

ภาคผนวกที่ 5

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

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

ตารางสรุปรายการเอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
คุณภาพอากาศ		
- TSP	- High Volume Air Sampler NO. B02, B05, B13, B15, B30	- Electronic Balance
- PM ₁₀	- High Volume PM-10 Air Sampler NO. B12, B25, B29, B30, B32	- Electronic Balance
- CO	- CO Analyzer NO. B03, B08, B09, B11, B12, B13, R02	- CO Analyzer NO. B03, B08, B09, B11, B12, B13, R02
- THC	- Personal Pump SKC NO. B20 - Rotameter NO. L-1	
- NO ₂	- NO ₂ Analyzer NO. B02, B07, B09, B14	- NO ₂ Analyzer NO. B02, B07, B09, B14
- SO ₂	- Gas Sampler Box NO. B13, B14	- Spectrophotometer
ระดับเสียง		
- Leq 24 hr, Lmax และเสียงรบกวน	- Acoustic Calibrator - Sound Level Meter NL 21-B18 ACO- B31, B24	- -
คุณภาพน้ำ		
- pH	-	- pH Meter
- BOD ₅	-	- BOD Analyzer
- TSS	-	- Electronic Balance
- TDS	-	- Electronic Balance
- TKN	-	- Electronic Balance
- Sulfide	-	- Electronic Balance
- Grease & Oil	-	- Electronic Balance
- Total Coliform Bacteria	-	- Electronic Balance
- Fecal Coliform Bacteria	-	- Electronic Balance

เอกสารที่ 5-1

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศ

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	01/11/2021	y = 1.254x-6.224	0.998
B02	B02	03/11/2021	y = 1.080x+0.873	0.999
B03	B03	01/11/2021	y = 1.049x+1.608	0.995
B04	B04	01/11/2021	y = 1.140x-2.855	1.000
B05	B05	01/11/2021	y = 1.148x-2.655	0.996
B06	B06	01/11/2021	y = 1.203x-4.180	0.997
B07	B07	03/11/2021	y = 1.136x-3.132	0.996
B08	B08	03/11/2021	y = 1.211x-6.101	0.995
B09	B09	03/11/2021	y = 1.291x-7.760	0.997
B10	B10	09/11/2021	y = 1.091x+0.142	0.995
B11	B11	03/11/2021	y = 1.090x-0.694	0.996
B12	B12	03/11/2021	y = 1.165x-2.613	1.000
B13	B13	03/11/2021	y = 1.115x-2.068	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 = 1.128x-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 = 1.248x-6.869	0.999
B34	B34	09/11/2021	y = 1.251x-7.511	0.998

Calibrated by :

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
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 = 1.128x-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 = 1.198x-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

Calibrated by :

High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard				Model : TE 5025A	SN : 3095
Calibration Data					
High Volume Air Sampler Data		Calibration Data			
Recorder No.	Blower No.	Date	Actual Flowrate (ft 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	03/02/2022	$y = 1.199x - 6.304$	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	

Calibrated by :



High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard				Model : TE 5025A	SN : 3095
Calibration Data					
High Volume Air Sampler Data		Calibration Data			
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²	
B35	B35	16/02/2022	$y = 1.274x - 9.241$	0.999	
B36	B36	15/02/2022	$y = 1.132x - 3.625$	0.996	
B37	B37	04/02/2022	$y = 1.157x + 2.640$	0.999	
B38	B38	15/02/2022	$y = 1.1432x - 2.720$	0.999	
B39	B39	07/02/2022	$y = 1.256x - 7.614$	1.000	
B40	B40	15/02/2022	$y = 1.175x - 4.385$	0.998	
B41	B41	07/02/2022	$y = 1.133x - 1.951$	0.998	
B42	B42	04/02/2022	$y = 1.127x - 1.985$	1.000	
B43	B43	16/02/2022	$y = 1.089x + 0.223$	0.996	
B44	B44	03/02/2022	$y = 1.333x - 1.136$	0.997	
R01	R01	02/02/2022	$y = 1.196x - 5.960$	0.996	
R02	R02	09/02/2022	$y = 1.175x - 5.572$	1.000	
R03	R03	02/02/2022	$y = 1.187x - 6.283$	0.995	
R04	R04	07/02/2022	$y = 1.100x - 1.352$	0.997	
R05	R05	09/02/2022	$y = 1.238x - 8.500$	0.997	
R06	R06	01/02/2022	$y = 1.328x - 11.118$	0.996	
R07	R07	07/02/2022	$y = 1.039x + 1.507$	0.995	
R08	R08	04/02/2022	$y = 1.141x - 3.942$	0.997	
R09	R09	01/02/2022	$y = 1.192x - 5.710$	0.997	
R10	R10	09/02/2022	$y = 1.194x - 5.807$	1.000	
R11	R11	01/02/2022	$y = 1.054x + 0.098$	0.996	
R12	R12	04/02/2022	$y = 1.171x - 5.349$	0.996	
R13	R13	04/02/2022	$y = 1.114x - 1.755$	0.999	
R14	R14	07/02/2022	$y = 1.100x - 0.965$	0.997	
R15	R15	14/02/2022	$y = 1.047x + 1.073$	0.995	
R16	R16	09/02/2022	$y = 1.129x - 3.642$	0.999	
R17	R17	03/02/2022	$y = 1.198x - 5.739$	1.000	
R18	R18	02/02/2022	$y = 1.268x - 9.241$	0.998	
R19	R19	03/02/2022	$y = 1.216x - 5.626$	0.999	
R20	R20	01/02/2022	$y = 1.197x - 5.676$	0.997	

Calibrated by :



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/min)	R ²	
B01	B01	04/05/2022	y = 1.313x-9.642	0.999	
B02	B02	02/05/2022	y = 1.069x+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-5.564	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	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	

Calibrated by :

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/min)	R ²	
B35	B35	02/05/2022	y = 1.345x-12.323	0.999	
B36	B36	03/05/2022	y = 1.154x-4.565	0.999	
B37	B37	04/05/2022	y = 1.139x-2.122	0.996	
B38	B38	06/05/2022	y = 1.126x-2.401	0.999	
B39	B39	02/05/2022	y = 1.188x-5.455	0.998	
B40	B40	06/05/2022	y = 1.156x-3.823	0.995	
B41	B41	06/05/2022	y = 1.187x-6.052	0.997	
B42	B42	04/05/2022	y = 1.063x+0.537	0.998	
B43	B43	04/05/2022	y = 1.258x-9.645	0.998	
B44	B44	03/05/2022	y = 1.252x-9.964	0.999	
R01	R01	02/05/2022	y = 1.220x-6.992	0.999	
R02	R02	10/05/2022	y = 1.121x-3.616	0.997	
R03	R03	02/05/2022	y = 1.161x-5.046	0.999	
R04	R04	06/05/2022	y = 1.115x-1.773	0.999	
R05	R05	06/05/2022	y = 1.217x-7.663	0.998	
R06	R06	04/05/2022	y = 1.245x-8.155	0.998	
R07	R07	06/05/2022	y = 1.042x+1.155	0.995	
R08	R08	04/05/2022	y = 1.220x-6.874	0.998	
R09	R09	04/05/2022	y = 1.192x-5.710	0.997	
R10	R10	10/05/2022	y = 1.209x-6.199	0.999	
R11	R11	02/05/2022	y = 1.101x-2.414	0.999	
R12	R12	10/05/2022	y = 1.209x-6.618	0.995	
R13	R13	10/05/2022	y = 1.158x-3.923	0.999	
R14	R14	06/05/2022	y = 1.128x-2.065	0.999	
R15	R15	04/05/2022	y = 1.014x+2.496	0.998	
R16	R16	04/05/2022	y = 1.159x-5.442	0.997	
R17	R17	10/05/2022	y = 1.203x-5.717	0.999	
R18	R18	02/05/2022	y = 1.395x-12.262	0.997	
R19	R19	03/05/2022	y = 1.246x-7.147	0.998	
R20	R20	04/05/2022	y = 1.230x-7.354	0.999	

Calibrated by :

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	06/02/2022	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	

Calibrated by :

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	
R01	R01	04/02/2022	y = 1.238x-7.598	0.995	
R02	R02	11/02/2022	y = 1.161x-3.899	0.996	
R03	R03	04/02/2022	y = 1.154x+2.827	0.998	
R04	R04	06/02/2022	y = 1.116x-1.752	0.995	
R05	R05	07/02/2022	y = 1.125x-2.487	0.995	
R06	R06	10/02/2022	y = 1.321x-9.065	0.998	
R07	R07	04/02/2022	y = 1.138x-1.986	0.996	
R08	R08	03/02/2022	y = 1.160x-3.759	0.996	
R09	R09	10/02/2022	y = 1.209x-6.918	0.995	
R10	R10	04/02/2022	y = 1.114x-1.889	0.995	
R11	R11	03/02/2022	y = 1.272x-7.597	1.000	
R12	R12	03/02/2022	y = 1.153x-3.385	0.995	
R13	R13	02/02/2022	y = 1.207x-4.913	0.996	
R14	R14	01/02/2022	y = 1.183x-3.660	0.996	
R15	R15	02/02/2022	y = 1.247x-7.741	0.999	
R16	R16	02/02/2022	y = 1.238x-6.677	0.996	
R17	R17	01/02/2022	y = 1.203x-5.310	0.998	
R18	R18	04/02/2022	y = 1.148x-3.211	0.998	
R19	R19	04/02/2022	y = 1.220x-6.839	0.997	
R20	R20	03/02/2022	y = 1.161x-5.047	0.997	

Calibrated by :

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	R01	02/05/2022	y = 1.171x-0.211	0.997	
B02	R02	02/05/2022	y = 0.960x+5.104	0.998	
B03	R03	04/05/2022	y = 1.214x-5.211	0.996	
B04	R04	02/05/2022	y = 1.310x-9.479	0.999	
B05	R05	03/05/2022	y = 1.202x-5.734	0.999	
B06	R06	04/05/2022	y = 1.241x-7.631	0.998	
B07	R07	04/05/2022	y = 1.186x-4.480	0.999	
B08	R08	03/05/2022	y = 1.322x-8.634	0.999	
B09	R09	04/05/2022	y = 1.219x-5.756	0.998	
B10	R10	03/05/2022	y = 1.234x-7.417	1.000	
B11	R11	02/05/2022	y = 1.260x-7.479	0.999	
B12	R12	02/05/2022	y = 1.225x-5.900	0.998	
B13	R13	04/05/2022	y = 1.326x-10.711	0.999	
B14	R14	07/05/2022	y = 1.197x-3.534	0.999	
B15	R15	04/05/2022	y = 1.096x-0.244	0.998	
B16	R16	04/05/2022	y = 1.209x-1.612	1.000	
B17	R17	03/05/2022	y = 1.198x-3.075	0.999	
B18	R18	07/05/2022	y = 1.159x-2.421	0.999	
B19	R19	03/05/2022	y = 1.053x+1.562	0.999	
B20	R20	03/05/2022	y = 1.206x-6.147	1.000	
B21	R21	04/05/2022	y = 1.156x-0.999	0.998	
B22	R22	04/05/2022	y = 1.293x-8.368	0.998	
B23	R23	07/05/2022	y = 1.149x-2.644	1.000	
B24	R24	02/05/2022	y = 1.250x-7.392	1.000	
B25	R25	03/05/2022	y = 1.131x-2.476	0.999	
B26	R26	07/05/2022	y = 1.154x+1.978	1.000	
B27	R27	02/05/2022	y = 1.276x-8.984	0.998	
B28	R28	04/05/2022	y = 1.093x-0.217	0.999	
B29	R29	04/05/2022	y = 1.280x-9.168	0.999	
B30	R30	03/05/2022	y = 1.290x-8.822	0.997	
B31	R31	03/05/2022	y = 1.116x-0.814	0.987	
B32	R32	05/05/2022	y = 1.156x-3.473	0.999	
B33	R33	06/05/2022	y = 1.254x-8.680	0.998	
B34	R34	03/05/2022	y = 1.157x-1.629	0.999	

Calibrated by :

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	
R01	R01	06/05/2022	y = 1.220x-6.822	0.999	
R02	R02	16/05/2022	y = 1.196x-6.112	0.998	
R03	R03	04/05/2022	y = 1.172x-3.836	1.000	
R04	R04	06/05/2022	y = 1.094x-1.025	0.998	
R05	R05	06/05/2022	y = 1.118x-2.214	0.999	
R06	R06	03/05/2022	y = 1.327x-9.050	0.999	
R07	R07	10/05/2022	y = 1.123x-1.146	0.998	
R08	R08	06/05/2022	y = 1.178x-4.322	0.998	
R09	R09	06/05/2022	y = 1.182x-5.965	0.998	
R10	R10	10/05/2022	y = 1.131x-2.385	0.997	
R11	R11	03/05/2022	y = 1.275x-7.441	0.999	
R12	R12	10/05/2022	y = 1.173x-4.483	0.997	
R13	R13	10/05/2022	y = 1.230x-5.394	1.000	
R14	R14	03/05/2022	y = 1.157x-2.812	0.998	
R15	R15	03/05/2022	y = 1.242x-7.800	0.997	
R16	R16	02/05/2022	y = 1.240x-6.268	0.999	
R17	R17	10/05/2022	y = 1.183x-4.691	0.995	
R18	R18	04/05/2022	y = 1.166x-3.714	0.999	
R19	R19	04/05/2022	y = 1.239x-7.405	0.998	
R20	R20	03/05/2022	y = 1.145x-4.137	0.999	

Calibrated by :

Gas Sampler Box Calibration Report

Calibration Method : Dry Cal Primary Flowmeter	Model : Dry Cal DCL-ML	S/N : 136164
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Calibration Data									
Gas Sampler Data			Calibration Data						
No.	Rotameter	Date	Setting (Constant Flow) (ml/min)	Actual Flow Rate (ml/min)					
				Sampling Line A		Sampling Line B		Standard Condition	Standard Condition
				Normal Condition	Standard Condition	Normal Condition	Standard Condition		
B01	2 (A&B)	01/06/2022	200	200.4	199.0	200.6	200.6	199.2	199.2
B02	2 (A&B)	01/06/2022	200	200.6	199.1	200.5	200.5	199.0	199.0
B03	2 (A&B)	03/06/2022	200	200.5	199.0	200.5	200.5	199.1	199.1
B04	2 (A&B)	02/06/2022	200	200.5	199.1	200.6	200.6	199.2	199.2
B05	2 (A&B)	01/06/2022	200	200.4	199.0	200.5	200.5	199.1	199.1
B06	2 (A&B)	01/06/2022	200	200.5	199.1	200.4	200.4	198.9	198.9
B07	2 (A&B)	03/06/2022	200	200.3	198.9	200.5	200.5	199.1	199.1
B08	2 (A&B)	01/06/2022	200	200.5	199.1	200.4	200.4	199.0	199.0
B09	2 (A&B)	01/06/2022	200	200.4	199.0	200.3	200.3	198.9	198.9
B10	2 (A&B)	02/06/2022	200	200.5	199.0	200.5	200.5	199.0	199.0
B11	2 (A&B)	01/06/2022	200	200.4	199.0	200.7	200.7	199.2	199.2
B12	2 (A&B)	01/06/2022	200	200.5	199.1	200.5	200.5	199.0	199.0
B13	2 (A&B)	02/06/2022	200	200.4	199.0	200.5	200.5	199.1	199.1
B14	2 (A&B)	02/06/2022	200	200.5	199.0	200.4	200.4	198.9	198.9
B15	2 (A&B)	03/06/2022	200	200.6	199.2	200.6	200.6	199.2	199.2
B16	2 (A&B)	01/06/2022	200	200.5	199.0	200.5	200.5	199.1	199.1
B17	2 (A&B)	01/06/2022	200	200.5	199.0	200.4	200.4	199.0	199.0

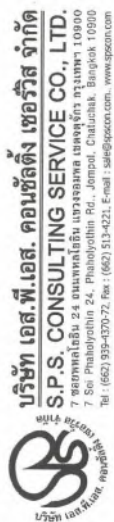
Calibrated by :

Rotameter Calibration Report (For Personal Pump Low Flow Adjust)											
Calibration Method : Dry Cal Primary Flowmeter				Model : Defender 510-H				S/N : 136633			
Calibration Data											
Rotameter Data				Calibration Data							
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)			y	R ²
				1	2	3	1	2	3		
L-B01	Dwyer	VFA-21	01/10/2021	50	100	200	49.7	98.7	201.6	1.002x - 0.298	1.000
L-B02	Dwyer	VFA-21	04/10/2021	50	100	200	49.5	99.7	200.5	0.989x + 0.651	1.000
L-B03	Dwyer	VFA-21	06/10/2021	50	100	200	49.9	98.8	197.6	0.996x - 0.812	1.000
L-B04	Dwyer	VFA-21	05/10/2021	50	100	200	49.8	98.4	199.3	1.002x - 1.169	1.000
L-B05	Dwyer	VFA-21	04/10/2021	50	100	200	50.4	100.3	198.8	0.988x + 1.330	1.000
L-B06	Dwyer	VFA-21	04/10/2021	50	100	200	50.1	100.7	200.2	0.992x + 0.996	1.000
L-B07	Dwyer	VFA-21	04/10/2021	50	100	200	49.9	98.8	202.4	0.999x - 0.095	1.000
L-B08	Dwyer	VFA-21	01/10/2021	50	100	200	50.1	99.4	200.7	1.005x - 0.462	1.000
L-B09	Dwyer	VFA-21	01/10/2021	50	100	200	50.1	99.3	201.5	0.997x + 0.544	1.000
L-B10	Dwyer	VFA-21	01/10/2021	50	100	200	49.4	100.0	200.5	1.006x - 0.997	1.000

Calibrated by :	

Rotameter Calibration Report (For Personal Pump Low Flow Adjust)											
Calibration Method : Dry Cal Primary Flowmeter				Model : Defender 510-H				S/N : 136164			
Calibration Data											
Rotameter Data				Calibration Data							
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)			y	R ²
				1	2	3	1	2	3		
L-B01	Dwyer	VFA-21	05/01/2022	50	100	200	50.5	99.3	199.9	0.992x + 0.557	1.000
L-B02	Dwyer	VFA-21	05/01/2022	50	100	200	49.4	99.2	199.3	0.993x - 0.049	1.000
L-B03	Dwyer	VFA-21	06/01/2022	50	100	200	50.0	98.8	198.5	0.998x - 0.422	1.000
L-B04	Dwyer	VFA-21	06/01/2022	50	100	200	49.5	100.4	200.3	0.994x + 0.727	1.000
L-B05	Dwyer	VFA-21	06/01/2022	50	100	200	49.8	98.4	199.2	1.004x - 1.156	1.000
L-B06	Dwyer	VFA-21	07/01/2022	50	100	200	49.9	100.7	198.8	0.992x + 0.922	1.000
L-B07	Dwyer	VFA-21	07/01/2022	50	100	200	49.8	100.2	199.2	1.007x - 1.047	1.000
L-B08	Dwyer	VFA-21	06/01/2022	50	100	200	50.2	99.9	200.7	0.994x + 0.769	1.000
L-B09	Dwyer	VFA-21	07/01/2022	50	100	200	49.8	99.8	199.6	1.010x - 1.438	1.000
L-B10	Dwyer	VFA-21	05/01/2022	50	100	200	50.6	100.2	201.6	0.991x + 1.825	1.000

Calibrated by :	



Rotameter Calibration Report (For Personal Pump Low Flow Adjust)											
Calibration Method : Dry Cal Primary Flowmeter					Model : Defender 510-H						
					S/N : 130164						
Calibration Data											
Rotameter Data			Flow Rate (ml/min)				Value From Calibration Curve				
No.	Brand	Model	Date	Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3		
L-101	Dwyer	VFA-21	01/04/2022	50	100	200	50.7	99.5	198.5	y	R ²
L-102	Dwyer	VFA-21	04/04/2022	50	100	200	49.8	99.8	198.3	0.985x + 1.282	1.000
L-103	Dwyer	VFA-21	01/04/2022	50	100	200	50.4	98.8	197.9	1.016x - 2.084	1.000
L-104	Dwyer	VFA-21	01/04/2022	50	100	200	49.5	101.6	201.1	1.017x - 2.648	1.000
L-105	Dwyer	VFA-21	01/04/2022	50	100	200	50.1	98.1	201.2	0.995x + 1.217	1.000
L-106	Dwyer	VFA-21	02/04/2022	50	100	200	50.3	100.1	202.6	0.993x + 0.208	1.000
L-107	Dwyer	VFA-21	01/04/2022	50	100	200	49.8	100.4	200.1	1.010x + 0.004	1.000
L-108	Dwyer	VFA-21	04/04/2022	50	100	200	50.2	100.9	198.1	1.018x + 1.855	1.000
L-109	Dwyer	VFA-21	01/04/2022	50	100	200	49.2	99.6	201.1	0.998x - 0.281	1.000
L-110	Dwyer	VFA-21	01/04/2022	50	100	200	50.6	100.2	203.2	1.022x - 2.466	1.000
										0.992x + 2.233	1.000

Calibrated by :

Model : Defender 510-H
S/N : 136164

Personal Pump Data			Calibration Data							Value From Calibration Curve		
No.	Brand	Model	Serial No.	Date	Flow Rate (gal/min)							
					Setting		Actual (Q act.)		Y	R²		
1	2	3	2	3								
B41	SKC	224-PCXR4	612669	04/04/2022	1,000	1,500	2,000	998	1,496	1,989	0.994x + 3.829	1.000
B42	SKC	224-PCXR4	636041	01/04/2022	1,000	1,500	2,000	1,003	1,498	1,993	0.996x + 13.348	1.000
B43	SKC	224-PCXR4	034636	11/04/2022	1,000	1,500	2,000	1,001	1,501	1,992	0.990x + 12.839	1.000
B44	SKC	224-PCXR8	593931	01/04/2022	1,000	1,500	2,000	1,002	1,501	2,002	1.011x - 21.577	0.999
B45	SKC	224-PCXR8	593959	12/04/2022	1,000	1,500	2,000	997	1,498	1,992	0.995x + 9.918	1.000
B46	SKC	224-PCXR8	566743	04/04/2022	1,000	1,500	2,000	994	1,504	2,002	1.016x - 33.204	0.999
B47	SKC	224-PCXR8	566747	01/04/2022	1,000	1,500	2,000	1,002	1,500	2,004	1.013x - 24.202	0.999
B48	SKC	224-PCXR8	566753	12/04/2022	1,000	1,500	2,000	999	1,494	1,997	0.999x + 1.795	1.000
B49	SKC	224-PCXR8	566760	01/04/2022	1,000	1,500	2,000	1,003	1,502	2,003	1.011x - 21.031	0.999
B50	SKC	224-PCXR8	560400	01/04/2022	1,000	1,500	2,000	1,002	1,495	2,002	1.001x + 2.900	1.000
B51	SKC	224-PCXR8	500393	01/04/2022	1,000	1,500	2,000	995	1,504	2,000	1.012x - 28.268	0.999
B52	SKC	224-PCXR8	093186	11/04/2022	1,000	1,500	2,000	995	1,498	1,994	0.997x - 1.240	1.000
B53	SKC	224-PCXR8	707670	12/04/2022	1,000	1,500	2,000	1,002	1,499	2,004	1.012x - 22.742	0.999
B54	SKC	224-PCXR3	509821	11/04/2022	1,000	1,500	2,000	993	1,501	2,001	1.018x - 33.718	0.999
B55	SKC	224-PCXR3	510710	01/04/2022	1,000	1,500	2,000	1,000	1,484	1,984	0.934x + 4.635	1.000
B56	SKC	224-PCXR3	511450	01/04/2022	1,000	1,500	2,000	1,002	1,500	2,001	1.011x - 20.684	0.999
B57	SKC	224-PCXR3	510798	12/04/2022	1,000	1,500	2,000	997	1,493	1,998	1.001x + 3.398	1.000
B58	SKC	224-PCXR3	509852	04/04/2022	1,000	1,500	2,000	1,001	1,498	2,000	1.007x - 19.631	0.999
B59	SKC	224-PCXR3	509862	01/04/2022	1,000	1,600	2,000	996	1,503	1,995	0.998x + 2.916	1.000
B60	SKC	224-PCXR3	512655	01/04/2022	1,000	1,500	2,000	1,002	1,500	2,004	1.013x - 22.891	0.999
B61	SKC	224-PCXR3	503915	12/04/2022	1,000	1,500	2,000	984	1,489	1,989	1.004x - 11.786	1.000
B62	SKC	224-PCXR3	505976	12/04/2022	1,000	1,500	2,000	989	1,494	1,995	0.997x - 0.503	1.000
B63	SKC	224-PCXR3	511432	01/04/2022	1,000	1,500	2,000	991	1,501	2,000	1.017x - 36.139	0.999
B64	SKC	224-PCXR3	508302	04/04/2022	1,000	1,500	2,000	997	1,493	1,990	0.994x + 3.892	1.000
B65	SKC	224-PCXR3	508310	01/04/2022	1,000	1,500	2,000	1,002	1,500	2,003	1.012x - 23.109	0.999
B66	SKC	224-PCXR3	509861	12/04/2022	1,000	1,500	2,000	1,002	1,491	1,991	0.987x + 14.701	1.000
B67	SKC	224-PCXR3	506976	12/04/2022	1,000	1,500	2,000	993	1,507	2,004	1.017x - 33.194	0.999
B68	SKC	224-PCXR3	506982	12/04/2022	1,000	1,500	2,000	1,002	1,491	1,997	0.994x + 5.556	1.000
B69	SKC	224-PCXR3	508375	01/04/2022	1,000	1,500	2,000	1,001	1,500	2,000	1.010x - 21.689	0.999
B70	SKC	224-PCXR3	510623	11/04/2022	1,000	1,500	2,000	992	1,503	1,997	1.002x - 6.683	1.000
B71	SKC	224-PCXR3	508367	12/04/2022	1,000	1,500	2,000	991	1,506	2,002	1.018x - 36.227	0.999
B72	SKC	224-PCXR3	505977	12/04/2022	1,000	1,500	2,000	1,001	1,498	1,993	0.992x + 7.687	1.000
B73	SKC	224-PCXR3	512606	01/04/2022	1,000	1,500	2,000	1,001	1,501	2,005	1.014x - 24.817	0.999
B74	SKC	224-PCXR3	505993	12/04/2022	1,000	1,500	2,000	998	1,495	1,994	0.999x - 4.363	1.000
B75	SKC	224-PCXR3	508592	12/04/2022	1,000	1,500	2,000	996	1,499	1,992	0.995x + 2.459	1.000
B76	SKC	224-PCXR3	509811	12/04/2022	1,000	1,500	2,000	992	1,498	1,996	1.007x - 15.040	1.000
B77	SKC	224-PCXR3	508301	12/04/2022	1,000	1,500	2,000	1,001	1,501	2,003	1.014x - 26.643	0.999
B78	SKC	224-PCXR3	510977	01/04/2022	1,000	1,500	2,000	996	1,503	1,999	1.012x - 27.630	0.999
B79	SKC	224-PCXR3	510920	01/04/2022	1,000	1,500	2,000	994	1,493	1,994	0.999x - 3.705	1.000

Calibrated by :

CALIBRATION REPORT
NON-DISPERSIVE INFRARED CO ANALYZER

DATE :	13 July 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.	24.6	% 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	39.94	-0.150	40.00	
INSTRUMENT STATUS					
CHAMBER TEMP	47.5 °C	FLOW	1.5 LPM		
PRESSURE	730.6 mm Hg	MOTOR SPEED	100.00%		

Calibrated by :

CALIBRATION REPORT
NON-DISPERSIVE INFRARED CO ANALYZER

DATE :	13 July 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	: 15 April 2024	Cylinder Conc.	: 4.570 PPM
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	% 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	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	4013.5	mV	2500-4800 mV		
CO REFERENCE	3947.4	mV	2500-4800 mV		
MEASURE/REFERENCE RATIO	1.179	-	1.1-1.3 w/zero air		
SAMPLE PRESSURE	28.5	In-Hg-A	~2"± ambient absolute pressure		
SAMPLE FLOW	809	cc/min	800 ± 10%		
SAMPLE TEMPERATURE	48.3	°C	48 ± 4		
BENCH TEMPERATURE	48.1	°C	48 ± 2		
WHEEL TEMPERATURE	68.4	°C	68 ± 2		
BOX TEMPERATURE	30.8	°C	Ambient temp + 7 ± 10		
PHOTO-DRIVE	3031.8	mV	250 mV to 4750 mV		
SLOPE	1.017	-	1.0 ± 0.3		
OFFSET	0.2	-	0 ± 0.3		

Calibrated by :

CALIBRATION REPORT

NON-DISPERSIVE INFRARED CO ANALYZER

DATE :	02 August 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	: 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	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	4015.3	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	28.6	In-Hg-A	~2"± ambient absolute pressure		
SAMPLE FLOW	807	cc/min	800 ± 10%		
SAMPLE TEMPERATURE	48.5	°C	48 ± 4		
BENCH TEMPERATURE	48.3	°C	48 ± 2		
WHEEL TEMPERATURE	68.5	°C	68 ± 2		
BOX TEMPERATURE	30.6	°C	Ambient temp + 7 ± 10		
PHOTO-DRIVE	3034.8	mV	250 mV to 4750 mV		
SLOPE	1.017	-	1.0 ± 0.3		
OFFSET	0.2	-	0 ± 0.3		

Calibrated by :

CALIBRATION REPORT

NON-DISPERSIVE INFRARED CO ANALYZER

DATE :	02 August 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	39.96	-0.100	40.00	
INSTRUMENT STATUS					
CHAMBER TEMP	47.5 °C	FLOW	1.5 LPM		
PRESSURE	730.6 mm Hg	MOTOR SPEED	100.00%		

Calibrated by :

CALIBRATION REPORT									
NON-DISPERSIVE INFRARED CO ANALYZER									
DATE :	25 September 2022	BRAND :	Thermo	MODEL :	48C				
NO.	CO-B11	SERIAL NO.	0401304262						
Calibrator (Dilution System)									
Brand	: API			Model	: 700				
Last Cal. Date	: 06 September 2022			Serial No.	: 421				
Reference Standard Gas									
Standard Gas	: Carbon Monoxide (CO)			Cylinder No.	: D196045				
Certified Date	: 16 April 2022			Expired Date	: 15 April 2024				
Cylinder Conc. : 4,570 PPM									
CALIBRATING CONDITION									
Pressure	1011	mmbar	Temp.	24.5	°C	% RH	49		
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.),PPM				Final Reading (After Adj.),PPM				
Set Point	Expected Concentration				Analyzer Response		%Dif		
Zero	0				-0.10		-		
CO Span	40.00				39.94		-0.150		
INSTRUMENT STATUS									
CHAMBER TEMP	47.3 °C				FLOW		1.5 LPM		
PRESSURE	730.5 mm Hg				MOTOR SPEED		100.00%		

Calibrated by :

CALIBRATION REPORT									
NON-DISPERSIVE INFRARED CO ANALYZER									
DATE :	25 September 2022	BRAND :	API	MODEL :	300E				
NO.	CO-R02	SERIAL NO.	171-S						
Calibrator (Dilution System)									
Brand	: API			Model	: 700				
Last Cal. Date	: 06 September 2022			Serial No.	: 421				
Reference Standard Gas									
Standard Gas	: Carbon Monoxide (CO)			Cylinder No.	: D196045				
Certified Date	: 16 April 2022			Expired Date	: 15 April 2024				
Cylinder Conc. : 4,570 PPM									
CALIBRATING CONDITION									
Pressure	1011	mmbar	Temp.	24.5	°C	% RH	49		
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.),PPM				Final Reading (After Adj.),PPM				
Set Point	Expected Concentration				Analyzer Response		%Dif		
Zero	0				0.10		-		
CO Span	40.00				40.03		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	4013.9				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	28.4				In-Hg-A		~2"± ambient absolute pressure		
SAMPLE FLOW	807				cc/min		800 ± 10%		
SAMPLE TEMPERATURE	48.3				°C		48 ± 4		
BENCH TEMPERATURE	48.1				°C		48 ± 2		
WHEEL TEMPERATURE	66.5				°C		68 ± 2		
BOX TEMPERATURE	30.8				°C		Ambient temp + 7 ± 10		
PHOTO-DRIVE	3024.5				mV		250 mV to 4750 mV		
SLOPE	1.017				-		1.0 ± 0.3		
OFFSET	0.2				-		0 ± 0.3		

Calibrated by :

CALIBRATION REPORT			
NON-DISPERSIVE INFRARED CO ANALYZER			
DATE :	24 October 2022	BRAND :	Thermo
MODEL :	48C	SERIAL NO.	0508011087
NO.	CO-B08		
Calibrator (Dilution System)			
Brand	: API	Model	: 700
Last Cal. Date	: 06 September 2022	Serial No.	: 421
Reference Standard Gas			
Standard Gas	: Carbon Monoxide (CO)	Cylinder No.	: D196045
Certified Date	: 16 April 2022	Expired Date	: 15 April 2024
Cylinder Conc.	: 4.570 PPM		
CALIBRATING CONDITION			
Pressure	1011 mmbar	Temp.	24.5 °C
% RH	49		
CALIBRATION SETTING			
Span	Initial Reading (Before Adj.),PPM		
Set Point	Expected Concentration	Analyzer Response	%Diff
Zero	0	0.11	-
CO Span	40.00	40.11	0.275
INSTRUMENT STATUS			
CHAMBER TEMP	47.6 °C	FLOW	1.5 LPM
PRESSURE	730.7 mm Hg	MOTOR SPEED	100.00%

Calibrated by :

CALIBRATION REPORT			
NON-DISPERSIVE INFRARED CO ANALYZER			
DATE :	24 October 2022	BRAND :	Thermo
MODEL :	48C	SERIAL NO.	65433-348
NO.	CO-B09		
Calibrator (Dilution System)			
Brand	: API	Model	: 700
Last Cal. Date	: 06 September 2022	Serial No.	: 421
Reference Standard Gas			
Standard Gas	: Carbon Monoxide (CO)	Cylinder No.	: D196045
Certified Date	: 16 April 2022	Expired Date	: 15 April 2024
Cylinder Conc.	: 4.570 PPM		
CALIBRATING CONDITION			
Pressure	1011 mmbar	Temp.	24.5 °C
% RH	49		
CALIBRATION SETTING			
Span	Initial Reading (Before Adj.),PPM		
Set Point	Expected Concentration	Analyzer Response	%Diff
Zero	0	-0.10	-
CO Span	40.00	39.91	-0.225
INSTRUMENT STATUS			
CHAMBER TEMP	47.5 °C	FLOW	1.5 LPM
PRESSURE	730.4 mm Hg	MOTOR SPEED	100.00%

Calibrated by :

CALIBRATION REPORT									
NON-DISPERSIVE INFRARED CO ANALYZER									
DATE :	31 October 2022	BRAND :	Thermo	MODEL :	48C				
NO.	CO-B07	SERIAL NO.	0335203746						
Calibrator (Dilution System)									
Brand	: API		Model	: 700					
Last Cal. Date	: 06 September 2022		Serial No.	: 421					
Reference Standard Gas									
Standard Gas	: Carbon Monoxide (CO)		Cylinder No.	: D196045					
Certified Date	: 16 April 2022		Expired Date	: 15 April 2024		Cylinder Conc.	: 4,570 PPM		
CALIBRATING CONDITION									
Pressure	1011	mmbar	Temp.	24.6	°C	% RH	49		
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.), PPM		Final Reading (After Adj.), PPM						
Set Point	Expected Concentration		Analyzer Response		% Dif	Analyzer Response			
Zero	0	-0.10	-	0					
CO Span	40.00	39.93	-0.17%	40.00					
INSTRUMENT STATUS									
CHAMBER TEMP	47.2	°C	FLOW	1.5	LPM				
PRESSURE	730.4	mm Hg	MOTOR SPEED	100.00	%				

Calibrated by :

CALIBRATION REPORT									
NON-DISPERSIVE INFRARED CO ANALYZER									
DATE :	31 October 2022	BRAND :	Thermo	MODEL :	48C				
NO.	CO-B11	SERIAL NO.	0401304262						
Calibrator (Dilution System)									
Brand	: API		Model	: 700					
Last Cal. Date	: 06 September 2022		Serial No.	: 421					
Reference Standard Gas									
Standard Gas	: Carbon Monoxide (CO)		Cylinder No.	: D196045					
Certified Date	: 16 April 2022		Expired Date	: 15 April 2024		Cylinder Conc.	: 4,570 PPM		
CALIBRATING CONDITION									
Pressure	1011	mmbar	Temp.	24.6	°C	% RH	49		
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.), PPM		Final Reading (After Adj.), PPM						
Set Point	Expected Concentration		Analyzer Response		% Dif	Analyzer Response			
Zero	0	-0.10	-	0					
CO Span	40.00	39.95	-0.12%	40.00					
INSTRUMENT STATUS									
CHAMBER TEMP	47.5	°C	FLOW	1.5	LPM				
PRESSURE	730.7	mm Hg	MOTOR SPEED	100.00	%				

Calibrated by :

CALIBRATION REPORT									
NON-DISPERSIVE INFRARED CO ANALYZER									
DATE :	14 December 2022	BRAND :	Thermo	MODEL :	48C				
NO.	CO-B07	SERIAL NO.	0335203746						
Calibrator (Dilution System)									
Brand	: API			Model	: 700				
Last Cal. Date	: 06 September 2022			Serial No.	: 421				
Reference Standard Gas									
Standard Gas	: Carbon Monoxide (CO)			Cylinder No.	: D196045				
Certified Date	: 16 April 2022			Expired Date	: 15 April 2024		Cylinder Conc.	: 4.570 PPM	
CALIBRATING CONDITION									
Pressure	1011	mmbar	Temp.	24.6	°C	% RH	49		
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM					
Set Point	Expected Concentration			Analyzer Response			%Dif		
Zero	0			-0.10			-		
CO Span	40.00			39.92			-0.200		
INSTRUMENT STATUS									
CHAMBER TEMP	47.6 °C			FLOW			1.5 LPM		
PRESSURE	730.7 mm Hg			MOTOR SPEED			100.00%		

Calibrated by :

CALIBRATION REPORT									
NON-DISPERSIVE INFRARED CO ANALYZER									
DATE :	14 December 2022	BRAND :	Thermo	MODEL :	48C				
NO.	CO-B09	SERIAL NO.	65433-348						
Calibrator (Dilution System)									
Brand	: API			Model	: 700				
Last Cal. Date	: 06 September 2022			Serial No.	: 421				
Reference Standard Gas									
Standard Gas	: Carbon Monoxide (CO)			Cylinder No.	: D196045				
Certified Date	: 16 April 2022			Expired Date	: 15 April 2024		Cylinder Conc.	: 4.570 PPM	
CALIBRATING CONDITION									
Pressure	1011	mmbar	Temp.	24.6	°C	% RH	49		
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM					
Set Point	Expected Concentration			Analyzer Response			%Dif		
Zero	0			0.10			-		
CO Span	40.00			39.95			-0.125		
INSTRUMENT STATUS									
CHAMBER TEMP	47.5 °C			FLOW			1.5 LPM		
PRESSURE	730.4 mm Hg			MOTOR SPEED			100.00%		

Calibrated by :

CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 13 July 2022 BRAND : API MODEL : 200E
NO. NOX-B09 SERIAL NO. 4412

Calibrator (Dilution System)	
Brand : API	Model : 700
Last Cal. Date : 05 August 2021	Serial No. : 911
Reference Standard Gas	
Standard Gas : Nitric Oxide (NO)	Cylinder No. : A006813K
Certified Date : 24 August 2020	Expired Date : 24 August 2022
Cylinder Conc. : 51.0 ppm	

CALIBRATING CONDITION

Pressure 1011 mmbar Temp. 24.6 °C % RH 49

CALIBRATION SETTING

Span	Initial Reading (Before Adj.), PPB		Final Reading (After Adj.), PPB	
	Expected Concentration	Analyzer Response	%Diff	Slope
Set Point				
Zero	0	0.11	-	-
NO Span	400	400.1	0.025	1.007
NO _x Span	400	400.3	0.075	1.012

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	505	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.3	mV	-20 - 150
AZERO	94.1	mV	-20 - 150
HVPS	673	V	420 - 900 constant
RCCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	29.5	°C	8 - 48
PMT TEMP	7.2	°C	7 ± 2
MOLY TEMP	315.2	°C	315 ± 5
RCCELL PRESS	8.4	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.007	-	1.0 ± 0.3
NO _x Slope	1.012	-	1.0 ± 0.3
NO Offset	1.4	mV	-20 to +150
NO _x Offset	0.9	mV	-20 to +150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by :

CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 13 July 2022 BRAND : API MODEL : 200E
NO. NOX-B07 SERIAL NO. 4338

Calibrator (Dilution System)	
Brand : API	Model : 700
Last Cal. Date : 05 August 2021	Serial No. : 911
Reference Standard Gas	
Standard Gas : Nitric Oxide (NO)	Cylinder No. : A006813K
Certified Date : 24 August 2020	Expired Date : 24 August 2022
Cylinder Conc. : 51.0 ppm	

CALIBRATING CONDITION

Pressure 1011 mmbar Temp. 24.6 °C % RH 49

CALIBRATION SETTING

Span	Initial Reading (Before Adj.), PPB		Final Reading (After Adj.), PPB	
	Expected Concentration	Analyzer Response	%Diff	Slope
Set Point				
Zero	0	0.11	-	-
NO Span	400	399.9	-0.025	1.005
NO _x Span	400	400.1	0.025	1.008

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	506	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.2	mV	-20 - 150
AZERO	93.9	mV	-20 - 150
HVPS	670	V	420 - 900 constant
RCCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.3	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	314.9	°C	315 ± 5
RCCELL PRESS	8.2	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.005	-	1.0 ± 0.3
NO _x Slope	1.008	-	1.0 ± 0.3
NO Offset	1.2	mV	-20 to +150
NO _x Offset	0.8	mV	-20 to +150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by :

CALIBRATION REPORT
CHEMILUMINESCENT NO / NO_x ANALYZER

DATE :	02 August 2022	BRAND :	API	MODEL :	200E
NO.	NOX-B07	SERIAL NO.	4338		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 20 September 2021		Serial No.	: 421	
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)		Cylinder No.	: D636192	
Certified Date	: 20 April 2022		Expired Date	: 20 April 2024	
Cylinder Conc. : 49.1 ppm					
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	49	

CALIBRATION SETTING

Span	Set Point	Initial Reading (Before Adj.), PPB			Final Reading (After Adj.), PPB	
		Expected Concentration	Analyzer Response	% Dif	Analyzer Response	Slope
Zero		0	0.11	-	0	-
NO Span		400	400.2	0.050	400.0	1.009
NO _x Span		400	400.3	0.075	400.0	1.013

API Model 200E NO_x Analyzer Check List

Test Values		Observed Value		Units	Nominal Range	
RANGE		500		PPB	500 standard	
STABILITY (Zero Gas)		0.1		PPB	< 2 with zero air	
SAMPLE FLOW		506		cc/min	500 ± 50	
OZONE FLOW		78		cc/min	80 ± 15	
PMT		103.2		mV	-20 - 150	
AZERO		94.0		mV	-20 - 150	
HVPS		675		V	420 - 900 constant	
RCCELL TEMP		50.3		°C	50 ± 1	
BOX TEMP		29.4		°C	8 - 48	
PMT TEMP		7.1		°C	7 ± 2	
MOLY TEMP		314.9		°C	315 ± 5	
RCCELL PRESS		8.3		IN-Hg-A	2 - 10 constant	
SAMPLE PRESS		28.6		IN-Hg-A	25 - 30 constant	
NO Span Conc		400		PPB	20 - 30,000	
NO _x Span Conc		400		PPB	20 - 30,000	
NO Slope		1.009		-	1.0 ± 0.3	
NO _x Slope		1.013		-	1.0 ± 0.3	
NO Offset		1.7		mV	-20 to +150	
NO _x Offset		1.0		mV	-20 to 150	
Stability at Zero		0.1		PPB	< 0.2	
Stability at Span		0.2		PPB	< 2 ppb @ 400 ppb span gas	

Calibrated by :

CALIBRATION REPORT
CHEMILUMINESCENT NO / NO_x ANALYZER

DATE :	02 August 2022	BRAND :	API	MODEL :	200E
NO.	NOX-B09	SERIAL NO.	4412		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 20 September 2021		Serial No.	: 421	
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)		Cylinder No.	: D636192	
Certified Date	: 20 April 2022		Expired Date	: 20 April 2024	
Cylinder Conc. : 49.1 ppm					
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	49	

CALIBRATION SETTING

Span	Set Point	Initial Reading (Before Adj.), PPB			Final Reading (After Adj.), PPB	
		Expected Concentration	Analyzer Response	% Dif	Analyzer Response	Slope
Zero		0	0.10	-	0	-
NO Span		400	400.1	0.025	400.0	1.007
NO _x Span		400	400.2	0.050	400.0	1.011

API Model 200E NO_x Analyzer Check List

Test Values		Observed Value		Units	Nominal Range	
RANGE		500		PPB	500 standard	
STABILITY (Zero Gas)		0.1		PPB	< 2 with zero air	
SAMPLE FLOW		510		cc/min	500 ± 50	
OZONE FLOW		79		cc/min	80 ± 15	
PMT		103.3		mV	-20 - 150	
AZERO		94.1		mV	-20 - 150	
HVPS		673		V	420 - 900 constant	
RCCELL TEMP		50.4		°C	50 ± 1	
BOX TEMP		29.3		°C	8 - 48	
PMT TEMP		7.5		°C	7 ± 2	
MOLY TEMP		315.4		°C	315 ± 5	
RCCELL PRESS		8.2		IN-Hg-A	2 - 10 constant	
SAMPLE PRESS		28.5		IN-Hg-A	25 - 30 constant	
NO Span Conc		400		PPB	20 - 30,000	
NO _x Span Conc		400		PPB	20 - 30,000	
NO Slope		1.007		-	1.0 ± 0.3	
NO _x Slope		1.011		-	1.0 ± 0.3	
NO Offset		1.4		mV	-20 to +150	
NO _x Offset		0.9		mV	-20 to 150	
Stability at Zero		0.1		PPB	< 0.2	
Stability at Span		0.2		PPB	< 2 ppb @ 400 ppb span gas	

Calibrated by :

CALIBRATION REPORT

CHEMILUMINESCENT NO / NO_x / NO₂ ANALYZER

DATE : 25 September 2022	BRAND : API	MODEL : 200A		
NO. NOX-B02		SERIAL NO. 2409		
Calibrator (Dilution System)				
Brand : API	Model : 700			
Last Cal. Date : 04 August 2022	Serial No. : 911			
Reference Standard Gas				
Standard Gas : Nitric Oxide (NO)	Cylinder No. : D636192			
Certified Date : 20 April 2022	Expired Date : 20 April 2024	Cylinder Conc. : 49.1 ppm		
CALIBRATING CONDITION				
Pressure : 1011 mmbar	Temp. : 24.5 °C	% RH : 49		
CALIBRATION SETTING				
Span	Initial Reading (Before Adj.), PPB	Final Reading (After Adj.), PPB		
Set Point	Expected Concentration	Analyzer Response		
%Diff	%Diff	Analyzer Response		
Slope	Slope	Slope		
Zero	0	-0.11	0	-
NO Span	400	400.2	400.0	1.009
NO _x Span	400	400.5	400.0	1.014
API Model 200A NO _x Analyzer Check List				
Test Values	Observed Value	Units	Nominal Range	
RANGE	500	PPB	500 standard	
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air	
SAMPLE FLOW	507	cc/min	500 ± 50	
OZONE FLOW	78	cc/min	80 ± 15	
PMT	103.2	mV	-20 - 150	
AZERO	93.9	mV	-20 - 150	
HVPS	670	V	420 - 900 constant	
RCCELL TEMP	50.3	°C	50 ± 1	
BOX TEMP	29.4	°C	8 - 48	
PMT TEMP	7.2	°C	7 ± 2	
MOLY TEMP	314.9	°C	315 ± 5	
RCCELL PRESS	8.4	IN-Hg-A	2 - 10 constant	
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant	
NO Span Conc	400	PPB	20 - 20,000	
NO _x Span Conc	400	PPB	20 - 20,000	
NO Slope	1.009	-	1.0 ± 0.3	
NO _x Slope	1.014	-	1.0 ± 0.3	
NO Offset	1.7	mV	-20 to +150	
NO _x Offset	1.0	mV	-20 to 150	
Stability at Zero	0.1	PPB	< 0.2	
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas	

Calibrated by :

CALIBRATION REPORT

CHEMILUMINESCENT NO / NO_x / NO₂ ANALYZER

DATE : 25 September 2022	BRAND : API	MODEL : 200A		
NO. NOX-B15		SERIAL NO. 213		
Calibrator (Dilution System)				
Brand : API	Model : 700			
Last Cal. Date : 04 August 2022	Serial No. : 911			
Reference Standard Gas				
Standard Gas : Nitric Oxide (NO)	Cylinder No. : D636192			
Certified Date : 20 April 2022	Expired Date : 20 April 2024	Cylinder Conc. : 49.1 ppm		
CALIBRATING CONDITION				
Pressure : 1011 mmbar	Temp. : 24.5 °C	% RH : 49		
CALIBRATION SETTING				
Span	Initial Reading (Before Adj.), PPB	Final Reading (After Adj.), PPB		
Set Point	Expected Concentration	Analyzer Response		
%Diff	%Diff	Analyzer Response		
Slope	Slope	Slope		
Zero	0	-0.10	0	-
NO Span	400	400.1	400.0	1.007
NO _x Span	400	400.3	400.0	1.011
API Model 200A NO _x Analyzer Check List				
Test Values	Observed Value	Units	Nominal Range	
RANGE	500	PPB	500 standard	
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air	
SAMPLE FLOW	509	cc/min	500 ± 50	
OZONE FLOW	78	cc/min	80 ± 15	
PMT	103.4	mV	-20 - 150	
AZERO	94.1	mV	-20 - 150	
HVPS	673	V	420 - 900 constant	
RCCELL TEMP	50.4	°C	50 ± 1	
BOX TEMP	29.2	°C	8 - 48	
PMT TEMP	7.1	°C	7 ± 2	
MOLY TEMP	315.2	°C	315 ± 5	
RCCELL PRESS	8.2	IN-Hg-A	2 - 10 constant	
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant	
NO Span Conc	400	PPB	20 - 20,000	
NO _x Span Conc	400	PPB	20 - 20,000	
NO Slope	1.007	-	1.0 ± 0.3	
NO _x Slope	1.011	-	1.0 ± 0.3	
NO Offset	1.2	mV	-20 to +150	
NO _x Offset	0.8	mV	-20 to 150	
Stability at Zero	0.1	PPB	< 0.2	
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas	

Calibrated by :

CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE :	31 October 2022	BRAND :	API	MODEL :	200E
NO.	NOX-B07			SERIAL NO.	4338
Calibrator (Dilution System)					
Brand :	API				
Last Cal. Date :	04 August 2022				
	Model : 700				
	Serial No. : 911				
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)				
Cylinder No. :	D636192				
Certified Date :	20 April 2022				
	Cylinder Conc. : 49.1 ppm				
CALIBRATING CONDITION					
Pressure	1011 mmbar	Temp.	24.6 °C	% RH	49

CALIBRATION SETTING

Span	Initial Reading (Before Adj.), PPB		Final Reading (After Adj.), PPB	
	Expected Concentration	Analyzer Response	%Diff	Slope
Set Point				
Zero	0	-0.10	0	-
NO Span	400	400.1	0.025	1.008
NO _x Span	400	400.3	0.075	1.011

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	511	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.2	mV	-20 - 150
AZERO	94.1	mV	-20 - 150
HVPS	670	V	420 - 900 constant
RCCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.3	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	314.9	°C	315 ± 5
RCCELL PRESS	8.4	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.008	-	1.0 ± 0.3
NO _x Slope	1.011	-	1.0 ± 0.3
NO Offset	1.6	mV	-20 to +150
NO _x Offset	1.0	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE :	31 October 2022	BRAND :	API	MODEL :	200E
NO.	NOX-B09			SERIAL NO.	4412
Calibrator (Dilution System)					
Brand :	API				
Last Cal. Date :	04 August 2022				
	Model : 700				
	Serial No. : 911				
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)				
Cylinder No. :	D636192				
Certified Date :	20 April 2022				
	Cylinder Conc. : 49.1 ppm				
CALIBRATING CONDITION					
Pressure	1011 mmbar	Temp.	24.6 °C	% RH	49

CALIBRATION SETTING

Span	Initial Reading (Before Adj.), PPB		Final Reading (After Adj.), PPB	
	Expected Concentration	Analyzer Response	%Diff	Slope
Set Point				
Zero	0	-0.11	0	-
NO Span	400	399.9	-0.025	1.005
NO _x Span	400	400.2	0.050	1.008

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	507	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.0	mV	-20 - 150
AZERO	93.8	mV	-20 - 150
HVPS	673	V	420 - 900 constant
RCCELL TEMP	50.4	°C	50 ± 1
BOX TEMP	29.5	°C	8 - 48
PMT TEMP	7.2	°C	7 ± 2
MOLY TEMP	315.2	°C	315 ± 5
RCCELL PRESS	8.2	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.005	-	1.0 ± 0.3
NO _x Slope	1.008	-	1.0 ± 0.3
NO Offset	1.2	mV	-20 to +150
NO _x Offset	0.9	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

CALIBRATION REPORT									
CHEMILUMINESCENT NO / NO _x ANALYZER									
DATE :	24 October 2022	BRAND :	API	MODEL :	200E				
NO.	NOX-B05			SERIAL NO.	2284				
Calibrator (Dilution System)									
Brand	: API			Model	: 700				
Last Cal. Date	: 04 August 2022			Serial No.	: 911				
Reference Standard Gas									
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: D636192				
Certified Date	: 20 April 2022			Expired Date	: 20 April 2024			Cylinder Conc.	: 49.1 ppm
CALIBRATING CONDITION									
Pressure	1011	mbar	Temp.	24.5	°C	% RH	49		
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB					
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response			Slope		
Zero	0	0.11	-	0	0			-	
NO Span	400	400.2	0.050	400.0	400.0			1.010	
NO _x Span	400	400.4	0.100	400.0	400.0			1.014	
API Model 200E NO _x Analyzer Check List									
Test Values	Observed Value	Units	Nominal Range						
RANGE	500	PPB	500 standard						
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air						
SAMPLE FLOW	505	cc/min	500 ± 50						
OZONE FLOW	78	cc/min	80 ± 15						
PMT	103.5	mV	-20 - 150						
AZERO	94.2	mV	-20 - 150						
HVPS	670	V	420 - 900 constant						
RCCELL TEMP	50.1	°C	50 ± 1						
BOX TEMP	29.2	°C	8 - 48						
PMT TEMP	7.4	°C	7 ± 2						
MOLY TEMP	314.9	°C	315 ± 5						
RCCELL PRESS	8.3	IN-Hg-A	2 - 10 constant						
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant						
NO Span Conc	400	PPB	20 - 20,000						
NO _x Span Conc	400	PPB	20 - 20,000						
NO Slope	1.010	-	1.0 ± 0.3						
NO _x Slope	1.014	-	1.0 ± 0.3						
NO Offset	1.7	mV	-20 to +150						
NO _x Offset	1.0	mV	-20 to 150						
Stability at Zero	0.1	PPB	< 0.2						
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas						

Calibrated by :

CALIBRATION REPORT									
CHEMILUMINESCENT NO / NO _x ANALYZER									
DATE :	24 October 2022	BRAND :	API	MODEL :	200A				
NO.	NOX-B14			SERIAL NO.	212				
Calibrator (Dilution System)									
Brand	: API			Model	: 700				
Last Cal. Date	: 04 August 2022			Serial No.	: 911				
Reference Standard Gas									
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: D636192				
Certified Date	: 20 April 2022			Expired Date	: 20 April 2024			Cylinder Conc.	: 49.1 ppm
CALIBRATING CONDITION									
Pressure	1011	mbar	Temp.	24.5	°C	% RH	49		
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB					
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response			Slope		
Zero	0	0.10	-	0	0			-	
NO Span	400	400.1	0.025	400.0	400.0			1.009	
NO _x Span	400	400.3	0.075	400.0	400.0			1.012	
API Model 200A NO _x Analyzer Check List									
Test Values	Observed Value	Units	Nominal Range						
RANGE	500	PPB	500 standard						
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air						
SAMPLE FLOW	511	cc/min	500 ± 50						
OZONE FLOW	79	cc/min	80 ± 15						
PMT	103.0	mV	-20 - 150						
AZERO	93.7	mV	-20 - 150						
HVPS	659	V	420 - 900 constant						
RCCELL TEMP	50.4	°C	50 ± 1						
BOX TEMP	29.5	°C	8 - 48						
PMT TEMP	7.2	°C	7 ± 2						
MOLY TEMP	315.2	°C	315 ± 5						
RCCELL PRESS	8.5	IN-Hg-A	2 - 10 constant						
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant						
NO Span Conc	400	PPB	20 - 20,000						
NO _x Span Conc	400	PPB	20 - 20,000						
NO Slope	1.009	-	1.0 ± 0.3						
NO _x Slope	1.012	-	1.0 ± 0.3						
NO Offset	1.6	mV	-20 to +150						
NO _x Offset	1.0	mV	-20 to 150						
Stability at Zero	0.1	PPB	< 0.2						
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas						

CALIBRATION REPORT									
CHEMILUMINESCENT NO / NO _x / NO _x ANALYZER									
DATE :	14 December 2022	BRAND :	API	MODEL :	200A				
NO.	NOX-B02			SERIAL NO.	2409				
Calibrator (Dilution System)									
Brand	: API			Model	: 700				
Last Cal. Date	: 04 August 2022			Serial No.	: 911				
Reference Standard Gas									
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: D636192				
Certified Date	: 20 April 2022			Expired Date	: 20 April 2024			Cylinder Conc.	: 49.1 ppm
CALIBRATING CONDITION									
Pressure	1011	mmbar	Temp.	24.6	°C	% RH	49		
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.), PPB			Final Reading (After Adj.), PPB					
Set Point	Expected Concentration	Analyzer Response	%dF	Analyzer Response	Slope				
Zero	0	0.11	-	0	-				
NO Span	400	400.2	0.050	400.0	1.010				
NO _x Span	400	400.3	0.075	400.0	1.013				
API Model 200A NO _x Analyzer Check List									
Test Values		Observed Value		Units	Nominal Range				
RANGE		500	PPB		500 standard				
STABILITY (Zero Gas)		0.1	PPB		< 2 with zero air				
SAMPLE FLOW		503	cc/min		500 ± 50				
OZONE FLOW		78	cc/min		80 ± 15				
PMT		102.9	mV		-20 - 150				
AZERO		93.8	mV		-20 - 150				
HVPS		670	V		420 - 900 constant				
RCELL TEMP		50.3	°C		50 ± 1				
BOX TEMP		29.4	°C		8 - 48				
PMT TEMP		7.2	°C		7 ± 2				
MOLY TEMP		314.9	°C		315 ± 5				
RCELL PRESS		8.5	IN-Hg-A		2 - 10 constant				
SAMPLE PRESS		28.7	IN-Hg-A		25 - 30 constant				
NO Span Conc		400	PPB		20 - 20,000				
NO _x Span Conc		400	PPB		20 - 20,000				
NO Slope		1.010	-		1.0 ± 0.3				
NO _x Slope		1.013	-		1.0 ± 0.3				
NO Offset		1.7	mV		-20 to +150				
NO _x Offset		1.0	mV		-20 to 150				
Stability at Zero		0.1	PPB		< 0.2				
Stability at Span		0.2	PPB		< 2 ppb @ 400 ppb span gas				

Calibrated by :

CALIBRATION REPORT									
CHEMILUMINESCENT NO / NO _x / NO _x ANALYZER									
DATE :	14 December 2022	BRAND :	API	MODEL :	200A				
NO.	NOX-B14			SERIAL NO.	212				
Calibrator (Dilution System)									
Brand	: API			Model	: 700				
Last Cal. Date	: 04 August 2022			Serial No.	: 911				
Reference Standard Gas									
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: D636192				
Certified Date	: 20 April 2022			Expired Date	: 20 April 2024			Cylinder Conc.	: 49.1 ppm
CALIBRATING CONDITION									
Pressure	1011	mmbar	Temp.	24.6	°C	% RH	49		
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.), PPB			Final Reading (After Adj.), PPB					
Set Point	Expected Concentration	Analyzer Response	%dF	Analyzer Response	Slope				
Zero	0	-0.10	-	0	-				
NO Span	400	399.6	-0.100	400.0	1.002				
NO _x Span	400	399.8	-0.050	400.0	1.005				
API Model 200A NO _x Analyzer Check List									
Test Values		Observed Value		Units	Nominal Range				
RANGE		500	PPB		500 standard				
STABILITY (Zero Gas)		0.1	PPB		< 2 with zero air				
SAMPLE FLOW		513	cc/min		500 ± 50				
OZONE FLOW		79	cc/min		80 ± 15				
PMT		103.3	mV		-20 - 150				
AZERO		94.0	mV		-20 - 150				
HVPS		669	V		420 - 900 constant				
RCELL TEMP		50.1	°C		50 ± 1				
BOX TEMP		29.2	°C		8 - 48				
PMT TEMP		7.5	°C		7 ± 2				
MOLY TEMP		315.2	°C		315 ± 5				
RCELL PRESS		8.3	IN-Hg-A		2 - 10 constant				
SAMPLE PRESS		28.4	IN-Hg-A		25 - 30 constant				
NO Span Conc		400	PPB		20 - 20,000				
NO _x Span Conc		400	PPB		20 - 20,000				
NO Slope		1.002	-		1.0 ± 0.3				
NO _x Slope		1.005	-		1.0 ± 0.3				
NO Offset		1.2	mV		-20 to +150				
NO _x Offset		0.7	mV		-20 to 150				
Stability at Zero		0.1	PPB		< 0.2				
Stability at Span		0.2	PPB		< 2 ppb @ 400 ppb span gas				



CERTIFICATE No : 21M3169
REFERENCE No : 60627-5

PAGE : 1 OF 2

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.



CERTIFICATE No : 21M3169

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
ID No : BA 05/50
RECEIVED DATE : 19-Mar-21
CALIBRATION DATE : 19-Mar-21
RELATIVE HUMIDITY : 52 %RH \pm 10 % RH
AIR PRESSURE : 1009mbar \pm 1mbar
AMBIENT TEMPERATURE : 24 $^{\circ}$ C \pm 1 $^{\circ}$ 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 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	M21032355	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:-

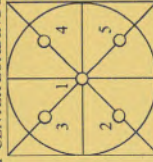
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 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	0.00000	0.00013
100.00	100.00001	-0.00001	0.00019
170.00	170.00001	-0.00001	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
COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



CERTIFICATE No : 22M2567
REFERENCE No : 64386-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS 105DU
SERIAL No : 1126422905
ID No : BA 05/50
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : TETNITHI W.
CALIBRATION DATE : 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 : 22M2567

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS 105DU
ID No : BA 05/50
SERIAL No : 1126422905
RECEIVED DATE : 11-Mar-22
CALIBRATION DATE : 11-Mar-22
RELATIVE HUMIDITY : 49 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

1) STANDARD WEIGHT SET
INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE :
E2 QK-1-151 C02210415 09-Feb-23

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

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

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

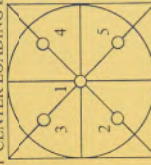
3. REPEATABILITY OF READING AT 20 g WAS 0.000004 g

4. REPEATABILITY OF READING AT 100 g WAS 0.000048 g

5. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

Lambda UV Preventive Maintenance (PM)			
Company Name:	S.P.S. CONSULTING SERVICE CO., LTD.		
Address:	7, Soi Phaholyothin24, Ladyao, Jatujak, Bangkok		
User Name:		WO Number:	WO-01338285
Telephone Number:	086-141-2523	PM Number:	6 of 6 P
Customer Support Engineer:		Certificate Number:	UV2043-2021
Date PM Performed: (DD-MMM-YYYY)	27-Jul-2021	Next PM Due Date: (DD-MMM-YYYY)	27-Jan-2022

Part Number	Release	Publication Date
09370504	B	March 2013

Scope

The purpose of this PM is to ensure the continued functionality of the PerkinElmer Lambda UV/Vis Spectrophotometer by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis. Should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

Component Model	Serial #	Software Version	Configuration Notes
Lambda 25	501S14123010	6.2.0.0741	STD 1.27
-	-	-	-
-	-	-	-
-	-	-	-

Parts Lists

Parts Included with the PM			
Part Number (if applicable)	Description	Quantity	Batch/Lot/SN #
B250 0999	Stray Light standard		
	NaI cell	1	11200
	NaNO ₂ cell	1	21175
	KCl cell	1	31873
B050 7805	H ₂ O	1	72075
	Secondary Standards for calibration of wavelength and photometric accuracy or use NBS/NIST 390 standards		
	Gray Glass G1	1	4660
	Gray Glass G2	1	4575
	Gray Glass G3	1	4525
	Holmium Glass	1	5499

Additional Tools Required for PM					
Part Number (if applicable)	Description	Quantity	Serial #	Calibration Due Date (MM/YY)	
-	-	-	-	-	
-	-	-	-	-	
-	-	-	-	-	
Additional Reagents and Standards Required for PM					
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)	
-	-	-	-	-	
-	-	-	-	-	
-	-	-	-	-	

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. Optical checks:

- ☒ Lamp Alignment/Energy
- ☒ Sample Compartment Windows/Monochromator
- ☒ Mirror and Grating Alignment
- ☒ Cell Holder Alignment

3. Mechanical:

- ☒ Physical inspection – Please write any comments in the additional comments section.
- ☒ Grating Drive Mechanism.
- ☒ Lamp Change Mechanism.
- ☐ Slit Drive Manual Servo.

4. Test:

Refer to Appendix A for the specifications of the instrument being tested.

- ☒ D2 Wavelength accuracy

	Actual Value	Specification
Accuracy at 656.1 nm	656.09	± 0.1

☒ Holmium Oxide wavelength accuracy

Filter ID #		5499		
Test	Calibration Value	Actual Value	Deviation	Specification
279.3 nm	279.3	279.37	-0.07	± 0.5
360.8 nm	360.9	360.92	-0.02	± 0.5
459.9 nm	459.9	460.00	-0.10	± 0.5
536.4 nm	536.2	536.33	-0.13	± 0.5

☒ Scattered Light.

Test	Filter ID #	Result	Specification
NaI @ 220 nm	11200	-0.1294	< 0.02 %T
NaNO ₂ @ 340 nm	21175	0.0034	< 0.02 %T
NaNO ₂ @ 370 nm	21175	0.0027	< 0.02 %T
KCl @ 200 nm	31873	2.2355	≥ 2 A

☒ Baseline Flatness.

Corrected Baseline	Specification
0.000316	± 0.001 A

☒ Noise Test @ 500 nm.

Actual Value	Specification
0.0000250	± 0.00008 A

☒ Photometric Accuracy.

Filter 1 ID #		4660		
Test	Calibrated Value	Actual Value	Deviation	Specification
440 nm	0.3208	0.3240	-0.0032	± 0.006 A
546 nm	0.3029	0.3049	-0.0020	± 0.006 A
635 nm	0.3572	0.3584	-0.0012	± 0.006 A
Filter 2 ID #		4575		
Test	Calibrated Value	Actual Value	Deviation	Specification
440 nm	1.06	1.0627	-0.0027	± 0.006 A
546 nm	0.9835	0.9851	-0.0016	± 0.006 A
635 nm	1.007	1.0087	-0.0017	± 0.006 A
Filter 3 ID #		4525		
Test	Calibrated Value	Actual Value	Deviation	Specification
440 nm	0.4981	0.4998	-0.0017	± 0.006 A
546 nm	0.4739	0.4751	-0.0012	± 0.006 A
635 nm	0.5274	0.5286	-0.0012	± 0.006 A

5. Accessory (where applicable):

- ☐ Integrating Sphere
☐ Reflecting Attachment
☐ Cell Changer
☐ Sipper
☐ Auto Sampler



6. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer-supplied materials to have on hand
- ☒ Attach PM sticker.
- ☒ Update Logbook.

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for Lambda UV have been completed.

This Lambda UV Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative:	Date: 9-Aug-21 (DD-MM-YYYY)
Authorized Customer Representative:	Date: 9-Aug-21 (DD-MM-YYYY)



Lambda UV Preventive Maintenance (PM)

Company Name:	S.P.S. CONSULTING SERVICE CO., LTD.		
Address:	7, Soi Phaholyothin24, Ladyao, Jatujak, Bangkok		
User Name:	K. Benjawan	WO Number:	WO-01550999
Telephone Number:	086-141-2523	PM Number:	6 of 6 P
Customer Support Engineer:	K. Anon	Certificate Number:	UV2004-2022
Date PM Performed: (DD-MMM-YYYY)	25-Jan-2022	Next PM Due Date: (DD-MMM-YYYY)	25-Jul-2022

Part Number	Release	Publication Date
09370504	B	March 2013

Scope

The purpose of this PM is to ensure the continued functionality of the PerkinElmer Lambda UV/Vis Spectrophotometer by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis. Should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument lookbook as required.

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Component List

Component Specific Model	Serial #	Software Version	Configuration Notes
Lambda 25	501S14123010	6.2.0.0741	STD 1.27
NA	NA	NA	NA

Parts Lists

Parts Included with the PM				
Part Number (if applicable)	Description	Quantity	Serial Number	Expiration Date (MM/YY)
B250 0099	Stray Light standard			
	Nal cell	1	1943	Jan-22
	NaNO2 cell	1	2963	
	KCl cell	1	31030	
	H2O	1	71497	
B050 7805	Secondary Standards for calibration of wavelength and photometric accuracy or use NBS/NIST 390 standards			
	Gray Glass G1	1	2926	Jan-22
	Gray Glass G2	1	3501	
	Gray Glass G3	1	2552	
	Holmium Glass	1	1085	

Additional Tools Required for PM

Part Number (if applicable)	Description	Quantity	Serial #	Remark
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Additional Reagents and Standards Required for PM

Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. Optical checks:

- ☒ Lamp Alignment/Energy
- ☒ Sample Compartment Windows/Monochromator
- ☒ Mirror and Grating Alignment
- ☒ Cell Holder Alignment

3. Mechanical:

- ☒ Physical inspection – Please write any comments in the additional comments section.
- ☒ Grating Drive Mechanism.
- ☒ Lamp Change Mechanism.
- ☐ Slit Drive Manual Servo.

4. Test:

Refer to **Appendix A** for the specifications of the instrument being tested.

- ☒ D2 Wavelength accuracy

	Actual Value	Specification
Accuracy at 656.1 nm	656.16	± 0.1

- ☒ Holmium Oxide wavelength accuracy

Filter ID #		1085		
Test	Calibration Value	Actual Value	Deviation	Specification
279.3 nm	279.3	279.39	-0.09	± 0.5
360.8 nm	360.9	360.93	-0.03	± 0.5
459.9 nm	460.0	460.07	-0.07	± 0.5
536.4 nm	536.2	536.40	-0.20	± 0.5

- ☒ Scattered Light.

Test	Filter ID #	Result	Specification
NaI @ 220 nm	1943	0.0133	< 0.02 %T
NaNO ₂ @ 340 nm	2963	-0.1296	< 0.02 %T
NaNO ₂ @ 370 nm	2963	-0.0002	< 0.02 %T
KCl @ 200 nm	31030	2.4808	≥ 2 A

- ☒ Baseline Flatness.

Corrected Baseline	Specification
0.000163	± 0.001 A

- ☒ Noise Test @ 500 nm.

Actual Value	Specification
0.0000240	± 0.00008 A

☒ Photometric Accuracy.

Filter 1 ID #		2926		
Test	Calibrated Value	Actual Value	Deviation	Specification
440 nm	0.3483	0.3493	-0.0010	± 0.006 A
546 nm	0.3029	0.3046	-0.0017	± 0.006 A
635 nm	0.3200	0.3232	-0.0032	± 0.006 A
Filter 2 ID #		3501		
Test	Calibrated Value	Actual Value	Deviation	Specification
440 nm	1.001	1.0024	-0.0014	± 0.006 A
546 nm	0.9797	0.9813	-0.0016	± 0.006 A
635 nm	1.0285	1.0325	-0.0040	± 0.006 A
Filter 3 ID #		2552		
Test	Calibrated Value	Actual Value	Deviation	Specification
440 nm	0.489	0.4935	-0.0045	± 0.006 A
546 nm	0.4582	0.4595	-0.0013	± 0.006 A
635 nm	0.5046	0.5075	-0.0029	± 0.006 A

5. Accessory (where applicable) :

- ☐ Integrating Sphere
☐ Reflecting Attachment
☐ Cell Changer
☐ Sipper
☐ Auto Sampler

6. Review:

- ☒ Review with the customer PM work performed.
☒ Review with the customer routine maintenance procedures.
☒ Discuss recommended customer-supplied materials to have on hand
☒ Attach PM sticker.
☒ Update Logbook.



Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for Lambda UV have been completed.	
This Lambda UV Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative:	Date: 25-Jan-2022 (DD-MM-YYYY)
Authorized Customer Representative:	Date: 25-Jan-2022 (DD-MM-YYYY)

เอกสารที่ 5-2

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียง



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 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 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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35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
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E-mail : numpai@tistr.or.th Website: www.tistr.or.th

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

FMBL-MTC.002 Rev.4



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 IEC 60942:2003 Class 1
1/2 inch Brüel&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 IEC 60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	999.9	-0.1	± 1.5	± 1.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC 60942:2003 Class 1
1/2 inch Brüel&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 :

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 28 Apr. 2022

Date of Issue : 28 Apr. 2022

Ref : 2011265042601787001

2 / 2

End of Certificate

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

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Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
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Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

FMBL-MTC.002 Rev.4

Request No. 21-65/0696 MTC No. EEL. BP. 52/0865

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 Level 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&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 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 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 : 15 Aug. 2022

Date of Calibration : 24 Aug. 2022

The results relate only to the items tested/calibrated or value assigned.
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Head Office 35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang, Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road, Chatuchak, Bangkok 10900.
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E-mail : rumpai@tistr.or.th Website: www.tistr.or.th

Office/Laboratory Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road, Chatuchak, Bangkok 10900.
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

FM.BLMTC.002 Rev.4

Request No. 21-65/0696 MTC No. EEL. BP. 52/0865

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	93.71	-0.29	± 0.10	IEC60942:2003 Class 2 ±0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit
1/2 inch Brüel&Kjær 4180	980.3	-19.7	± 1.5	IEC60942:2003 Class 2 ±2.0%

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit
1/2 inch Brüel&Kjær 4180	1.05	± 0.50	IEC60942:2003 Class 2 ±4.0%

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

Date of Calibration : 24 Aug. 2022

Date of Issue : 25 Aug. 2022

Ref : 2011265081503588001

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.

Head Office 35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang, Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road, Chatuchak, Bangkok 10900.
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : rumpai@tistr.or.th Website: www.tistr.or.th

Office/Laboratory Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road, Chatuchak, Bangkok 10900.
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

FM.BLMTC.002 Rev.4

Noise B. 663/22

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]
ACO-B24	ACO	6236	00182005	14 November 2022	Before Adjustment 94.1 After Adjustment 94.0
ACO-B31	ACO	6236	00182013	14 November 2022	94.0 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.93 ± 0.10 dB

Calibrated by :

Noise B. 597/22

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]
ACO-B14	ACO	6236	00172034	31 October 2022	Before Adjustment 93.9 After Adjustment 94.0
ACO-B31	ACO	6236	00182013	31 October 2022	94.0 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.93 ± 0.10 dB

Calibrated by :

Note B_436/22

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]
ACO-1031	ACO	6236	00182013	02 August 2022	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.93 ± 0.10 dB

Calibrated by :

Note B_547/22

Sound Level Meter Calibration Report

Acoustic Calibrator Data					
Brand	RION		Number		AC 01/40
Model	NC-73		Serial No.		10576192
Calibration Range	94 dB, 1000 Hz		Last Calibration		07 December 2021
			Due Date		07 December 2022
Calibration Data					
Sound Level Meter Data			Calibration Data		
S/LM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]
NL 21-B18	RION	NL-21	00554236	30 August 2022	94.1
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					94.25 ± 0.10 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	18 August 2021
		Due Date	18 August 2022
Calibration Data			
Sound Level Meter Data		Calibration Data	
SLM No.	Brand	Model	Serial No.
NL 21-B18	RION	NL-21	00554236
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)		Date	31 July 2022
		Before Adjustment	93.9
		After Adjustment	94.0
		93.88 ± 0.10 dB	

Calibrated by :

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	18 August 2021
		Due Date	18 August 2022
Calibration Data			
Sound Level Meter Data		Calibration Data	
SLM No.	Brand	Model	Serial No.
NL 21-B18	RION	NL-21	00554236
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)		Date	07 August 2022
		Before Adjustment	93.9
		After Adjustment	94.0
		93.88 ± 0.10 dB	



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 แขวงพญาไท เขตพญาไท กรุงเทพฯ 10600
โทรศัพท์ : 02-009-4370-2 โทรสาร : 02-009-4370-3
โทร : (662) 009-4370-2 Fax : (662) 531-4221 E-mail : sales@spson.com, www.spson.com

Noise B_491/22

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	18 August 2021		
		Due Date	18 August 2022		
Calibration Data					
Sound Level Meter Data			Calibration Data		
S/LM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]
NL 21-B18	RION	NL-21	00554236	14 August 2022	Before Adjustment 93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					After Adjustment 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.88 ± 0.10 dB

Calibrated by :



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 แขวงพญาไท เขตพญาไท กรุงเทพฯ 10600
โทรศัพท์ : 02-009-4370-2 โทรสาร : 02-009-4370-3
โทร : (662) 009-4370-2 Fax : (662) 531-4221 E-mail : sales@spson.com, www.spson.com

Noise B_504/22

Sound Level Meter Calibration Report

Acoustic Calibrator Data					
Brand	RION	Number	AC 01/40		
Model	NC-73	Serial No.	10576192		
Calibration Range	94 dB, 1000 Hz	Last Calibration	07 December 2021		
		Due Date	07 December 2022		
Calibration Data					
Sound Level Meter Data			Calibration Data		
S/LM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]
NL 21-B18	RION	NL-21	00554236	21 August 2022	Before Adjustment 94.1
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					After Adjustment 94.2
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					94.25 ± 0.10 dB

Noise B_521/22

Sound Level Meter Calibration Report

Acoustic Calibrator Data					
Brand	RION		Number		
Model	NC-73		Serial No.		
Calibration Range	94 dB, 1000 Hz		Last Calibration		
			Due Date		
Sound Level Meter Data			Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	
NL 21-B1B	RION	NL-21	00554236	28 August 2022	
				Actual Reading [dB]	
				Before Adjustment	After Adjustment
				94.1	94.2
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)				94.25 ± 0.10 dB	

Calibrated by :

Noise B_544/22

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]
ACO-B31	ACO	6236	00182013	04 September 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

Noise B_557/22

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				
S/LM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
ACO-B31	ACO	6236	00182013	18 September 2022	Before Adjustment	After Adjustment
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.9	94.0
					93.9 ± 0.10 dB	

Noise B_545/22

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				
S/LM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
ACO-B31	ACO	6236	00182013	11 September 2022	Before Adjustment	After Adjustment
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.9	94.0
					93.9 ± 0.10 dB	

Calibrated by :

Noise B. 556/22

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]	
ACO-B31	ACO	6236	00182013	25 September 2022	Before Adjustment	After Adjustment
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.9	94.0
					93.93 ± 0.10 dB	

Calibrated by :

Noise B. 546/22

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]	
ACO-B14	ACO	6236	00172034	25 September 2022	Before Adjustment	After Adjustment
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.9	94.0
					93.93 ± 0.10 dB	

Note B_583/22

Sound Level Meter Calibration Report

Acoustic Calibrator Data						
Brand	ACO		Number	AC 03/56		
Model	21-27		Serial No.	1300006		
Calibration Range	94 dBr, 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]	
ACO-B14	ACO	6236	00172034	24 October 2022	Before Adjustment	93.9
ACO-B24	ACO	6236	00182005	24 October 2022	After Adjustment	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.93 ± 0.10 dB	

Calibrated by :

Note B_397/22

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	18 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]
NL 21-B18	RION	NL-21	00554286	29 June 2022	Before Adjustment 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					After Adjustment 94.0
					93.88 ± 0.10 dB

Note B_412/22

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	18 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]
NL 21-B18	RION	NL-21	00554236	03 July 2022	Before Adjustment
					93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					94.0
					93.89 ± 0.10 dB

Calibrated by :

Note B_306/22

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	18 August 2021		
		Due Date	18 August 2022		
Calibration Data					
Sound Level Meter Data				Calibration Data	
SLM No.	Brand	Model	Serial No.	Date	
NL-21-B18	RION	NL-21	00554236	26 June 2022	
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)				Before Adjustment	After Adjustment
				93.9	94.0
				93.89 ± 0.10 dB	

Noise B_413/22

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	18 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]
NL 21-B18	RION	NL-21	00554236	10 July 2022	Before Adjustment 93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					After Adjustment 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.88 ± 0.10 dB

Calibrated by :

Noise B_424/22

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	18 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]
NL 21-B18	RION	NL-21	00554236	17 July 2022	Before Adjustment 93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					After Adjustment 94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.88 ± 0.10 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	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]				
ACO-B14	ACO	6236	00172034	13 July 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				

Calibrated by :

เอกสารที่ 5-3

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำทิ้ง



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 :

Calibration Engineer



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

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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

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Accredited
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CALIBRATION LABORATORY CO., LTD.

21/10-11, 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



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



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CALIBRATION LABORATORY Co., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd, Ladphrao, Bangkok 10230
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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 :

Calibration Engineer



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

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@clcalibration



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



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



@clcalibration



CALIBRATION LABORATORY CO., LTD.

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ANAB
ACCREDITED
DIMENSIONAL MEASUREMENT
ACDM-2814



Accredited
ISO/IEC 17025

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. FSL-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



ANAB
ACCREDITED
DIMENSIONAL MEASUREMENT
ACDM-2814



Accredited
ISO/IEC 17025

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 : Walalak Sirithean

Approved by :

(/) Mailee Bulkrua
() Sathip Meangmai
() Warakorn Lengagtrakul

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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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 : Walalak Sirthean

Approved by :

() Malee Butkruea
() Saithip Meangmai
() Warakorn Lengagtrakul

Issue Date : 25 April 2022



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 :-				
Sodium Thiosulfate pentahydrate	Merck	AM1763316	Assay	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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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.



CERTIFICATE No : 21M3168

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
MODEL : BSA224S-CW
ID No : 36591842
RECEIVED DATE : 19-Mar-21
AIR PRESSURE : 1009mbar \pm 1mbar
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:-

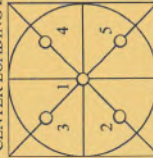
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

- ZERO SETTING FUNCTION : NORMAL
- TARE FUNCTION : NORMAL
- REPEATABILITY OF READING AT 200 g WAS 0.000045 g
- DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm 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



CERTIFICATE No : 22M2568

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
ID No : BA 08/61
MODEL : BSA224S-CW
SERIAL No : 36591842
RECEIVED DATE : 11-Mar-22
CALIBRATION DATE : 11-Mar-22
RELATIVE HUMIDITY : 51 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

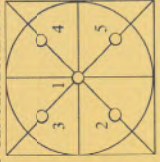
1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING WEIGHT OF QUALITY CALIBRATION TO ADJUST. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY 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
09-Feb-23
 3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
 4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
 5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 200 g WAS 0.000048 g
4. DEPARTURE FROM NOMINAL VALUE/LINEARITY

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

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT