

## ภาคผนวกที่ 5

### เอกสารสอบเทียบความถูกต้องของเครื่องมือ

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

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของ  
เครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

รายงานตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
<b>คุณภาพอากาศ</b>		
- TSP	- High Volume Air Sampler	- Electronic Balance
- PM <sub>10</sub>	- High Volume PM <sub>10</sub> Sampler	- Electronic Balance
- SO <sub>2</sub>	- SO <sub>2</sub> Analyzer	- SO <sub>2</sub> Analyzer
- NO <sub>2</sub>	- NO <sub>2</sub> Analyzer	- NO <sub>2</sub> Analyzer
- CO	- CO Analyzer	- CO Analyzer
- THC	- Personal Pump SKC	- THC Analyzer
	- Rotameter L-3, L-5	
<b>ระดับเสียง</b>		
- Leq 24 hr, Lmax	- Acoustic Calibrator	-
	- Sound Level Meter	-
<b>คุณภาพน้ำทิ้ง</b>		
- pH	-	- pH Meter
- BOD <sub>5</sub>	-	- BOD Analyzer
- Total Suspended Solids	-	- Electronic Balance
- Total Dissolve Solids	-	- Electronic Balance
- TKN	-	- Electronic Balance
- Sulfide	-	- Electronic Balance
- Setttable Solid	-	- Electronic Balance
- Grease & Oil	-	- Electronic Balance
- Fecal Coliform Bacteria (FCB)	-	- Water Bath

## เอกสารที่ 5-1

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศ



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### High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard      Model : TE 5025A      S/N : 3095

#### Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	01/11/2021	y = 1.254x-6.224	0.998
B02	B02	03/11/2021	y = 1.080x+0.873	0.999
B03	B03	01/11/2021	y = 1.049x+1.608	0.995
B04	B04	01/11/2021	y = 1.140x-2.855	1.000
B05	B05	01/11/2021	y = 1.148x-2.655	0.996
B06	B06	01/11/2021	y = 1.203x-4.180	0.997
B07	B07	03/11/2021	y = 1.136x-3.132	0.996
B08	B08	03/11/2021	y = 1.211x-6.101	0.995
B09	B09	03/11/2021	y = 1.291x-7.760	0.997
B10	B10	09/11/2021	y = 1.091x+0.142	0.995
B11	B11	03/11/2021	y = 1.090x-0.694	0.996
B12	B12	03/11/2021	y = 1.165x-2.613	1.000
B13	B13	03/11/2021	y = 1.115x-2.066	1.000
B14	B14	03/11/2021	y = 1.174x-2.498	0.998
B15	B15	01/11/2021	y = 1.109x-0.219	0.999
B16	B16	01/11/2021	y = 1.211x-5.379	0.995
B17	B17	01/11/2021	y = 1.160x-2.153	0.997
B18	B18	01/11/2021	y = 1.235x-6.315	0.999
B19	B19	04/11/2021	y = 1.262x-7.960	0.997
B20	B20	04/11/2021	y = 1.263x-8.626	0.995
B21	B21	04/11/2021	y = 1.126x-1.642	0.998
B22	B22	04/11/2021	y = 1.224x-5.593	0.996
B23	B23	03/11/2021	y = 1.145x-2.521	0.999
B24	B24	03/11/2021	y = 1.097x-0.331	0.995
B25	B25	03/11/2021	y = 1.029x+2.874	0.997
B26	B26	03/11/2021	y = 1.121x-1.443	0.996
B27	B27	03/11/2021	y = 1.191x-5.420	0.997
B28	B28	03/11/2021	y = 1.248x-6.941	0.995
B29	B29	03/11/2021	y = 1.223x-5.741	0.997
B30	B30	03/11/2021	y = 1.171x-3.691	0.997
B31	B31	03/11/2021	y = 1.158x-2.458	1.000



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Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B35	B35	02/11/2021	y = 1.268x-7.802	1.000
B36	B36	02/11/2021	y = 1.127x-2.341	0.995
B37	B37	03/11/2021	y = 1.117x+0.086	0.997
B38	B38	03/11/2021	y = 1.141x-2.288	0.998
B39	B39	03/11/2021	y = 1.255x-6.396	1.000
B40	B40	03/11/2021	y = 1.177x-3.231	0.997
B41	B41	03/11/2021	y = 1.128x-0.683	0.998
B42	B42	04/11/2021	y = 1.126x-0.904	1.000
B43	B43	04/11/2021	y = 1.083x+0.949	0.996
B44	B44	04/11/2021	y = 1.338x-10.349	0.998
R01	R01	05/11/2021	y = 1.199x-4.664	0.997
R02	R02	02/11/2021	y = 1.176x-4.215	0.999
R03	R03	02/11/2021	y = 1.186x-5.147	0.996
R04	R04	02/11/2021	y = 1.115x-1.051	0.997
R05	R05	09/11/2021	y = 1.244x-7.591	0.996
R06	R06	02/11/2021	y = 1.339x-10.396	0.996
R07	R07	09/11/2021	y = 1.073x+0.747	0.996
R08	R08	09/11/2021	y = 1.157x-3.653	0.996
R09	R09	04/11/2021	y = 1.208x-5.357	0.997
R10	R10	04/11/2021	y = 1.211x-5.464	1.000
R11	R11	05/11/2021	y = 1.067x+1.406	0.996
R12	R12	04/11/2021	y = 1.188x-5.042	0.996
R13	R13	04/11/2021	y = 1.129x-1.431	0.999
R14	R14	08/11/2021	y = 1.105x-0.232	0.998
R15	R15	09/11/2021	y = 1.062x+1.362	0.995
R16	R16	01/11/2021	y = 1.144x-3.331	1.000
R17	R17	01/11/2021	y = 1.203x-4.883	0.999
R18	R18	01/11/2021	y = 1.285x-8.875	0.998
R19	R19	02/11/2021	y = 1.223x-4.925	1.000
R20	R20	02/11/2021	y = 1.201x-4.814	0.996





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S/N : 3095

#### Calibration Data

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Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	09/02/2022	y = 1.255x-7.443	0.998
B02	B02	02/02/2022	y = 1.075x+1.871	0.999
B03	B03	04/02/2022	y = 1.032x+1.126	0.997
B04	B04	04/02/2022	y = 1.158x-3.770	0.995
B05	B05	02/02/2022	y = 1.199x-5.374	1.000
B06	B06	01/02/2022	y = 1.215x-6.623	0.995
B07	B07	01/02/2022	y = 1.142x-4.465	0.997
B08	B08	02/02/2022	y = 1.241x-8.074	0.999
B09	B09	08/02/2022	y = 1.206x-5.652	0.995
B10	B10	07/02/2022	y = 1.095x+0.184	0.998
B11	B11	10/02/2022	y = 1.099x-2.021	0.996
B12	B12	09/02/2022	y = 1.169x-3.784	1.000
B13	B13	03/02/2022	y = 1.163x-4.662	0.996
B14	B14	07/02/2022	y = 1.169x-3.363	0.998
B15	B15	03/02/2022	y = 1.106x-1.273	0.998
B16	B16	09/02/2022	y = 1.218x-6.757	0.997
B17	B17	07/02/2022	y = 1.132x-1.890	0.998
B18	B18	16/02/2022	y = 1.239x-7.560	0.999
B19	B19	16/02/2022	y = 1.265x-8.934	0.997
B20	B20	0302/2022	y = 1.199x-6.304	0.998
B21	B21	17/02/2022	y = 1.120x-2.616	0.997
B22	B22	08/02/2022	y = 1.216x-6.597	0.995
B23	B23	03/02/2022	y = 1.139x-3.341	0.999
B24	B24	03/02/2022	y = 1.126x-2.172	1.000
B25	B25	09/02/2022	y = 1.016x+2.185	0.996
B26	B26	04/02/2022	y = 1.122x-2.540	0.997
B27	B27	08/02/2022	y = 1.192x-6.584	0.997
B28	B28	04/02/2022	y = 1.254x-8.360	0.995
B29	B29	02/02/2022	y = 1.217x-6.791	0.996
B30	B30	04/02/2022	y = 1.162x-4.303	0.997
B31	B31	16/02/2022	y = 1.101x-0.556	0.998
B32	B32	04/02/2022	y = 1.208x-5.034	0.997



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### High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3095

#### Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B35	B35	16/02/2022	y = 1.274x-9.241	0.999
B36	B36	15/02/2022	y = 1.132x-3.625	0.996
B37	B37	04/02/2022	y = 1.157x+2.640	0.999
B38	B38	15/02/2022	y = 1.1432x-2.720	0.999
B39	B39	07/02/2022	y = 1.256x-7.614	1.000
B40	B40	15/02/2022	y = 1.175x-4.385	0.998
B41	B41	07/02/2022	y = 1.133x-1.951	0.998
B42	B42	04/02/2022	y = 1.127x-1.985	1.000
B43	B43	16/02/2022	y = 1.089x+0.223	0.996
B44	B44	03/02/2022	y = 1.339x-11.636	0.997
R01	R01	02/02/2022	y = 1.196x-5.960	0.996
R02	R02	09/02/2022	y = 1.175x-5.572	1.000
R03	R03	02/02/2022	y = 1.187x-6.283	0.995
R04	R04	07/02/2022	y = 1.100x-1.352	0.997
R05	R05	09/02/2022	y = 1.238x-8.500	0.997
R06	R06	01/02/2022	y = 1.328x-11.118	0.996
R07	R07	07/02/2022	y = 1.039x+1.507	0.995
R08	R08	04/02/2022	y = 1.141x-3.942	0.997
R09	R09	01/02/2022	y = 1.192x-5.710	0.997
R10	R10	09/02/2022	y = 1.194x-5.807	1.000
R11	R11	01/02/2022	y = 1.054x+0.098	0.996
R12	R12	04/02/2022	y = 1.171x-5.349	0.996
R13	R13	04/02/2022	y = 1.114x-1.755	0.999
R14	R14	07/02/2022	y = 1.100x-0.965	0.997
R15	R15	14/02/2022	y = 1.047x+1.073	0.995
R16	R16	09/02/2022	y = 1.129x-3.642	0.999
R17	R17	03/02/2022	y = 1.198x-5.739	1.000
R18	R18	02/02/2022	y = 1.268x-9.241	0.998
R19	R19	03/02/2022	y = 1.216x-5.626	0.999
R20	R20	01/02/2022	y = 1.197x-5.676	0.997



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### High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3095

#### Calibration Data

##### High Volume PM-10 Data

##### Calibration Data

Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	01/11/2021	y = 1.208x-4.065	0.995
B02	B02	01/11/2021	y = 1.063x+1.371	0.999
B03	B03	01/11/2021	y = 1.048x+1.850	0.997
B04	B04	01/11/2021	y = 1.210x-4.614	0.998
B05	B05	02/11/2021	y = 1.191x-4.399	1.000
B06	B06	02/11/2021	y = 1.304x-9.578	0.998
B07	B07	02/11/2021	y = 1.106x-0.463	0.996
B08	B08	02/11/2021	y = 1.169x-3.444	0.998
B09	B09	04/11/2021	y = 1.157x-2.570	0.997
B10	B10	03/11/2021	y = 1.212x-5.982	0.997
B11	B11	04/11/2021	y = 1.154x-3.419	0.995
B12	B12	04/11/2021	y = 1.212x-5.982	0.997
B13	B13	04/11/2021	y = 1.249x-7.657	1.000
B14	B14	04/11/2021	y = 1.095x+0.679	0.999
B15	B15	03/11/2021	y = 1.102x-0.132	0.995
B16	B16	05/11/2021	y = 1.196x-2.682	0.998
B17	B17	04/11/2021	y = 1.211x-4.732	0.999
B18	B18	05/11/2021	y = 1.224x-5.520	0.996
B19	B19	05/11/2021	y = 1.074x+1.056	0.998
B20	B20	05/11/2021	y = 1.153x-3.408	0.995
B21	B21	01/11/2021	y = 1.174x-2.651	0.999
B22	B22	03/11/2021	y = 1.383x-12.324	1.000
B23	B23	03/11/2021	y = 1.107x-0.811	0.996
B24	B24	03/11/2021	y = 1.197x-5.593	0.998
B25	B25	03/11/2021	y = 1.166x-2.717	0.997
B26	B26	01/11/2021	y = 1.053x+1.597	0.996
B27	B27	01/11/2021	y = 1.205x-5.691	0.996
B28	B28	01/11/2021	y = 1.095x-0.442	0.995
B29	B29	02/11/2021	y = 1.272x-7.969	1.000
B30	B30	02/11/2021	y = 1.149x-3.091	0.998
B31	B31	02/11/2021	y = 1.049x+1.595	0.996
B32	B32	02/11/2021	y = 1.142x-1.981	1.000
B33	B33	04/11/2021	y = 1.227x-6.487	0.997



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### High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3095

#### Calibration Data

##### High Volume PM-10 Data

##### Calibration Data

Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
R01	R01	05/11/2021	y = 1.211x-6.104	0.997
R02	R02	05/11/2021	y = 1.214x-4.615	0.997
R03	R03	01/11/2021	y = 1.084x+0.130	0.997
R04	R04	01/11/2021	y = 1.259x-8.531	0.998
R05	R05	09/11/2021	y = 1.072x+0.329	0.999
R06	R06	09/11/2021	y = 1.227x-4.906	1.000
R07	R07	03/11/2021	y = 1.112x-0.122	0.997
R08	R08	03/11/2021	y = 1.094x-0.497	0.999
R09	R09	03/11/2021	y = 1.304x-9.083	0.999
R10	R10	03/11/2021	y = 1.093x-0.132	0.996
R11	R11	01/11/2021	y = 1.278x-9.253	1.000
R12	R12	01/11/2021	y = 1.124x-1.702	0.999
R13	R13	01/11/2021	y = 1.197x-4.323	0.995
R14	R14	01/11/2021	y = 1.179x-4.500	0.997
R15	R15	01/11/2021	y = 1.259x-7.023	1.000
R16	R16	02/11/2021	y = 1.187x-3.968	0.999
R17	R17	02/11/2021	y = 1.197x-3.940	0.997
R18	R18	02/11/2021	y = 1.149x-2.227	0.998
R19	R19	04/11/2021	y = 1.159x-3.569	1.000
R20	R20	04/11/2021	y = 1.172x-4.515	0.995



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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 : 3095
Calibration Data				
High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	02/02/2022	y = 1.199x-0.729	0.999
B02	B02	04/02/2022	y = 1.047x+3.100	0.999
B03	B03	07/02/2022	y = 1.212x+3.555	0.997
B04	B04	09/02/2022	y = 1.314x-9.389	1.000
B05	B05	03/02/2022	y = 1.207x-5.472	0.995
B06	B06	04/02/2022	y = 1.260x-8.728	0.997
B07	B07	04/02/2022	y = 1.212x-5.353	0.996
B08	B08	09/02/2022	y = 1.285x-7.356	0.998
B09	B09	08/02/2022	y = 1.243x-6.277	1.000
B10	B10	07/02/2022	y = 1.285x-9.647	0.998
B11	B11	02/02/2022	y = 1.240x-6.135	0.995
B12	B12	01/02/2022	y = 1.285x-9.647	0.998
B13	B13	04/02/2022	y = 1.302x-9.419	0.996
B14	B14	07/02/2022	y = 1.199x+3.376	0.998
B15	B15	04/02/2022	y = 1.118x-0.993	0.995
B16	B16	04/02/2022	y = 1.190x-1.101	0.998
B17	B17	03/02/2022	y = 1.201x-2.953	0.998
B18	B18	07/02/2022	y = 1.143x-1.983	0.998
B19	B19	03/02/2022	y = 1.036x+1.865	0.998
B20	B20	03/02/2022	y = 1.201x-6.181	0.997
B21	B21	04/02/2022	y = 1.158x-0.828	0.998
B22	B22	04/02/2022	y = 1.290x-8.497	0.998
B23	B23	07/02/2022	y = 1.090x-0.542	1.000
B24	B24	01/02/2022	y = 1.218x-6.279	0.998
B25	B25	01/02/2022	y = 1.156x-3.313	0.997
B26	B26	07/02/2022	y = 1.135x+1.438	0.998
B27	B27	02/02/2022	y = 1.260x-8.474	0.998
B28	B28	04/02/2022	y = 1.090x-0.306	0.999
B29	B29	04/02/2022	y = 1.262x-8.639	1.000
B30	B30	03/02/2022	y = 1.219x-6.529	0.996
B31	B31	17/02/2022	y = 1.059x+0.716	0.997
B32	B32	16/02/2022	y = 1.154x-3.610	0.999
B33	B33	03/02/2022	y = 1.258x-8.776	0.999
B34	B34	16/02/2022	y = 1.123x+0.227	0.995



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### High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard			Model : TE 5025A	S/N : 3095
Calibration Data				
High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
R01	R01	04/02/2022	y = 1.238x-7.598	0.995
R02	R02	11/02/2022	y = 1.161x-3.899	0.996
R03	R03	04/02/2022	y = 1.154x+2.827	0.998
R04	R04	06/02/2022	y = 1.116x-1.752	0.995
R05	R05	07/02/2022	y = 1.125x-2.487	0.995
R06	R06	10/02/2022	y = 1.321x-9.065	0.998
R07	R07	04/02/2022	y = 1.138x-1.986	0.996
R08	R08	03/02/2022	y = 1.160x-3.759	0.996
R09	R09	10/02/2022	y = 1.209x-6.918	0.995
R10	R10	04/02/2022	y = 1.114x-1.889	0.995
R11	R11	03/02/2022	y = 1.272x-7.597	1.000
R12	R12	03/02/2022	y = 1.153x-3.385	0.995
R13	R13	02/02/2022	y = 1.207x-4.913	0.996
R14	R14	01/02/2022	y = 1.183x-3.660	0.996
R15	R15	02/02/2022	y = 1.247x-7.741	0.999
R16	R16	02/02/2022	y = 1.238x-6.677	0.996
R17	R17	01/02/2022	y = 1.203x-5.310	0.998
R18	R18	04/02/2022	y = 1.148x-3.211	0.998
R19	R19	04/02/2022	y = 1.220x-6.839	0.997
R20	R20	03/02/2022	y = 1.161x-5.047	0.997



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### CALIBRATION REPORT

#### SO<sub>2</sub> FLUORESCENT ANALYZER

DATE : 25 January 2022

BRAND : API

MODEL : 100A

NO. SO<sub>2</sub>-B03

SERIAL NO. 1846

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2021

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Sulphur Dioxide (SO<sub>2</sub>)

Cylinder No. : A00814SK

Certified Date : 21 June 2021

Expired Date : 21 June 2029

Cylinder Conc. : 50.0 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	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO <sub>2</sub> Span	400.0	400.3	0.075	400.0	1.010

#### API Model 100A SO<sub>2</sub> Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.6	in-Hg	25-35
SAMPLE FLOW	658	cc/min	650 ± 10%
PMT	103.1	mV	-20-150 with Zero Air
UV LAMP	3036.4	mV	1000-4900
STR. LGT	61.6	PPB	<100
DRK PMT	63.2	mV	-50 - 200
DRK LMP	58.0	mV	-50 - 200
HVPS	671	V	550-900 constant
DCPS	2528	mV	2500 ± 200
RCELL TEMP	50.5	°C	50 ± 1
BOX TEMP	29.4	°C	5-40
PMT TEMP	7.0	°C	7 ± 2.0
SO <sub>2</sub> Span Conc	400	PPB	20-20,000
SO <sub>2</sub> Slope	1.010	-	1.0 ± 0.3
SO <sub>2</sub> Offset	21.6	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)



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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	25 January 2022	BRAND :	API	MODEL :	100E
NO.	SO <sub>2</sub> -B04	SERIAL NO.	3159		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 05 August 2021		Serial No.	: 911	
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO <sub>2</sub> )		Cylinder No.	: A00814SK	
Certified Date	: 21 June 2021		Expired Date	: 21 June 2029	
			Cylinder Conc.	: 50.0 ppm	
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	-
SO <sub>2</sub> Span	400.0	400.2	0.050	400.0	1.008
API Model 100E SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.5	in-Hg	25-35		
SAMPLE FLOW	654	cc/min	650 ± 10%		
PMT	103.0	mV	-20-150 with Zero Air		
UV LAMP	3039.2	mV	1000-4900		
STR. LGT	61.7	PPB	<100		
DRK PMT	63.4	mV	-50 - 200		
DRK LMP	58.1	mV	-50 - 200		
HVPS	670	V	550-900 constant		
DCPS	2516	mV	2500 ± 200		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.1	°C	5-40		
PMT TEMP	7.5	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.008	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	21.9	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		





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## CALIBRATION REPORT

### SO<sub>2</sub> FLUORESCENT ANALYZER

DATE : 07 February 2022

BRAND : API

MODEL : 100E

NO. SO<sub>2</sub>-B04

SERIAL NO. 3159

#### Calibrator (Dilution System)

Brand : API Model : 700  
Last Cal. Date : 05 August 2021 Serial No. : 911

#### Reference Standard Gas

Standard Gas : Sulphur Dioxide (SO<sub>2</sub>) Cylinder No. : A00814SK  
Certified Date : 21 June 2021 Expired Date : 21 June 2029 Cylinder Conc. : 50.0 ppm

Pressure 1011 mmbar Temp. 24.6 °C % RH 48

#### CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO <sub>2</sub> Span	400.0	400.2	0.050	400.0	1.010

#### API Model 100E SO<sub>2</sub> Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.5	in-Hg	25-35
SAMPLE FLOW	654	cc/min	650 ± 10%
PMT	103.2	mV	-20-150 with Zero Air
UV LAMP	3017.6	mV	1000-4900
STR. LGT	61.3	PPB	<100
DRK PMT	62.9	mV	-50 - 200
DRK LMP	57.8	mV	-50 - 200
HVPS	671	V	550-900 constant
DCPS	2518	mV	2500 ± 200
RCELL TEMP	50.4	°C	50 ± 1
BOX TEMP	29.2	°C	5-40
PMT TEMP	7.0	°C	7 ± 2.0
SO <sub>2</sub> Span Conc	400	PPB	20-20,000
SO <sub>2</sub> Slope	1.010	-	1.0 ± 0.3
SO <sub>2</sub> Offset	21.9	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)



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### CALIBRATION REPORT

#### SO<sub>2</sub> FLUORESCENT ANALYZER

DATE : 07 February 2022

BRAND : Thermo

MODEL : 43C

NO. SO2-B10

SERIAL NO. 43C-69604-364

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2021

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Sulphur Dioxide (SO<sub>2</sub>)

Cylinder No. : A00814SK

Certified Date : 21 June 2021

Expired Date : 21 June 2029

Cylinder Conc. : 50.0 ppm

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 48

#### CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.), PPB			Final Reading (After Adj.), PPB
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response
Zero	0	0.10	-	0
SO <sub>2</sub> Span	400.0	399.7	-0.075	400.0

#### INSTRUMENT STATUS

CHAMBER TEMP

44.5 °C

FLOW

1.0 LPM

PRESSURE

728.8 mm Hg



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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 March 2022	BRAND :	API	MODEL :	100E
NO.	SO <sub>2</sub> -B06			SERIAL NO.	3430
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2021			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO <sub>2</sub> )			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 50.0 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	-
SO <sub>2</sub> Span	400.0	400.4	0.100	400.0	1.016
API Model 100E SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.6	in-Hg	25-35		
SAMPLE FLOW	658	cc/min	650 ± 10%		
PMT	103.2	mV	-20-150 with Zero Air		
UV LAMP	3005.1	mV	1000-4900		
STR. LGT	61.4	PPB	<100		
DRK PMT	62.9	mV	-50 - 200		
DRK LMP	57.5	mV	-50 - 200		
HVPS	671	V	550-900 constant		
DCPS	2518	mV	2500 ± 200		
RCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.2	°C	5-40		
PMT TEMP	7.0	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.016	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	22.0	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		





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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	20 March 2022	BRAND :	Thermo	MODEL :	43C
NO.	SO <sub>2</sub> -B10			SERIAL NO.	43C-69604-364
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2021			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Sulphur Dioxide (SO <sub>2</sub> )			Cylinder No. : A00814SK		
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 50.0 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	
Zero	0	0.11	-	0	
SO <sub>2</sub> Span	400.0	400.2	0.050	400.0	
INSTRUMENT STATUS					
CHAMBER TEMP	44.4	°C	FLOW	1.0	LPM
PRESSURE	728.6	mm Hg			



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## CALIBRATION REPORT

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

DATE : 25 January 2022

BRAND : API

MODEL : 200E

NO. NOX-R09

SERIAL NO. 252

#### Calibrator (Dilution System)

Brand : API Model : 700

Last Cal. Date : 05 August 2021 Serial No. : 911

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO) Cylinder No. : A00917SK

Certified Date : 01 June 2020 Expired Date : 01 June 2022 Cylinder Conc. : 49.9 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	-0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.004
NO <sub>x</sub> Span	400	400.1	0.025	400.0	1.007

#### API Model 200E NO<sub>x</sub> Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	511	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.1	mV	-20 - 150
AZERO	93.9	mV	-20 - 150
HVPS	670	V	420 - 900 constant
RCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	29.4	°C	8 - 48
PMT TEMP	7.3	°C	7 ± 2
MOLY TEMP	315.3	°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 <sub>x</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.004	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.007	-	1.0 ± 0.3
NO Offset	1.2	mV	-20 to +150
NO <sub>x</sub> Offset	0.8	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas





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## CALIBRATION REPORT

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

DATE : 25 January 2022

BRAND : API

MODEL : 200E

NO. NOX-B11

SERIAL NO. 4467

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2021

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : A00917SK

Certified Date : 01 June 2020

Expired Date : 01 June 2022

Cylinder Conc. : 49.9 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	399.6	-0.100	400.0	1.003
NO <sub>x</sub> Span	400	399.8	-0.050	400.0	1.006

#### API Model 200E NO<sub>x</sub> Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	505	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.3	mV	-20 - 150
AZERO	94.0	mV	-20 - 150
HVPS	674	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	8.3	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.003	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.006	-	1.0 ± 0.3
NO Offset	1.1	mV	-20 to +150
NO <sub>x</sub> Offset	0.6	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas



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## CALIBRATION REPORT

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

DATE : 07 February 2022

BRAND : API

MODEL : 200E

NO. NOX-B04

SERIAL NO. 750

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2021

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : A00917SK

Certified Date : 01 June 2020

Expired Date : 01 June 2022

Cylinder Conc. : 49.9 ppm

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 48

#### 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	400.2	0.050	400.0	1.008
NO <sub>x</sub> Span	400	400.4	0.100	400.0	1.013

#### API Model 200E NO<sub>x</sub> Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	507	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.2	mV	-20 - 150
AZERO	94.0	mV	-20 - 150
HVPS	674	V	420 - 900 constant
RCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	28.9	°C	8 - 48
PMT TEMP	7.3	°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 <sub>x</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.008	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.013	-	1.0 ± 0.3
NO Offset	1.6	mV	-20 to +150
NO <sub>x</sub> Offset	1.0	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas





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## CALIBRATION REPORT

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

DATE : 07 February 2022

BRAND : API

MODEL : 200E

NO. NOX-B11

SERIAL NO. 4467

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2021

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : A00917SK

Certified Date : 01 June 2020

Expired Date : 01 June 2022

Cylinder Conc. : 49.9 ppm

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 48

#### 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	399.7	-0.075	400.0	1.003
NO <sub>x</sub> Span	400	400.2	0.050	400.0	1.006

#### API Model 200E NO<sub>x</sub> Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	505	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.0	mV	-20 - 150
AZERO	93.8	mV	-20 - 150
HVPS	675	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.1	°C	8 - 48
PMT TEMP	7.3	°C	7 ± 2
MOLY TEMP	315.2	°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 <sub>x</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.003	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.006	-	1.0 ± 0.3
NO Offset	0.9	mV	-20 to +150
NO <sub>x</sub> Offset	0.5	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas



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## CALIBRATION REPORT

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

DATE : 20 March 2022

BRAND : API

MODEL : 200A

NO. NOX-B02

SERIAL NO. 2409

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2021

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : A00917SK

Certified Date : 01 June 2020

Expired Date : 01 June 2022

Cylinder Conc. : 49.9 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	400.2	0.050	400.0	1.008
NO <sub>x</sub> Span	400	400.3	0.075	400.0	1.012

#### API Model 200A NO<sub>x</sub> Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	506	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.3	mV	-20 - 150
AZERO	93.9	mV	-20 - 150
HVPS	675	V	420 - 900 constant
RCELL TEMP	50.4	°C	50 ± 1
BOX TEMP	29.3	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	314.7	°C	315 ± 5
RCELL PRESS	8.5	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.008	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.012	-	1.0 ± 0.3
NO Offset	1.6	mV	-20 to +150
NO <sub>x</sub> Offset	1.0	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas





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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	20 March 2022	BRAND :	API	MODEL :	200E
NO.	NOX-B19	SERIAL NO.	353		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 05 August 2021		Serial No.	: 911	
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)		Cylinder No.	: A00917SK	
Certified Date	: 01 June 2020	Expired Date	: 01 June 2022	Cylinder Conc.	: 49.9 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C % RH <span style="border: 1px solid black; text-align: center;">49</span>
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	1.008
NO <sub>x</sub> Span	400	400.4	0.100	400.0	1.014
API Model 200A NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	512	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.5	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	675	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.3	°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 <sub>x</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.008	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.014	-	1.0 ± 0.3		
NO Offset	1.7	mV	-20 to +150		
NO <sub>x</sub> Offset	1.0	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		



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## CALIBRATION REPORT

### NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 25 January 2022 BRAND : API MODEL : 300E  
NO. CO-B01 SERIAL NO. 782

#### Calibrator (Dilution System)

Brand : API Model : 700  
Last Cal. Date : 20 September 2021 Serial No. : 421

#### Reference Standard Gas

Standard Gas : Carbon Monoxide (CO) Cylinder No. : D824478  
Certified Date : 15 April 2020 Expired Date : 14 April 2022 Cylinder Conc. : 4,740 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	39.93	-0.175	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	4016.2	mV	2500-4800 mV
CO REFERENCE	3949.7	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	48.3	°C	48 ± 4
BENCH TEMPERATURE	48.1	°C	48 ± 2
WHEEL TEMPERATURE	68.5	°C	68 ± 2
BOX TEMPERATURE	30.6	°C	Ambient temp + 7 ± 10
PHOTO-DRIVE	3041.8	mV	250 mV to 4750 mV
SLOPE	1.017	-	1.0 ± 0.3
OFFSET	0.2	-	0 ± 0.3





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## CALIBRATION REPORT

### NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 25 January 2022

BRAND : Thermo

MODEL : 48C

NO. CO-B11

SERIAL NO. 0401304262

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 20 September 2021

Serial No. : 421

#### Reference Standard Gas

Standard Gas : Carbon Monoxide (CO)

Cylinder No. : D824478

Certified Date : 15 April 2020

Expired Date : 14 April 2022

Cylinder Conc. : 4,740 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	0.11	-	0
CO Span	40.00	40.10	0.250	40.00

#### INSTRUMENT STATUS

CHAMBER TEMP

47.4 °C

FLOW

1.5 LPM

PRESSURE

730.6 mm Hg

MOTOR SPEED

100.00%



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## CALIBRATION REPORT

### NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 07 February 2022

BRAND : API

MODEL : 300E

NO. CO-B01

SERIAL NO. 782

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 20 September 2021

Serial No. : 421

#### Reference Standard Gas

Standard Gas : Carbon Monoxide (CO)

Cylinder No. : D824478

Certified Date : 15 April 2020

Expired Date : 14 April 2022

Cylinder Conc. : 4,740 PPM

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 48

#### CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response
Zero	0	0.11	-	0
CO Span	40.00	40.10	0.250	40.00

#### API Model 300E CO Analyzer Check list

Parameter	Observed Value	Units	Nominal Range
RANGE	50	PPM	0-1000 ppm
STABILITY	0.10	PPM	< 1 ppm with zero air
CO MEASURE	4013.2	mV	2500-4800 mV
CO REFERENCE	3947.6	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	809	cc/min	800 ± 10%
SAMPLE TEMPERATURE	48.3	°C	48 ± 4
BENCH TEMPERATURE	48.1	°C	48 ± 2
WHEEL TEMPERATURE	68.5	°C	68 ± 2
BOX TEMPERATURE	30.6	°C	Ambient temp + 7 ± 10
PHOTO-DRIVE	3007.5	mV	250 mV to 4750 mV
SLOPE	1.017	-	1.0 ± 0.3
OFFSET	0.2	-	0 ± 0.3





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## CALIBRATION REPORT

### NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 07 February 2022

BRAND : API

MODEL : 300E

NO. CO-B13

SERIAL NO. 176

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 20 September 2021

Serial No. : 421

#### Reference Standard Gas

Standard Gas : Carbon Monoxide (CO)

Cylinder No. : D824478

Certified Date : 15 April 2020

Expired Date : 14 April 2022

Cylinder Conc. : 4,740 PPM

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 48

#### 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	39.89	-0.275	40.00

#### API Model 300E CO Analyzer Check list

Parameter	Observed Value	Units	Nominal Range
RANGE	50	PPM	0-1000 ppm
STABILITY	0.10	PPM	< 1 ppm with zero air
CO MEASURE	4015.3	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	806	cc/min	800 ± 10%
SAMPLE TEMPERATURE	48.2	°C	48 ± 4
BENCH TEMPERATURE	48.0	°C	48 ± 2
WHEEL TEMPERATURE	68.6	°C	68 ± 2
BOX TEMPERATURE	30.5	°C	Ambient temp + 7 ± 10
PHOTO-DRIVE	3041.8	mV	250 mV to 4750 mV
SLOPE	1.017	-	1.0 ± 0.3
OFFSET	0.2	-	0 ± 0.3



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CALIBRATION REPORT							
NON-DISPERSIVE INFRARED CO ANALYZER							
DATE :	20 March 2022	BRAND :	API	MODEL :	300E		
NO.	CO-B03	SERIAL NO.	3019				
Calibrator (Dilution System)							
Brand	: API			Model	: 700		
Last Cal. Date	: 20 September 2021			Serial No.	: 421		
Reference Standard Gas							
Standard Gas	: Carbon Monoxide (CO)			Cylinder No.	: D824478		
Certified Date	: 15 April 2020	Expired Date	: 14 April 2022	Cylinder Conc.	: 4,740 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	40.09	0.225	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	4014.7	mV	2500-4800 mV				
CO REFERENCE	3948.2	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	804	cc/min	800 ± 10%				
SAMPLE TEMPERATURE	48.5	°C	48 ± 4				
BENCH TEMPERATURE	48.2	°C	48 ± 2				
WHEEL TEMPERATURE	68.5	°C	68 ± 2				
BOX TEMPERATURE	30.8	°C	Ambient temp + 7 ± 10				
PHOTO-DRIVE	3021.3	mV	250 mV to 4750 mV				
SLOPE	1.017	-	1.0 ± 0.3				
OFFSET	0.2	-	0 ± 0.3				



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CALIBRATION REPORT							
NON-DISPERSIVE INFRARED CO ANALYZER							
DATE :	20 March 2022	BRAND :	Thermo	MODEL :	48C		
NO.	CO-B11	SERIAL NO.	0401304262				
Calibrator (Dilution System)							
Brand : API			Model : 700				
Last Cal. Date : 20 September 2021			Serial No. : 421				
Reference Standard Gas							
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D824478				
Certified Date : 15 April 2020		Expired Date : 14 April 2022		Cylinder Conc. : 4,740 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	39.91		-0.225	40.00		
INSTRUMENT STATUS							
CHAMBER TEMP	47.3 °C		FLOW	1.5 LPM			
PRESSURE	730.7 mm Hg		MOTOR SPEED	100.00%			





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Personal Pump Calibration Report											
Calibration Method : Dry Cal Primary Flowmeter						Model : Defender 510-H				S/N : 136164	
Environmental Conditions											
Temperature		. 25		± 3		°C					
Pressure		. 1010		± 15		mmbar					

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	Actual (Q std.)	3	y	R <sup>2</sup>
B01	SKC	224-PCXR4	262101	05/01/2022	1,000	1,500	2,000	995	1,496	1,995	0.999x - 1.938	1.000
B02	SKC	224-PCXR4	626166	05/01/2022	1,000	1,500	2,000	998	1,504	2,001	1.011x - 24.413	0.999
B03	SKC	224-PCXR4	612968	05/01/2022	1,000	1,500	2,000	995	1,490	1,995	1.001x - 6.653	1.000
B04	SKC	224-PCXR4	602804	05/01/2022	1,000	1,500	2,000	996	1,496	1,993	0.999x - 4.391	1.000
B05	SKC	224-PCXR4	612693	05/01/2022	1,000	1,500	2,000	1,003	1,500	2,003	1.012x - 21.952	0.999
B06	SKC	224-PCXR4	262188	05/01/2022	1,000	1,500	2,000	996	1,504	2,000	1.012x - 26.866	0.999
B07	SKC	224-PCXR4	626262	05/01/2022	1,000	1,500	2,000	998	1,492	1,994	0.996x + 1.898	1.000
B08	SKC	224-PCXR4	626100	05/01/2022	1,000	1,500	2,000	1,003	1,499	2,003	1.011x - 21.912	0.999
B09	SKC	224-PCXR4	626479	05/01/2022	1,000	1,500	2,000	997	1,490	1,994	0.994x + 3.550	1.000
B10	SKC	224-PCXR4	091950	06/01/2022	1,000	1,500	2,000	994	1,504	2,001	1.016x - 32.434	0.999
B11	SKC	224-PCXR8	564315	06/01/2022	1,000	1,500	2,000	994	1,490	1,998	1.004x - 10.450	1.000
B12	SKC	224-PCXR4	034656	06/01/2022	1,000	1,500	2,000	1,001	1,503	2,003	1.012x - 22.618	0.999
B13	SKC	224-PCXR4	602073	06/01/2022	1,000	1,500	2,000	995	1,498	1,994	1.000x - 3.701	1.000
B14	SKC	224-PCXR4	626313	05/01/2022	1,000	1,500	2,000	998	1,491	1,988	0.992x + 6.286	1.000
B15	SKC	224-PCXR4	626474	07/01/2022	1,000	1,500	2,000	1,003	1,501	2,004	1.012x - 22.048	0.999
B16	SKC	224-PCXR4	626477	07/01/2022	1,000	1,500	2,000	993	1,504	2,000	1.015x - 31.345	0.999
B17	SKC	224-PCXR4	626860	07/01/2022	1,000	1,500	2,000	997	1,495	1,992	0.995x + 2.034	1.000
B18	SKC	224-PCXR4	691484	07/01/2022	1,000	1,500	2,000	1,003	1,501	2,001	1.009x - 18.586	0.999
B19	SKC	224-PCXR4	691599	07/01/2022	1,000	1,500	2,000	992	1,499	1,997	1.003x - 9.253	1.000
B20	SKC	224-PCXR4	691587	07/01/2022	1,000	1,500	2,000	992	1,504	1,999	1.015x - 31.915	0.999
B21	SKC	224-PCXR4	691531	07/01/2022	1,000	1,500	2,000	993	1,499	1,992	1.000x - 5.273	1.000
B22	SKC	224-PCXR4	691654	07/01/2022	1,000	1,500	2,000	1,005	1,501	2,003	1.010x - 18.195	0.999
B23	SKC	224-PCXR4	798393	07/01/2022	1,000	1,500	2,000	993	1,505	2,002	1.017x - 34.683	0.999
B24	SKC	224-PCXR4	626363	07/01/2022	1,000	1,500	2,000	1,000	1,501	2,005	1.016x - 28.338	0.999
B25	SKC	224-PCXR4	798489	06/01/2022	1,000	1,500	2,000	1,000	1,495	1,997	0.997x + 2.018	1.000
B26	SKC	224-PCXR4	798479	06/01/2022	1,000	1,500	2,000	997	1,497	1,990	0.994x + 3.251	1.000
B27	SKC	224-PCXR4	691673	06/01/2022	1,000	1,500	2,000	994	1,503	2,001	1.015x - 31.951	0.999
B28	SKC	224-PCXR4	691570	06/01/2022	1,000	1,500	2,000	1,000	1,500	2,003	1.015x - 27.022	0.999
B29	SKC	224-PCXR4	626472	06/01/2022	1,000	1,500	2,000	999	1,494	1,998	1.002x - 6.856	1.000
B30	SKC	224-PCXR4	691489	06/01/2022	1,000	1,500	2,000	1,003	1,500	2,004	1.013x - 24.106	0.999
B31	SKC	224-PCXR4	691509	06/01/2022	1,000	1,500	2,000	995	1,495	1,995	1.001x - 4.894	1.000
B32	SKC	224-PCXR4	091567	06/01/2022	1,000	1,500	2,000	994	1,504	2,001	1.014x - 28.868	0.999
B33	SKC	224-PCXR4	091756	06/01/2022	1,000	1,500	2,000	996	1,496	1,991	0.995x + 3.183	1.000
B34	SKC	224-PCXR4	612962	06/01/2022	1,000	1,500	2,000	1,001	1,501	2,002	1.012x - 22.531	0.999
B35	SKC	224-PCXR4	602682	06/01/2022	1,000	1,500	2,000	993	1,498	1,996	1.002x - 8.448	1.000
B36	SKC	224-PCXR4	626164	05/01/2022	1,000	1,500	2,000	1,000	1,497	1,999	0.999x - 3.231	1.000
B37	SKC	224-PCXR4	626256	05/01/2022	1,000	1,500	2,000	994	1,504	2,002	1.016x - 31.604	0.999
B38	SKC	224-PCXR4	626167	10/01/2022	1,000	1,500	2,000	999	1,497	1,996	1.000x - 1.875	1.000
B39	SKC	224-PCXR4	034637	10/01/2022	1,000	1,500	2,000	1,002	1,500	2,002	1.012x - 23.643	0.999
B40	SKC	224-PCXR4	798349	10/01/2022	1,000	1,500	2,000	993	1,505	2,000	1.016x - 32.992	0.999



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Personal Pump Calibration Report											
Calibration Method : Dry Cal Primary Flowmeter						Model : Defender 510-H				S/N : 136164	
Environmental Conditions											
Temperature				25	±	3	°C				
Pressure				1010	±	15	mmbar				

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B41	SKC	224-PCXR4	612669	10/01/2022	1,000	1,500	2,000	998	1,496	1,989	0.994x + 2.680	1.000
B42	SKC	224-PCXR4	626041	07/01/2022	1,000	1,500	2,000	1,003	1,498	1,993	0.990x + 11.710	1.000
B43	SKC	224-PCXR4	034636	05/01/2022	1,000	1,500	2,000	998	1,500	1,992	0.992x + 8.392	1.000
B44	SKC	224-PCXR8	529341	07/01/2022	1,000	1,500	2,000	1,004	1,500	2,003	1.011x - 21.139	0.999
B45	SKC	224-PCXR8	529594	07/01/2022	1,000	1,500	2,000	997	1,498	1,992	0.995x + 2.728	1.000
B46	SKC	224-PCXR8	566743	07/01/2022	1,000	1,500	2,000	994	1,504	2,002	1.015x - 32.087	0.999
B47	SKC	224-PCXR8	566747	07/01/2022	1,000	1,500	2,000	1,002	1,501	2,003	1.013x - 23.580	0.999
B48	SKC	224-PCXR8	566753	07/01/2022	1,000	1,500	2,000	1,000	1,494	1,996	0.996x + 1.567	1.000
B49	SKC	224-PCXR8	566780	07/01/2022	1,000	1,500	2,000	1,002	1,501	2,004	1.012x - 22.236	0.999
B50	SKC	224-PCXR8	500400	07/01/2022	1,000	1,500	2,000	1,000	1,493	1,996	0.995x + 3.641	1.000
B51	SKC	224-PCXR8	500363	07/01/2022	1,000	1,500	2,000	995	1,504	2,000	1.013x - 27.704	0.999
B52	SKC	224-PCXR8	093186	07/01/2022	1,000	1,500	2,000	995	1,498	1,994	0.997x - 0.283	1.000
B53	SKC	224-PCXR8	707670	10/01/2022	1,000	1,500	2,000	1,002	1,499	2,004	1.012x - 23.580	0.999
B54	SKC	224-PCXR3	509821	05/01/2022	1,000	1,500	2,000	994	1,501	2,001	1.015x - 32.043	0.999
B55	SKC	224-PCXR3	510710	06/01/2022	1,000	1,500	2,000	1,000	1,494	1,994	0.994x + 4.830	1.000
B56	SKC	224-PCXR3	511450	06/01/2022	1,000	1,500	2,000	1,004	1,502	2,002	1.010x - 19.248	0.999
B57	SKC	224-PCXR3	510798	06/01/2022	1,000	1,500	2,000	997	1,492	1,996	0.996x + 1.747	1.000
B58	SKC	224-PCXR3	509852	06/01/2022	1,000	1,500	2,000	997	1,499	2,000	1.011x - 27.010	0.999
B59	SKC	224-PCXR3	509862	06/01/2022	1,000	1,500	2,000	997	1,495	1,991	0.995x + 3.833	1.000
B60	SKC	224-PCXR3	512655	06/01/2022	1,000	1,500	2,000	1,002	1,500	2,004	1.013x - 24.688	0.999
B61	SKC	224-PCXR3	503915	06/01/2022	1,000	1,500	2,000	994	1,488	1,999	1.005x - 12.631	1.000
B62	SKC	224-PCXR3	505975	10/01/2022	1,000	1,500	2,000	994	1,491	1,995	1.002x - 8.089	1.000
B63	SKC	224-PCXR3	511432	10/01/2022	1,000	1,500	2,000	992	1,501	2,000	1.016x - 33.906	0.999
B64	SKC	224-PCXR3	508302	10/01/2022	1,000	1,500	2,000	998	1,493	1,990	0.994x + 4.272	1.000
B65	SKC	224-PCXR3	508310	10/01/2022	1,000	1,500	2,000	1,002	1,500	2,004	1.012x - 23.077	0.999
B66	SKC	224-PCXR3	509861	10/01/2022	1,000	1,500	2,000	997	1,494	1,994	0.995x + 3.953	1.000
B67	SKC	224-PCXR3	506295	10/01/2022	1,000	1,500	2,000	993	1,507	2,002	1.017x - 34.005	0.999
B68	SKC	224-PCXR3	505872	13/01/2022	1,000	1,500	2,000	1,000	1,495	1,994	0.995x + 4.188	1.000
B69	SKC	224-PCXR3	508375	13/01/2022	1,000	1,500	2,000	1,002	1,501	2,002	1.011x - 21.984	0.999
B70	SKC	224-PCXR3	510623	13/01/2022	1,000	1,500	2,000	995	1,490	1,997	1.001x - 7.267	1.000
B71	SKC	224-PCXR3	508367	13/01/2022	1,000	1,500	2,000	991	1,506	2,001	1.017x - 35.429	0.999
B72	SKC	224-PCXR3	505977	13/01/2022	1,000	1,500	2,000	1,001	1,498	1,991	0.991x + 8.882	1.000
B73	SKC	224-PCXR3	512606	13/01/2022	1,000	1,500	2,000	1,001	1,501	2,004	1.013x - 23.520	0.999
B74	SKC	224-PCXR3	505993	13/01/2022	1,000	1,500	2,000	996	1,495	1,995	1.000x - 5.161	1.000
B75	SKC	224-PCXR3	509820	13/01/2022	1,000	1,500	2,000	996	1,499	1,992	0.996x + 1.831	1.000
B76	SKC	224-PCXR3	509811	13/01/2022	1,000	1,500	2,000	995	1,496	1,998	1.003x - 9.950	1.000
B77	SKC	224-PCXR3	508301	13/01/2022	1,000	1,500	2,000	1,001	1,500	2,004	1.014x - 26.595	0.999
B78	SKC	224-PCXR3	510677	13/01/2022	1,000	1,500	2,000	994	1,504	1,999	1.013x - 28.238	0.999
B79	SKC	224-PCXR3	510920	12/01/2022	1,000	1,500	2,000	994	1,493	1,994	0.999x - 4.304	1.000



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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 <sup>2</sup>
B80	SKC	224-PCXR3	504569	12/01/2022	1,000	1,500	2,000	1,003	1,499	2,002	1.010x - 20.915	0.999
B81	SKC	224-PCXR3	503480	10/01/2022	1,000	1,500	2,000	994	1,499	2,000	1.015x - 31.401	0.999
B82	SKC	224-PCXR3	505673	10/01/2022	1,000	1,500	2,000	993	1,499	1,996	1.003x - 7.857	1.000
B83	SKC	224-PCXR3	510785	13/01/2022	1,000	1,500	2,000	1,000	1,500	2,002	1.012x - 23.548	0.999
B84	SKC	224-PCXR3	508333	12/01/2022	1,000	1,500	2,000	995	1,497	1,992	0.997x - 0.016	1.000
B85	SKC	224-PCXR3	505757	10/01/2022	1,000	1,500	2,000	993	1,502	1,999	1.014x - 30.555	0.999
B86	SKC	224-PCXR3	512625	10/01/2022	1,000	1,500	2,000	1,002	1,500	2,004	1.013x - 23.520	0.999
B87	SKC	224-PCXR3	504324	13/01/2022	1,000	1,500	2,000	997	1,499	1,997	1.000x - 1.667	1.000
B88	SKC	224-PCXR3	508307	13/01/2022	1,000	1,500	2,000	996	1,495	1,992	0.996x + 0.451	1.000
B89	SKC	224-PCXR3	509860	13/01/2022	1,000	1,500	2,000	1,000	1,501	2,003	1.013x - 25.008	0.999
B90	SKC	224-PCXR3	508366	13/01/2022	1,000	1,500	2,000	992	1,502	2,001	1.017x - 33.531	0.999
B91	SKC	224-PCXR3	510919	13/01/2022	1,000	1,500	2,000	998	1,498	1,997	1.001x - 4.563	1.000
B92	SKC	224-PCXR3	510987	13/01/2022	1,000	1,500	2,000	1,003	1,501	2,004	1.012x - 21.996	0.999
B93	SKC	224-PCXR3	509845	13/01/2022	1,000	1,500	2,000	1,000	1,498	1,999	1.000x - 3.059	1.000



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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

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R <sup>2</sup>
L-B01	Dwyer	VFA-21	05/01/2022	50	100	200	50.5	99.3	199.9	0.992x + 0.587	1.000
L-B02	Dwyer	VFA-21	05/01/2022	50	100	200	49.4	99.2	199.3	0.993x – 0.049	1.000
L-B03	Dwyer	VFA-21	06/01/2022	50	100	200	50.0	98.8	198.5	0.998x – 0.422	1.000
L-B04	Dwyer	VFA-21	06/01/2022	50	100	200	49.5	100.4	200.3	0.994x + 0.727	1.000
L-B05	Dwyer	VFA-21	06/01/2022	50	100	200	49.8	98.4	199.2	1.004x – 1.156	1.000
L-B06	Dwyer	VFA-21	07/01/2022	50	100	200	49.9	100.7	198.8	0.992x + 0.922	1.000
L-B07	Dwyer	VFA-21	07/01/2022	50	100	200	49.8	100.2	199.2	1.007x – 1.047	1.000
L-B08	Dwyer	VFA-21	06/01/2022	50	100	200	50.2	99.9	200.7	0.994x + 0.789	1.000
L-B09	Dwyer	VFA-21	07/01/2022	50	100	200	49.8	99.8	199.6	1.010x – 1.438	1.000
L-B10	Dwyer	VFA-21	05/01/2022	50	100	200	50.6	100.2	201.6	0.991x + 1.825	1.000



**QUALITY CALIBRATION CO.,LTD.**

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

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

[www.qcalibration.com](http://www.qcalibration.com)

CERTIFICATE No : 22M2567

REFERENCE No : 64386-1

PAGE : 1 OF 2

**Certificate of Calibration**

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XS 105DU

SERIAL No : 1126422905

ID No : BA 05/50

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : TETNITHI W.

CALIBRATION DATE : [REDACTED]

APPROVED BY : [REDACTED]

ISSUED DATE : 17-Mar-22

RECEIVED DATE : 11-Mar-22

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

F-G010 REV 02

**QUALITY CALIBRATION CO.,LTD.**

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

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

[www.qcalibration.com](http://www.qcalibration.com)

CERTIFICATE No : 22M2567

PAGE : 2 OF 2

**Calibration Report**

EQUIPMENT : DIGITAL BALANCE MODEL : XS 105DU

MANUFACTURER : METTLER TOLEDO S/N : 1126422905

ID No : BA 05/50 RECEIVED DATE : 11-Mar-22

AIR PRESSURE : 1008mbar  $\pm$  1mbar CALIBRATION DATE : 11-Mar-22

AMBIENT TEMPERATURE : 22° 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-1-151	C02210415	09-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES**RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT**

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 20 g WAS 0.000004 g

4. REPEATABILITY OF READING AT 100 g WAS 0.000048 g

5. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.00000	0.00000	0.000058
0.02	0.01999	0.00001	0.000058
0.10	0.09999	0.00001	0.000059
0.20	0.19999	0.00001	0.000059
0.50	0.50001	-0.00001	0.000058
1.00	1.00001	-0.00001	0.000059
2.00	2.00000	0.00000	0.000059
5.00	5.00001	-0.00001	0.000061
10.00	10.00005	-0.00005	0.000063
20.00	20.00006	-0.00006	0.000069
50.00	50.00000	0.00000	0.00011
100.00	100.00001	-0.00001	0.00019
120.00	120.00001	-0.00001	0.00022

**6. OFF CENTER LOADING ERROR**

POINT	READING (g)	
1	10.00001	50.0000
2	10.00002	50.0000
3	10.00001	50.0000
4	10.00001	50.0000
5	10.00002	50.0001
OFF-CENTER LOADING	0.00001	0.0001

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

Calibration Report Total Hydrocarbon Analyzer			
Date : 05 January 2022		Brand : HORIBA	Model : APHA-360CE
No. B01		Serial No. 4211954001	
Calibrator (Dilution System)			
Brand : API		Model : 700	
Last Cal. Date : 05 August 2021		Serial No. : 911	
Reference Standard Gas			
Standard Gas : Methane (CH <sub>4</sub> )		Cylinder No. : D595075	
Certified Date : 17 March 2015	Expired Date : 17 March 2023	Cylinder Conc. : 456 ppm	
Calibrating Condition			
Pressure 1011 mmbar	Temp. 24.6 °C	% RH 48	
Start Time : 2:00 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	10.02	10
Calibration Setting (Final)			
Span Instrument Gain: 0.997		Finish Time: 3:00 PM	
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH <sub>4</sub> )	911.2	mV	800-1,350
Signal (THC)	916.1	mV	800-1,350
Detector	78.1	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.0	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

Calibration Report Total Hydrocarbon Analyzer			
Date : 02 February 2022		Brand : HORIBA	Model : APHA-360CE
No. B01		Serial No. 4211954001	
Calibrator (Dilution System)			
Brand : API		Model : 700	
Last Cal. Date : 05 August 2021		Serial No. : 911	
Reference Standard Gas			
Standard Gas : Methane (CH <sub>4</sub> )		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 48	
Start Time : 10:00 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	0.11	0
Span	10	10.05	10
Calibration Setting (Final)			
Span Instrument Gain: 0.999		Finish Time: 11:00 AM	
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH <sub>4</sub> )	910.2	mV	800-1,350
Signal (THC)	915.6	mV	800-1,350
Detector	77.8	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.1	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



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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			
Total Hydrocarbon Analyzer			
Date :	07 March 2022	Brand :	HORIBA
		Model :	APHA-360CE
No.	B01	Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	05 August 2021	Serial No. :	911
Reference Standard Gas			
Standard Gas :	Methane (CH <sub>4</sub> )	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	48
		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	10.02	10
Calibration Setting (Final)			
Span Instrument Gain:	0.999	Finish Time:	2:00 PM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH <sub>4</sub> )	910.3	mV	800-1,350
Signal (THC)	915.7	mV	800-1,350
Detector	77.9	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.0	kPa	8 - 25
NMC	259.8	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

## เอกสารที่ 5-2

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียง





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0455

MTC No. EEL. BP. 41/0465

## CALIBRATION CERTIFICATE

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

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

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

### Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

### Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) kPa

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

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

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

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

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer 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 : 22 Apr. 2022

Date of Calibration : 28 Apr. 2022

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.



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0455

MTC No. EEL. BP. 41/0465

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

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

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

### 1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.93	-0.07	± 0.10	± 0.40 dB

### 2. Frequency

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

### 3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.44	± 0.50	± 3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

Approved by :



(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Date of Calibration

Date of Issue : 28 Apr. 2022

Ref : 2011265042601787001

2 / 2

End of Certificate

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

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Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

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E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

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E-mail : sumalee@tistr.or.th



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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

Noise B\_039/22

## 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	15 May 2021
		Due Date	15 May 2022

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B14	ACO	6236	00172034	25 January 2022	94.0	94.0
ACO-B24	ACO	6236	00182005	25 January 2022	93.9	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB	

Calibr



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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

Noise B\_065/22

## 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	15 May 2021
		Due Date	15 May 2022

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B24	ACO	6236	00182005	07 February 2022	93.9	94.0
NL 21-B13	RION	NL-21	00932860	07 February 2022	94.1	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB	



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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
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Noise B\_155/22

## 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	15 May 2021
		Due Date	15 May 2022

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B05	ACO	6236	00142002	20 March 2022	93.9	94.0
ACO-B14	ACO	6236	00172034	20 March 2022	93.9	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB	



### เอกสารที่ 5-3

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำ



CERT NO.: C22/0066B

PAGE : 1 OF 3

**ISOCAL TECHNOLOGY CO.,LTD.**  
**INDUSTRIAL INSTRUMENT CALIBRATION CENTER**

170/405 Moo 3 Serithai Rd., Kannayao Kannayao Bangkok 10230

Tel. 0-2906-3040-1 Fax. 0-2919-9948

**Certificate of Calibration**

EQUIPMENT : PH METER  
MODEL : HI98190  
SERIAL NO. : 04260035101  
ID NO. : B01  
MANUFACTURER : HANNA  
MADE IN : ROMANIA  
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO.,LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,JOMPOL,  
CHATUCHAK , BANGKOK  
AMBIENT TEMPERATURE : ( 23 ± 2 ) °C  
RELATIVE HUMIDITY : ( 50 ± 5 ) %  
CALIBRATED BY: [REDACTED]  
APPROVED BY : [REDACTED]  
ISSUE DATE : 23-Mar-2022

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL, EXCEPT WITH THE PRIOR  
WRITTEN APPROVAL OF THE HEAD OF THE INDUSTRIAL INSTRUMENTS CALIBRATION CENTER.

