

ภาคผนวก จ

ใบแสดงการตรวจเทียบเครื่องมือ

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04NI99E15AC084 Reference Number: 82-401409170-1  
Cylinder Number: EB0102326 Cylinder Volume: 144.4 CF  
Laboratory: 124 - Riverton (SAP) - NJ Cylinder Pressure: 2015 PSIG  
PGVP Number: B52019 Valve Outlet: 660  
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Feb 05, 2019

Expiration Date: Feb 05, 2027

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	50.00 PPM	51.01 PPM	G1	+/- 0.9% NIST Traceable	01/28/2019, 02/05/2019
NITRIC OXIDE	50.00 PPM	50.86 PPM	G1	+/- 0.9% NIST Traceable	01/28/2019, 02/05/2019
SULFUR DIOXIDE	50.00 PPM	50.87 PPM	G1	+/- 1.0% NIST Traceable	01/28/2019, 02/05/2019
CARBON MONOXIDE	0.5000 %	0.5050 %	G1	+/- 0.7% NIST Traceable	01/31/2019
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060206	CC401947	4950 PPM CARBON MONOXIDE/NITROGEN	+/- 0.4%	Feb 15, 2019
PRM	12367	APEX1099237	9.82 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Jun 02, 2017
NTRM	12010724	KAL004497	50.03 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Mar 12, 2024
GMIS	1114201601	CC506710	4.971 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Nov 14, 2019
NTRM	14010327	KAL004376	49.08 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Apr 17, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Siemens Ultramat 6 J3-599 COHIGH	NDIR	Jan 18, 2019
Nicolet 6700 APW1100391 NO	FTIR	Jan 10, 2019
Nicolet 6700 APW1100391 NO2	FTIR	Jan 10, 2019
Nicolet 6700 APW1100391 SO2	FTIR	Jan 10, 2019

Triad Data Available Upon Request

PERMANENT NOTES: PRODUCED IN ACCORDANCE WITH ISO17025 REQUIREMENTS

#### NOTES:

Gross Weight: 27806.3 grams

Net Weight: 4733.2 grams

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2008 and relate only to items identified on this certificate. All items are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 3082.05

*[Signature]*  
Approved for Release

Page 1 of 82-401409170-1



## TE-5009X TSP/PM10 Calibration Worksheet

Date: 29 Feb 24

Temp (°C): 35

Barometric pressure (mm Hg): 758

### Reference Standard Calibration

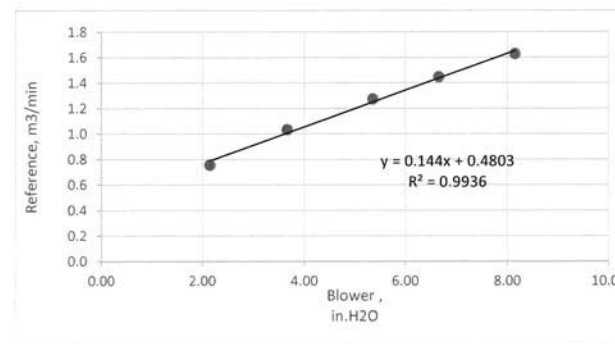
Equipment: Orifice  
Model No: TE-5025A  
Serial No: 4218  
Manufacturer: Tisch

### Unit Under Test

Equipment: High Volume Blower  
Model No: TE-5009X  
Serial No: BH-002

Calibrated by: Surachart L.

Test No.	Orifice (in.H2O)	Qstd (m3/min)	Blower (in.H2O)	Blower Correct (in.H2O)
1	11.98	1.63	8.30	8.15
2	9.43	1.45	6.78	6.66
3	7.27	1.27	5.45	5.35
4	4.76	1.03	3.73	3.66
5	2.51	0.76	2.19	2.15



Approved by: *[Signature]*



## TE-5009X TSP/PM10 Calibration Worksheet

Date: 29 Feb 24

Temp (°C): 30

Barometric pressure (mm Hg): 758

## Reference Standard Calibration

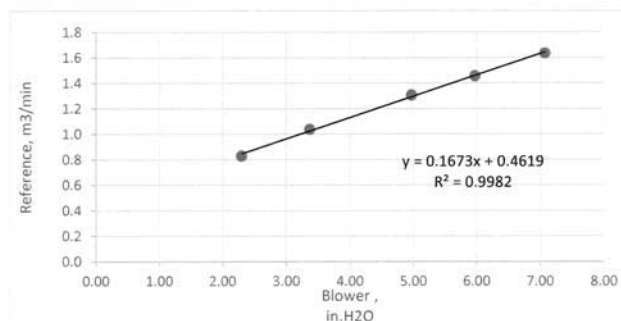
Equipment: Orifice  
 Model No: TE-5025A  
 Serial No: 4218  
 Manufacturer: Tisch

## Unit Under Test

Equipment: High Volume Blower  
 Model No: TE-5009X  
 Serial No: BH-031

Calibrated by : Surachart I.

Test No.	Orifice (in.H2O)	Qstd (m3/min)	Blower (in.H2O)	Blower Correct (in.H2O)
1	11.90	1.64	7.14	7.07
2	9.41	1.46	6.03	5.97
3	7.55	1.31	5.02	4.97
4	4.73	1.04	3.40	3.37
5	2.98	0.83	2.32	2.30



Approved by : Wittaya K.

SECOT CO., LTD.

239 Rimklongprapa Rd. Bangsue, Bangkok, 10800, THAILAND

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E-Mail: envserv@secot.co.th



## TE-5009X TSP/PM10 Calibration Worksheet

Date: 28 Feb 24

Temp (°C): 32

Barometric pressure (mm Hg): 757

## Reference Standard Calibration

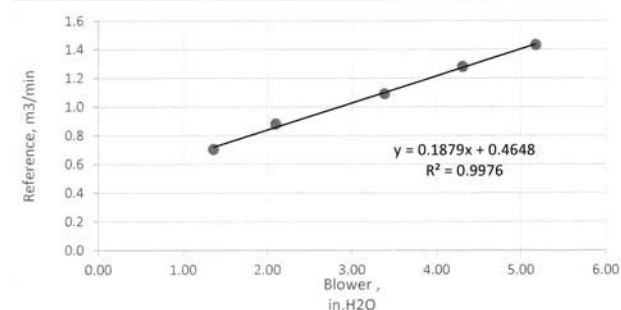
Equipment: Orifice  
 Model No: TE-5025A  
 Serial No: 4218  
 Manufacturer: Tisch

## Unit Under Test

Equipment: High Volume Blower  
 Model No: TE-5009X  
 Serial No: BH-028

Calibrated by : Surachart I.

Test No.	Orifice (in.H2O)	Qstd (m3/min)	Blower (in.H2O)	Blower Correct (in.H2O)
1	9.16	1.43	5.25	5.18
2	7.30	1.28	4.37	4.31
3	5.28	1.09	3.43	3.38
4	3.40	0.88	2.13	2.10
5	2.15	0.71	1.38	1.36



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## TE-5009X TSP/PM10 Calibration Worksheet

Date: 29 Feb 24

Temp (°C): 30

Barometric pressure (mm Hg): 758

## Reference Standard Calibration

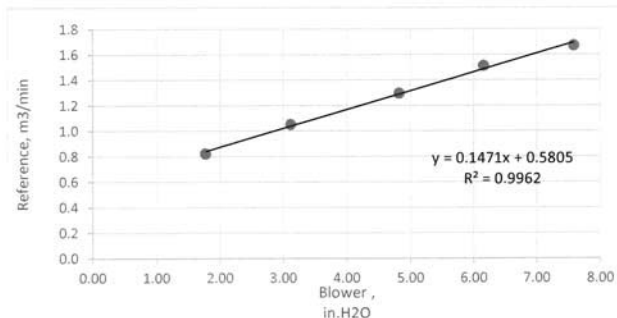
Equipment: Orifice  
 Model No: TE-5025A  
 Serial No: 4218  
 Manufacturer: Tisch

## Unit Under Test

Equipment: High Volume Blower  
 Model No: TE-5009X  
 Serial No: BH-027

Calibrated by : Surachart I.

Test No.	Orifice (in.H2O)	Qstd (m3/min)	Blower (in.H2O)	Blower Correct (in.H2O)
1	12.42	1.67	7.66	7.59
2	10.13	1.51	6.22	6.16
3	7.41	1.30	4.87	4.82
4	4.84	1.05	3.15	3.12
5	2.93	0.82	1.79	1.77

Approved by : *Wittaya Kr.*

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## TE-5009X TSP/PM10 Calibration Worksheet

Date: 1 Mar 24

Temp (°C): 33

Barometric pressure (mm Hg): 759

## Reference Standard Calibration

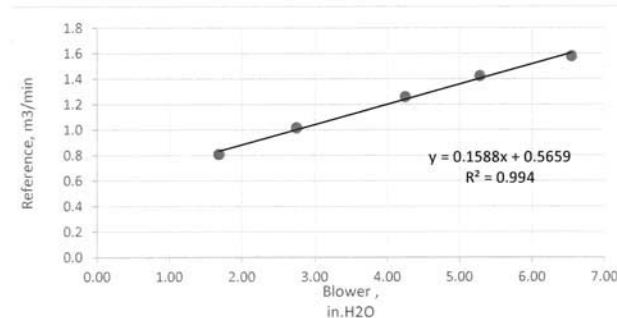
Equipment: Orifice  
 Model No: TE-5025A  
 Serial No: 4218  
 Manufacturer: Tisch

## Unit Under Test

Equipment: High Volume Blower  
 Model No: TE-5009X  
 Serial No: BH-029

Calibrated by : Surachart I.

Test No.	Orifice (in.H2O)	Qstd (m3/min)	Blower (in.H2O)	Blower Correct (in.H2O)
1	11.15	1.58	6.64	6.55
2	9.05	1.42	5.36	5.29
3	7.05	1.26	4.31	4.25
4	4.56	1.02	2.79	2.75
5	2.85	0.81	1.71	1.69

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## TE-5009X TSP/PM10 Calibration Worksheet

Date: 29 Feb 24

Temp (°C): 35

Barometric pressure (mm Hg): 758

## Reference Standard Calibration

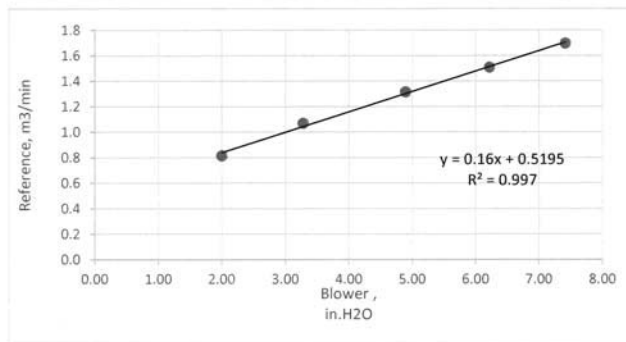
Equipment: Orifice  
 Model No: TE-5025A  
 Serial No: 4218  
 Manufacturer: Tisch

## Unit Under Test

Equipment: High Volume Blower  
 Model No: TE-5009X  
 Serial No: BH-001

Calibrated by : Surachart I.

Test No.	Orifice (in.H2O)	Qstd (m3/min)	Blower (in.H2O)	Blower Correct (in.H2O)
1	13.03	1.70	7.55	7.42
2	10.26	1.51	6.33	6.22
3	7.77	1.32	4.98	4.89
4	5.09	1.07	3.34	3.28
5	2.93	0.82	2.04	2.00



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## TE-5009X TSP/PM10 Calibration Worksheet

Date: 1 Mar 24

Temp (°C): 28

Barometric pressure (mm Hg): 759

## Reference Standard Calibration

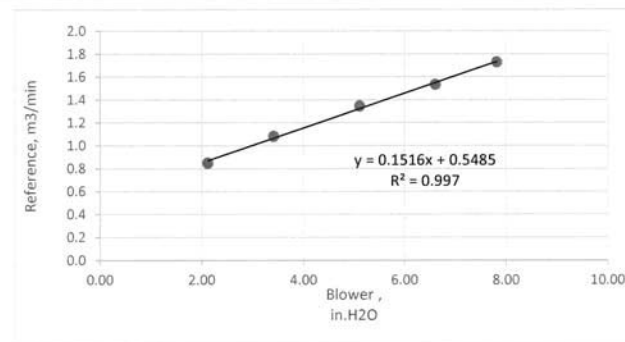
Equipment: Orifice  
 Model No: TE-5025A  
 Serial No: 4218  
 Manufacturer: Tisch

## Unit Under Test

Equipment: High Volume Blower  
 Model No: TE-5009X  
 Serial No: BH-015

Calibrated by : Surachart I.

Test No.	Orifice (in.H2O)	Qstd (m3/min)	Blower (in.H2O)	Blower Correct (in.H2O)
1	13.20	1.73	7.86	7.82
2	10.35	1.53	6.64	6.60
3	7.94	1.35	5.14	5.11
4	5.09	1.08	3.43	3.41
5	3.10	0.85	2.13	2.12



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## TE-5009X TSP/PM10 Calibration Worksheet

Date: 29 Feb 24

Temp (°C): 35

Barometric pressure (mm Hg): 758

## Reference Standard Calibration

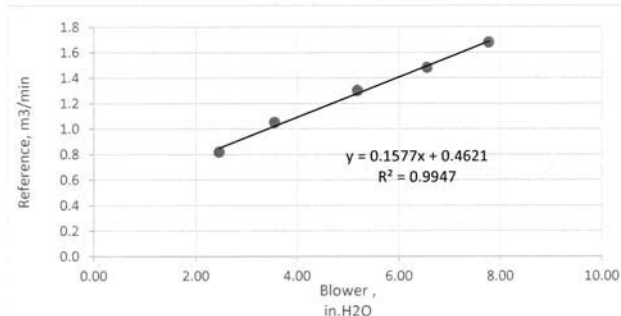
Equipment: Orifice  
 Model No: TE-5025A  
 Serial No: 4218  
 Manufacturer: Tisch

## Unit Under Test

Equipment: High Volume Blower  
 Model No: TE-5009X  
 Serial No: BH-013

Calibrated by : Surachart L.

Test No.	Orifice (in.H2O)	Qstd (m3/min)	Blower (in.H2O)	Blower Correct (in.H2O)
1	12.76	1.68	7.91	7.77
2	9.90	1.48	6.67	6.55
3	7.61	1.30	5.28	5.19
4	4.92	1.05	3.62	3.56
5	2.96	0.82	2.51	2.47



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## TE-5009X TSP/PM10 Calibration Worksheet

Date: 29 Feb 24

Temp (°C): 33

Barometric pressure (mm Hg): 758

## Reference Standard Calibration

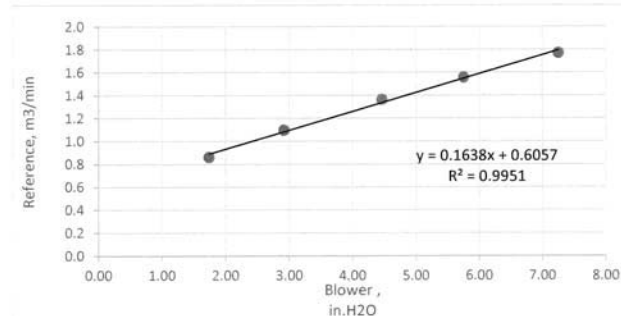
Equipment: Orifice  
 Model No: TE-5025A  
 Serial No: 4218  
 Manufacturer: Tisch

## Unit Under Test

Equipment: High Volume Blower  
 Model No: TE-5009X  
 Serial No: BH-033

Calibrated by : Surachart L.

Test No.	Orifice (in.H2O)	Qstd (m3/min)	Blower (in.H2O)	Blower Correct (in.H2O)
1	14.08	1.77	7.36	7.25
2	10.87	1.56	5.84	5.76
3	8.33	1.37	4.53	4.46
4	5.34	1.10	2.96	2.92
5	3.26	0.86	1.77	1.74



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## TE-5009X TSP/PM10 Calibration Worksheet

Date:

1 Mar 24

Temp (°C):

29

Barometric pressure (mm Hg):

759

## Reference Standard Calibration

Equipment:

Orifice

Model No:

TE-5025A

Serial No:

4218

Manufacturer:

Tisch

## Unit Under Test

Equipment:

High Volume Blower

Model No:

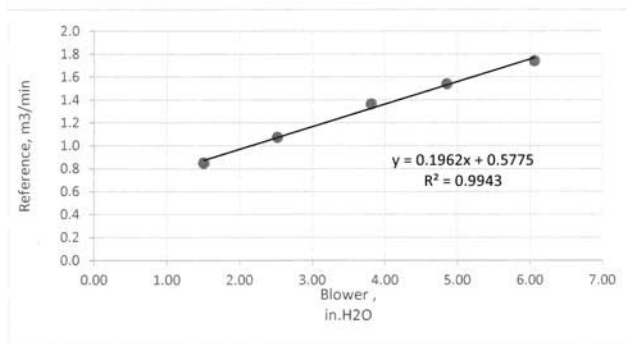
TE-5009X

Serial No:

BH-011

Calibrated by : Surachart I.

Test No.	Orifice (in.H2O)	Qstd (m3/min)	Blower (in.H2O)	Blower Correct (in.H2O)
1	13.42	1.74	6.11	6.07
2	10.46	1.54	4.89	4.85
3	8.19	1.36	3.84	3.81
4	5.03	1.07	2.54	2.52
5	3.12	0.85	1.52	1.51

Approved by : *Wittaya K.*

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E-Mail: emserv@secot.co.th

THE LINDE GROUP

Linde

Certificate Of Analysis  
Special Gases Mixture

## Customer Details

Name:

Secot Co., Ltd.

Address:

239, Rimklongprapa Rd., Bangsue, Bangkok  
10800

Customer Tag No.:

## Certificate Details

Number:

0275/22

Date of Issue:

4-Feb-2022

Expiry date:

4-Feb-2026

Material Details

Production Order:

90169722

Material Code:

631500-SK-44

Cylinder No.:

D636195

Gas content:

5.52 M<sup>3</sup>

Filling pressure:

145.0 bar

Valve:

CGA 660 SS

Cylinder Owner:

LINDE

Cylinder Material:

Spectra seal

Cylinder Size:

40 L

## Laboratory Report

## Analytical Result

Component	Nominal Concentration	Analysis Result <sup>1</sup>	Uncertainty <sup>2</sup>	Method of Analysis <sup>3</sup>	Assay Date
Sulphur Dioxide In Nitrogen	20.0 ppm	20.4 ppm	± 1% relative	(6) I-PB-352	28-Jan & 4-Feb-22

Reference Standard

Sulphur Dioxide  
In Nitrogen

## Reference Standard used in Assay

Cylinder number

1457545G

Concentration

25.03 ± 0.25 ppm

Expiry date:

18-Aug-2022

## Analytical Instruments used in Assay

Instrument/Make/Model  
FTIR Spectrometers Nicolet iS50Analytical Principle  
FTIR-SO2Last Multipoint Calibration  
27-Jan-2022

## Recommend usage condition

Minimum utilization: 5% of actual content or before expiry date whichever comes first.

Storage condition: Keep in well ventilation and secure area.

## Comments

When reordering, please quote the material number

## Note:

1. All results expressed in this report are on mole/mole basis, unless otherwise specified. The Assay of this Standard has been performed in accordance with the EPA Traceability Protocol EPA-600/R-12/531 for the Assay and Certification of Gaseous Calibration Standards using procedure G1
2. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.
3. (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyzer, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Moisture Analyzer, (5) Total Hydrocarbon Analyzer, (6) Other - Specified

Sukanya Parinyasontorn

Signatory for and on behalf of Linde (Thailand) Co., Ltd.

Page 1 of 1

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บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

เลขที่ใบขึ้นทะเบียนมาตรฐาน 0107537000785

ชั้น 15 อาคารทาวเวอร์ เอ 2/3 หมู่ 14 ถนนพหลโยธิน-ศรีนครินทร์ แขวง 6-5 กรุงเทพมหานคร

เลขหมายติดต่อฉุกเฉิน 10540 โทรสาร (66) 2338-6100 โทรสาร (66) 2338-6333

โรงงานผลิต : 105 หมู่ 5 ตำบลบึงนาราง อำเภอสากเหล็ก จังหวัดพิจิตร 24180

โทรสาร (66) 38.570-479-93

โทรสาร (66) 38.570-323

Linde (Thailand) Public Company Limited

PLC Registration no. 0107537000785

15<sup>th</sup> Floor, Bangna Tower A, 2/3 Moo 14, Bangna Trad KM. 6.5 Road, Bangkok

Bangplee, Samutprakarn 10540, Tel (66) 2338-6100 Fax (66) 2338-6333

Wellgong Plant : 105 Moo 5, T.Bangsamak, A.Bangpakong, Chachoengsao 24180

Thailand, Tel (66) 38.570-479-93

Fax (66) 38.570-323

### Certificate Of Analysis

Special Gases Mixture

## Customer Details

Name: Secot Co., Ltd. Address: 239 Rimklongpropa Rd. Bangsue Khet Bangsue Bangkok 10800 Customer Tag No.:

## Certificate Details

Number: 0484/23 Date of Issue: 22-Feb-2023 Expiry date: 21-Feb-2027  
Material Details  
Production Order: 90176403 Material Code: 478100-J-62 Cylinder No.: 12360  
Gas content: 6.520 M<sup>3</sup> (nominal) Filling pressure: 145 bar (g) Valve: CGA 590 BRASS  
Cylinder Owner: LINDE Cylinder Material: STEEL Cylinder Size: 47 L

## Laboratory Report

Component	Normal Concentration	Analysis Result <sup>1</sup>	Uncertainty <sup>2</sup>	Method of Analysis <sup>3</sup>
Oxygen	8.00%	7.94%	± 2% relative	(1) SG-O-01
In Nitrogen				

## Recommend usage condition

Minimum utilization: 5% of actual content or before expire date whichever comes first.

Storage condition: Keep in well ventilation and secure area.

## Comments

## Note:

1. All results expressed in this report are on mole/mole basis, unless otherwise specified.
2. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The measurement of this material is traceable to the SI through the reference gas standard which is traceable to Swiss National Standard of Mass or other recognised national metrology institutes.
3. (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyzer, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Moisture Analyzer, (5) Total Hydrocarbon Analyzer, (6) Other - Specified

Sukanya Parinyasootorn  
Signatory for and on behalf of Linde (Thailand) Co., Ltd.

Page 1 of 1

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PB-002/F004

Iss:K/2, 15 Oct 2021

## บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

PLC Registration No. 0107533000785

ชั้น 15 อาคารทาวเวอร์ เอ 2/3 หมู่ 14 ถนนรามคำแหง-คลองหลวง กม. 6.5 แขวงคลองหลวง

Bangplee, Samutprakarn 10540, Tel (66) 2338-6100 โทรสาร (66) 2338-6333

โรงงานผลิตแก๊ส: 105 หมู่ 5 ตำบลบางพลีใหญ่ อำเภอบางพลี จังหวัดสมุทรปราการ 24180

โทรศัพท์ (66) 38.570-479-93

โทรสาร (66) 38.570-323

## Linde (Thailand) Public Company Limited

PLC Registration No. 0107533000785

15<sup>th</sup> Floor, Bangna Tower A, 2/3 Moo 14, Bangna Trad KM. 6.5 Road, Bangkaew

Bangplee, Samutprakarn 10540, Tel (66) 2338-6100 โทรสาร (66) 2338-6333

Wellgrow Plant: 105 Moo 5, T.Bangsamak, A.Bangpakong, Chachoengsao 24180

Thailand, Tel (66) 38.570-479-93

Fax (66) 38.570-323

### Certificate Of Analysis

Special Gases Mixture

## Customer Details

Name: Secot Co., Ltd. Address: 239 Rimklongpropa Rd. Bangsue Khet Bangsue Bangkok 10800 Customer Tag No.:

## Certificate Details

Number: 0483/23 Date of Issue: 22-Feb-2023 Expiry date: 21-Feb-2027  
Material Details  
Production Order: 90176403 Material Code: 478100-J-62 Cylinder No.: 51108  
Gas content: 6.520 M<sup>3</sup> (nominal) Filling pressure: 145 bar (g) Valve: CGA 590 BRASS  
Cylinder Owner: LINDE Cylinder Material: STEEL Cylinder Size: 47 L

## Laboratory Report

Component	Normal Concentration	Analysis Result <sup>1</sup>	Uncertainty <sup>2</sup>	Method of Analysis <sup>3</sup>
Oxygen	8.00%	7.93%	± 2% relative	(1) SG-O-01
In Nitrogen				

## Recommend usage condition

Minimum utilization: 5% of actual content or before expire date whichever comes first.

Storage condition: Keep in well ventilation and secure area.

## Comments

## Note:

1. All results expressed in this report are on mole/mole basis, unless otherwise specified.
2. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The measurement of this material is traceable to the SI through the reference gas standard which is traceable to Swiss National Standard of Mass or other recognised national metrology institutes.
3. (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyzer, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Moisture Analyzer, (5) Total Hydrocarbon Analyzer, (6) Other - Specified

Sukanya Parinyasootorn  
Signatory for and on behalf of Linde (Thailand) Co., Ltd.

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PB-002/F004

Iss:K/2, 15 Oct 2021

## บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

PLC Registration No. 0107533000785

ชั้น 15 อาคารทาวเวอร์ เอ 2/3 หมู่ 14 ถนนรามคำแหง-คลองหลวง กม. 6.5 แขวงคลองหลวง

Bangplee, Samutprakarn 10540, Tel (66) 2338-6100 โทรสาร (66) 2338-6333

โรงงานผลิตแก๊ส: 105 หมู่ 5 ตำบลบางพลีใหญ่ อำเภอบางพลี จังหวัดสมุทรปราการ 24180

โทรศัพท์ (66) 38.570-479-93

โทรสาร (66) 38.570-323

## Linde (Thailand) Public Company Limited

PLC Registration No. 0107533000785

15<sup>th</sup> Floor, Bangna Tower A, 2/3 Moo 14, Bangna Trad KM. 6.5 Road, Bangkaew

Bangplee, Samutprakarn 10540, Tel (66) 2338-6100 โทรสาร (66) 2338-6333

Wellgrow Plant: 105 Moo 5, T.Bangsamak, A.Bangpakong, Chachoengsao 24180

Thailand, Tel (66) 38.570-479-93

Fax (66) 38.570-323



Sheet No. : CAL-M5007/01/24



## CONTROL UNIT CALIBRATION

(Metric units, mm)

Date 12 Jan 24

Initial Final Average  
Barometric press, Pb 758 758 758 mmHg

### Dry Gas Meter Data

Console No. M50-07

Metering System ID

DGM Number 90331

DGM Model MST-C2-1

Calibrated by Montri P.

### Reference Dry Gas Meter Data

Serial No. 358794

Model S110

Correction factor (Yr) 1.0068

Last Calibration Date 26 Oct 23

Orifice manometer setting, ΔH mm H2O	Ref. DGM Volume V <sub>r</sub> Liters	DGM Volume V <sub>m</sub> Liters	Temperature (°C)				Time ⊙ min	DGM Correction factor (Y)	ΔH@ mm
			Ref DGM T <sub>r</sub>	Dry Gas Meter					
				Inlet T <sub>i</sub>	Outlet T <sub>o</sub>	Avg T <sub>m</sub>			
12.5	100.0	100.6	25	25	24	24.5	9.72	0.9981	53.7523
25.0	100.2	100.2	25	25	24	24.5	6.48	1.0029	47.6709
50.0	100.0	100.8	25	25	24	24.5	4.77	0.9919	51.7327
76.0	100.2	100.9	25	25	24	24.5	3.90	0.9908	52.4606
100.0	100.1	99.6	25	25	24	24.5	3.90	1.0005	53.0627
150.0	100.2	98.9	25	25	24	24.5	2.82	1.0032	54.0289
Average								0.9979	52.1180

Approved by :

Sheet No. : CAL-PI-PS10-02/2024



## PITOT TUBE CALIBRATION

Calibration Location: SECOT

Calibration Date : 09-01-2024

Calibration Duct No.: CD-0123

Calibration Standard Pitot tube data

Pitot No. : Std-02

Coefficient (Cp) : 0.99

Type S Pitot No. : PS10-02

Calibrated by : Mr. Montri P.

### A Side Calibration

Run No.	ΔPstd (mm H <sub>2</sub> O)	ΔPs (mm H <sub>2</sub> O)	Cp(s)	Deviation, δ Cp(s) - Cp(A)
1	15.00	21.00	0.8367	0.0000
2	15.00	21.00	0.8367	0.0000
3	15.00	21.00	0.8367	0.0000

C<sub>P(A),avg</sub> 0.8367

### B Side Calibration

Run No.	ΔPstd (mm H <sub>2</sub> O)	ΔPs (mm H <sub>2</sub> O)	Cp(s)	Deviation, δ Cp(s) - Cp(B)
1	15.00	21.00	0.8367	0.0000
2	15.00	21.00	0.8367	0.0000
3	15.00	21.00	0.8367	0.0000

C<sub>P(B),avg</sub> 0.8367

| CP(A)-CP(B) | = 0.0000

C<sub>P(Avg)</sub> = 0.8367

Approved by :

\*\*\* δ must be ≤ 0.01 for the test to be acceptable \*\*\*  
\*\*\* | Cp(A)-Cp(B) | must also be < 0.01 if average of Cp(A) and Cp(B) is to be used \*\*\*



## SOUND LEVEL METER CALIBRATION

Calibration Location: SECOT

Calibration Date: Sep 4, 24

### ACOUSTIC CALIBRATOR

Brand	Model	Serial No.	Frequency (Hz)	Ref.Calibrated (dB)	Eff.Calibrated (dB)
Cirrus	CR:515	94296	1000.00	94.0	93.7

No.	Brand	Model	Serial No.	Reading (dB)	dB Adjust
15	Cirrus	CR162B	G300769	93.8	-0.1
19	Cirrus	CR162B	G300990	93.5	0.2
39	Cirrus	CR162B	G302743	93.6	0.1

Calibrated by :

Approved by :

Preeda S.



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-67/0303

MTC.No.23-67/0303-02

Number of page(s) 2

## CALIBRATION CERTIFICATE

### Nomenclature : DRYCAL

Manufacturer : Mesa Labs

Serial No.: 160100

Model : Defender 520-L

Scale range : 5 ml/min to 500 ml/min

Subdivision : ( 0.001, 0.01 ) ml/min

Submitted by : SECOT CO.,LTD.

239, Rimklongprapa Road, Bangsue,  
Bangkok 10800, Thailand.

Received date : 13 February 2024 Condition of measured item : Normal

Calibration date : 6 March 2024

### Standard :

Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 643/65	1-Jun-24	TISTR
Molbox/PressureTransducer/UpStream	MP-0076-23	2-Apr-25	NIMT
Primary Flow Calibrator S/N 117982	MW-0034-23	11-Jun-25	NIMT

Calibrated by :

Terasak Panna

(Mr.Terasak Panna)

Approved by :

(Ms.Kirana Luanghirun)

Mechanical Engineering Standards Laboratory

Ref. 2013267021300639002

Issued Date 11 March 2024

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

### Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

### Office/Laboratory

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

### Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-67/0303

2/2

MTC.No.23-67/0303-02

**Calibration point :** (20, 50, 100, 200, 400) ml/min

**Ambient condition :** Temperature ( 23 ± 3 ) °C , Relative humidity ( 55 ± 15 ) %

Atmospheric pressure ( 1010±13) hPa

**Calibration method :** The flowmeter (UUC) was calibrated by comparison method with standard flowmeter according to CP-370.01.

The reported value is the value that converted to value at reference condition within pressure and temperature of the actual gas entering the UUC

**Measurement data :**

UUC Value	Standard Value	Temperature	Pressure	Deviation	Uncertainty
(ml/min)	(ml/min)	(°C)	(hPa)	(%)	(%)
19.854*	19.920	25.169	1006.69	-0.33	1.1
49.990	50.384	25.058	1006.80	-0.78	1.1
99.770	99.036	25.047	1006.89	+0.74	0.99
199.87	192.51	24.984	1007.03	+3.82	1.0
401.92	384.44	24.959	1007.30	+4.55	0.99

The reported expanded uncertainties are based on standard uncertainties multiplied by a coverage factor  $k=2$ , which provides a level of confidence of approximately 95%.

\* : The calibration point is not the scope of accreditation.

The end of calibration certificate.

TB.

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

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

FM.BL.MTC.002 Rev.4

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Tel. (66) 0 2323 1672-80 ext. 115, 116  
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E-mail : mtc@tistr.or.th

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

Sheet No. : CAL-2409-0071-01



## SOUND LEVEL METER CALIBRATION

Calibration Location: SECOT

Calibration Date: 06-09-2024

### ACOUSTIC CALIBRATOR

Brand	Model	Serial No.	Frequency (Hz)	Ref.Calibrated (dB)	Eff.Calibrated (dB)
Cirrus	CR:515	94296	1000.00	94	93.8

No.	Brand	Model	Serial No.	Reading (dB)	dB Adjust
1	SCARLET TECH	ST-21D	820728	93.8	0.0
2	SCARLET TECH	ST-21D	820723	93.8	0.0
3	SCARLET TECH	ST-21D	820725	93.8	0.0
4	SCARLET TECH	ST-21D	820727	93.8	0.0
5	SCARLET TECH	ST-21D	820722	93.8	0.0
6	SCARLET TECH	ST-21D	820731	93.8	0.0

Calibrated by :

Approved by :

CER\_CCE\_2409-0071\_Leq/CALSHEET01/21-09-24

SECOT CO., LTD.  
239 Rimkhongprapa Rd. Bangsue, Bangkok, 10800, THAILAND  
Tel: (662) 959-3600 Fax: (662) 959-3535  
E-Mail: envserv@secot.co.th



## SOUND LEVEL METER CALIBRATION

Calibration Location: SECOT

Calibration Date: 11-12-2024

## ACOUSTIC CALIBRATOR

Brand	Model	Serial No.	Frequency (Hz)	Ref.Calibrated (dB)	Eff.Calibrated (dB)
Cirrus	CR:515	94296	1000.00	94	93.8

No.	Brand	Model	Serial No.	Reading (dB)	dB Adjust
1	SCARLET TECH	ST-21D	820722	93.8	0.0
2	SCARLET TECH	ST-21D	820723	93.8	0.0
3	SCARLET TECH	ST-21D	820725	93.8	0.0
4	SCARLET TECH	ST-21D	820727	93.8	0.0
5	SCARLET TECH	ST-21D	820729	93.8	0.0
6	SCARLET TECH	ST-21D	820728	93.8	0.0

Calibrated by :

Approved by :

## CERTIFICATE OF CALIBRATION

ISSUED BY Noisemeters

DATE OF ISSUE 26 March 2024

CERTIFICATE NUMBER 211259

 NoiseMeters  
 Acoustic House  
 Bridlington Road  
 Hunmanby  
 YO14 0PH  
 United Kingdom  
 www.noisemeters.com

Page 1 of 2

 Approved signatory  
 N.Smith  
 Electronically signed:

NoiseMeters

## doseBadge Reader : IEC 60942:2003

## Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: RC:110A

Serial number: 95167

Class: 2

## Test summary

Date of calibration: 25 March 2024

The doseBadge reader detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC60942\_2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The doseBadge Reader has been shown to conform to the Class 2 requirements for periodic testing, described in Annex B of IEC 60942:2003 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

However, as public evidence was not available, from a testing organisation responsible for pattern approval, to demonstrate that the model of doseBadge Reader conformed to the requirements for pattern approval described in Annex A of IEC 60942:2003, no general statement or conclusion can be made about conformance of the doseBadge Reader to the requirements of IEC 60942:2003.

Notes:

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a coverage probability of approximately 95%.



# CERTIFICATE OF CALIBRATION

Certificate Number:

211259

Page 2 of 2

## Environmental conditions

The following conditions were recorded at the time of the test:

**Before** Pressure: 99.26 kPa Temperature: 22.1 °C Humidity: 33.4 %  
**After** Pressure: 99.26 kPa Temperature: 22.1 °C Humidity: 34.6 %

## Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	0839263
Acoustic Calibrator	Bruel and Kjaer	4231	2610257
Environmental Monitor	Comet	T7510	21962628

## Initial Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	113.41	113.54	113.55	113.50	-0.50	±0.75	0.11 dB
Distortion (%)	< 4.00	0.49	0.50	0.55	0.51	0.51	+4.00	0.13 %
Frequency (Hz)	1000.0	990.5	990.5	990.4	990.5	-9.5	±20.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

## Adjusted Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	113.99	113.99	113.98	113.99	-0.01	±0.75	0.11 dB
Distortion (%)	< 4.00	0.42	0.41	0.41	0.42	0.42	+4.00	0.13 %
Frequency (Hz)	1000.0	990.3	990.4	990.3	990.4	-9.6	±20.0	0.1 Hz

## Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

End of results

# CERTIFICATE OF CALIBRATION

ISSUED BY Noisemeters

DATE OF ISSUE 29 April 2024

CERTIFICATE NUMBER 213338

NoiseMeters  
Acoustic House  
Bridlington Road  
Hunmanby  
YO14 0PH  
United Kingdom  
www.noisemeters.com

NoiseMeters

Page 1 of 2

Approved signatory  
N.Smith  
Electronically signed:



## doseBadge Reader : IEC 60942:2003

### Instrument information

Manufacturer: Pulsar Instruments

Notes:

Model: Model 22R

Serial number: 79781

Class: 2

### Test summary

Date of calibration: 29 April 2024

The doseBadge reader detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC60942\_2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The doseBadge Reader has been shown to conform to the Class 2 requirements for periodic testing, described in Annex B of IEC 60942:2003 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

However, as public evidence was not available, from a testing organisation responsible for pattern approval, to demonstrate that the model of doseBadge Reader conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, no general statement or conclusion can be made about conformance of the doseBadge Reader to the requirements of IEC 60942:2003.

Notes:

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

# CERTIFICATE OF CALIBRATION

Certificate Number:

213338

Page 2 of 2

## Environmental conditions

The following conditions were recorded at the time of the test:

**Before** Pressure: 100.34 kPa Temperature: 22.4 °C Humidity: 38.5 %

**After** Pressure: 100.34 kPa Temperature: 22.7 °C Humidity: 36.3 %

## Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	0839263
Acoustic Calibrator	Bruel and Kjaer	4231	2610257
Environmental Monitor	Comet	T7510	21962628

## Initial Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	113.94	113.93	113.94	113.94	-0.06	±0.75	0.11 dB
Distortion (%)	< 4.00	0.49	0.49	0.49	0.49	0.49	+4.00	0.13 %
Frequency (Hz)	1000.0	998.9	998.9	998.9	998.9	-1.1	±20.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

## Adjusted Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	114.01	113.98	113.98	113.99	-0.01	±0.75	0.11 dB
Distortion (%)	< 4.00	0.49	0.49	0.49	0.49	0.49	+4.00	0.13 %
Frequency (Hz)	1000.0	998.9	999.0	998.9	998.9	-1.1	±20.0	0.1 Hz

## Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

End of results

# Calibration Certificate

BEIJING J.T TECHNOLOGY CO., LTD.  
www.jttech.com  
www.janttech.com

## Instrument information

Name	WET BULB GLOBE TEMPERATURE (WBGT)METER
Series No	3522210172
Type	JT2011-E2A
Customer	SECOT CO., LTD.
Address	239 Rim Klong Prapa Road, Bang Sue, Bang Sue, Bangkok 10800

## Integrity check of instrument

Appearance	✓
Parts integrity	✓
Screen display or touch	✓
Instrument button	✓
Power supply	✓
battery	✓
Data storage and export	✓
Deviation degree of comparison testwith standard instrument	✓

## Calibration Results

UUC Sensor	Standard Temperature ( °C )	UUCReading ( °C )	Correction ( °C )	Uncertainty ( ±°C )
WET	25.0	25.1	-0.1	0.2
	30.0	30.1	0.1	0.2
	35.0	35.2	-0.2	0.2
	40.0	39.9	0.1	0.2
	45.0	45.1	-0.1	0.2
DRY	25.0	24.9	0.1	0.2
	30.0	29.9	0.1	0.2
	35.0	35.1	-0.1	0.2
	40.0	39.8	0.2	0.2
	45.0	44.9	0.1	0.2
GLOBE	25.0	24.9	0.1	0.2
	30.0	29.8	0.2	0.2
	35.0	35.1	-0.1	0.2
	40.0	39.9	0.1	0.2
	45.0	44.9	0.1	0.2

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers, Manufacturer: BGRI, Model: STA, SN : 2-56,

Calibrated Date : 20 February 2023, Calibration Certificate No. : RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK000075

Calibration Engineer : \_\_\_\_\_

Date : \_\_\_\_\_ January 16, 2024



# Calibration Certificate

BEIJING J.T TECHNOLOGY CO., LTD.  
www.jttech.com  
www.jantech.com

## Instrument information



Name	WET BULB GLOBE TEMPERATURE (WBGT)METER
Series No	3522210173
Type	JT2011-E2A
Customer	SECOT CO., LTD.
Address	239 Rim Klong Prapa Road, Bang Sue, Bang Sue, Bangkok 10800

## Integrity check of instrument

Appearance	✓
Parts integrity	✓
Screen display or touch	✓
Instrument button	✓
Power supply	✓
battery	✓
Data storage and export	✓
Deviation degree of comparison test with standard instrument	✓

## Calibration Results

UUC Sensor	Standard Temperature ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ±°C )
WET	25.0	24.9	0.1	0.2
	30.0	29.8	0.2	0.2
	35.0	35.1	-0.1	0.2
	40.0	40.2	-0.2	0.2
	45.0	45.1	-0.1	0.2
DRY	25.0	24.9	0.1	0.2
	30.0	29.8	0.2	0.2
	35.0	35.1	-0.1	0.2
	40.0	40.2	-0.2	0.2
	45.0	45.1	-0.1	0.2
GLOBE	25.0	24.9	0.1	0.2
	30.0	29.8	0.2	0.2
	35.0	35.2	-0.2	0.2
	40.0	40.1	-0.1	0.2
	45.0	45.1	-0.1	0.2

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers, Manufacturer: BGRI, Model: STA, SN : 2-56,  
Calibrated Date : 20 February 2023, Calibration Certificate No. : RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK000075

Calibration Engineer : \_\_\_\_\_

Date : January 16, 2024



# Calibration Certificate

BEIJING J.T TECHNOLOGY CO., LTD.  
www.jttech.com  
www.jantech.com

## Instrument information



Name	WET BULB GLOBE TEMPERATURE (WBGT)METER
Series No	3522210176
Type	JT2011-E2A
Customer	SECOT CO., LTD.
Address	239 Rim Klong Prapa Road, Bang Sue, Bang Sue, Bangkok 10800

## Integrity check of instrument

Appearance	✓
Parts integrity	✓
Screen display or touch	✓
Instrument button	✓
Power supply	✓
battery	✓
Data storage and export	✓
Deviation degree of comparison test with standard instrument	✓

## Calibration Results

UUC Sensor	Standard Temperature ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ±°C )
WET	25.0	24.9	0.1	0.2
	30.0	29.8	0.2	0.2
	35.0	35.1	-0.1	0.2
	40.0	40.1	-0.1	0.2
	45.0	45.2	-0.2	0.2
DRY	25.0	25.1	-0.1	0.2
	30.0	30.2	-0.2	0.2
	35.0	35.2	-0.2	0.2
	40.0	39.8	0.2	0.2
	45.0	44.8	0.2	0.2
GLOBE	25.0	24.9	0.1	0.2
	30.0	29.8	0.2	0.2
	35.0	35.1	-0.1	0.2
	40.0	39.9	0.1	0.2
	45.0	44.8	0.2	0.2

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers, Manufacturer: BGRI, Model: STA, SN : 2-56,  
Calibrated Date : 20 February 2023, Calibration Certificate No. : RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK000075

Calibration Engineer : \_\_\_\_\_

Date : January 16, 2024





**INTERNATIONAL TESTING SERVICE CO., LTD**1213/388 Ladprao 94 Ladprao Rd. Wangtonglang Bangkok 10310  
Tel 0-2559-2095 Fax 0-2559-2096E-mail : sale@itest-lab.com web site : [www.itest-lab.com](http://www.itest-lab.com)

# CALIBRATION CERTIFICATE

Issued date: 9 February 2024

Client Name : **SECOT CO., LTD**

Address : 239 Rimklongprapa Rd., Bangsue, Bangkok 10800

Request No: **C-2402 - 035**Laboratory No.: **CAL- 035**

Date of Request: 6 February 2024.

Date of Calibration: 9 February 2024.

**1. Unit Under Calibration (UUC) :**

Nomenclature : Digital Light Meter

Serial No. : A.056654

Maker : EXTECH

Model : 407026

**2. Place of Calibration:** Photometry Standard Laboratory, INTERNATIONAL TESTING SERVICE CO., LTD.**3. Range of Calibration:** 2 Range**4. Condition of Laboratory:** Ambient temperature:  $(25 \pm 2) ^\circ\text{C}$  and relative humidity  $(60 \pm 20) \%$ .

**5. Reference Standard:** Standard Tungsten Halogen Lamp, Serial No.: 504010, which was calibrated on 14 June 2023, can be traceable to International System of Unit (SI) through National Institute of Metrology (Thailand), Certificate No.: TP-1027-23.

**6. Support Equipment:**

1. Photometric bench, 6.3 meter long.
2. DC. power supply, Serial No.: EJ 19A 009, Model: GPR-25H 300, Maker: GW INSTR.
3. Digital Multimeter, Model: 34401A, S/N: MY44011212 and MY44011215.
4. Foot Candle / Lux Meter, Model: 407026, S/N: Q 558437, Maker: EXTECH.

**7. Calibration Procedure:**

The measurement was done in accordance with WI-CP-01. The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95 %.

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The Results shown in this certification report refer only to the equipment(s) calibrated unless otherwise stated.  
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**INTERNATIONAL TESTING SERVICE CO., LTD**1213/388 Ladprao 94 Ladprao Rd. Wangtonglang Bangkok 10310  
Tel 0-2559-2095 Fax 0-2559-2096E-mail : sale@itest-lab.com web site : [www.itest-lab.com](http://www.itest-lab.com)Request No: **C-2402 - 035**

Serial No.: A.056654

Laboratory No.: **CAL - 035****Results:**

UUC Range	Standard (lx)	Unit Under Calibration Reading (lx)	Correction (lx)	Uncertainty of Measurement ( $\pm$ lx)
2000	0	0	0	0.60
	100	100	0	2.9 % of Reading
	504	507	-3	
	1013	1012	+1	
	1523	1519	+4	
	1933	1901	+32	
20000 (x10)	1933	1990	-57	2.9 % of Reading
	2878	2950	-72	
	3813	3930	-117	

- Note : 1. The results relate only to the items calibrated.  
2. Zero adjust before used.  
3. The UUC of range 20000 lux is cannot adjust because it has effect to range 2000 lux.

Calibration result approved by

Approved on behalf of  
International Testing Service Co., Ltd  
(Mr. Yuttana Tholueng)  
(Mr. Pichit Vivat-Anant)  
Managing Director

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