034636	07/04/2023	1,000	1,500	2,000	1,001	1,503	1,993	0.992x + 8.810	1.000
B44	SKC	224-PCXR8	529341	10/04/2023	1,000	1,500	2,000	1,000	1,499	2,005	1.008x - 14.358	1.000
B45	SKC	224-PCXR8	529594	10/04/2023	1,000	1,500	2,000	998	1,506	1,987	0.990x + 12.580	1.000
B46	SKC	224-PCXR8	566743	05/04/2023	1,000	1,500	2,000	996	1,502	2,000	1.012x - 26.902	0.999
B47	SKC	224-PCXR8	566747	07/04/2023	1,000	1,500	2,000	998	1,501	2,002	1.014x - 27.552	0.999
B48	SKC	224-PCXR8	566753	10/04/2023	1,000	1,500	2,000	998	1,493	1,996	0.997x - 0.359	1.000
B49	SKC	224-PCXR8	566780	05/04/2023	1,000	1,500	2,000	1,007	1,501	2,007	1.011x - 19.156	0.999
B50	SKC	224-PCXR8	500400	07/04/2023	1,000	1,500	2,000	1,004	1,495	2,004	1.000x - 1.663	1.000
B51	SKC	224-PCXR8	500363	04/04/2023	1,000	1,500	2,000	997	1,502	1,998	1.008x - 21.322	0.999
B52	SKC	224-PCXR8	093186	05/04/2023	1,000	1,500	2,000	993	1,493	1,995	1.000x - 6.106	1.000
B53	SKC	224-PCXR8	707670	05/04/2023	1,000	1,500	2,000	1,000	1,498	2,002	1.009x - 18.883	0.999
B54	SKC	224-PCXR3	509821	05/04/2023	1,000	1,500	2,000	995	1,500	2,001	1.016x - 32.482	0.999
B55	SKC	224-PCXR3	510710	10/04/2023	1,000	1,500	2,000	998	1,497	1,992	0.996x - 0.191	1.000
B56	SKC	224-PCXR3	511450	05/04/2023	1,000	1,500	2,000	1,003	1,501	2,003	1.005x - 8.081	1.000
B57	SKC	224-PCXR3	510798	05/04/2023	1,000	1,500	2,000	999	1,490	2,000	1.001x - 2.920	1.000
B58	SKC	224-PCXR3	509852	10/04/2023	1,000	1,500	2,000	1,002	1,496	1,998	1.004x - 15.922	0.999
B59	SKC	224-PCXR3	509862	10/04/2023	1,000	1,500	2,000	998	1,501	1,996	0.996x + 4.471	1.000
B60	SKC	224-PCXR3	512655	07/04/2023	1,000	1,500	2,000	1,003	1,499	2,004	1.005x - 9.971	1.000
B61	SKC	224-PCXR3	503915	10/04/2023	1,000	1,500	2,000	993	1,488	1,999	1.007x - 15.934	1.000
B62	SKC	224-PCXR3	505975	10/04/2023	1,000	1,500	2,000	1,001	1,495	1,997	1.000x - 4.802	1.000
B63	SKC	224-PCXR3	511432	07/04/2023	1,000	1,500	2,000	993	1,500	2,000	1.015x - 32.709	0.999
B64	SKC	224-PCXR3	508302	05/04/2023	1,000	1,500	2,000	998	1,491	1,987	0.989x + 9.855	1.000
B65	SKC	224-PCXR3	508310	10/04/2023	1,000	1,500	2,000	998	1,502	2,005	1.012x - 20.596	1.000
B66	SKC	224-PCXR3	509861	10/04/2023	1,000	1,500	2,000	1,000	1,492	1,992	0.990x + 10.912	1.000
B67	SKC	224-PCXR3	506295	07/04/2023	1,000	1,500	2,000	993	1,506	2,002	1.007x - 13.999	1.000
B68	SKC	224-PCXR3	505872	05/04/2023	1,000	1,500	2,000	998	1,488	1,997	0.998x - 1.743	1.000
B69	SKC	224-PCXR3	508375	04/04/2023	1,000	1,500	2,000	1,004	1,502	2,002	1.009x - 18.897	0.999
B70	SKC	224-PCXR3	510623	05/04/2023	1,000	1,500	2,000	994	1,505	1,998	1.004x - 8.846	1.000
B71	SKC	224-PCXR3	508367	10/04/2023	1,000	1,500	2,000	994	1,503	2,003	1.011x - 23.544	0.999
B72	SKC	224-PCXR3	505977	10/04/2023	1,000	1,500	2,000	1,005	1,493	1,992	0.988x + 13.309	1.000
B73	SKC	224-PCXR3	512606	05/04/2023	1,000	1,500	2,000	1,000	1,504	2,004	1.008x - 14.506	1.000
B74	SKC	224-PCXR3	505993	05/04/2023	1,000	1,500	2,000	997	1,497	1,996	1.001x - 7.514	1.000
B75	SKC	224-PCXR3	509820	07/04/2023	1,000	1,500	2,000	997	1,496	1,992	0.997x + 0.195	1.000
B76	SKC	224-PCXR3	509811	05/04/2023	1,000	1,500	2,000	995	1,498	1,999	1.004x - 11.212	1.000
B77	SKC	224-PCXR3	508301	10/04/2023	1,000	1,500	2,000	1,003	1,502	2,004	1.013x - 23.811	0.999
B78	SKC	224-PCXR3	510677	04/04/2023	1,000	1,500	2,000	997	1,505	2,000	1.007x - 16.113	0.999
B79	SKC	224-PCXR3	510920	10/04/2023	1,000	1,500	2,000	996	1,495	1,993	0.998x - 1.232	1.000

Calibrated by :

(Mr. Adui Dangkiom)

Approved by :

(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
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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	R²
B80	SKC	224-PCXR3	504569	05/04/2023	1,000	1,500	2,000	1,003	1,498	2,003	1.011x – 22.431	0.999
B81	SKC	224-PCXR3	503480	05/04/2023	1,000	1,500	2,000	995	1,500	2,001	1.016x – 32.797	0.999
B82	SKC	224-PCXR3	505673	05/04/2023	1,000	1,500	2,000	995	1,496	1,997	1.003x – 7.259	1.000
B83	SKC	224-PCXR3	510785	05/04/2023	1,000	1,500	2,000	1,007	1,498	2,001	1.006x – 13.816	0.999
B84	SKC	224-PCXR3	508333	10/04/2023	1,000	1,500	2,000	995	1,498	1,993	0.998x – 1.970	1.000
B85	SKC	224-PCXR3	505757	10/04/2023	1,000	1,500	2,000	996	1,500	2,000	1.004x – 12.009	1.000
B86	SKC	224-PCXR3	512625	05/04/2023	1,000	1,500	2,000	1,011	1,501	2,005	1.002x – 3.877	0.999
B87	SKC	224-PCXR3	504324	05/04/2023	1,000	1,500	2,000	999	1,495	1,998	0.999x + 0.606	1.000
B88	SKC	224-PCXR3	508307	05/04/2023	1,000	1,500	2,000	997	1,497	1,992	0.994x + 4.682	1.000
B89	SKC	224-PCXR3	509860	05/04/2023	1,000	1,500	2,000	1,001	1,498	2,002	1.007x – 13.92	1.000
B90	SKC	224-PCXR3	508366	05/04/2023	1,000	1,500	2,000	995	1,507	1,998	1.004x – 9.640	1.000
B91	SKC	224-PCXR3	510919	04/04/2023	1,000	1,500	2,000	1,003	1,500	1,995	0.988x + 13.505	1.000
B92	SKC	224-PCXR3	510987	05/04/2023	1,000	1,500	2,000	1,003	1,503	1,998	0.997x + 5.125	1.000
B93	SKC	224-PCXR3	509845	10/04/2023	1,000	1,500	2,000	996	1,498	2,003	1.007x – 13.628	1.000
B94	SKC	224-PCXR8	A127871	04/04/2023	1,000	1,500	2,000	1,001	1,495	2,003	1.006x – 18.746	0.999
B95	SKC	224-PCXR8	A127921	03/04/2023	1,000	1,500	2,000	995	1,504	2,001	1.013x – 26.112	0.999
B96	SKC	224-PCXR8	A127942	07/04/2023	1,000	1,500	2,000	999	1,499	1,997	1.000x – 2.010	1.000
B97	SKC	224-PCXR8	A127955	07/04/2023	1,000	1,500	2,000	1,006	1,503	2,005	1.011x – 18.638	0.999
B98	SKC	224-PCXR8	A127956	07/04/2023	1,000	1,500	2,000	994	1,497	1,998	1.005x – 11.436	1.000

Calibrated by :

(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 Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

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	R²
L-B01	Dwyer	VFA-21	04/01/2023	50	100	200	50.7	99.1	198.5	0.985x + 1.102	1.000
L-B02	Dwyer	VFA-21	04/01/2023	50	100	200	51.0	99.4	198.7	0.994x + 1.097	0.999
L-B03	Dwyer	VFA-21	06/01/2023	50	100	200	50.8	99.2	198.3	1.006x – 0.866	1.000
L-B04	Dwyer	VFA-21	06/01/2023	50	100	200	49.1	101.6	201.1	1.016x – 1.187	1.000
L-B05	Dwyer	VFA-21	06/01/2023	50	100	200	50.5	98.1	200.8	1.001x + 0.196	0.999
L-B06	Dwyer	VFA-21	03/01/2023	50	100	200	50.1	100.1	203.4	1.010x + 0.062	1.000
L-B07	Dwyer	VFA-21	03/01/2023	50	100	200	49.4	100.8	199.7	1.019x – 2.253	1.000
L-B08	Dwyer	VFA-21	03/01/2023	50	100	200	49.8	101.3	198.1	0.999x – 0.218	1.000
L-B09	Dwyer	VFA-21	03/01/2023	50	100	200	50.0	99.2	200.7	0.993x + 1.212	0.999
L-B10	Dwyer	VFA-21	05/01/2023	50	100	200	51.0	99.8	202.8	1.004x + 0.747	1.000

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

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	R²
L-B01	Dwyer	VFA-21	05/04/2023	50	100	200	50.3	98.7	198.9	0.986x + 0.859	1.000
L-B02	Dwyer	VFA-21	04/04/2023	50	100	200	50.6	99.8	198.3	0.995x + 0.956	0.999
L-B03	Dwyer	VFA-21	07/04/2023	50	100	200	50.4	99.6	197.9	1.009x - 1.350	1.000
L-B04	Dwyer	VFA-21	07/04/2023	50	100	200	49.5	102.0	200.7	1.012x - 0.487	1.000
L-B05	Dwyer	VFA-21	07/04/2023	50	100	200	50.9	98.9	201.2	0.998x + 1.040	0.999
L-B06	Dwyer	VFA-21	07/04/2023	50	100	200	50.8	99.7	202.8	1.009x + 0.150	1.000
L-B07	Dwyer	VFA-21	04/04/2023	50	100	200	49.0	101.2	200.5	1.014x - 1.381	1.000
L-B08	Dwyer	VFA-21	05/04/2023	50	100	200	50.2	102.1	197.7	0.997x + 0.307	1.000
L-B09	Dwyer	VFA-21	07/04/2023	50	100	200	50.8	99.6	201.1	0.990x + 2.095	0.999
L-B10	Dwyer	VFA-21	10/04/2023	50	100	200	51.0	99.0	203.2	1.005x + 0.453	1.000

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)

**QUALITY CALIBRATION CO.,LTD.**

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

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

www.qcalibration.comCERTIFICATE No : 23M2445
REFERENCE No : 68471-5

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XSR105DU

SERIAL No : B926859981

ID No : BA 10/62

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 10-Mar-23

APPROVED BY : 

ISSUED DATE : 16-Mar-23

RECEIVED DATE : 10-Mar-23

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



CERTIFICATE No : 23M2445

PAGE : 2 OF 2

Calibration Report

EQUIPMENT	:	DIGITAL BALANCE	MODEL	:	XSR105DU
MANUFACTURER	:	METTLER TOLEDO	S/N	:	B926859981
ID No	:	BA 10/62	RECEIVED DATE	:	10-Mar-23
AIR PRESSURE	:	1010mbar \pm 1mbar	CALIBRATION DATE	:	10-Mar-23
AMBIENT TEMPERATURE	:	23° C \pm 1° C	RELATIVE HUMIDITY	:	49 %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. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

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

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

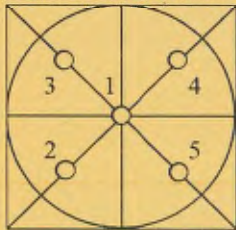
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 100 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000039
0.02	0.02000	0.00000	0.000039
0.10	0.10000	0.00000	0.000039
0.20	0.20000	0.00000	0.000040
0.50	0.50000	0.00000	0.000040
1.00	1.00001	-0.00001	0.000041
2.00	2.00000	0.00000	0.000042
5.00	5.00000	0.00000	0.000046
10.00	10.00004	-0.00004	0.000053
20.00	20.00005	-0.00005	0.000067
50.00	50.00005	-0.00005	0.00011
100.00	100.00009	-0.00009	0.00019
120.00	120.00015	-0.00015	0.00019

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.00000
2	50.00003
3	50.00000
4	49.99997
5	50.00003
OFF-CENTER LOADING	0.00003

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

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

END OF CALIBRATION REPORT

SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



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

NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. No. : SP22018

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 : ORGANIC LABORATORY IV

Ambient Temperature : (24.4 ± 5) °C
Relative Humidity : (60.1 ± 25) %

Received Date : 30 AUGUST 2022
Calibration Date : 30 AUGUST 2022
Date of Issue : 31 AUGUST 2022

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

(นานากุล เพ็ชรกุล)

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

Continuation of Calibration Certificate

Cert. No. : SP22018

Job No. : VC65SP0008

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	87569	13/10/2022
Didymium liquid	RM-DL	28912	87588	15/10/2022
Neutral density filter	RM-1N2N3N	13877	87600	15/10/2022
Potassium dichromate solutions	RM-0204060810	14204	87614	16/10/2022
Potassium Iodide solution	-	KI-0701-001	CI-0090-22	08/04/2024

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

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

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology,NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (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	467.8	-0.02	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.5	0.00	0.16	2.00
RM-DL	740.09	740.0	-0.09	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC* = Unit Under Calibration

Continuation of Calibration Certificate

Cert. No. : SP22018
Job No. : VC65SP0008
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	1.0524	1.0539	0.0015	0.0028	2.00
		29914	0.7	0.7454	0.7459	0.0005	0.0029	2.00
		29381	0.5	0.5426	0.5426	0.0000	0.0028	2.00
	546.1	29360	1.0	0.9822	0.9810	-0.0012	0.0028	2.00
		29914	0.7	0.6962	0.6960	-0.0002	0.0028	2.00
		29381	0.5	0.5076	0.5070	-0.0006	0.0029	2.00
	590.0	29360	1.0	1.0221	1.0202	-0.0019	0.0028	2.00
		29914	0.7	0.7238	0.7230	-0.0008	0.0029	2.00
		29381	0.5	0.5364	0.5360	-0.0004	0.0031	2.00
	635.0	29360	1.0	0.9751	0.9732	-0.0019	0.0028	2.00
		29914	0.7	0.6912	0.6902	-0.0010	0.0029	2.00
		29381	0.5	0.5214	0.5210	-0.0004	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	0.2436	0.2419	-0.0017	0.0101	2.00	
		40	0.4905	0.4855	-0.0050	0.0115	2.00	
		60	0.7453	0.7388	-0.0065	0.0067	2.00	
		80	0.9920	0.9839	-0.0081	0.0071	2.00	
		100	1.2487	1.2414	-0.0073	0.0073	2.00	

UUC* = Unit Under Calibration

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

Resolution of Wavelength Mode 0.1 nm
Resolution of Photometric Mode 0.0001 A
Parameter Setting
Measurement Mode Wavelength, Absorbance
Wavelength Scan 1100 nm-190 nm
Scanning Speed 7.5 nm/min
Data Pitch 0.1 nm
Band width(Wavelength) 1.0 nm
Band width(Vis) 1.0 nm
Band width(Uv) 1.0 nm

Stray Light** UUC* Reading at 220 nm	
Transimission T(%)	Absorbance(A)
0.0107	3.9886

**Specific Acceptance :
Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A
**Stray light not TISI Accredited

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

End of Calibration Certificate



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน 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 Total Hydrocarbon Analyzer			
Date :	04 January 2023	Brand :	HORIBA
No.	B01	Model :	APHA-360CE
		Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	04 August 2022	Serial No. :	911
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No. :	D595075
Certified Date :	17 March 2015	Expired Date :	17 March 2023
		Cylinder Conc. :	456 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.5 °C
		% RH	49
		Start Time :	1:00 PM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	0.11	0
Span	10	10.05	10
Calibration Setting (Final)			
Span Instrument Gain:	0.995	Finish Time:	2:00 PM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	911.9	mV	800-1,350
Signal (THC)	916.2	mV	800-1,350
Detector	77.9	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.2	kPa	8 - 25
NMC	258.7	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by : _____
(Mr. Achai Langkiam)

Approved by : _____
(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

Calibration Report Total Hydrocarbon Analyzer			
Date :	02 February 2023	Brand :	HORIBA
		Model :	APHA-360CE
No.	B01	Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	04 August 2022	Serial No.	911
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No.	D595075
Certified Date :	17 March 2015	Expired Date :	17 March 2023
		Cylinder Conc.	456 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.5 °C
		% RH	49
		Start Time :	9:00 AM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	-0.10	0
Span	10	10.04	10
Calibration Setting (Final)			
Span Instrument Gain:	0.997	Finish Time:	10:00 AM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	911.4	mV	800-1,350
Signal (THC)	916.5	mV	800-1,350
Detector	77.8	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.0	kPa	8 - 25
NMC	259.1	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by : _____

(Mr. Peera Detudom)

Approved by : _____

(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 Total Hydrocarbon Analyzer			
Date :	02 March 2023	Brand :	HORIBA
		Model :	APHA-360CE
No.	B01	Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	04 August 2022	Serial No. :	911
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No. :	D595075
Certified Date :	17 March 2015	Expired Date :	17 March 2023
		Cylinder Conc. :	456 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.5 °C
		% RH	49
		Start Time :	1:00 PM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	0.10	0
Span	10	10.06	10
Calibration Setting (Final)			
Span Instrument Gain:	0.995	Finish Time:	2:00 PM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	912.1	mV	800-1,350
Signal (THC)	917.4	mV	800-1,350
Detector	78.0	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.2	kPa	8 - 25
NMC	258.9	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by : _____
(Mr.Adul Dangklom)

Approved by : _____



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 Total Hydrocarbon Analyzer			
Date :	04 April 2023	Brand :	HORIBA
		Model :	APHA-360CE
No.	B01	Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	04 August 2022	Serial No. :	911
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No. :	D612165
Certified Date :	25 February 2023	Expired Date :	25 February 2031
		Cylinder Conc. :	453 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.5 °C
		% RH	48
		Start Time :	9:00 AM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	0.10	0
Span	10	10.04	10
Calibration Setting (Final)			
Span Instrument Gain:	0.997	Finish Time:	10:00 AM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	911.7	mV	800-1,350
Signal (THC)	916.5	mV	800-1,350
Detector	78.2	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.4	kPa	8 - 25
NMC	258.6	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by : _____
(Mr. Adul Dangklom)

Approved by : _____
(Mr. Peera Detudom)

เอกสารที่ 5-2

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียง

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0413

MTC No. EEL. BP. 109/0366

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

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/N 4106495.
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was 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 : 27 Mar. 2023

Date of Calibration : 29 Mar. 2023

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

E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0413

MTC No. EEL. BP. 109/0366

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 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ 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 1
1/2 inch Bruel&Kjaer 4180	93.94	-0.06	± 0.10	± 0.40 dB

2. Frequency

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

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.80	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

.....
(Mr.Weerachai Deechaiyae)

Approved by :


(Mr.Prawate Kluaypa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 29 Mar. 2023

Date of Issue : 30 Mar. 2023

Ref : 2011266032701228001

End of Certificate

2 / 2

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

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

FM.BL.MTC.002 Rev.4



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ซอยพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jangpui, Chaitumak, Bangkok 10900
Tel : (662) 939-4179-72, Fax : (662) 513-4225, E-mail : sale@spscon.com, www.spscon.com

Noise B_009/23

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	28 April 2022
		Due Date	28 April 2023

Calibration Data

Sound Level Meter Data

Calibration Data

SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B30	ACO	6236	00182012	09 January 2023	94.0	94.0
ACO-B42	ACO	6236	00192033	09 January 2023	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.93 ± 0.10 dB	

Calibrated by : _____

(Mr. Pura Langkorn J)

Approved by : _____

(Mr. Peera Detudom)



Noise B_063/23

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	28 April 2022
		Due Date	28 April 2023

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B22	ACO	6236	00172060	23 February 2023	94.1	94.0
ACO-B34	ACO	6236	00192025	23 February 2023	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.93 ± 0.10 dB	

Calibrated by : _____
(Mr. Adul Dangklom)

Approved by : _____
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 แขวงพหลโยธิน เขตจตุจักร กรุงเทพฯ 10000
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10000
Tel : (662) 939-4370-72, Fax : (662) 513-4321, E-mail : sales@spscon.com, www.spscon.com

Noise B_101/23

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	28 April 2022
		Due Date	28 April 2023

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B21	ACO	6236	00172059	19 March 2023	94.0	94.0
ACO-B35	ACO	6236	00192026	19 March 2023	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.93 \pm 0.10 dB	

Calibrated by : _____
(Mr. Adul Dangklom)

Approved by : _____
[Signature]



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร กรุงเทพฯ 10000

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompori, Chatuchak, Bangkok 10000

Tel : (662) 939-4370-72, Fax : (662) 513-4121, E-mail : sales@spscon.com, www.spscon.com

Noise B_153/23

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	29 March 2023
		Due Date	29 March 2024

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B03	ACO	6236	00222297	24 April 2023	94.0	94.0
ACO-B04	ACO	6236	00222298	24 April 2023	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.94 ± 0.10 dB	

Calibrated by : _____

Approved by : _____

เอกสารที่ 5-3

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำ



Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

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



CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : pH METER
MANUFACTURER : WTW
MODEL / TYPE : INOLAB pH LEVEL1
SERIAL NO. : 01510033/B211901089[PH 03/45]
CLID. NO. : 272201870
JOB CONTROL NO. : 220620061975

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

DATE OF RECEIVED : 20 June 2022

DATE OF ISSUED : 24 June 2022

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

Calibrated By : Sukgasem Seehanart
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
24 June 2022



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. Q22061975

F3-011-04/01-12

page 1 of 4



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : pH METER
MANUFACTURER : WTW
MODEL / TYPE : INOLAB pH LEVEL1
SERIAL NO. : 01510033/B211901089[PH 03/45]
DATE OF CALIBRATION : 21 June 2022

ENVIRONMENT CONDITIONS :

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

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPCH-01**. The calibration was performed by direct measurement with Certified Reference Material (CRM) and comparison with Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Control Company Catalog Number 06-664-260,11754256, Lot Number CC728484.
3. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F201 S/N. 016168/09.
5. IPRT, ASL Model T100-250-1D S/N. L0193A-1-1.





CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

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



TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).
Lot Number. 160221 , 180121. Due Date 05 May 2023.
2. The measurements are traceable to International System of Units (SI) , through Control Company.
Certificate No. 4281-12405788 , Due Date 30 June 2023.
3. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.
Certificate No. Q22007520, Due Date 22 January 2023.
4. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 1094/64, Due Date 04 November 2022.
5. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).
Certificate No. TT-0121-21, Due Date 24 November 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2021)"

Certificate No. Q22061975

F3-011-04/01-12

page 3 of 4



@clccalibration

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of pH meter.

CALIBRATION DATA

1. pH METER RESULT @ 25 °C

Standard pH Buffer Solution (pH)	pH Meter Reading (pH)	pH Meter Reading (mV)	Correction (pH)	Uncertainty of pH Measurement (\pm pH)	k Factor
4.000	4.008	160.7	-0.008	0.010	2,00
6.996	7.021	0.1	-0.025	0.012	2,00
10.007	10.011	-161.9	-0.004	0.012	2,00

Technical Note. DUC slow reading.

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 2,3 of 54

*2. TEMPERATURE RESULT [PROBE pH]

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty \pm (°C)
100	24.93	24.9	+0.03	0.07

Note. * means Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k = 2,00$.

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

End of Certificate

Certificate No. Q22061975

F3-011-04/01-12

page 4 of 4



CERT.No.: HS-U017D

Calibration Date : 3 Apr 23
Submitted by : S.P.S CONSULTING SERVICE CO.,LTD
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,
Chatuchak, Bangkok, Thailand 10900

Avg Room Temp : 20 °C
Avg Water Temp : 20 °C
Air Pressure : 760.00 mmHg
Salinity : 0 ppt

Model : YSI 5000
S/N : 15B100751
Probe : YSI 5010
S/N : 22D100097
ID NO. : -
Air Temp ref : S/N. E00522
Barometric ref : S/N. E00522
Water Temp ref : S/N. 11431
Technician : Kittipong M.

Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.08	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.08	(PASS)	-
Measurement 4 (mg/l)	9.08	(PASS)	-
Measurement 5 (mg/l)	9.08	(PASS)	-
Measurement 6 (mg/l)	9.08	(PASS)	-
Measurement 7 (mg/l)	9.08	(PASS)	-
Measurement 8 (mg/l)	9.08	(PASS)	-
Measurement 9 (mg/l)	9.08	(PASS)	-
Measurement 10 (mg/l)	9.08	(PASS)	-
Mean Measurement	9.08	mg/l	-
Inaccuracy	0.01	mg/l	-
Overall Status	(PASS)		

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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

Technician Signature
(Kittipong Maekwong)

Laboratory Manager
(Natenapha Pisatkunchon)



QUALITY CALIBRATION CO.,LTD.

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

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

www.qcalibration.com



CERTIFICATE No : 23M2444

REFERENCE No : 68471-4

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BCA224I-1S

SERIAL No : 0042506394

ID No : BA 11/65

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 10-Mar-23

APPROVED BY : 

ISSUED DATE : 16-Mar-23

RECEIVED DATE : 10-Mar-23

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



CERTIFICATE No : 23M2444

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : BCA224I-1S
MANUFACTURER : SARTORIUS S/N : 0042506394
ID No : BA 11/65 RECEIVED DATE : 10-Mar-23
AIR PRESSURE : 1010mbar \pm 1mbar CALIBRATION DATE : 10-Mar-23
AMBIENT TEMPERATURE : 23° C \pm 1° C RELATIVE HUMIDITY : 49 %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. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

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

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

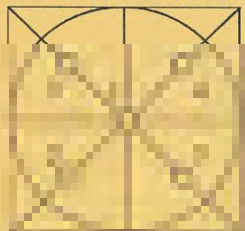
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.0	0.0000	0.0000	0.000058
0.1	0.1000	0.0000	0.000059
0.2	0.2000	0.0000	0.000059
0.5	0.5000	0.0000	0.000060
1.0	1.0000	0.0000	0.000060
2.0	2.0000	0.0000	0.000061
5.0	5.0000	0.0000	0.000063
10.0	10.0000	0.0000	0.000067
20.0	20.0001	-0.0001	0.000073
50.0	50.0000	0.0000	0.00011
100.0	100.0001	-0.0001	0.00019
200.0	200.0000	0.0000	0.00032

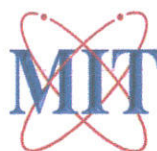
5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	
2	
3	
4	
5	

NOTE: THIS CALIBRATION WAS PERFORMED BY THE QUALITY CALIBRATION CO., LTD. IN ACCORDANCE WITH THE ISO 9001:2015 STANDARD. THE MEASUREMENT 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



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkae Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Certificate No. : S2022090647-0003

Date Issued : 03-Oct-22

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

Equipment : Incubator

Manufacturer : BINDER

Model : BD 115

Serial No. : 12-16967

ID No./Tag No. : IN 05/56

Date Received : 30-Sep-22

Date Calibrated : 30-Sep-22

Calibrated by : Mr. Surat Aumarb

Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

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

Result of Calibration

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

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

Approved by:

(Mr. Sarayuth Tochua)



Certificate No. : S2022090647-0003

Environment : Ambient Temperature : Start record 26.5 °C, Stop record 26.6 °C
Relative Humidity : Start record 54.8 %RH, Stop record 54.6 %RH

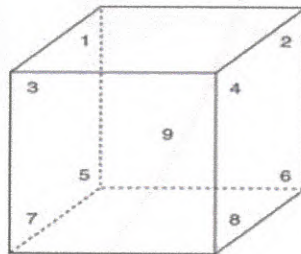
Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability ¹ (°C)	Measured Uniformity ² (°C)	Overall Variation ³ (°C)
35	35.0	35.0	0.03	0.07	0.14
41.5	41.5	41.5	0.03	0.08	0.15

Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	Uncertainty ⁴ ±°C
35	34.88	34.86	34.89	34.90	34.93	34.92	34.95	34.89	34.93	0.18
41.5	41.40	41.33	41.32	41.41	41.43	41.43	41.38	41.33	41.37	0.18

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. 0



Condition As-Received : Used Item

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

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2207-125-0001 for Digital Thermometer with Probe (Agilent) Module 1 (73) NTC, Pt1000 Serial No. MY44024042, Due 01-Feb-23

- Notes :
1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.
 2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.
 3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.
 4. The uncertainty of measurement is included temperature stability.
 5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

End of Certificate



QUALITY CALIBRATION CO.,LTD.

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

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

www.qcalibration.com



CERTIFICATE No : 23T2449

REFERENCE No : 68472-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : WATER BATH

MANUFACTURER : MEMMERT

MODEL : WPE45

SERIAL No : L715.0400

ID No : WB 06/58

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

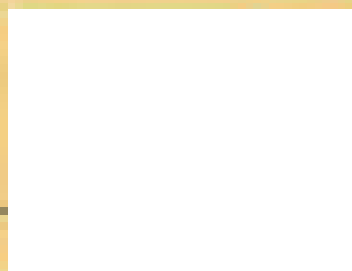
CALIBRATED BY : CHUCHAN CH

CALIBRATION DATE : 10-Nov-23

APPROVED BY

ISSUED DATE

RECEIVED DATE



10-Nov-23

10-Nov-23



CERTIFICATE No : 23T2449

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : WB 06/58
RECEIVED DATE : 10-Mar-23
AMBIENT TEMPERATURE : $26^{\circ}\text{C} \pm 1^{\circ}\text{C}$

MODEL : WPE45
SERIAL NUMBER : L715.0400
CALIBRATION DATE : 10-Mar-23
RELATIVE HUMIDITY : $51\% \text{RH} \pm 10\% \text{RH}$

CONDITION OF THIS RESULTS OF CALIBRATION

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

INSTRUMENT**MODEL****SERIAL No****CERTIFICATE No****DUE DATE**

1) DATA LOGGER WITH RTD

2625A

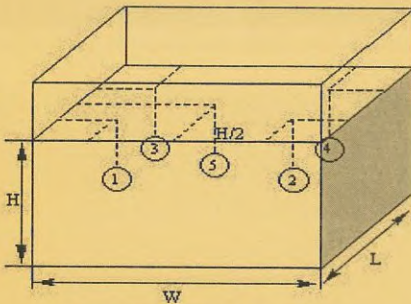
6603614

22T7514

05-Jul-23

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION
POSITION IN THE BATH

GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath ($^{\circ}\text{C}$) : 1.4

Overall Variation of Line Voltage (V) : 0

Instrument Condition : Normal

BATH PERFORMANCE

Controller Temperature ($^{\circ}\text{C}$)	Temperature Stability ($\pm^{\circ}\text{C}$)	Radius Uniformity ($^{\circ}\text{C}$)	Axial Uniformity ($^{\circ}\text{C}$)	Overall Variation ($^{\circ}\text{C}$)
44.6	0.05	0.01	0.03	0.10

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp ($^{\circ}\text{C}$)	Indicating Temp ($^{\circ}\text{C}$)	Measured Temperature ($^{\circ}\text{C}$) at Spread Locations					Uncertainty ($\pm^{\circ}\text{C}$)
		#1	#2	#3	#4	Ref. 5	
44.6	44.6	44.62	44.62	44.62	44.61	44.62	0.14

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

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

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

QUALITY CALIBRATION REPORT