FM-15-2:00



**ISOCAL TECHNOLOGY CO., LTD.**

CERT NO.: C22/0066B

PAGE : 2 OF 3

**CALIBRATION REPORT**

EQUIPMENT : PH METER  
MANUFACTURER : HANNA  
MODEL : HI98190  
SERIAL NO. : 04260035101  
ID NO. : B01  
CALIBRATION DATE : 19-Mar-2022  
RECEIVED DATE : 17-Mar-2022  
PROCEDURE USED :

CALIBRATION WERE CONDUCTED USING IN-HOUSE CALIBRATION PROCEDURE WI-18-22 ACCORDING TO  
COMPARISON WITH PH SOLUTION STANDARD.

**CONDITION OF THIS RESULT OF CALIBRATION**

1. THIS RESULT OF CALIBRATION WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
2. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL OF THIS RESULT OF CALIBRATION.
3. REFERENCE STANDARDS INSTRUMENTS :-

PH SOLUTION MODEL PH 4.01 SERIAL NO. 1.09435.1000 CERT. NO HC02910835 DATE 24-APR-2022  
- NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY(NIST), U.S.A  
-PHYSIKALISCH-TECHNISCHE BUNDESANSTALT (PTB),GERMANY.  
THROUGH SUPELCO CO., LTD.

PH SOLUTION MODEL PH 7.01 SERIAL NO. 1.09439.1000 CERT. NO HC02387439 DUE DATE 18-APR-2022  
- NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY(NIST), U.S.A  
-PHYSIKALISCH-TECHNISCHE BUNDESANSTALT (PTB),GERMANY.  
THROUGH SUPELCO CO., LTD.

PH SOLUTION MODEL PH 10.01 SERIAL NO. 1.09438.1000 CERT. NO HC01501438 DUE DATE 27-MAR-2022  
- NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY(NIST), U.S.A  
-PHYSIKALISCH-TECHNISCHE BUNDESANSTALT (PTB),GERMANY.  
THROUGH SUPELCO CO., LTD.

FM-15-3:00



ISOCAL TECHNOLOGY CO., LTD.

CALIBRATION REPORT

CERT.NO.: C22/0066B

PAGE : 3 OF 3

RESULT OF CALIBRATION: ADJUSTMENT ( YES )

FUNCTION: PH MEASUREMENT WITH SOLUTION @ 25 °C

SCALE RANGE : 4.01 pH TO 10.01 pH

RESOLUTION: 0.01 pH

STANDARD VALUE ( pH )	UUC READING ( pH )	ERROR ( pH )	UNCERTAINTY ( pH )
4.01	3.97	-0.04	0.012
7.01	7.03	0.02	0.012
10.01	10.04	0.03	0.012

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

UUC = UNIT UNDER CALIBRATE

- oOo -



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 22TW98  
Page.: 1 of 2

## Certificate of Testing

Equipment : DO Meter  
Manufacturer : YSI  
Model : 5000-230V  
Serial No. : 15B100751  
ID No. : -  
Received Date : 20 April 2022  
Test Date : 21 April 2022  
Reference : 2204-0429WC-1  
Submitted by : S.P.S. Consulting Service Co.,Ltd.  
7 Phaholyothin 24, Phaholyothin Road.,  
Jompol, Chatuchak, Bangkok 10900  
Laboratory Condition : Temperature ( 25 ± 5 ) °C  
Humidity (50 ± 20) %  
Test Procedure : In - house method : CP-CH9  
by Comparison Technique with Azide Modification Method

Tested by :

Approved by :

( / ) Malee Butkruea  
( ) Saithip Meangmai  
( ) Warakorn Lerngagtrakul

Issue Date : 25 April 2022

B 0286555



Cert.No.: 22TW98  
Page.: 2 of 2

### Condition of this result of calibration

#### 1. Reference Standard Instruments :

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1) Burette	-	130BU10	21CG1389	25 Mar 2023
2) Balance	1126143764	140RC004	21MM430	21 Sep 2022

#### 2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 14J100195

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.12	8.14	0.0084

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

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

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

[www.qcalibration.com](http://www.qcalibration.com)CERTIFICATE No : 22M2568  
REFERENCE No : 64386-2

PAGE : 1 OF 2

**Certificate of Calibration**

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591842

ID No : BA 08/61

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : TETNITHI W.

CALIBRATION DATE : 11-Mar-22

APPROVED BY :

ISSUED DATE :

RECEIVED DATE :

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

F-G010 REV 02

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

[www.qcalibration.com](http://www.qcalibration.com)

CERTIFICATE No : 22M2568

PAGE : 2 OF 2

**Calibration Report**

EQUIPMENT : DIGITAL BALANCE MODEL : BSA224S-CW

MANUFACTURER : SARTORIUS S/N : 36591842

ID No : BA 08/61 RECEIVED DATE : 11-Mar-22

AIR PRESSURE : 1008mbar  $\pm$  1mbar CALIBRATION DATE : 11-Mar-22

AMBIENT TEMPERATURE : 22°C  $\pm$  1°C RELATIVE HUMIDITY : 51 %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 ADJUSTED USING WEIGHT OF QUALITY CALIBRATION TO ADJUST. 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	C02210415	09-Feb-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 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 0.000048 g
4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.0000	0.0000	0.000078
0.10	0.1000	0.0000	0.000078
0.20	0.2000	0.0000	0.000078
0.50	0.5000	0.0000	0.000079
1.00	1.0000	0.0000	0.000079
2.00	2.0000	0.0000	0.000080
5.00	5.0000	0.0000	0.000081
10.00	10.0000	0.0000	0.000084
20.00	20.0000	0.0000	0.000089
50.00	50.0000	0.0000	0.00011
100.00	100.0000	0.0000	0.00019
200.00	199.9999	0.0001	0.00032

**5. OFF CENTER LOADING ERROR**

POINT	READING (g)
1	99.9999
2	100.0000
3	99.9999
4	100.0000
5	100.0000
OFF-CENTER LOADING	0.0001

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

END OF CALIBRATION REPORT



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www.qcalibration.com



CERTIFICATE No : 22T2575

REFERENCE No : 64387-1

PAGE : 1 OF 2

**Certificate of Calibration**

**EQUIPMENT** : WATER BATH

**MANUFACTURER** : MEMMERT

**MODEL** : WNB 29

**SERIAL No** : L614.0123

**ID No** : WB 05/58

**CONDITION AS RECEIVED** : USED ITEM

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

**CALIBRATED BY** : CHAICHARN CH.

**CALIBRATION DATE** : 11-Mar-22

**APPROVED BY** :

**ISSUED DATE** : 17-Mar-22

**RECEIVED DATE** : 11-Mar-22

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

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CERTIFICATE No : 22T2575

PAGE : 2 OF 2

**Calibration Report**

**EQUIPMENT** : WATER BATH

**MANUFACTURER** : MEMMERT

**ID NUMBER** : WB 05/58

**RECEIVED DATE** : 11-Mar-22

**AMBIENT TEMPERATURE** : 24 °C ± 1 °C

**MODEL** : WNB 29

**SERIAL NUMBER** : L614.0123

**CALIBRATION DATE** : 11-Mar-22

**RELATIVE HUMIDITY** : 50 %RH ± 10 % RH

**CONDITION OF THIS RESULTS OF CALIBRATION**

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

2. REFERENCE STANDARD INSTRUMENTS :-

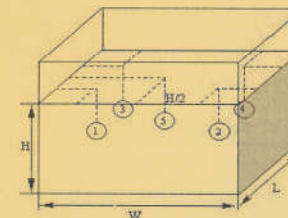
INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	2625A	6603614	21T6761	05-Jul-22

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 (°C) : 0.8

Overall Variation of Line Voltage (V) : 4

Instrument Condition : Normal

Bath Inner Size (W\*L\*H) : 59\*35\*14 cm

**BATH PERFORMANCE**

Calibration Point (°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
50.0	0.05	0.04	0.05	0.09
60.0	0.04	0.05	0.05	0.12

**TEMPERATURE MEASUREMENT ACCURACY TEST**

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
50.3	50.3	50.07	50.08	50.05	50.04	50.07	0.14
60.3	60.3	60.03	60.07	60.07	60.07	60.03	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 LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT