

ภาคผนวกที่ 4

เอกสารการสอบเทียบความถูกต้องของเครื่องมือ



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chaluchek, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

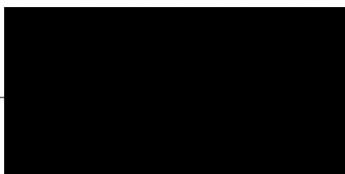
Model : TE 5025A

S/N : 3611

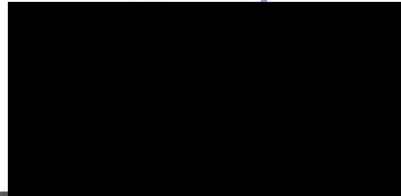
Calibration Data

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

Calibrated by :



Approved by :

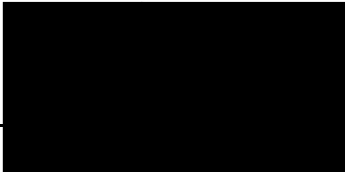




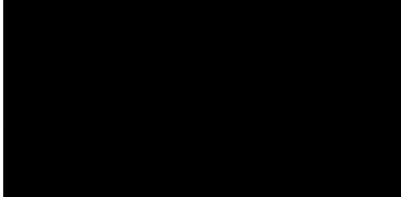
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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	18 April 2023		BRAND :	TELEDYNE	
MODEL :			MODEL :	TML-60	
NO.	SO ₂ -R08		SERIAL NO.	TRS1064	
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 04 August 2022			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Sulphur Dioxide (SO ₂)			Cylinder No. : A00814SK		
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 50.0 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
% RH	48				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO ₂ Span	400.0	400.4	0.100	400.0	1.008
API Model TML-60 SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.7	in-Hg	25-35		
SAMPLE FLOW	656	cc/min	650 ± 10%		
PMT	103.4	mV	-20-150 with Zero Air		
UV LAMP	3004	mV	1000-4900		
STR. LGT	61.4	PPB	<100		
DRK PMT	62.8	mV	-50 - 200		
DRK LMP	58.4	mV	-50 - 200		
HVPS	674	V	550-900 constant		
DCPS	2520	mV	2500 ± 200		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	29.1	°C	5-40		
PMT TEMP	7.2	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.008	-	1.0 ± 0.3		
SO ₂ Offset	22.1	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :



Approved

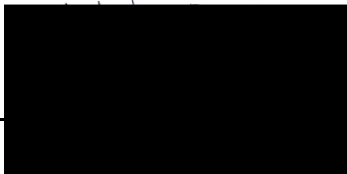




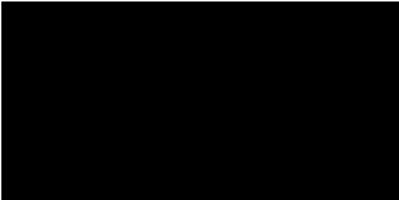
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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	18 April 2023	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R04			SERIAL NO.	3489
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 04 August 2022			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 50.0 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	48	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO ₂ Span	400.0	400.1	0.025	400.0	1.004
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.4	in-Hg	25-35		
SAMPLE FLOW	657	cc/min	650 ± 10%		
PMT	102.9	mV	-20-150 with Zero Air		
UV LAMP	3010	mV	1000-4900		
STR. LGT	61.5	PPB	<100		
DRK PMT	63.1	mV	-50 - 200		
DRK LMP	58.3	mV	-50 - 200		
HVPS	672	V	550-900 constant		
DCPS	2520	mV	2500 ± 200		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.1	°C	5-40		
PMT TEMP	7.2	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.004	-	1.0 ± 0.3		
SO ₂ Offset	21.7	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :



Approved

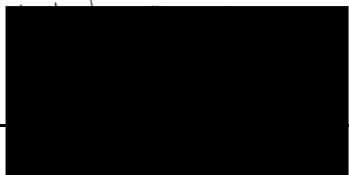




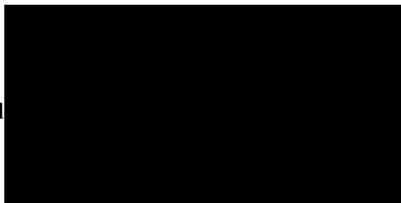
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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	18 April 2023	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R03			SERIAL NO.	3488
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 04 August 2022			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 50.0 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	48	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO ₂ Span	400.0	400.1	0.025	400.0	1.005
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.5	in-Hg	25-35		
SAMPLE FLOW	655	cc/min	650 ± 10%		
PMT	102.9	mV	-20-150 with Zero Air		
UV LAMP	3010	mV	1000-4900		
STR. LGT	61.1	PPB	<100		
DRK PMT	62.7	mV	-50 - 200		
DRK LMP	58.1	mV	-50 - 200		
HVPS	671	V	550-900 constant		
DCPS	2521	mV	2500 ± 200		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.2	°C	5-40		
PMT TEMP	7.2	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.005	-	1.0 ± 0.3		
SO ₂ Offset	21.7	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :



Approved





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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 18 April 2023

BRAND : API

MODEL : 200E

NO. NOX-R05

SERIAL NO. 4413

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 48

CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.008
NO _x Span	400	400.3	0.075	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	505	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	102.9	mV	-20 - 150
AZERO	93.8	mV	-20 - 150
HVPS	671	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.1	°C	8 - 48
PMT TEMP	7.2	°C	7 ± 2
MOLY TEMP	315.1	°C	315 ± 5
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.008	-	1.0 ± 0.3
NO _x Slope	1.011	-	1.0 ± 0.3
NO Offset	0.9	mV	-20 to +150
NO _x Offset	0.5	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by :

Approved by :



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 18 April 2023

BRAND : API

MODEL : 200E

NO. NOX-R04

SERIAL NO. 4411

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 48

CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.6	-0.100	400.0	1.003
NO _x Span	400	399.8	-0.050	400.0	1.006

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	504	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	102.9	mV	-20 - 150
AZERO	93.7	mV	-20 - 150
HVPS	674	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.3	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	315.1	°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	1.003	-	1.0 ± 0.3
NO _x Slope	1.006	-	1.0 ± 0.3
NO Offset	1.0	mV	-20 to +150
NO _x Offset	0.5	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by :

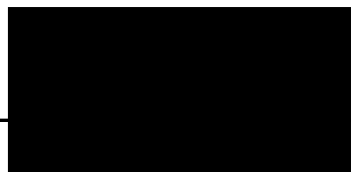
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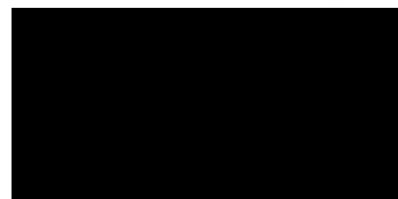
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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	18 April 2023	BRAND :	API	MODEL :	200E
NO.	NOX-R01	SERIAL NO.	769		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 04 August 2022		Serial 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	48				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
NO Span	400	400.1	0.025	400.0	1.003
NO _x Span	400	400.3	0.075	400.0	1.006
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	102.9	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.3	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.5	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	1.003	-	1.0 ± 0.3		
NO _x Slope	1.006	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO _x Offset	0.6	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :



Approved by





CERTIFICATE No : 23M2441
REFERENCE No : 68471-1

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 : 10-Mar-23

APPROVED BY : 

ISSUED DATE : 16-Mar-23

RECEIVED DATE : 10-Mar-23



CERTIFICATE No : 23M2441

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA 05/50 RECEIVED DATE : 10-Mar-23
AIR PRESSURE : 1010mbar \pm 1mbar CALIBRATION DATE : 10-Mar-23
AMBIENT TEMPERATURE : 23° C \pm 1° C RELATIVE HUMIDITY : 49 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-25

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

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

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000039
0.02	0.02000	0.00000	0.000039
0.10	0.10000	0.00000	0.000039
0.20	0.20001	-0.00001	0.000040
0.50	0.50001	-0.00001	0.000040
1.00	1.00000	0.00000	0.000041
2.00	2.00003	-0.00003	0.000042
5.00	5.00001	-0.00001	0.000046
10.00	10.00003	-0.00003	0.000053
20.00	20.00005	-0.00005	0.000067
50.00	50.00001	-0.00001	0.00011
100.00	100.00001	-0.00001	0.00019
200.00	200.00001	-0.00001	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0001
3	50.0000
4	50.0000
5	49.9999
OFF-CENTER LOADING	0.0001

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



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Console Calibration Report

Calibration Method

Critical Orifices

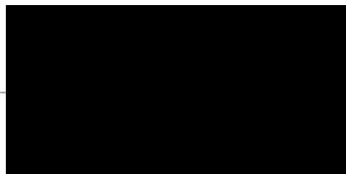
Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	DH _@ (mmH ₂ O)
B01	1563	02/03/2023	0.998	50.11
B02	8002514	03/03/2023	1.004	49.25
B03	1503016	03/03/2023	1.002	50.62
B04	00006659	02/03/2023	1.004	50.14
B05	00007428	03/03/2023	1.001	49.76
R01	1561	01/03/2023	0.997	49.86
R02	8002513	03/03/2023	0.996	49.93
R03	1570	02/03/2023	1.003	49.57
R04	8002519	01/03/2023	1.002	48.90
R05	1503015	01/03/2023	0.998	50.20

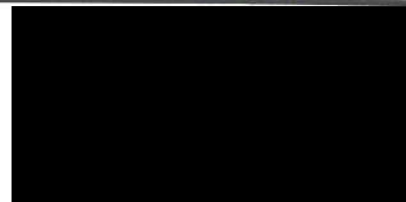
Remark : Accept Value of y (test) is $0.97 < y < 1.03$

Accept Value of $\Delta H_{@}$ (test) is 46.7 ± 6.4 (mmH₂O)

Calibrated by :



Approved by :





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Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B03	S	0.99	02/02/2023	0.84	0.84
B04	S	0.99	01/02/2023	0.84	0.83
B05	S	0.99	02/02/2023	0.84	0.85
B07	S	0.99	02/02/2023	0.85	0.84
B08	S	0.99	01/02/2023	0.83	0.84
B09	S	0.99	01/02/2023	0.84	0.84
B11	S	0.99	01/02/2023	0.84	0.84
B16	S	0.99	01/02/2023	0.84	0.83
B18	S	0.99	02/02/2023	0.84	0.84
B19	S	0.99	02/02/2023	0.85	0.84
B21	S	0.99	03/02/2023	0.84	0.84
B24	S	0.99	03/02/2023	0.84	0.83
B27	S	0.99	02/02/2023	0.84	0.84
B30	S	0.99	01/02/2023	0.83	0.84
B31	S	0.99	02/02/2023	0.84	0.85
B33	S	0.99	03/02/2023	0.84	0.84
B35	S	0.99	02/02/2023	0.84	0.85

Remark : Accept value of Cp (test) is 0.84 ± 0.01

Calibrated by :

Approved by :



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Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	02/02/2023	0.85	0.84
B37	S	0.99	02/02/2023	0.84	0.85
B38	S	0.99	01/02/2023	0.84	0.84
B39	S	0.99	03/02/2023	0.85	0.84
B40	S	0.99	02/02/2023	0.84	0.84
B41	S	0.99	02/02/2023	0.84	0.85
B44	S	0.99	03/02/2023	0.84	0.84
B45	S	0.99	01/02/2023	0.84	0.85
B46	S	0.99	01/02/2023	0.84	0.83
B47	S	0.99	01/02/2023	0.84	0.84
B48	S	0.99	03/02/2023	0.84	0.83
B49	S	0.99	03/02/2023	0.83	0.84
B54	S	0.99	03/02/2023	0.85	0.84
B56	S	0.99	02/02/2023	0.84	0.83
B57	S	0.99	02/02/2023	0.84	0.84
B58	S	0.99	02/02/2023	0.84	0.84

Remark : Accept value of Cp (test) is 0.84 ± 0.01

Calibrated by : _____

Approved by : _____



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Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R²
H-B01	Dwyer	VFB-65	05/04/2023	500	1,000	2,000	506.9	990.3	1974.3	0.989x + 9.271	1.000
H-B02	Dwyer	VFB-65	04/04/2023	500	1,000	2,000	495.3	999.1	1996.1	0.994x + 4.127	1.000
H-B03	Dwyer	VFB-65	07/04/2023	500	1,000	2,000	497.5	988.1	2009.6	1.003x - 14.485	0.999
H-B04	Dwyer	VFB-65	07/04/2023	500	1,000	2,000	501.2	1000.3	2006.5	0.997x - 1.216	1.000
H-B05	Dwyer	VFB-65	07/04/2023	500	1,000	2,000	500.2	999.6	1974.3	0.980x + 21.307	0.999
H-B06	Dwyer	VFB-65	07/04/2023	500	1,000	2,000	504.3	996.2	1984.0	1.004x - 6.770	1.000
H-B07	Dwyer	VFB-65	04/04/2023	500	1,000	2,000	502.3	990.7	2016.7	1.001x - 1.154	1.000
H-B08	Dwyer	VFB-65	05/04/2023	500	1,000	2,000	500.2	1000.6	1979.8	0.995x + 5.040	0.999
H-B09	Dwyer	VFB-65	07/04/2023	500	1,000	2,000	504.4	1007.4	2010.7	0.993x + 15.376	1.000
H-B10	Dwyer	VFB-65	10/04/2023	500	1,000	2,000	495.7	1001.6	2009.2	0.996x + 3.956	1.000

Calibrated by :

Approved by :



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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R²
L-B01	Dwyer	VFA-21	05/04/2023	50	100	200	50.3	98.7	198.9	0.986x + 0.859	1.000
L-B02	Dwyer	VFA-21	04/04/2023	50	100	200	50.6	99.8	198.3	0.995x + 0.956	0.999
L-B03	Dwyer	VFA-21	07/04/2023	50	100	200	50.4	99.6	197.9	1.009x - 1.350	1.000
L-B04	Dwyer	VFA-21	07/04/2023	50	100	200	49.5	102.0	200.7	1.012x - 0.487	1.000
L-B05	Dwyer	VFA-21	07/04/2023	50	100	200	50.9	98.9	201.2	0.998x + 1.040	0.999
L-B06	Dwyer	VFA-21	07/04/2023	50	100	200	50.8	99.7	202.8	1.009x + 0.150	1.000
L-B07	Dwyer	VFA-21	04/04/2023	50	100	200	49.0	101.2	200.5	1.014x - 1.381	1.000
L-B08	Dwyer	VFA-21	05/04/2023	50	100	200	50.2	102.1	197.7	0.997x + 0.307	1.000
L-B09	Dwyer	VFA-21	07/04/2023	50	100	200	50.8	99.6	201.1	0.990x + 2.095	0.999
L-B10	Dwyer	VFA-21	10/04/2023	50	100	200	51.0	99.0	203.2	1.005x + 0.453	1.000

Calibrated by :

Approved by :



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 \pm 3 $^{\circ}$ C
Pressure : 1010 \pm 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B01	SKC	224-PCXR4	262101	03/01/2023	1,000	1,500	2,000	993	1,497	1,998	1.003x - 5.584	1.000
B02	SKC	224-PCXR4	626166	03/01/2023	1,000	1,500	2,000	1,003	1,505	2,001	1.009x - 19.667	0.999
B03	SKC	224-PCXR4	612968	03/01/2023	1,000	1,500	2,000	996	1,494	2,000	1.006x - 12.109	1.000
B04	SKC	224-PCXR4	602804	04/01/2023	1,000	1,500	2,000	1,000	1,502	1,995	1.000x - 0.893	1.000
B05	SKC	224-PCXR4	612693	04/01/2023	1,000	1,500	2,000	1,003	1,500	2,003	1.012x - 22.224	0.999
B06	SKC	224-PCXR4	262188	03/01/2023	1,000	1,500	2,000	995	1,508	2,005	1.011x - 20.273	1.000
B07	SKC	224-PCXR4	626262	03/01/2023	1,000	1,500	2,000	998	1,492	1,995	0.993x + 6.086	1.000
B08	SKC	224-PCXR4	626100	03/01/2023	1,000	1,500	2,000	1,003	1,500	2,003	1.012x - 23.308	0.999
B09	SKC	224-PCXR4	626479	03/01/2023	1,000	1,500	2,000	996	1,490	1,994	0.995x + 1.117	1.000
B10	SKC	224-PCXR4	091950	03/01/2023	1,000	1,500	2,000	992	1,503	2,001	1.018x - 36.582	0.999
B11	SKC	224-PCXR8	564315	05/01/2023	1,000	1,500	2,000	996	1,490	1,999	1.003x - 8.256	1.000
B12	SKC	224-PCXR4	034656	05/01/2023	1,000	1,500	2,000	1,003	1,503	2,003	1.010x - 19.324	0.999
B13	SKC	224-PCXR4	602073	05/01/2023	1,000	1,500	2,000	995	1,500	1,998	1.001x - 3.474	1.000
B14	SKC	224-PCXR4	626313	04/01/2023	1,000	1,500	2,000	999	1,491	1,988	0.992x + 6.844	1.000
B15	SKC	224-PCXR4	626474	04/01/2023	1,000	1,500	2,000	1,001	1,502	2,005	1.014x - 25.558	0.999
B16	SKC	224-PCXR4	626477	04/01/2023	1,000	1,500	2,000	994	1,504	2,001	1.015x - 31.345	0.999
B17	SKC	224-PCXR4	626860	04/01/2023	1,000	1,500	2,000	997	1,494	1,991	0.997x - 0.359	1.000
B18	SKC	224-PCXR4	691484	04/01/2023	1,000	1,500	2,000	1,003	1,500	2,001	1.008x - 17.589	0.999
B19	SKC	224-PCXR4	691599	03/01/2023	1,000	1,500	2,000	993	1,503	1,999	1.007x - 11.574	1.000
B20	SKC	224-PCXR4	691587	03/01/2023	1,000	1,500	2,000	992	1,504	1,999	1.015x - 32.235	0.999
B21	SKC	224-PCXR4	691531	03/01/2023	1,000	1,500	2,000	993	1,499	1,994	1.001x - 7.107	1.000
B22	SKC	224-PCXR4	691654	05/01/2023	1,000	1,500	2,000	1,003	1,501	2,003	1.011x - 21.107	0.999
B23	SKC	224-PCXR4	798393	05/01/2023	1,000	1,500	2,000	992	1,507	2,002	1.018x - 34.883	0.999
B24	SKC	224-PCXR4	626363	05/01/2023	1,000	1,500	2,000	1,000	1,502	2,000	1.011x - 22.387	0.999
B25	SKC	224-PCXR4	798489	05/01/2023	1,000	1,500	2,000	1,001	1,492	2,001	0.998x + 1.101	1.000
B26	SKC	224-PCXR4	798479	05/01/2023	1,000	1,500	2,000	999	1,500	1,993	0.996x + 4.008	1.000
B27	SKC	224-PCXR4	691673	04/01/2023	1,000	1,500	2,000	994	1,503	2,002	1.016x - 32.071	0.999
B28	SKC	224-PCXR4	691570	04/01/2023	1,000	1,500	2,000	1,002	1,500	2,002	1.012x - 22.515	0.999
B29	SKC	224-PCXR4	626472	04/01/2023	1,000	1,500	2,000	1,000	1,496	1,998	1.001x - 4.842	1.000
B30	SKC	224-PCXR4	691489	03/01/2023	1,000	1,500	2,000	1,004	1,510	2,004	1.008x - 12.460	0.999
B31	SKC	224-PCXR4	691509	03/01/2023	1,000	1,500	2,000	992	1,497	1,998	1.006x - 12.711	1.000
B32	SKC	224-PCXR4	091567	05/01/2023	1,000	1,500	2,000	991	1,504	2,001	1.016x - 32.322	0.999
B33	SKC	224-PCXR4	091756	05/01/2023	1,000	1,500	2,000	993	1,497	1,991	0.997x - 0.004	1.000
B34	SKC	224-PCXR4	612962	05/01/2023	1,000	1,500	2,000	1,002	1,501	2,002	1.007x - 14.195	1.000
B35	SKC	224-PCXR4	602682	05/01/2023	1,000	1,500	2,000	993	1,498	1,995	1.002x - 8.448	1.000
B36	SKC	224-PCXR4	626164	03/01/2023	1,000	1,500	2,000	999	1,496	1,999	1.001x - 5.424	1.000
B37	SKC	224-PCXR4	626256	03/01/2023	1,000	1,500	2,000	994	1,506	1,999	1.013x - 27.815	0.999
B38	SKC	224-PCXR4	626167	03/01/2023	1,000	1,500	2,000	997	1,496	1,996	0.999x - 0.997	1.000
B39	SKC	224-PCXR4	034637	03/01/2023	1,000	1,500	2,000	1,005	1,501	2,001	1.010x - 18.618	0.999
B40	SKC	224-PCXR4	798349	05/01/2023	1,000	1,500	2,000	994	1,506	1,999	1.014x - 22.622	0.999

Calibrated by :

Approved by :



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 \pm 3 $^{\circ}$ C
Pressure : 1010 \pm 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B41	SKC	224-PCXR4	612669	05/01/2023	1,000	1,500	2,000	998	1,497	1,990	0.997x + 0.718	1.000
B42	SKC	224-PCXR4	626041	05/01/2023	1,000	1,500	2,000	1,004	1,498	1,991	0.986x + 18.291	1.000
B43	SKC	224-PCXR4	034636	05/01/2023	1,000	1,500	2,000	1,000	1,501	1,992	0.991x + 11.882	1.000
B44	SKC	224-PCXR8	529341	06/01/2023	1,000	1,500	2,000	1,002	1,502	2,002	1.005x - 9.213	1.000
B45	SKC	224-PCXR8	529594	06/01/2023	1,000	1,500	2,000	999	1,501	1,989	0.991x + 11.184	1.000
B46	SKC	224-PCXR8	566743	06/01/2023	1,000	1,500	2,000	995	1,504	2,002	1.014x - 30.571	0.999
B47	SKC	224-PCXR8	566747	06/01/2023	1,000	1,500	2,000	1,002	1,502	2,004	1.013x - 24.601	0.999
B48	SKC	224-PCXR8	566753	04/01/2023	1,000	1,500	2,000	1,000	1,494	1,998	0.998x + 0.319	1.000
B49	SKC	224-PCXR8	566780	04/01/2023	1,000	1,500	2,000	1,003	1,502	2,006	1.013x - 23.982	0.999
B50	SKC	224-PCXR8	500400	04/01/2023	1,000	1,500	2,000	1,001	1,496	2,002	1.001x - 3.538	1.000
B51	SKC	224-PCXR8	500363	04/01/2023	1,000	1,500	2,000	996	1,504	1,999	1.011x - 25.031	0.999
B52	SKC	224-PCXR8	093186	04/01/2023	1,000	1,500	2,000	995	1,496	1,994	0.997x - 0.602	1.000
B53	SKC	224-PCXR8	707870	03/01/2023	1,000	1,500	2,000	1,002	1,500	2,002	1.008x - 15.403	0.999
B54	SKC	224-PCXR3	509821	03/01/2023	1,000	1,500	2,000	993	1,502	2,001	1.017x - 34.237	0.999
B55	SKC	224-PCXR3	510710	03/01/2023	1,000	1,500	2,000	999	1,494	1,994	0.997x - 0.989	1.000
B56	SKC	224-PCXR3	511450	03/01/2023	1,000	1,500	2,000	1,002	1,500	2,001	1.004x - 8.081	1.000
B57	SKC	224-PCXR3	510798	06/01/2023	1,000	1,500	2,000	997	1,492	1,998	1.000x - 2.680	1.000
B58	SKC	224-PCXR3	509852	06/01/2023	1,000	1,500	2,000	1,000	1,498	1,999	1.007x - 18.953	0.999
B59	SKC	224-PCXR3	509862	06/01/2023	1,000	1,500	2,000	996	1,503	1,994	0.997x + 3.235	1.000
B60	SKC	224-PCXR3	512655	06/01/2023	1,000	1,500	2,000	1,002	1,500	2,003	1.006x - 11.407	1.000
B61	SKC	224-PCXR3	503915	06/01/2023	1,000	1,500	2,000	994	1,489	1,998	1.004x - 12.623	1.000
B62	SKC	224-PCXR3	505975	06/01/2023	1,000	1,500	2,000	999	1,494	1,996	0.997x + 0.343	1.000
B63	SKC	224-PCXR3	511432	03/01/2023	1,000	1,500	2,000	991	1,501	1,999	1.016x - 34.624	0.999
B64	SKC	224-PCXR3	508302	03/01/2023	1,000	1,500	2,000	997	1,492	1,989	0.992x + 6.226	1.000
B65	SKC	224-PCXR3	508310	03/01/2023	1,000	1,500	2,000	1,002	1,500	2,003	1.007x - 13.936	1.000
B66	SKC	224-PCXR3	509861	03/01/2023	1,000	1,500	2,000	1,002	1,491	1,991	0.987x + 14.183	1.000
B67	SKC	224-PCXR3	506295	04/01/2023	1,000	1,500	2,000	993	1,508	2,004	1.009x - 15.555	1.000
B68	SKC	224-PCXR3	505872	04/01/2023	1,000	1,500	2,000	1,002	1,490	1,997	0.995x + 3.841	1.000
B69	SKC	224-PCXR3	508375	04/01/2023	1,000	1,500	2,000	1,002	1,499	2,000	1.010x - 20.772	0.999
B70	SKC	224-PCXR3	510623	05/01/2023	1,000	1,500	2,000	992	1,503	1,997	1.002x - 5.855	1.000
B71	SKC	224-PCXR3	508367	05/01/2023	1,000	1,500	2,000	992	1,506	2,002	1.017x - 34.791	0.999
B72	SKC	224-PCXR3	505977	05/01/2023	1,000	1,500	2,000	1,001	1,498	1,993	0.991x + 8.962	1.000
B73	SKC	224-PCXR3	512606	05/01/2023	1,000	1,500	2,000	1,002	1,501	2,005	1.009x - 14.785	1.000
B74	SKC	224-PCXR3	505993	05/01/2023	1,000	1,500	2,000	996	1,495	1,994	1.000x - 6.916	1.000
B75	SKC	224-PCXR3	509820	04/01/2023	1,000	1,500	2,000	995	1,498	1,990	0.996x + 1.791	1.000
B76	SKC	224-PCXR3	509811	04/01/2023	1,000	1,500	2,000	993	1,498	1,998	1.006x - 14.322	1.000
B77	SKC	224-PCXR3	508301	04/01/2023	1,000	1,500	2,000	1,000	1,501	2,003	1.014x - 26.603	0.999
B78	SKC	224-PCXR3	510677	04/01/2023	1,000	1,500	2,000	995	1,503	1,999	1.013x - 28.156	0.999
B79	SKC	224-PCXR3	510920	03/01/2023	1,000	1,500	2,000	994	1,493	1,994	0.999x - 4.184	1.000

Calibrated by :

Approved by :



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 \pm 3 $^{\circ}$ C
Pressure : 1010 \pm 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B80	SKC	224-PCXR3	504569	03/01/2023	1,000	1,500	2,000	1,002	1,499	2,002	1.012x - 24.026	0.999
B81	SKC	224-PCXR3	503480	03/01/2023	1,000	1,500	2,000	996	1,499	2,000	1.014x - 30.524	0.999
B82	SKC	224-PCXR3	505673	06/01/2023	1,000	1,500	2,000	994	1,498	1,996	1.001x - 5.943	1.000
B83	SKC	224-PCXR3	510785	06/01/2023	1,000	1,500	2,000	1,010	1,499	2,002	1.004x - 10.466	0.999
B84	SKC	224-PCXR3	508333	06/01/2023	1,000	1,500	2,000	997	1,495	1,991	0.996x + 1.260	1.000
B85	SKC	224-PCXR3	505757	06/01/2023	1,000	1,500	2,000	994	1,502	1,998	1.005x - 13.844	1.000
B86	SKC	224-PCXR3	512625	03/01/2023	1,000	1,500	2,000	1,013	1,503	2,004	1.001x - 0.726	0.999
B87	SKC	224-PCXR3	504324	03/01/2023	1,000	1,500	2,000	998	1,496	2,000	1.000x - 1.109	1.000
B88	SKC	224-PCXR3	508307	03/01/2023	1,000	1,500	2,000	996	1,498	1,994	0.996x + 1.532	1.000
B89	SKC	224-PCXR3	509860	04/01/2023	1,000	1,500	2,000	1,000	1,499	2,003	1.008x - 15.156	1.000
B90	SKC	224-PCXR3	508366	04/01/2023	1,000	1,500	2,000	993	1,508	1,999	1.006x - 12.512	1.000
B91	SKC	224-PCXR3	510919	04/01/2023	1,000	1,500	2,000	1,000	1,498	1,996	0.990x + 8.719	1.000
B92	SKC	224-PCXR3	510987	04/01/2023	1,000	1,500	2,000	1,002	1,501	1,999	1.000x + 0.299	1.000
B93	SKC	224-PCXR3	509845	04/01/2023	1,000	1,500	2,000	995	1,496	2,004	1.009x - 16.979	1.000
B94	SKC	224-PCXR8	A127871	03/01/2023	1,000	1,500	2,000	1,000	1,500	2,002	1.007x - 19.105	0.999
B95	SKC	224-PCXR8	A127921	03/01/2023	1,000	1,500	2,000	993	1,502	2,001	1.015x - 30.898	0.999
B96	SKC	224-PCXR8	A127942	03/01/2023	1,000	1,500	2,000	998	1,498	1,995	0.998x - 1.485	1.000
B97	SKC	224-PCXR8	A127955	03/01/2023	1,000	1,500	2,000	1,003	1,501	2,003	1.011x - 20.356	0.999
B98	SKC	224-PCXR8	A127956	03/01/2023	1,000	1,500	2,000	996	1,498	1,997	1.003x - 7.473	1.000

Calibrated by :

Approved by :



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 \pm 3 $^{\circ}$ C
Pressure : 1010 \pm 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R01	SKC	224-PCXR4	602467	03/01/2023	1,000	1,500	2,000	993	1,508	2,004	1.008x - 13.936	0.999
R02	SKC	224-PCXR4	626450	06/01/2023	1,000	2,000	3,000	998	1,499	1,990	0.989x + 12.268	1.000
R03	SKC	224-PCXR4	691592	06/01/2023	1,000	1,500	2,000	1,003	1,500	2,004	1.011x - 21.761	0.999
R04	SKC	224-PCXR4	691672	06/01/2023	1,000	1,500	2,000	996	1,493	1,995	0.997x - 1.563	1.000
R05	SKC	224-PCXR4	798470	06/01/2023	1,000	1,500	2,000	993	1,505	1,999	1.014x - 31.752	0.999
R06	SKC	224-PCXR4	798456	06/01/2023	1,000	1,500	2,000	993	1,498	1,994	1.003x - 8.555	1.000
R07	SKC	224-PCXR4	798480	04/01/2023	1,000	1,500	2,000	994	1,490	1,999	1.007x - 16.073	1.000
R08	SKC	224-PCXR4	883215	04/01/2023	1,000	1,500	2,000	1,011	1,501	2,005	0.999x + 3.207	1.000
R09	SKC	224-PCXR4	034650	04/01/2023	1,000	1,500	2,000	991	1,504	2,002	1.018x - 35.900	0.999
R10	SKC	224-PCXR4	091765	04/01/2023	1,000	1,500	2,000	997	1,512	1,994	0.999x + 0.977	1.000
R11	SKC	224-PCXR4	091763	03/01/2023	1,000	1,500	2,000	1,000	1,499	2,002	1.013x - 25.119	0.999
R12	SKC	224-PCXR4	091568	03/01/2023	1,000	1,500	2,000	997	1,501	1,999	1.001x - 4.906	1.000
R13	SKC	224-PCXR4	091638	03/01/2023	1,000	1,500	2,000	1,002	1,499	1,994	0.992x + 9.636	1.000
R14	SKC	224-PCXR4	091764	03/01/2023	1,000	1,500	2,000	994	1,502	1,999	1.014x - 30.212	0.999
R15	SKC	224-PCXR8	529457	03/01/2023	1,000	1,500	2,000	1,001	1,500	2,004	1.006x - 11.941	1.000
R16	SKC	224-PCXR8	529643	05/01/2023	1,000	1,500	2,000	998	1,497	1,994	1.000x - 4.686	1.000
R17	SKC	224-PCXR8	529645	05/01/2023	1,000	1,500	2,000	994	1,509	2,000	1.015x - 30.731	0.999
R18	SKC	224-PCXR8	566756	05/01/2023	1,000	1,500	2,000	991	1,498	1,998	1.001x - 6.840	1.000
R19	SKC	224-PCXR8	566802	05/01/2023	1,000	1,500	2,000	1,002	1,499	2,000	1.010x - 21.027	0.999
R20	SKC	224-PCXR8	529089	03/01/2023	1,000	1,500	2,000	991	1,501	2,003	1.020x - 39.916	0.999
R21	SKC	224-PCXR8	665728	03/01/2023	1,000	1,500	2,000	998	1,493	1,999	1.000x - 5.404	1.000
R22	SKC	224-PCXR8	707444	03/01/2023	1,000	1,500	2,000	1,002	1,500	2,002	1.004x - 7.135	1.000
R23	SKC	224-PCXR8	761067	03/01/2023	1,000	1,500	2,000	998	1,494	1,991	0.993x + 4.132	1.000
R24	SKC	224-PCXR8	707893	04/01/2023	1,000	1,500	2,000	996	1,505	2,000	1.008x - 17.553	0.999
R25	SKC	224-PCXR8	761052	04/01/2023	1,000	1,500	2,000	1,010	1,499	1,993	0.984x + 23.464	1.000
R26	SKC	224-PCXR8	707956	04/01/2023	1,000	1,500	2,000	1,002	1,500	2,004	1.009x - 15.842	1.000
R27	SKC	224-PCXR8	707398	04/01/2023	1,000	1,500	2,000	996	1,503	2,001	1.005x - 13.449	1.000
R28	SKC	224-PCXR8	707461	04/01/2023	1,000	1,500	2,000	1,004	1,500	2,002	1.010x - 19.288	0.999
R29	SKC	224-PCXR8	707402	03/01/2023	1,000	1,500	2,000	1,004	1,493	1,991	0.988x + 14.167	1.000
R30	SKC	224-PCXR8	093811	03/01/2023	1,000	1,500	2,000	1,000	1,495	1,994	0.996x + 1.922	1.000
R31	SKC	224-PCXR8	093183	03/01/2023	1,000	1,500	2,000	1,001	1,501	2,001	1.002x - 3.618	1.000
R32	SKC	224-PCXR8	671950	03/01/2023	1,000	1,500	2,000	998	1,498	1,994	0.995x + 4.970	1.000
R33	SKC	224-PCXR4	626254	03/01/2023	1,000	1,500	2,000	995	1,502	1,999	1.014x - 31.070	0.999
R34	SKC	224-PCXR4	626131	03/01/2023	1,000	1,500	2,000	1,002	1,498	2,004	1.006x - 11.810	1.000
R35	SKC	224-PCXR8	707460	03/01/2023	1,000	1,500	2,000	999	1,498	1,995	0.994x + 6.669	1.000
R36	SKC	224-PCXR8	707446	03/01/2023	1,000	1,500	2,000	1,004	1,499	2,001	1.009x - 18.036	0.999
R37	SKC	224-PCXR8	707432	03/01/2023	1,000	1,500	2,000	996	1,499	1,998	1.000x - 2.070	1.000
R38	SKC	224-PCXR8	707349	03/01/2023	1,000	1,500	2,000	996	1,500	2,001	1.004x - 9.345	1.000
R39	SKC	224-PCXR8	761095	03/01/2023	1,000	1,500	2,000	1,001	1,495	1,994	0.996x + 1.922	1.000

Calibrated by :

Approved by :



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 \pm 3 $^{\circ}$ C
 Pressure : 1010 \pm 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R²
R40	SKC	224-PCXR4	612753	05/01/2023	1,000	1,500	2,000	1,001	1,502	2,003	1.012x - 23.564	0.999
R41	SKC	224-PCXR4	626140	05/01/2023	1,000	1,500	2,000	992	1,509	2,001	1.017x - 32.442	0.999
R42	SKC	224-PCXR4	626463	05/01/2023	1,000	1,500	2,000	998	1,493	1,999	1.001x - 2.963	1.000
R43	SKC	224-PCXR4	626129	05/01/2023	1,000	1,500	2,000	1,003	1,501	2,003	1.010x - 18.945	0.999
R44	SKC	224-PCXR4	602753	05/01/2023	1,000	1,500	2,000	1,002	1,496	1,993	0.995x + 2.529	1.000
R45	SKC	224-PCXR4	626137	05/01/2023	1,000	1,500	2,000	992	1,505	2,002	1.019x - 37.408	0.999

Calibrated by :

Approved by



CERTIFICATE No : 23M2441
REFERENCE No : 68471-1

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 : 10-Mar-23

APPROVED BY : 

ISSUED DATE : 16-Mar-23

RECEIVED DATE : 10-Mar-23



CERTIFICATE No : 23M2441

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA 05/50 RECEIVED DATE : 10-Mar-23
AIR PRESSURE : 1010mbar \pm 1mbar CALIBRATION DATE : 10-Mar-23
AMBIENT TEMPERATURE : 23° C \pm 1° C RELATIVE HUMIDITY : 49 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-25

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

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

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000039
0.02	0.02000	0.00000	0.000039
0.10	0.10000	0.00000	0.000039
0.20	0.20001	-0.00001	0.000040
0.50	0.50001	-0.00001	0.000040
1.00	1.00000	0.00000	0.000041
2.00	2.00003	-0.00003	0.000042
5.00	5.00001	-0.00001	0.000046
10.00	10.00003	-0.00003	0.000053
20.00	20.00005	-0.00005	0.000067
50.00	50.00001	-0.00001	0.00011
100.00	100.00001	-0.00001	0.00019
200.00	200.00001	-0.00001	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0001
3	50.0000
4	50.0000
5	49.9999
OFF-CENTER LOADING	0.0001

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



บริษัท เอกเสคคิวทิฟ เทรดดิง จำกัด (สำนักงานใหญ่)

48/194-5 ซอยประดิษฐ์มนูธรรม 19 ถนนประดิษฐ์มนูธรรม แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230
TEL. (662) 515-0145-50 FAX. (662) 515-0144 www.etlthai.com E-mail : info@etlthai.com

ที่ RA 033/23

ใบรายงานผลการปรับเทียบ

ชื่อผู้ขอรับบริการ : บริษัท ไออาร์พีซี จำกัด (มหาชน)

ที่อยู่ : 299 หมู่ 5 ถนนสุขุมวิท ตำบลเชิงเนิน อำเภอเมืองระยอง จังหวัดระยอง 21000

ปรับเทียบที่ : บริษัท เอกเสคคิวทิฟ เทรดดิง จำกัด

ที่อยู่ : 48/194-5 ซอย ประดิษฐ์มนูธรรม 19 ถนนประดิษฐ์มนูธรรม แขวง/เขตลาดพร้าว กรุงเทพฯ 10230

รายละเอียดเครื่องมือที่ทำการปรับเทียบ :

เครื่องมือ : เครื่องตรวจวัดไอระเหยจากสารเคมี

ผลิตภัณฑ์ : RAE Systems

รุ่น : MiniRAE3000

หมายเลขเครื่อง : 592-001193

สภาวะแวดล้อม :

อุณหภูมิ : $(25 \pm 3) ^\circ\text{C}$

ความชื้นสัมพัทธ์ : $(24 \pm 15) \%$

ความดันบรรยากาศ : 760 มิลลิเมตรปรอท

วันที่ปรับเทียบมาตรฐาน : 7 มีนาคม 2566

วันที่ครบกำหนดการปรับเทียบ : 7 มีนาคม 2567

วิธีการปรับเทียบมาตรฐาน : ปรับเทียบ โดยใช้ Standard Reference Gas ผลิตภัณฑ์ CALGAZ.

- Isobutylene Standard Gas 100 ppm; Lot number 304-402257108-1.

- Isobutylene Standard Gas 1000 ppm; Lot number 304-402250416-1.

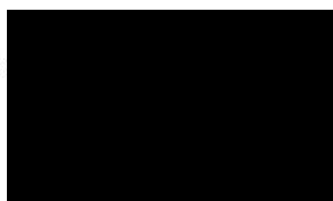
ผลการปรับเทียบมาตรฐาน

Sensor Type	Reference Concentration	Before Cal.	After Cal.	Error Reading	Result
PID	0 ppm (Air Zero)	0.0 ppm	0.0 ppm	0.0 ppm	Pass
PID	100 ppm (Isobutylene 100 ppm)	85.0 ppm	100.0 ppm	0.0 ppm	Pass
PID	1000 ppm (Isobutylene 1000 ppm)	899.5 ppm	991.8 ppm	8.2 ppm	Pass

Flow Rate of Pump : 480 cc/min.

Accuracy : $\pm 2 \%$ at calibration point

ผู้ปรับเทียบ :



ผู้ตรวจสอบ :



ผลการสอบเทียบ/ปรับเทียบ นี้ รับรองเฉพาะตัวอย่างและรายการที่ได้รับไว้เท่านั้น

การนำรายงานผล/ใบรับรองนี้ไปโฆษณาและการคัดลอกหรือการนำผลบางส่วนไปเผยแพร่ต่อสาธารณะต้องได้รับอนุญาตเป็นลายลักษณ์อักษรจากทางบริษัทฯ



บริษัท เอกเสคคิวทิฟ เทรตติ้ง จำกัด (สำนักงานใหญ่)

48/194-5 ซอยประดิษฐ์มนูธรรม 19 ถนนประดิษฐ์มนูธรรม แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230
TEL. (662) 515-0145-50 FAX. (662) 515-0144 www.etlthai.com E-mail : info@etlthai.com

No. RA 033/23

Certificate of Calibration

Customer : IRPC Public Company Limited.
Address : 169 Moo 9, Suk Sawat 45, Suk Sawat Road, Bang Kru, Phra Pradaeng, Samut Prakan 10130
Thailand.

Calibration location : Executive Trading Limited.
Address : 48/194-5 Soi Praditmanutham 19, Pradit Manutham Road, Latphrao, Bangkok 10230

Tools :

Environmental Condition :

Instrument	: Gas Detector	Temperature	: $(25 \pm 3) ^\circ\text{C}$
Product	: RAE Systems	Relative Humidity	: $(24 \pm 15) \%$
Model Name	: MiniRAE3000	Pressure	: 760 mmHg
Serial Number	: 592-001193		

Date of Calibration : March 7, 2023

Due Date of Calibration : March 7, 2024

Calibration Method : This instrument has been calibrated using calibration gases. Test and calibration data is
On file with Executive trading limited.

Reference Standard : - Isobutylene Standard Gas 100 ppm; Lot number 304-402257108-1.
- Isobutylene Standard Gas 1000 ppm; Lot number 304-402250416-1.

Test Result

Sensor Type	Reference Concentration	Before Cal.	After Cal.	Error Reading	Result
PID	0 ppm (Air Zero)	0.0 ppm	0.0 ppm	0.0 ppm	Pass
PID	100 ppm (Isobutylene 100 ppm)	85.0 ppm	100.0 ppm	0.0 ppm	Pass
PID	1000 ppm (Isobutylene 1000 ppm)	899.5 ppm	991.8 ppm	8.2 ppm	Pass

Flow Rate of Pump : 480 cc/min.

Accuracy : $\pm 2 \%$ at calibration point

Calibrated By :

Approved By :

The results relate only to the items tested or calibrated.

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



บริษัท เอกเสคคิวทิฟ เทรตติ้ง จำกัด (สำนักงานใหญ่)

48/194-5 ซอยประดิษฐ์มนูธรรม 19 ถนนประดิษฐ์มนูธรรม แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230
TEL. (662) 515-0145-50 FAX. (662) 515-0144 www.etlthai.com E-mail : info@etlthai.com

ที่ RA 033/23

ใบรายงานการตรวจเช็คเครื่องตรวจวัดก๊าซ รุ่น MiniREA3000

หมายเลขเครื่อง : 592-001193

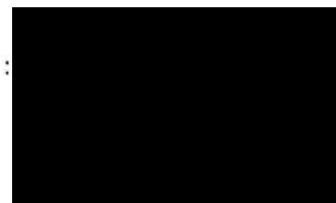
วันที่ตรวจเช็ค : 7 มีนาคม 2566

ลำดับที่	รายละเอียดการตรวจสอบ	RAW COUNT		สรุป	หมายเหตุ
		REF.	REAL		
1.	PID RAW COUNT				
	Ch.H	10000-62500	48079	■ YES □ NO	
	Ch.L	<62500	52722	■ YES □ NO	
2.	Lamp	>40	48	■ YES □ NO	

ลำดับที่	รายละเอียดการตรวจซ่อม	การแก้ไข	สรุป	หมายเหตุ
1.	Motor Pump	Check flow rate	■ YES □ NO	480 cc/min.
2.	Buzzer	-	■ YES □ NO	-
3.	Li-ion Battery	-	■ YES □ NO	-
4.	Key Pad			
	Y/+	-	■ YES □ NO	-
	N/-	-	■ YES □ NO	-
	MODE	-	■ YES □ NO	-
5.	LCD Display	-	■ YES □ NO	-
6.	Light Sensor	-	■ YES □ NO	-
7.	Pocket Clip	-	□ YES □ NO	-
8.	PC Port	-	■ YES □ NO	-
9.	Slim Rubber Boot	-	■ YES □ NO	-
10.	Tube adapter assembly	-	□ YES □ NO	-

ผู้ตรวจเช็ค

:



ผลการสอบเทียบ/ปรับเทียบ นี้ รับรองเฉพาะตัวอย่างและรายการที่ได้ระบุไว้เท่านั้น

การนำรายงานผล/ใบรับรองนี้ไปโฆษณาและการคัดลอกหรือการนำผลบางส่วนไปเผยแพร่ต่อสาธารณะต้องได้รับอนุญาตเป็นลายลักษณ์อักษรจากทางบริษัทฯ



CERTIFICATE OF ANALYSIS

Date: November 8, 2021
PO Number: 0000020821
Lot Number: 304-402257108-1

Customer: CalGaz Internl LLC

Use Before: 11/08/2025

<u>Component</u>	<u>Requested Concentration</u>	<u>Analytical Result (+/- 2%)</u>
Isobutylene Air	100 PPM Balance	100.5 PPM Balance

Cylinder Size: 3.6 Cu. Ft.
Contents: 103 Liter

Valve: 5/8" -18UNF
Pressure: 1000 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/ or N.I.S.T.
Gas Mixture reference materials.

Analyst:





CERTIFICATE OF ANALYSIS

Date: November 8, 2021
Order Number: 0000020821
Lot Number: 304-402250416-1

Customer: CalGaz Internl LLC
Use Before: 11/08/2025

<u>Component</u>	<u>Requested Concentration</u>	<u>Analytical Result (+/- 2%)</u>
Isobutylene Air	1000 PPM Balance	995 PPM Balance

Cylinder Size: 1.2 Cu. Ft.
Contents: 34 Liter

Valve: CGA 600
Pressure: 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/ or N.I.S.T. Gas Mixture reference materials.



**CERTIFICATE
of
Attendance**

It is hereby certified that

Mr Surinthorn Sainate
(Executive Trading Limited)

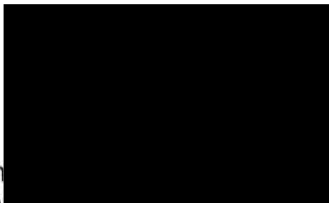
has successfully completed the

RAE Service Training Course

Conducted by

HONEYWELL

on **2nd August 2022**



Conducted by
Service Engineer / Technical Trainer
Date of Issue : 2nd August 2022
Certificate valid for 2 years from date of issue

SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



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

NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. No. : SP22018

Pages 1 of 3

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER
Manufacturer : PERKINELMER
Model : LAMBDA 25
Serial No.: 501S14123010
ID No.: SP03/58
Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY

Condition As Found : GOOD

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD,
CHOMPHON, CHATUCHAK,
BANGKOK 10900, THAILAND.

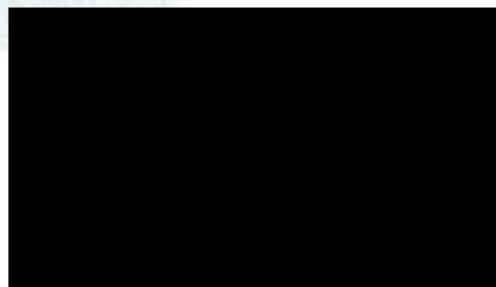
Location : ORGANIC LABORATORY IV

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

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

Calibrated by :

Approved by :



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

Continuation of Calibration Certificate

Cert. No. : SP22018

Job No. : VC65SP0008

Pages : 2 of 3

Calibration Method :

This instrument was calibrated by using on-site calibration procedure In-house method : CP-SP-01

The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution, Photometric accuracy by using absorbance standard filter and absorbance standard solution

The calibration procedure used was based on ASTM E275-01,ASTM E925-02

Condition of this result of calibration :

1. Certified reference materials

<u>Material</u>	<u>Ref. type</u>	<u>Cell serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Holmium liquid	RM-HL	29706	87569	13/10/2022
Didymium liquid	RM-DL	28912	87588	15/10/2022
Neutral density filter	RM-1N2N3N	13877	87600	15/10/2022
Potassium dichromate solutions	RM-0204060810	14204	87614	16/10/2022
Potassium Iodide solution	-	KI-0701-001	CI-0090-22	08/04/2024

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

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

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology,NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

<u>Material</u>	<u>Certified Values of Reference Material (nm)</u>	<u>UUC* Reading (nm)</u>	<u>Error (nm)</u>	<u>Uncertainty ± (nm)</u>	<u>k Factor</u>
RM-HL	278.13	278.3	0.17	0.16	2.00
	361.25	361.4	0.15	0.16	2.00
	467.82	467.8	-0.02	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.5	0.00	0.16	2.00
RM-DL	740.09	740.0	-0.09	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC* = Unit Under Calibration

Continuation of Calibration Certificate

Cert. No. : SP22018
Job No. : VC65SP0008
Pages : 3 of 3

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Filter: S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0524	1.0539	0.0015	0.0028	2.00
		29914	0.7	0.7454	0.7459	0.0005	0.0029	2.00
		29381	0.5	0.5426	0.5426	0.0000	0.0028	2.00
	546.1	29360	1.0	0.9822	0.9810	-0.0012	0.0028	2.00
		29914	0.7	0.6962	0.6960	-0.0002	0.0028	2.00
		29381	0.5	0.5076	0.5070	-0.0006	0.0029	2.00
	590.0	29360	1.0	1.0221	1.0202	-0.0019	0.0028	2.00
		29914	0.7	0.7238	0.7230	-0.0008	0.0029	2.00
		29381	0.5	0.5364	0.5360	-0.0004	0.0031	2.00
	635.0	29360	1.0	0.9751	0.9732	-0.0019	0.0028	2.00
		29914	0.7	0.6912	0.6902	-0.0010	0.0029	2.00
		29381	0.5	0.5214	0.5210	-0.0004	0.0032	2.00
Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor	
RM-0204060810	235.0	20	0.2436	0.2419	-0.0017	0.0101	2.00	
		40	0.4905	0.4855	-0.0050	0.0115	2.00	
		60	0.7453	0.7388	-0.0065	0.0067	2.00	
		80	0.9920	0.9839	-0.0081	0.0071	2.00	
		100	1.2487	1.2414	-0.0073	0.0073	2.00	

UUC* = Unit Under Calibration

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

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

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

**Specific Acceptance :
Transmission \leq 1.0 T(%), Absorbance \geq 2.0 A
**Stray light not TISI Accredited

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

End of Calibration Certificate



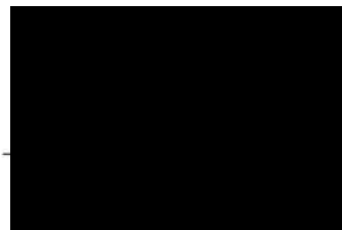
บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	05 April 2023	Brand :	API	Model :	300E
No.	CO-B01			Serial No.	782
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	39.92	-0.200	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4015.7	mV	2500-4800 mV		
CO Reference	3948.5	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.5	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	804	CC/Min	800 ± 10%		
Sample Temperature	48.3	°C	48 ± 4		
Bench Temperature	48.1	°C	48 ± 2		
Wheel Temperature	68.3	°C	68 ± 2		
Box Temperature	30.6	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3029.3	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :



Approved by :





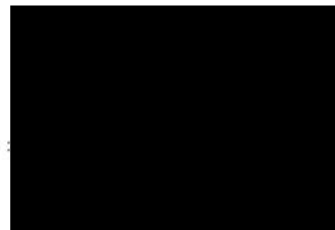
บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72 Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report							
Non-Dispersive Infrared CO Analyzer							
Date :	07 April 2023	Brand :	API	Model :	300E		
No.	CO-B02	Serial No.	965				
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	0.11		-	0		
CO Span	40.00	40.04		0.100	40.00		
API Model 300E CO Analyzer Check List							
Parameter	Observed Value	Units	Nominal Range				
Range	50	PPM	0-1000 ppm				
Stability	0.10	PPM	< 1 ppm With Zero Air				
CO Measure	4016.1	mV	2500-4800 mV				
CO Reference	3948.9	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	814	CC/Min	800 ± 10%				
Sample Temperature	46.5	°C	48 ± 4				
Bench Temperature	48.2	°C	48 ± 2				
Wheel Temperature	68.4	°C	68 ± 2				
Box Temperature	30.8	°C	Ambient Temp + 7 ± 10				
Photo-Drive	3025.1	mV	250 mV to 4750 mV				
Slope	1.017	-	1.0 ± 0.3				
Offset	0.2	-	0 ± 0.3				

Calibrated by :



Approved by :

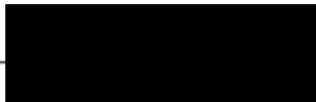




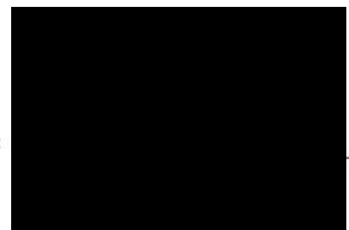
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Tel : (662) 939-4370-72 Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	07 April 2023	Brand :	API	Model :	300E
No.	CO-B03	Serial No.	3019		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 06 September 2022		Serial No.	: 421	
Reference Standard Gas					
Standard Gas	: Carbon Monoxide (CO)		Cylinder No.	: D196045	
Certified Date	: 16 April 2022	Expired Date	: 15 April 2024	Cylinder Conc.	: 4,570 ppm
Calibrating Condition					
Pressure	1011	mmbar	Temp.	24.6	°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	39.96	-0.100	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4013.6	mV	2500-4800 mV		
CO Reference	3946.8	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.4	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	805	CC/Min	800 ± 10%		
Sample Temperature	48.3	°C	48 ± 4		
Bench Temperature	48.0	°C	48 ± 2		
Wheel Temperature	68.2	°C	68 ± 2		
Box Temperature	30.6	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3038.2	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :



Approved by :

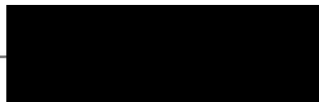




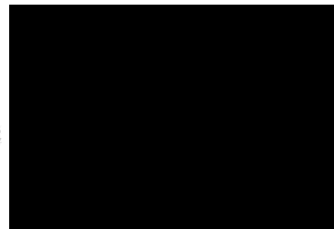
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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	05 April 2023	Brand :	API	Model :	300E
No.	CO-B04			Serial No.	3089
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 06 September 2022			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D196045		
Certified Date : 16 April 2022		Expired Date : 15 April 2024		Cylinder Conc. : 4,570 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.6 °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	40.06		0.150	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4014.5	mV	2500-4800 mV		
CO Reference	3947.2	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.7	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	813	CC/Min	800 ± 10%		
Sample Temperature	48.4	°C	48 ± 4		
Bench Temperature	48.1	°C	48 ± 2		
Wheel Temperature	68.2	°C	68 ± 2		
Box Temperature	30.7	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3026.5	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :



Approved by :

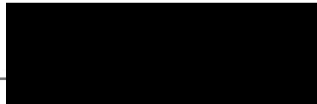




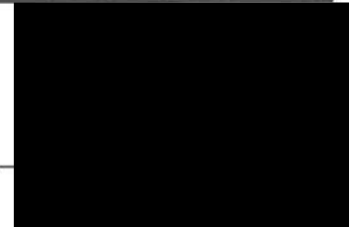
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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	07 April 2023	Brand :	API	Model :	300E
No.	CO-B05			Serial No.	3116
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 06 September 2022			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D196045		
Certified Date : 16 April 2022		Expired Date : 15 April 2024		Cylinder Conc. : 4,570 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.6 °C		% RH : 49	
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.10	-	0	
CO Span	40.00	39.95	-0.125	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4017.4	mV	2500-4800 mV		
CO Reference	3949.1	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.5	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	810	CC/Min	800 ± 10%		
Sample Temperature	48.2	°C	48 ± 4		
Bench Temperature	48.0	°C	48 ± 2		
Wheel Temperature	68.3	°C	68 ± 2		
Box Temperature	30.8	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3036.2	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :



Approved by :

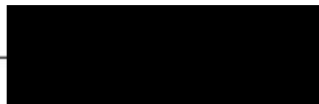




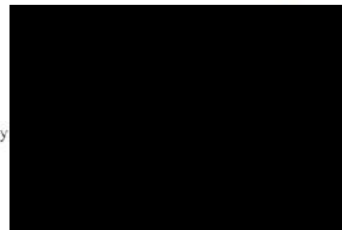
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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	07 April 2023	Brand :	API	Model :	300E
No.	CO-B06			Serial No.	3117
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 06 September 2022			Serial No. : 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	0.11	-	0	
CO Span	40.00	40.10	0.250	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4015.9	mV	2500-4800 mV		
CO Reference	3946.1	mV	2500-4800 mV		
Measure/Reference Ratio	1.181	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.4	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	811	CC/Min	800 ± 10%		
Sample Temperature	48.5	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.5	°C	68 ± 2		
Box Temperature	30.6	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3021.5	mV	250 mV to 4750 mV		
Slope	1.018	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :



Approved by





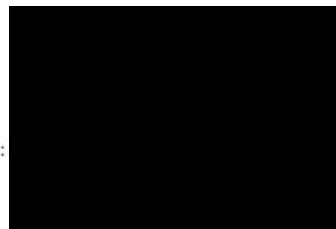
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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	05 April 2023	Brand :	Thermo	Model :	48C
No.	CO-B07	Serial No.	0335203746		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 06 September 2022		Serial 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	39.98	-0.050	40.00	
Instrument Status					
Chamber Temp	47.5	°C	Flow	1.5	LPM
Pressure	730.8	mm Hg	Motor Speed	100.00	%

Calibrated by :



Approved by :





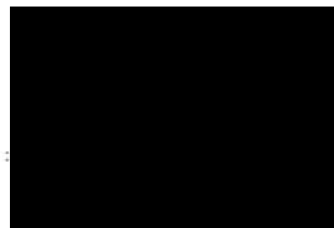
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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	05 April 2023	Brand :	Thermo	Model :	48C
No.	CO-B08	Serial No.	0508011067		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 06 September 2022		Serial 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	39.94	-0.150	40.00	
Instrument Status					
Chamber Temp	47.3	°C	Flow	1.5	LPM
Pressure	730.6	mm Hg	Motor Speed	100.00	%

Calibrated by :



Approved by :





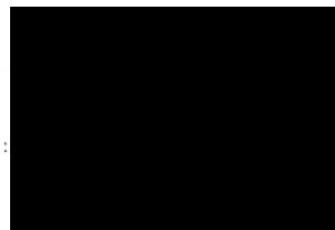
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Tel : (662) 939-4370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com, www.spscon.com

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	04 April 2023	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	Analyzer Response	
Zero	0	-0.10	-	0	
CO Span	40.00	40.03	0.075	40.00	
Instrument Status					
Chamber Temp	47.2 °C		Flow	1.5 LPM	
Pressure	730.5 mm Hg		Motor Speed	100.00%	

Calibrated by :



Approved by :

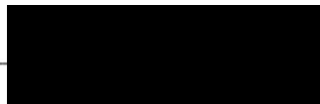




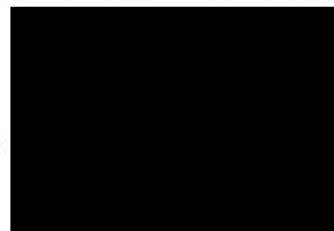
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Calibration Report							
Non-Dispersive Infrared CO Analyzer							
Date :	05 April 2023	Brand :	API	Model :	300E		
No.	CO-B10	Serial No.	199-S				
Calibrator (Dilution System)							
Brand : API			Model : 700				
Last Cal. Date : 06 September 2022			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.	24.6	°C	% RH	49
Calibration Setting							
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM			
Set Point	Expected Concentration	Analyzer Response		%Dif	Analyzer Response		
Zero	0	-0.10		-	0		
CO Span	40.00	40.09		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	4015.3	mV	2500-4800 mV				
CO Reference	3949.2	mV	2500-4800 mV				
Measure/Reference Ratio	1.179	-	1.1-1.3 W/Zero Air				
Sample Pressure	28.6	In-Hg-A	-2" < Ambient Absolute Pressure				
Sample Flow	806	CC/Min	800 ± 10%				
Sample Temperature	48.3	°C	48 ± 4				
Bench Temperature	48.0	°C	48 ± 2				
Wheel Temperature	68.4	°C	68 ± 2				
Box Temperature	30.6	°C	Ambient Temp + 7 ± 10				
Photo-Drive	3014.3	mV	250 mV to 4750 mV				
Slope	1.017	-	1.0 ± 0.3				
Offset	0.2	-	0 ± 0.3				

Calibrated by :



Approved by :





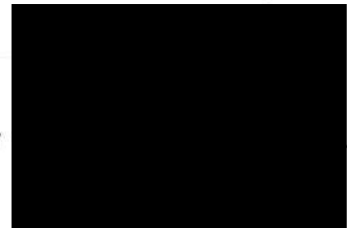
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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	07 April 2023	Brand :	Thermo	Model :	48C
No.	CO-B11	Serial No.	401304262		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 06 September 2022		Serial 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	39.97	-0.075	40.00	
Instrument Status					
Chamber Temp	47.4 °C	Flow	1.5 LPM		
Pressure	730.7 mm Hg	Motor Speed	100.00%		

Calibrated by :



Approved by





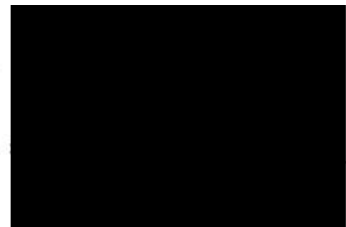
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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	05 April 2023	Brand :	Thermo	Model :	48C
No.	CO-B12	Serial No.	TL-65343-348		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 06 September 2022		Serial 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	Analyzer Response	
Zero	0	0.11	-	0	
CO Span	40.00	39.93	-0.175	40.00	
Instrument Status					
Chamber Temp	47.3 °C		Flow	1.5 LPM	
Pressure	730.4 mm Hg		Motor Speed	100.00%	

Calibrated by :



Approved by





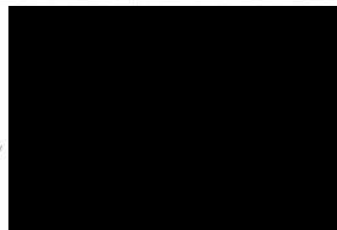
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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	04 April 2023	Brand :	API	Model :	300E
No.	CO-B13			Serial No.	176
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 06 September 2022			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D196045		
Certified Date : 16 April 2022		Expired Date : 15 April 2024		Cylinder Conc. : 4,570 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.6 °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	0.11		-	
CO Span	40.00	40.07		0.175	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4014.8	mV	2500-4800 mV		
CO Reference	3947.5	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.3	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	809	CC/Min	800 ± 10%		
Sample Temperature	48.2	°C	48 ± 4		
Bench Temperature	48.1	°C	48 ± 2		
Wheel Temperature	68.2	°C	68 ± 2		
Box Temperature	30.9	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3031.6	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :



Approved by





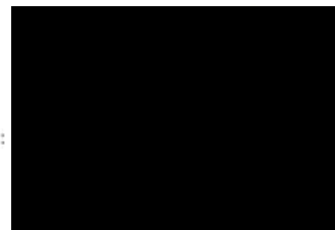
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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	03 April 2023	Brand :	API	Model :	300EU
No.	CO-B14			Serial No.	131
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 06 September 2022			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D196045		
Certified Date : 16 April 2022		Expired Date : 15 April 2024		Cylinder Conc. : 4,570 ppm	
Calibrating Condition					
Pressure	1011	mmbar	Temp.	24.6	°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	39.90	-0.250	40.00	
API Model 300EU CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4016.8	mV	2500-4800 mV		
CO Reference	3948.6	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.4	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	808	CC/Min	800 ± 10%		
Sample Temperature	48.4	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.5	°C	68 ± 2		
Box Temperature	30.9	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3040.3	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :



Approved by :





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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	05 April 2023	Brand :	API	Model :	300E
No.	CO-B15			Serial No.	226
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 06 September 2022			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D196045		
Certified Date : 16 April 2022		Expired Date : 15 April 2024		Cylinder Conc. : 4,570 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.6 °C		% RH : 49	
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	-0.10	-	0	
CO Span	40.00	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	4013.7	mV	2500-4800 mV		
CO Reference	3947.9	mV	2500-4800 mV		
Measure/Reference Ratio	1.179	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.7	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	812	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	30.6	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3022.8	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :

Approved by



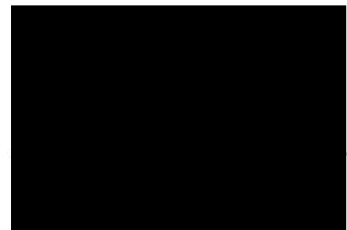
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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	03 April 2023	Brand :	API	Model :	300E
No.	CO-R01			Serial No.	704
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 06 September 2022			Serial No. : 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	40.05	0.125	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4014.7	mV	2500-4800 mV		
CO Reference	3948.1	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.5	In-Hg-A	-2" < Ambient Absolute Pressure		
Sample Flow	803	CC/Min	800 ± 10%		
Sample Temperature	48.5	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.3	°C	68 ± 2		
Box Temperature	30.9	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3042.4	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :



Approved by :





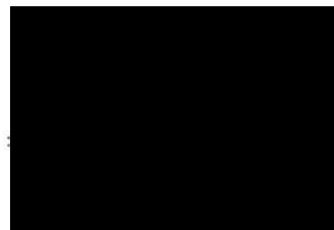
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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	03 April 2023	Brand :	API	Model :	300E
No.	CO-R02			Serial No.	171-S
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 06 September 2022			Serial No. : 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.	24.6	°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	39.91	-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	4017.2	mV	2500-4800 mV		
CO Reference	3949.4	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.3	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	813	CC/Min	800 ± 10%		
Sample Temperature	48.2	°C	48 ± 4		
Bench Temperature	48.0	°C	48 ± 2		
Wheel Temperature	68.2	°C	68 ± 2		
Box Temperature	30.6	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3037.6	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :



Approved by :





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

Calibration Report

Non-Dispersive Infrared CO Analyzer

Date : 05 April 2023

Brand : API

Model : 300E

No. CO-R03

Serial No. 1352

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 Set Point	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM
	Expected Concentration	Analyzer Response	% Dif	Analyzer Response
Zero	0	0.11	-	0
CO Span	40.00	39.89	-0.275	40.00

API Model 300E CO Analyzer Check List

Parameter	Observed Value	Units	Nominal Range
Range	50	PPM	0-1000 ppm
Stability	0.10	PPM	< 1 ppm With Zero Air
CO Measure	4016.5	mV	2500-4800 mV
CO Reference	3949.9	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	802	CC/Min	800 ± 10%
Sample Temperature	48.3	°C	48 ± 4
Bench Temperature	48.1	°C	48 ± 2
Wheel Temperature	68.2	°C	68 ± 2
Box Temperature	30.8	°C	Ambient Temp + 7 ± 10
Photo-Drive	3049.3	mV	250 mV to 4750 mV
Slope	1.017	-	1.0 ± 0.3
Offset	0.2	-	0 ± 0.3

Calibrated by :

Approved by :



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PETRO-INSTRUMENTS CORP., LTD.

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<http://www.pico.co.th> E-mail-address : pico@pico.co.th

TEST REPORT OF CALIBRATION

We hereby certify that the equipment mentioned below have been maintained and have duly performed in accordance with HORIBA specifications.

Equipment	:	Multi Water Quality Checker
Model	:	U-5000G
Manufacture	:	HORIBA
Serial No.	:	RAAGSEN3
Job No.	:	JID2300281-002
Customer	:	IRPC Public Company Limited
Calibration date	:	June 21, 2023
Calibration due	:	June 21, 2024

Petro-Instruments Corp., Ltd.

Calibrated by .

Approved by.

Scientific Product Business Unit



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CALIBRATION REPORT

Equipment : Multi Water Quality Checker
Manufacturer : HORIBA
Model : U-53
Serial No. : V39CGM6U
Date of Calibration : June 21, 2023
Customer Name : IRPC Public Company Limited

HORIBA, Multi Water Quality Checker model U-53 was tested according to service manual.

Auto Calibration (1- point)

Check function	Calibration	Before Calibrate	After Calibrate
pH	1- point auto (Zero) (4.01 pH)	4.05 pH	4.01 pH
CONDUCTIVITY	1- point auto (Span) (4.49 mS/cm)	4.45 mS/cm	4.49 mS/cm
DO	1- point auto (Span) (8.92 mg/L)	8.87 mg/L	8.92 mg/L
Depth	(0 m)	0 m	0 m

Reference Standard

- Standard Solution of HORIBA, pH 4 Lot No. S3316/03



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Manual Calibration (2- point)

A. pH Measurement.

Check item	pH Standard Solution	Before Calibrate	After Calibrate	Error	Judgment
Zero Calibration	6.86	6.86	6.86	0.00	PASS
Span Calibration	4.01	4.01	4.01	0.00	PASS

Measure at temperature 25 °C Within ± 0.1 pH

B. Conductivity Measurement.

Check item	Conductivity Standard Solution	Before Calibrate	After Calibrate	Error	Judgment
Zero Calibration	0.00 mS/cm	0.000 mS/cm	0.00 mS/cm	0.000 mS/cm	PASS
Span Calibration	Range 1 (0.100-0.999 S/m) 0.718 mS/cm	0.728 mS/cm	0.718 mS/cm	0.01 mS/cm	PASS
	Range 2 (1.00-10.00 S/m) 6.67 mS/cm	6.70 mS/cm	6.67 mS/cm	0.003 mS/cm	PASS
	Range 3 (0.0-99.9 mS/m) 58.7 mS/cm	59.0 mS/cm	58.7 mS/cm	0.3 mS/cm	PASS

Measure at temperature 25 °C Within $\pm 1\%$ /F.S.



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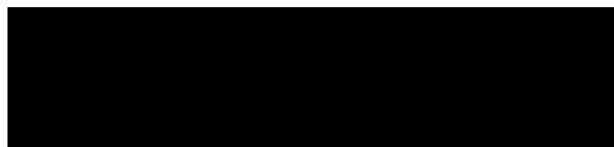
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C. DO Measurement.

Check item	DO Standard Solution	Before Calibrate	After Calibrate	Error	Judgment
Zero Calibration	(Solution of NaSO ₃) 0.00 mg/l	0.00 mg/l	0.00 mg/l	0.00 mg/l	PASS
Span Calibration	(Saturated with oxygen in air) 8.11 mg/l	8.15 mg/l	8.11 mg/l	0.04 mg/l	PASS

Measure at temperature 25 °C With in 0 to 20 mg/L :± 0.2 mg/l, 20 to 50 mg/L :± 0.5 mg/l





PETRO-INSTRUMENTS CORP., LTD.

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Website : <http://www.pico.co.th> email-address: pico@pico.co.th , service@pico.co.th

DOC. NUMBER

CMV-S23-0034

SERVICE REPORT

REPORT DATE

June 21, 2023

EQUIPMENT: Multi Water Quality Checker, U-5000G	SERIAL NUMBER / TAG NUMBER RAAGSEN3	BRAND / MANUFACTURER HORIBA
CUSTOMER NAME: IRPC PUBLIC COMPANY LIMITED	LACATION: rayong	JOB NUMBER / REQUESTED NUMBER JID2300281-002

SCOPE OF WORK / REASON FOR VISIT

Repair and Calibration

FOUND FAILURE & CORRECTIVE ACTION DETAILS

1. ตรวจเช็คสภาพเครื่อง Multi Water Quality Checker

- Meter Model: U-5000G S/N: RAAGSEN3 สามารถใช้งานได้ปกติ
- Probe Model: U-53 S/N: V39CGM6U พบว่า **Sensor Turbidity** ไม่สามารถใช้งานได้
- Sensor pH,COND,ORP,DO ใช้งานได้ปกติ

2. ทำการ Cleaning sensor ทุก parameter

- เติมน Internal Solution (KCl) ใน Reference sensor

3. ปรับเทียบ Auto Calibration ด้วย Buffer pH 4

- พบว่าสามารถปรับเทียบค่าผ่าน คือ pH , COND, ORP, Temp, DO and Depth

4. ปรับเทียบ Manual Calibration 2 จุด (zero , span)

- พบว่าสามารถปรับเทียบค่าผ่าน คือ pH , COND,ORP, Temp, DO and Depth

สรุป : เครื่อง Multi Water Quality Checker Meter Model: U-5000G S/N: RAAGSEN3 และ

Sensor Model: U-53 S/N: V39CGM6U สามารถใช้งานได้ตามปกติ ยกเว้น Sensor Turbidity

WORK CONCLUSION

<input checked="" type="checkbox"/> COMPLETED		<input type="checkbox"/> IN COMPLETED	PARTS REPLACEMENT		
<input checked="" type="checkbox"/> CHARGE	<input type="checkbox"/> NO CHARGE		PARTS NAME	P/N	QTY.
<input checked="" type="checkbox"/> Service Fee	<input type="checkbox"/> Project Warranty	<input type="checkbox"/> Take to Office			
<input type="checkbox"/> Travelling	<input type="checkbox"/> Service Warranty	<input type="checkbox"/> Wait for Parts			
<input type="checkbox"/> Spare Parts	<input type="checkbox"/> Spare Parts Warranty	<input type="checkbox"/> In Progress			
<input type="checkbox"/> Other	<input type="checkbox"/> Service Contract	<input type="checkbox"/> Other			

TIME SPENT (HOURS)

YEAR	2023							TOTAL HOURS	TRAVELING DETAILS	
MONTH	6									
DATE	21								TRAVEL BY	-
SERVICE TIME	4							4	FROM	-
OVERTIME	-							-	TO	-
TRAVELING TIME	-							-	TOTAL ROUND TRIP	-
TOTAL HOURS	4							4	DISTANCE (KM.)	-

SERVICE CREW

NAME		NAME	
1. Chamaiporn Vongchalee		3.	
2.		4.	

CUSTOMER'S NAME	CUSTOMER'S SIGNATURE	DATE



**ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**

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Certificate No.: CP20230235EA

Operation No.: CP2023050018

Certificate of Calibration

Equipment: Sound Calibrator

Manufacturer: Svantek

Model/Type: SV 35A

Serial No.: 58079

ID No.: 06-ACT

Customer: Innovative Instrument Co., Ltd.

Address: 7/139 Moo 13, Soi suntinakorn 11, Bangkaeo,
Bangphli, Samutprakarn, 10540 Thailand.

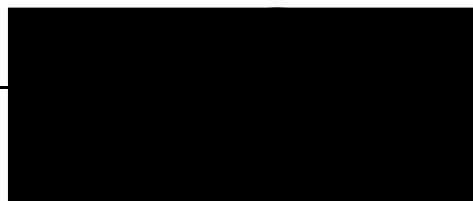
Received Date: 25 May 2023

Calibrated Date: 1 June 2023

Issued Date: 2 June 2023

Calibrated by: Ms. Juntaporn Kunhakom

Approved by: _____



This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

Certificate No.: CP20230235EA

Calibration Report

Equipment: Sound Calibrator
Manufacturer: Svantek
Model/Type: SV 35A
Serial No.: 58079
ID No.: 06-ACT
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-

IEC 60942:2017

Condition of this result of calibration

1. Reference standards instrument :-

	Instrument	Model	Serial No.	Cert. No.	Due Date
1)	Standard microphone	4180	2787490	AA-1024-22	6 November 2023
2)	Waveform Generator	33511B	MY52302264	CK20220058EA	19 June 2023
3)	Audio Analyzing DMM	2015-P	000136E	E1U225466	2 December 2023
4)	Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P230024 CL1-P220029	20 March 2024 24 July 2023

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

1. Function : Sound pressure level

Normal Frequency (Hz)	Specified Sound Pressure level (dB)	Measured value (dB)	Deviated value ^[1] (dB)	Acceptance limit ^[3] (dB)
1000	94	93.80	-0.20	±0.25
1000	114	113.78	-0.22	±0.25

2. Function : Frequency

Normal Sound Pressure level (dB)	Specified Frequency (Hz)	Measured value (Hz)	Deviated value ^[2] (%)	Acceptance limit ^[3] (%)
94	1000	1000.0	0.00	±0.7
114	1000	1000.0	0.00	±0.7

Certificate No.: CP20230235EA

Calibration Report

3. Function : Total distortion + noise

Normal Sound Pressure level (dB)	Normal Frequency (Hz)	Measured value ^[4] (%)	Acceptance limit ^[5] (%)
94	1000	0.8	2.5
114	1000	0.4	2.5

Uncertainty of measurement

Function	Uncertainty	Maximum-permitted uncertainty of measurement
Sound pressure level	0.10 dB	0.35 dB
Frequency	0.10 %	0.20 %
Total distortion + noise	0.40 %	1.00 %

- Note:
- [1] The deviated value is the absolute value of the difference between the measured value and the corresponding specified sound pressure level.
 - [2] The deviated value is the absolute value of the difference in percent between the measured value and the corresponding specified frequency.
 - [3] The acceptance limit is for the deviated value.
 - [4] The measured value is the total distortion + noise, measured over the frequency range from 20 Hz to 20 kHz.
 - [5] The acceptance limit is for the Measured value.

- Remarks:
- 1. Acceptance limit was IEC 60942:2017 Class 1.
 - 2. The coverage factor $k = 2.00$

-- End of Report --