

ภาคผนวกที่ 5

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

- เอกสารที่ 5-1 เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศ
เอกสารที่ 5-2 เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียง
เอกสารที่ 5-3 เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำ

ตารางสรุปรายการเอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
คุณภาพอากาศ		
- TSP	- High Volume Air Sampler No. B05, B15, B18	- Electronic Balance
- PM ₁₀	- High Volume PM-10 Air Sampler No. B12, B25, B32	- Electronic Balance
- CO	- CO Analyzer - No. B01, B03, B11, B13	- CO Analyzer No. B01, B03, B11, B13
ระดับเสียง		
- Leq 24 hr	- Acoustic Calibrator	-
- Lmax	- Sound Level Meter No. NL 21-B19, ACO-B05, ACO-B14, ACO-B24, ACO-B31	
คุณภาพน้ำ		
- pH	-	- pH Meter
- BOD ₅	-	- DO Meter
- TSS	-	- Electronic Balance
- TDS	-	- Electronic Balance
- Settleable Solids	-	- Electronic Balance
- TKN	-	- Electronic Balance
- Sulfide	-	- Electronic Balance
- Grease & Oil	-	- Electronic Balance

เอกสารที่ 5-1

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศ

High Volume Air Sampler Calibration Report				
Calibration Method : Multipoint Orifice Flow Transfer Standard			Model : TE 50 25A	S/N : 3095
Calibration Data				
High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (l ³ /min)	R ²
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	$y = 1.044x + 1.608$	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
B32	B32	03/11/2021	$y = 1.197x - 3.536$	0.997
B33	B33	02/11/2021	$y = 1.246x - 6.869$	0.999
B34	B34	09/11/2021	$y = 1.251x - 7.511$	0.998

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 (l ³ /min)	R ²
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	$y = 1.254x - 6.360$	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
B33	B33	07/02/2022	$y = 1.242x - 5.616$	0.999
B34	B34	09/02/2022	$y = 1.240x - 8.273$	0.999

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 ³ /min)	R ²	
B01	B01	01/11/2021	y = 1.203x-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	
B34	B34	04/11/2021	y = 1.108x+0.446	0.999	

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 ³ /min)	R ²	
B01	B01	04/05/2022	y = 1.313x-9.642	0.999	
B02	B02	02/05/2022	y = 1.062x+2.593	1.000	
B03	B03	04/05/2022	y = 1.045x+0.757	0.998	
B04	B04	04/05/2022	y = 1.161x-3.877	0.996	
B05	B05	02/05/2022	y = 1.218x-6.416	1.000	
B06	B06	04/05/2022	y = 1.235x-6.768	0.998	
B07	B07	06/05/2022	y = 1.178x-5.564	0.999	
B08	B08	02/05/2022	y = 1.223x-6.991	1.000	
B09	B09	04/05/2022	y = 1.240x-6.649	0.996	
B10	B10	04/05/2022	y = 1.091x+0.142	0.995	
B11	B11	04/05/2022	y = 1.120x-2.107	1.000	
B12	B12	02/05/2022	y = 1.102x-1.916	0.996	
B13	B13	03/05/2022	y = 1.187x-5.240	0.999	
B14	B14	06/05/2022	y = 1.290x-9.276	0.998	
B15	B15	02/05/2022	y = 1.093x-0.919	0.999	
B16	B16	04/05/2022	y = 1.223x-6.745	0.999	
B17	B17	03/05/2022	y = 1.172x-3.414	0.998	
B18	B18	04/05/2022	y = 1.259x-8.700	1.000	
B19	B19	03/05/2022	y = 1.307x-10.268	0.999	
B20	B20	02/05/2022	y = 1.232x-7.260	0.999	
B21	B21	04/05/2022	y = 1.209x-7.461	0.996	
B22	B22	02/05/2022	y = 1.239x-7.827	0.999	
B23	B23	03/05/2022	y = 1.227x-6.159	0.999	
B24	B24	03/05/2022	y = 1.075x-0.925	0.997	
B25	B25	04/05/2022	y = 0.997x+2.795	0.998	
B26	B26	04/05/2022	y = 1.185x-5.015	0.998	
B27	B27	06/05/2022	y = 1.148x-5.099	0.996	
B28	B28	04/05/2022	y = 1.221x-6.454	1.000	
B29	B29	02/05/2022	y = 1.181x-5.705	0.995	
B30	B30	04/05/2022	y = 1.136x-3.406	0.999	
B31	B31	04/05/2022	y = 1.114x-1.568	0.999	
B32	B32	04/05/2022	y = 1.249x-6.749	1.000	
B33	B33	06/05/2022	y = 1.195x-4.397	0.996	
B34	B34	04/05/2022	y = 1.222x-7.759	0.999	

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 ³ /min)	R ²	
B01	B01	02/05/2022	y = 1.171x-0.211	0.997	
B02	B02	02/05/2022	y = 0.960x+5.104	0.998	
B03	B03	04/05/2022	y = 1.214x-5.211	0.998	
B04	B04	02/05/2022	y = 1.310x-9.479	0.999	
B05	B05	03/05/2022	y = 1.202x-5.734	0.999	
B06	B06	04/05/2022	y = 1.241x-7.631	0.998	
B07	B07	04/05/2022	y = 1.186x-4.480	0.999	
B08	B08	03/05/2022	y = 1.322x-8.634	0.999	
B09	B09	04/05/2022	y = 1.219x-5.756	0.998	
B10	B10	03/05/2022	y = 1.234x-7.417	1.000	
B11	B11	02/05/2022	y = 1.260x-7.479	0.999	
B12	B12	02/05/2022	y = 1.225x-5.900	0.998	
B13	B13	04/05/2022	y = 1.326x-10.711	0.999	
B14	B14	07/05/2022	y = 1.197x-3.534	0.999	
B15	B15	04/05/2022	y = 1.096x-0.244	0.998	
B16	B16	04/05/2022	y = 1.209x-1.612	1.000	
B17	B17	03/05/2022	y = 1.198x-3.075	0.999	
B18	B18	07/05/2022	y = 1.159x-2.421	0.999	
B19	B19	03/05/2022	y = 1.053x+1.562	0.999	
B20	B20	03/05/2022	y = 1.306x-6.147	1.000	
B21	B21	04/05/2022	y = 1.156x-0.999	0.998	
B22	B22	04/05/2022	y = 1.293x-8.368	0.998	
B23	B23	07/05/2022	y = 1.149x-2.644	1.000	
B24	B24	02/05/2022	y = 1.250x-7.382	1.000	
B25	B25	03/05/2022	y = 1.131x-2.476	0.999	
B26	B26	07/05/2022	y = 1.154x+1.978	1.000	
B27	B27	02/05/2022	y = 1.278x-8.954	0.998	
B28	B28	04/05/2022	y = 1.093x-0.217	0.999	
B29	B29	04/05/2022	y = 1.280x-9.168	0.999	
B30	B30	03/05/2022	y = 1.290x-8.822	0.997	
B31	B31	03/05/2022	y = 1.116x-0.814	0.997	
B32	B32	05/05/2022	y = 1.156x-3.473	0.999	
B33	B33	06/05/2022	y = 1.254x-8.880	0.998	
B34	B34	03/05/2022	y = 1.157x-1.629	0.999	

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 ³ /min)	R ²	
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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CERTIFICATE No : 21M3169

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
ID No : BA 05/50
AIR PRESSURE : 1009mbar ± 1mbar
AMBIENT TEMPERATURE : 24° C ± 1° C
RELATIVE HUMIDITY : 52 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS 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 :-

1) STANDARD WEIGHT SET E2
2) STANDARD WEIGHT E2
3) STANDARD WEIGHT E2
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

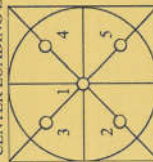
INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE :
1) STANDARD WEIGHT SET E2 QK-I-151 C02210415 09-Feb-23
2) STANDARD WEIGHT E2 15843 C02210419 10-Feb-23
3) STANDARD WEIGHT E2 QK-I-349 M21032358 26-Mar-23

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 100 g WAS 0.000055 g
4. DEPARTURE FROM NOMINAL VALUE/LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (±g)
0.00	0.00000	0.00000	0.000066
0.02	0.01998	0.00002	0.000066
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000067
0.50	0.49996	0.00004	0.000065
1.00	0.99997	0.00003	0.000066
2.00	2.00000	0.00000	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00003	-0.00003	0.000070
20.00	20.00000	0.00000	0.000075
50.00	50.00000	0.00013	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	0.00022

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT



F-G010 REV 02



QUALITY CALIBRATION CO.,LTD.

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

www.qcalibration.com

CERTIFICATE No : 21M3169

REFERENCE No : 60627-3

Certificate of Calibration

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 19-Mar-21

APPROVED BY

ISSUED DATE : 20-Mar-21

RECEIVED DATE : 19-Mar-21

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



CERTIFICATE No : 22M2567

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
ID No : BA 05/50
AIR PRESSURE : 1008mbar \pm 1mbar
AMBIENT TEMPERATURE : 22°C \pm 1°C

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.

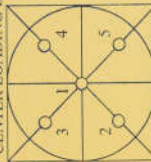
2. REFERENCE STANDARD INSTRUMENTS :-

1) STANDARD WEIGHT SET
2) TARE FUNCTION : NORMAL
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

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	100.0001	-0.00001	0.00019
120.00	120.0001	-0.00001	0.00022

6. OFF CENTER LOADING ERROR



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

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

CERTIFICATE No : 22M2567
REFERENCE No : 64386-1

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 : 11-Mar-22
APPROVED BY :
ISSUED DATE : 17-Mar-22
RECEIVED DATE : 11-Mar-22

CALIBRATION REPORT									
NON-DISPERSIVE INFRARED CO ANALYZER									
DATE :	04 January 2022	BRAND :	API	MODEL :	300E				
NO.	CO-B13	SERIAL NO.	176						
Calibrator (Dilution System)									
Brand	: API	Model	: 700						
Last Cal. Date	: 30 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	40.08	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	4016.3	mV	2500-4800 mV						
CO REFERENCE	3947.9	mV	2500-4800 mV						
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air						
SAMPLE PRESSURE	26.7	In-Hg-A	-2" < ambient absolute pressure						
SAMPLE FLOW	806	cc/min	800 ± 10%						
SAMPLE TEMPERATURE	48.5	°C	48 ± 4						
BENCH TEMPERATURE	48.3	°C	48 ± 2						
WHEEL TEMPERATURE	68.4	°C	68 ± 2						
BOX TEMPERATURE	30.6	°C	Ambient temp + 7 ± 10						
PHOTO-DRIVE	2987.3	mV	250 mV to 4750 mV						
SLOPE	1.017	-	1.0 ± 0.3						
OFFSET	0.2	-	0 ± 0.3						

CALIBRATION REPORT									
NON-DISPERSIVE INFRARED CO ANALYZER									
DATE :	04 January 2022	BRAND :	API	MODEL :	300E				
NO.	CO-BG3	SERIAL NO.	3019						
Calibrator (Dilution System)									
Brand	: API	Model	: 700						
Last Cal. Date	: 30 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	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	4014.2	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	26.6	In-Hg-A	-2" < ambient absolute pressure						
SAMPLE FLOW	807	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	30.8	°C	Ambient temp + 7 ± 10						
PHOTO-DRIVE	3028.2	mV	250 mV to 4750 mV						
SLOPE	1.017	-	1.0 ± 0.3						
OFFSET	0.2	-	0 ± 0.3						

CALIBRATION REPORT

NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 03 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. 24.5 °C	% RH 48
CALIBRATION SETTING		
Span	Initial Reading (Before Adj.), PPM	Final Reading (After Adj.), PPM
Set Point	Expected Concentration	% Dif
Zero	Analyzer Response	Analyzer Response
CO Span	0	0
40.00	40.10	0.250
API Model 300E CO Analyzer Check list		
Parameter	Observed Value	Units
RANGE	50	PPM
STABILITY	0.10	PPM
CO MEASURE	4015.9	mV
CO REFERENCE	3947.5	mV
MEASURE/REFERENCE RATIO	1.180	-
SAMPLE PRESSURE	25.4	In-Hg-A
SAMPLE FLOW	811	cc/min
SAMPLE TEMPERATURE	48.3	°C
BENCH TEMPERATURE	48.1	°C
WHEEL TEMPERATURE	65.4	°C
BOX TEMPERATURE	30.7	°C
PHOTO-DRIVE	3045.3	mV
SLOPE	1.017	-
OFFSET	0.2	-
		0 ± 0.3

CALIBRATION REPORT

NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 03 February 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 48
CALIBRATION SETTING		
Span	Initial Reading (Before Adj.), PPM	Final Reading (After Adj.), PPM
Set Point	Expected Concentration	% Dif
Zero	Analyzer Response	Analyzer Response
CO Span	0	0
40.00	39.94	-0.150
API Model 300E CO Analyzer Check list		
Parameter	Observed Value	Units
RANGE	50	PPM
STABILITY	0.10	PPM
CO MEASURE	4014.7	mV
CO REFERENCE	3948.5	mV
MEASURE/REFERENCE RATIO	1.179	-
SAMPLE PRESSURE	25.6	In-Hg-A
SAMPLE FLOW	807	cc/min
SAMPLE TEMPERATURE	48.2	°C
BENCH TEMPERATURE	48.0	°C
WHEEL TEMPERATURE	66.5	°C
BOX TEMPERATURE	30.9	°C
PHOTO-DRIVE	3026.4	mV
SLOPE	1.017	-
OFFSET	0.2	-
		0 ± 0.3

CALIBRATION REPORT									
NON-DISPERSIVE INFRARED CO ANALYZER									
DATE :	09 March 2022	BRAND :	API	MODEL :	300E				
NO.	CO-803	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			%Diff		
Zero	0			0.10			-		
CO Span	40.00			39.97			-0.075		
API Model 300E CO Analyzer Check list									
Parameter	Observed Value	Units	Nominal Range						
RANGE	50	PPM	0-1000 ppm						
STABILITY	0.10	PPM	< 1 ppm with zero air						
CO MEASURE	4015.9	mV	2500-4800 mV						
CO REFERENCE	3948.3	mV	2500-4800 mV						
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air						
SAMPLE PRESSURE	28.6	In-Hg-A	-2"± ambient absolute pressure						
SAMPLE FLOW	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	30.6	°C	Ambient temp + 7 ± 10						
PHOTO-DRIVE	3046.1	mV	250 mV to 4750 mV						
SLOPE	1.017	-	1.0 ± 0.3						
OFFSET	0.2	-	0 ± 0.3						

CALIBRATION REPORT									
NON-DISPERSIVE INFRARED CO ANALYZER									
DATE :	09 March 2022	BRAND :	API	MODEL :	300E				
NO.	CO-301	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.	24.5	°C	% RH	49		
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM					
Set Point	Expected Concentration			Analyzer Response			%Diff		
Zero	0			-0.10			-		
CO Span	40.00			39.92			-0.200		
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	4013.8	mV	2500-4800 mV						
CO REFERENCE	3947.2	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	48.4	°C	48 ± 4						
BENCH TEMPERATURE	48.1	°C	48 ± 2						
WHEEL TEMPERATURE	68.2	°C	68 ± 2						
BOX TEMPERATURE	30.7	°C	Ambient temp + 7 ± 10						
PHOTO-DRIVE	3011.4	mV	250 mV to 4750 mV						
SLOPE	1.017	-	1.0 ± 0.3						
OFFSET	0.2	-	0 ± 0.3						

CALIBRATION REPORT

NON-DISPERSIVE INFRARED CO ANALYZER

DATE :	06 April 2022	BRAND :	API	MODEL :	300E
NO.	CO-E13			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.	24.5 °C	% RH	49
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPM		Final Reading (After Adj.),PPM		
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	
Zero	0	0.10	-	0	
CO Span	40.00	39.97	-0.075	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	3948.7	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	808	cc/min	800 ± 10%		
SAMPLE TEMPERATURE	46.2	°C	46 ± 4		
BENCH TEMPERATURE	48.0	°C	46 ± 2		
WHEEL TEMPERATURE	68.4	°C	68 ± 2		
BOX TEMPERATURE	30.7	°C	Ambient temp + 7 ± 10		
PHOTO-DRIVE	3010.9	mV	250 mV to 4750 mV		
SLOPE	1.017	-	1.0 ± 0.3		
OFFSET	0.2	-	0 ± 0.3		

CALIBRATION REPORT

NON-DISPERSIVE INFRARED CO ANALYZER

DATE :	06 April 2022	BRAND :	API	MODEL :	300E
NO.	CO-E01			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.	24.5 °C	% RH	49
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPM		Final Reading (After Adj.),PPM		
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	
Zero	0	0.11	-	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	3947.4	mV	2500-4800 mV		
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air		
SAMPLE PRESSURE	28.7	In-Hg-A	-2"± ambient absolute pressure		
SAMPLE FLOW	811	cc/min	800 ± 10%		
SAMPLE TEMPERATURE	46.5	°C	46 ± 4		
BENCH TEMPERATURE	48.2	°C	46 ± 2		
WHEEL TEMPERATURE	68.3	°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		

CALIBRATION REPORT									
NON-DISPERSIVE INFRARED CO ANALYZER									
DATE :	12 May 2022	BRAND :	Thermo	MODEL :	48C				
NO.	CO-B11	SERIAL NO.	O401304262						
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.	: D196045				
Certified Date	: 16 April 2022			Expired Date	: 15 April 2024				
CYLINDER CONCENTRATION									
Pressure	10.11	mmbar	Temp.	24.5	°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			39.36	-0.100	40.00			
INSTRUMENT STATUS									
CHAMBER TEMP	47.5 °C			FLOW	1.5 LPM				
PRESSURE	730.7 mm Hg			MOTOR SPEED	100.00%				

CALIBRATION REPORT									
NON-DISPERSIVE INFRARED CO ANALYZER									
DATE :	12 May 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.	: D196045				
Certified Date	: 16 April 2022			Expired Date	: 15 April 2024				
CYLINDER CONCENTRATION									
Pressure	10.11	mmbar	Temp.	24.5	°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			40.05	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	4014.4			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	28.5			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	68.3			°C	68 ± 2				
BOX TEMPERATURE	30.7			°C	Ambient temp + 7 ± 10				
PHOTO-DRIVE	3008.4			mV	250 mV to 4750 mV				
SLOPE	1.017			-	1.0 ± 0.3				
OFFSET	0.2			-	0 ± 0.3				

CALIBRATION REPORT

NON-DISPERSIVE INFRARED CO ANALYZER

DATE :	09 June 2022	BRAND :	API	MODEL :	300E
NO.	CO-B03			SERIAL NO.	3019

Brand	: API	Calibrator (Dilution System)	Model	: 700
Last Cal. Date	: 20 September 2021		Serial No.	: 421

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
Zero	0	0.10	-	0
CO Span	40.00	39.97	-0.075	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	3949.8	mV	2500-4800 mV	
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air	
SAMPLE PRESSURE	25.6	In-Hg-A	-2"± ambient absolute pressure	
SAMPLE FLOW	808	cc/min	800 ± 10%	
SAMPLE TEMPERATURE	48.2	°C	48 ± 4	
BENCH TEMPERATURE	48.0	°C	48 ± 2	
WHEEL TEMPERATURE	68.4	°C	68 ± 2	
BOX TEMPERATURE	30.9	°C	Ambient temp + 7 ± 10	
PHOTO-DRIVE	3010.9	mV	250 mV to 4750 mV	
SLOPE	1.017	-	1.0 ± 0.3	
OFFSET	0.2	-	0 ± 0.3	

CALIBRATION REPORT

NON-DISPERSIVE INFRARED CO ANALYZER

DATE :	09 June 2022	BRAND :	API	MODEL :	300E
NO.	CO-B01			SERIAL NO.	782

Brand	: API	Calibrator (Dilution System)	Model	: 700
Last Cal. Date	: 20 September 2021		Serial No.	: 421

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
Zero	0	-0.10	-	0
CO Span	40.00	40.05	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	4013.5	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	28.5	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	68.3	°C	68 ± 2	
BOX TEMPERATURE	30.7	°C	Ambient temp + 7 ± 10	
PHOTO-DRIVE	3013.5	mV	250 mV to 4750 mV	
SLOPE	1.016	-	1.0 ± 0.3	
OFFSET	0.2	-	0 ± 0.3	

เอกสารที่ 5-2

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียง

Request No. 21-64/0528 **MTC No. EEL. BP.** 17/0564

CALIBRATION CERTIFICATE

Submitted by : S.P.S. Consulting Services 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 Brüel&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 Brüel&Kjaer 4180 S/N 2889871.

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

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

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

Date of Receipt : 6 May 2021

Date of Calibration : 15 May 2021

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

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

Head Office 35 Mu. 3 Tambon Khlong Ha, Amphoe Khlong Luang, Changwat Pathumthani 12120, Thailand
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Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

FM.BLMTC.002 Rev.4

Request No. 21-64/0528 **MTC No. EEL. BP.** 17/0564

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
1/2 inch Brüel&Kjaer 4180	93.96	-0.04	± 0.10	IEC60942:2003 Class 1 ±0.40 dB

2. Frequency

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

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit
1/2 inch Brüel&Kjaer 4180	1.26	± 0.50	IEC60942:2003 Class 1 ±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 :

Acting Director
Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 15 May 2021

Date of Issue : 18 May 2021

End of Certificate

2 / 2

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

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FM.BLMTC.002 Rev.4



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, Chauchak, 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 Brüel&Kjær 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 Brüel&Kjær 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.

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FM.BL.MTC.002 Rev.4

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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
1/2 inch Brüel&Kjær 4180	93.93	-0.07	± 0.10	IEC60942:2003 Class 1 ± 0.40 dB

2. Frequency

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

3. Total Distortion

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



Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011265042601787001

Date of Calibration : 28 Apr. 2022

Date of Issue : 28 Apr. 2022

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.

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FM.BL.MTC.002 Rev.4

Request No. 21-64/0776

MTC No. EEL. BP. 44/0864

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 : Rion

Model : NC-73

Serial No. : 10727909

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 Brüel&Kjaer 2636 S/N 1537484.

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

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

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

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

7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942:2003; The sound pressure level generated by sound

calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards

Laboratory (EEL), which are traceable to the International System of Units through the National Institute of

Metrology (Thailand).

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

Date of Receipt : 16 Aug. 2021

Date of Calibration : 18 Aug. 2021

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

FM.BLMTC.002 Rev.4

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Request No. 21-64/0776

MTC No. EEL. BP. 44/0864

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 Brüel&Kjaer 4180	93.88	-0.12	± 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 Brüel&Kjaer 4180	980.9	-19.1	± 1.5	±1.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	1.56	± 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 :



Acting Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 2011264081603374001

End of Certificate

2 / 2

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

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FM.BLMTC.002 Rev.4

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Nisee B_009/22

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]
NL 21-B19	RION	NL-21	00554237	02 January 2022	Before Adjustment After Adjustment
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

Nisee B_015/22

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]
NL 21-B19	RION	NL-21	00554237	09 January 2022	Before Adjustment After Adjustment
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

Note B_030/22

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

Sound Level Meter Data			
SLM No.	Brand	Model	Serial No.
NL 21-B19	RION	NL-21	00554237
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)			

Calibration Data	
Actual Reading [dB]	
Before Adjustment	93.9
After Adjustment	94.0
93.96 ± 0.40 dB	

Note B_044/22

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

Sound Level Meter Data			
SLM No.	Brand	Model	Serial No.
NL 21-B19	RION	NL-21	00554237
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)			

Calibration Data	
Actual Reading [dB]	
Before Adjustment	94.0
After Adjustment	94.0
93.96 ± 0.40 dB	

Noise B_0552/22

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]
NL 21-B19	RION	NL-21	00554237	30 January 2022	Before Adjustment After Adjustment
				94.1	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)				93.96 ± 0.40 dB	

Noise B_003/22

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]
ACO-B14	ACO	6236	00172034	04 January 2022		
				Before Adjustment	After Adjustment	
				94.1		94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)				93.96 ± 0.40 dB		

Noise B_068/22

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]
NL 21-B19	RION	NL-21	00554237	06 February 2022	Before Adjustment 93.9 After Adjustment 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

Noise B_080/22

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]
NL 21-B19	RION	NL-21	00554237	13 February 2022	Before Adjustment 93.9 After Adjustment 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

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]
NL 21-B19	RION	NL-21	00554237	20 February 2022	Before Adjustment After Adjustment
					93.9 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

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]
NL 21-B19	RION	NL-21	00554237	27 February 2022	Before Adjustment After Adjustment
					93.9 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

Noise B_054/22

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]
ACO-B24	ACO	6236	00182003	03 February 2022	Before Adjustment 94.1 After Adjustment 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

Noise B_136/22

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]
NL 21-B19	RION	NL-21	00854237	06 March 2022	Before Adjustment 93.9 After Adjustment 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

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]
NL 21-B19	RION	NL-21	00554237	13 March 2022	Before Adjustment 93.9
					After Adjustment 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

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]
NL 21-B19	RION	NL-21	00554237	20 March 2022	Before Adjustment 93.9
					After Adjustment 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

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]
NL 21-B19	RION	NL-21	00554237	27 March 2022	Before Adjustment After Adjustment
					93.9 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

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]
ACO-B14	ACO	6236	00172034	09 March 2022	Before Adjustment After Adjustment
					93.9 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

Note T_198/22

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		
SIM No.	Brand	Model	Serial No.	Date	
NL 21-B19	RION	NL-21	00554237	03 April 2022	
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)				93.96 ± 0.40 dB	

Note B_199/22

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		
SIM No.	Brand	Model	Serial No.	Date	
NL 21-B19	RION	NL-21	00554237	10 April 2022	
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)				93.96 ± 0.40 dB	

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]
NL 21-B19	RION	NL-21	00554237	17 April 2022	Before Adjustment After Adjustment
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.9 94.0

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]
NL 21-B19	RION	NL-21	00554237	24 April 2022	Before Adjustment After Adjustment
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.9 94.0

Noise B_1 97/22

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		
SIM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]
ACO-B05	ACO	6236	00142002	06 April 2022	Before Adjustment 93.9 After Adjustment 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

Noise B_240/22

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		
SIM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]
NL 21-B19	RION	NL-21	00554237	01 May 2022	Before Adjustment 93.9 After Adjustment 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB

Sound Level Meter Calibration Report

Acoustic Calibrator Data					
Brand	RION	Number	AC 02/40		
Model	NC-73	Serial No.	10727909		
Calibration Range	94 dB, 1000 Hz	Last Calibration	16 August 2021		
		Due Date	18 August 2022		
Calibration Data					
Sound Level Meter Data				Calibration Data	
SIM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]
NL 21-B19	RION	NL-21	00554237	08 May 2022	Before Adjustment After Adjustment
					93.9 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)				93.88 ± 0.40 dB	

Sound Level Meter Calibration Report

Acoustic Calibrator Data					
Brand	RION	Number	AC 02/40		
Model	NC-73	Serial No.	10727909		
Calibration Range	94 dB, 1000 Hz	Last Calibration	16 August 2021		
		Due Date	18 August 2022		
Calibration Data					
Sound Level Meter Data				Calibration Data	
SIM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]
NL 21-B19	RION	NL-21	00554237	15 May 2022	Before Adjustment After Adjustment
					93.9 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)				93.88 ± 0.40 dB	

Noise B_249/22

Sound Level Meter Calibration Report

Acoustic Calibrator Data			
Brand	RION	Number	AC 02/40
Model	NC-73	Serial No.	10727909
Calibration Range	94 dB, 1000 Hz	Last Calibration	16 August 2021
		Due Date	18 August 2022
Calibration Data			
Sound Level Meter Data			
SLM No.	Brand	Model	Serial No.
ACO-B14	ACO	6236	00172034
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)		Date	12 May 2022
		Before Adjustment	93.9
		After Adjustment	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)		93.88 ± 0.40 dB	

Noise B_317/22

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	28 April 2022
		Due Date	28 April 2023
Calibration Data			
Sound Level Meter Data			
SLM No.	Brand	Model	Serial No.
ACO-B14	ACO	6236	00172034
ACO-B31	ACO	6236	00182013
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)		Date	09 June 2022
		Before Adjustment	93.9
		After Adjustment	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)		93.93 ± 0.10 dB	

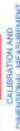
เอกสารที่ 5-3

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำ



CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yeak 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 : ECOSENSE/YSI
MODEL / TYPE : PH100A
SERIAL NO. : JC03148/YSI60537718A[PH 05/61]
CLID. NO. : 272101139
JOB CONTROL NO. : 210428037544

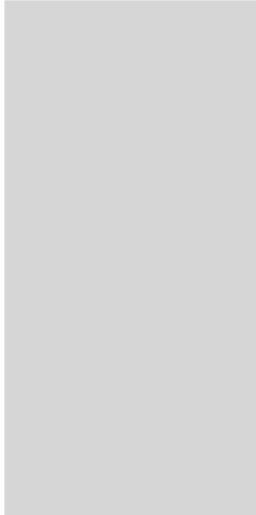
CUSTOMER : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24 ROAD, JOMPOL,
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 28 April 2021

DATE OF ISSUED : 04 May 2021

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

Calibrated By :



Approved By :

Authorized Signatory

04 May 2021

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. Q21037544

F3-011-04/01-12

page 1 of 3



@calibration



CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yeak 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



REPORT OF CALIBRATION

FOR

NOMENCLATURE : pH METER
MANUFACTURER : ECOSENSE/YSI
MODEL / TYPE : PH100A
SERIAL NO. : JC03148/YSI60537718A[PH 05/61]
DATE OF CALIBRATION : 29 April 2021

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, TRM CODE TRM-S-2003, TRM CODE TRM-S-2005, TRM CODE TRM-S-2007.
2. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
3. Precision Thermometer, ASL Model F201 S/N. 016168/09.
4. IPRT, ASL Model T100-250-1D S/N. PO106346-1-13.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand). Lot Number. 280319, 280119, 080719, Due Date 16 June 2021.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21006472, Due Date 23 January 2022.
3. The measurements are traceable to International System of Units (SI), through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 814/63, Due Date 12 August 2021.
4. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand). Certificate No. TT-0014-21, Due Date 10 February 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:2013)"

Certificate No. Q21037544

F3-011-04/01-12

page 2 of 3



@calibration



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
4.003	4.00	149	+0.003	0.012	2.20
7.025	7.01	-27	+0.015	0.012	2.17
10.008	10.00	-195	+0.008	0.016	2.00

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 006 Page 2,3 of 57

*2. TEMPERATURE RESULT [PROBE pH]

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty \pm (°C)
100	25.00	24.9	+0.10	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. Q21037544

F3-011-04/01-12

page 3 of 3



calibration



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



Accredited
ISO/IEC 17025

CERTIFICATE OF CALIBRATION

FOR

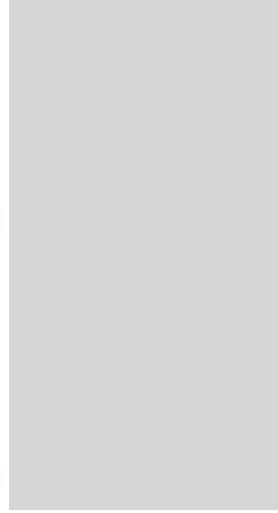
NOMENCLATURE : pH METER
MANUFACTURER : ECOSENSE/YSI
MODEL / TYPE : PH100A
SERIAL NO. : JC03148/YSI60537718A[PH 05/61]
CLID. NO. : 272101139
JOB CONTROL NO. : 220419039554

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

DATE OF RECEIVED : 19 April 2022 DATE OF ISSUED : 23 April 2022

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

Calibrated By :



Approved By :

Authorized Signatory

23 April 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. Q22039554

F3-011-04/01-12

page 1 of 4



@calibration



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



Accredited
ISO/IEC 17025

REPORT OF CALIBRATION

FOR

NOMENCLATURE : pH METER
MANUFACTURER : ECOSENSE/YSI
MODEL / TYPE : PH100A
SERIAL NO. : JC03148/YSI60537718A[PH 05/61]
DATE OF CALIBRATION : 20 April 2022

ENVIRONMENT CONDITIONS :

Temperature : (25 ± 2.5) °C Relative Humidity : (50 ± 15) % RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPCH-01, CLC-CPTH-04. 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, TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Catalog Number 06-664-260, 11754256, Lot Number CC728484.
3. Calibration Bath, Kambic Model OB-222 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F200 S/N. 014433/03.
5. IPRT, ASL Model T100-250-1D S/N. L0193A-1-1.

Certificate No. Q22039554

F3-011-04/01-12

page 2 of 4



@calibration



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 14 June 2022.
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 0717/64, Due Date 14 June 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 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. Q22039554

F3-011-04/01-12

page 3 of 4



@calibration



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



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 (± pH)	k Factor
4.000	3.98	133	+0.020	0.012	2.20
6.996	7.02	-38	-0.024	0.015	2.06
10.007	10.02	-206	-0.013	0.013	2.00

Note. 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 ± (°C)
100	25.02	25.0	+0.02	0.07

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 47 of 54

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. Q22039554

F3-011-04/01-12

page 4 of 4



@calibration



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.: 21TW101
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-230V
Serial No. : 15B100751
ID No. :
Received Date : 28 April 2021
Test Date : 30 April 2021
Reference : 2104-0741WN-1
Submitted by : S.P.S. Consulting Service Co.,Ltd.
7 Soi Phaholyothin 24, Phaholyothin Rd.,
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 :

Approved Signatory

Issue Date :

7 May 2021

B 0259620



Cert.No.: 21TW101
Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 14K100246

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.08	8.09	0.0071

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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a 1053122



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 :

Approved Signatory

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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a 1105753



QUALITY CALIBRATION CO.,LTD.

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

www.qcalibration.com



CERTIFICATE No : 21M3168
REFERENCE No : 60627-4

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	:	ATSAWIN Y.
CALIBRATION DATE	:	19-Mar-21
APPROVED BY	:	
ISSUED DATE	:	20-Mar-21
RECEIVED DATE	:	19-Mar-21

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



QUALITY CALIBRATION CO.,LTD.

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

www.qcalibration.com

CERTIFICATE No : 21M3168

PAGE : 2 OF 2

Calibration Report

EQUIPMENT	:	DIGITAL BALANCE	MODEL	:	BSA224S-CW
MANUFACTURER	:	SARTORIUS	S/N	:	36591842
ID No	:	BA 08/61	RECEIVED DATE	:	19-Mar-21
AIR PRESSURE	:	1009mbar \pm 1mbar	CALIBRATION DATE	:	19-Mar-21
AMBIENT TEMPERATURE	:	24° C \pm 1° C	RELATIVE HUMIDITY	:	52 %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-1-151	C02210415	09-Feb-23
2) STANDARD WEIGHT	E2	15843	C02210419	10-Feb-23
3) STANDARD WEIGHT	E2	QK-1-349	M2103235S	26-Mar-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:-

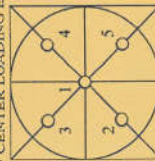
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 200 g WAS 0.000045 g
4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (±g)
0.0	0.0000	0.0000	0.000075
0.1	0.1000	0.0000	0.000075
0.2	0.2000	0.0000	0.000076
0.5	0.5000	0.0000	0.000076
1.0	1.0000	0.0000	0.000077
2.0	2.0000	0.0000	0.000079
5.0	5.0000	0.0000	0.000082
10.0	10.0000	0.0000	0.000086
20.0	20.0000	0.0000	0.00013
50.0	50.0000	-0.0001	0.00019
100.0	100.0001	0.0000	0.00032
200.0	200.0000	0.0000	0.00032

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT

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 : 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.

CERTIFICATE No : 22M2568

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
ID No : BA 08/61
AIR PRESSURE : 1008mbar \pm 1mbar
AMBIENT TEMPERATURE : 22 $^{\circ}$ C \pm 1 $^{\circ}$ C
MODEL : BSA224S-CW
S/N : 36591842
RECEIVED DATE : 11-Mar-22
CALIBRATION DATE : 11-Mar-22
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 :-

- 1) STANDARD WEIGHT SET E2 QK-1-151 C02210415
2) THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
- 3) THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
- 4) 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 MULTIPLIED BY A
COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT