

## ภาคผนวกที่ 5

### เอกสารการสอบเทียบความถูกต้องของเครื่องมือ

- เอกสาร 5-1 เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศ  
เอกสาร 5-2 เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียง

**ตารางสรุปรายการเอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
<b>คุณภาพอากาศ</b>		
- TSP	- High Volume Air Sampler No. B05, B15, R14	- Electronic Balance
- PM <sub>10</sub>	- High Volume PM-10 Air Sampler No. B25, B32, R10	- Electronic Balance
- CO	- CO Analyzer No. B03, B11, B12, B14, R01	- CO Analyzer No. B03, B11, B12, B14, R01
<b>ระดับเสียง</b>		
- Leq 24 hr	- Acoustic Calibrator	-
- Lmax	- Sound Level Meter No. ACO-B05, B14, B24, B31, R43	-

## 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>
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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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
B33	B33	07/02/2022	y = 1.242x-5.616	0.999
B34	B34	09/02/2022	y = 1.240x-8.273	0.999



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#### Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	04/05/2022	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-3.677	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-5.584	0.999
B08	B08	02/05/2022	y = 1.222x-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	03/05/2022	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



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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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### 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>
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	0.996
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 = 1.206x-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-7.392	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-8.984	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



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

CALIBRATION REPORT					
NON-DISPERSIVE INFRARED CO ANALYZER					
DATE :	27 January 2022	BRAND :	API	MODEL :	300E
NO.	CO-R01	SERIAL NO.	704		
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	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.10	-	0	
CO Span	40.00	40.07	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	4013.2	mV	2500-4800 mV		
CO REFERENCE	3948.8	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	808	cc/min	800 ± 10%		
SAMPLE TEMPERATURE	48.5	°C	48 ± 4		
BENCH TEMPERATURE	48.3	°C	48 ± 2		
WHEEL TEMPERATURE	68.2	°C	68 ± 2		
BOX TEMPERATURE	30.6	°C	Ambient temp + 7 ± 10		
PHOTO-DRIVE	2996.4	mV	250 mV to 4750 mV		
SLOPE	1.016	-	1.0 ± 0.3		
OFFSET	0.2	-	0 ± 0.3		



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CALIBRATION REPORT					
NON-DISPERSIVE INFRARED CO ANALYZER					
DATE :	24 February 2022	BRAND :	Thermo	MODEL :	48C
NO.	CO-B12	SERIAL NO.	TL-65343-348		
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	40.10	0.250	40.00	
INSTRUMENT STATUS					
CHAMBER TEMP	47.3 °C		FLOW	1.5 LPM	
PRESSURE	730.8 mm Hg		MOTOR SPEED	100.00%	





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CALIBRATION REPORT					
NON-DISPERSIVE INFRARED CO ANALYZER					
DATE :	15 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	0.11	-	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	4014.6	mV	2500-4800 mV		
CO REFERENCE	3948.5	mV	2500-4800 mV		
MEASURE/REFERENCE RATIO	1.179	-	1.1-1.3 w/zero air		
SAMPLE PRESSURE	28.6	In-Hg-A	-2"± ambient absolute pressure		
SAMPLE FLOW	810	cc/min	800 ± 10%		
SAMPLE TEMPERATURE	48.5	°C	48 ± 4		
BENCH TEMPERATURE	48.2	°C	48 ± 2		
WHEEL TEMPERATURE	68.3	°C	68 ± 2		
BOX TEMPERATURE	30.8	°C	Ambient temp + 7 ± 10		
PHOTO-DRIVE	3043.5	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 :	25 April 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.	: D196045	
Certified Date	: 16 April 2022	Expired Date	: 14 April 2024	Cylinder Conc.	: 4,570 PPM
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
% RH	49				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	-0.10	-	0	
CO Span	40.00	40.12	0.300	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	4015.6	mV	2500-4800 mV		
CO REFERENCE	3948.5	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	804	cc/min	800 ± 10%		
SAMPLE TEMPERATURE	48.2	°C	48 ± 4		
BENCH TEMPERATURE	48.0	°C	48 ± 2		
WHEEL TEMPERATURE	68.5	°C	68 ± 2		
BOX TEMPERATURE	30.6	°C	Ambient temp + 7 ± 10		
PHOTO-DRIVE	3005.1	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 :	24 May 2022	BRAND :	API	MODEL :	300EU
NO.	CO-B14	SERIAL NO.	131		
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 Conc.	: 4,570 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	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.11	-	0	
CO Span	40.00	39.95	-0.125	40.00	
API Model 300EU CO Analyzer Check list					
Parameter	Observed Value	Units	Nominal Range		
RANGE	50	PPM	0-1000 ppm		
STABILITY	0.10	PPM	< 1 ppm with zero air		
CO MEASURE	4015.5	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	28.7	In-Hg-A	-2" <sup>m</sup> < ambient absolute pressure		
SAMPLE FLOW	811	cc/min	800 ± 10%		
SAMPLE TEMPERATURE	48.5	°C	48 ± 4		
BENCH TEMPERATURE	48.2	°C	48 ± 2		
WHEEL TEMPERATURE	68.3	°C	68 ± 2		
BOX TEMPERATURE	30.8	°C	Ambient temp + 7 ± 10		
PHOTO-DRIVE	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 :	26 June 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.	: D196045	
Certified Date	: 16 April 2022	Expired Date	: 15 April 2024	Cylinder Conc.	: 4,570 PPM
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	49	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	-0.10	-	0	
CO Span	40.00	39.91	-0.225	40.00	
INSTRUMENT STATUS					
CHAMBER TEMP	47.5	°C	FLOW	1.5	LPM
PRESSURE	730.6	mm Hg	MOTOR SPEED	100.00%	

**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.

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 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 :

Date of Calibration : 28 Apr. 2022

Date of Issue : 28 Apr. 2022

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Ref : 2011265042601787001

2 / 2

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

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

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

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

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

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

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

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

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

### Ambient Environment

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

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

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

**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

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

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 20 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0  $^\circ\text{C}$  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	93.88	-0.12	$\pm 0.10$	$\pm 0.40 \text{ dB}$

### 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	980.9	-19.1	$\pm 1.5$	$\pm 1.0\%$

### 3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.56	$\pm 0.50$	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

Approved by :

Acting Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 18 Aug. 2021

Date of Issue : 23 Aug. 2021

Ref : 2011264081603374001

End of Certificate

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

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Noise R\_069/22

### 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-R43	ACO	6236	00192055	27 January 2022	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB	



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

Noise B\_100/22

### 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	22 February 2022	93.9	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB	



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Noise B\_139/22

### 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-B31	ACO	6236	00182013	15 March 2022	93.9	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB	



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Noise B\_213/22

### 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	25 April 2022	93.9	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.96 ± 0.40 dB	





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Noise B\_280/22

### 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				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B24	ACO	6236	00182005	24 May 2022	93.9	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.88 ± 0.40 dB	



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Noise B\_378/22

### 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				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B05	ACO	6236	00142002	26 June 2022	93.9	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.93 ± 0.10 dB	