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ภาคผนวก ง

สำเนาใบรับรองการสอบเทียบเครื่องมือการตรวจวัด


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Mettler-Toledo (Thailand) Ltd.  
846/4 - 846/5 Laksale Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+662 723 0382  
MT-TH.ServicesSupport@mtl.com



## Accuracy Calibration Certificate

### Customer

Company: SGS (THAILAND) CO., LTD.  
Address: 1/209, 1/211 Moo 1, Ban Chang  
City: Ban Chang  
Zip / Postal: 21130  
State / Province: Rayong  
Order Number:   
Contact: Hatairat Lujice

### Weighing Device

Manufacturer: Mettler Toledo  
Model: XS205DU  
Serial No.: B036065880  
Building: LABORATORY  
Floor: 1  
Room: Balance Lab  
Instrument Type: Weighing Instrument  
Asset Number: N/A  
Terminal Model: SAT  
Terminal Serial No.: B036065880  
Terminal Asset No.: N/A

Range	Max. Capacity	Readability (g)
1	81 g	0.00001 g
2	220 g	0.0001 g

### Procedure

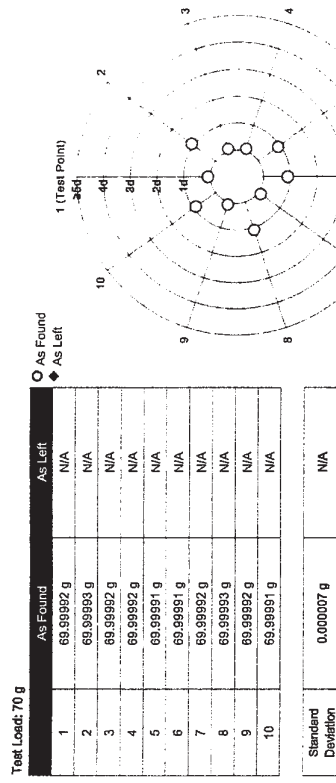
Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)  
CP19A002220  
METTLER TOLEDO Work Instruction:  
This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.  
The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.  
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

As Found	Temperature		Humidity	
	Start: 23.4 °C	End: 23.5 °C	Start: 74.0 %	End: 72.6 %

As Found Calibration Date: 18-Mar-2022  
As Left Calibration Date: N/A  
Issue Date: 19-Mar-2022  
Calibrator:   
Srasit Kosicharoenkul  
Approved Signatory:   
☒ Kasakorn Tassanachaisakul  
☐ Sani Jitinyom  
☐ Surachet Sukkale

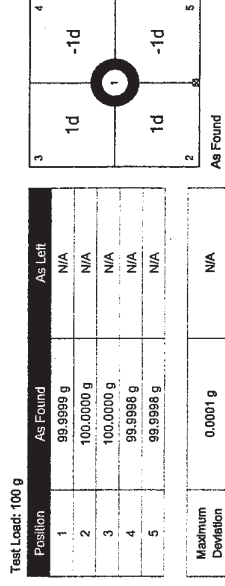
## Measurement Results

### Repeatability



The "σ" in the graph represents the readability of the range interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

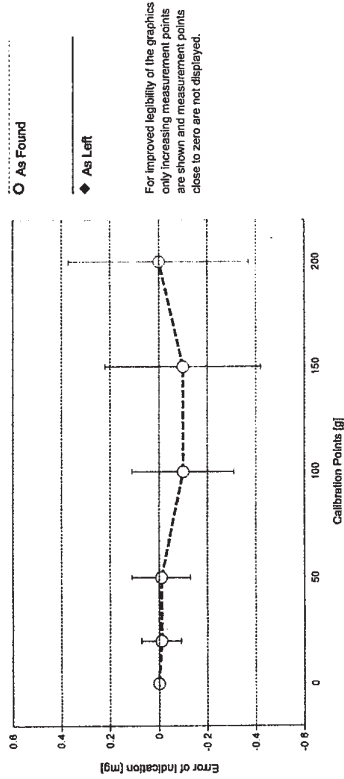


The "σ" in the graph represents the readability of the range interval in which the test was performed.

**Error of Indication**

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.016 mg	2
2	0.01000 g	0.00999 g	-0.00001 g	0.018 mg	2
3	0.10000 g	0.10000 g	0.00000 g	0.022 mg	2
4	1.00000 g	1.00000 g	0.00000 g	0.032 mg	2
5	5.00000 g	5.00000 g	0.00000 g	0.048 mg	2
6	9.99999 g	9.99999 g	0.00000 g	0.061 mg	2
7	19.99995 g	19.99994 g	-0.00001 g	0.082 mg	2
8	49.99998 g	49.99997 g	-0.00001 g	0.12 mg	2
9	100.00000 g	99.99999 g	-0.00001 g	0.21 mg	2
10	150.00000 g	149.99999 g	-0.00001 g	0.32 mg	2
11	199.99998 g	199.99998 g	0.00000 g	0.37 mg	2

\*The calculated uncertainty was replaced by the CMC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the CMC value.



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

**Test Equipment**

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2			
Weight Set No.:	W634	Date of Issue:	05-Jul-2021
Certificate Number:	174045	Calibration Due Date:	01-Jan-2023
Weight Set 2: OIML E2			
Weight Set No.:	WS71	Date of Issue:	21-Oct-2021
Certificate Number:	C142784703	Calibration Due Date:	27-Mar-2023
Hygrometer			
Equipment No.:	IN285	Date of Issue:	11-May-2021
Certificate Number:	21H1104	Calibration Due Date:	05-May-2022

**Remarks**

FACT adjustment functionality activated  
Equipment condition: Good  
Next calibration according to customer's procedure  
Calibration data not decide by calibration laboratory

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with  $k=2$  in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $1.5 \cdot 10^{-4} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 5 K

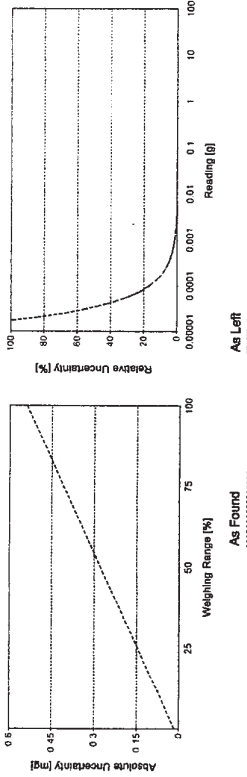
Linearization of Uncertainty Equation

Range		As Found		As Left	
d	Max				
1	0.00001 g	81 g	$U_1 = 0.017 \text{ mg} + 0.00645 \text{ mg/g} \cdot R$	N/A	N/A
2	0.0001 g	220 g	$U_2 = 0.06 \text{ mg} + 0.00639 \text{ mg/g} \cdot R$	N/A	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication		As Found		As Left	
0.00220 g		0.017 mg	0.77%	N/A	N/A
0.02200 g		0.017 mg	0.078%	N/A	N/A
0.22000 g		0.018 mg	0.0084%	N/A	N/A
2.20000 g		0.031 mg	0.0014%	N/A	N/A
220.0000 g		1.5 mg	0.00067%	N/A	N/A



The weighing ranges shown in the absolute uncertainty graph refers to the first interval/range of the device.



Certificate

As Found ✓ As Left ✓

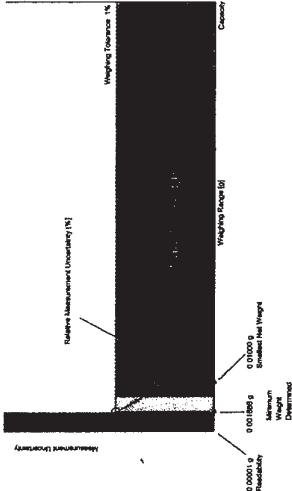
The weighing device meets the given process requirements.

Tests Performed: ☒ As Found ☐ As Left ☒ No adjustments/modifications made. As Left results correspond to As Found.

Process Requirements

Weighing Tolerance: 1% | Smallest Net Weight: 0.01000 g | Safety Factor: 2

Safe Weighing Range



While the values in the graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left testing, unless only As Found was performed.

## Minimum Weight

### As Found Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.016975 g	0.034172 g	0.051595 g	0.087139 g	0.180288 g
0.2%	0.008460 g	0.016975 g	0.025545 g	0.042855 g	0.087139 g
0.5%	0.003377 g	0.006764 g	0.010159 g	0.016975 g	0.034172 g
1%	0.001688 g	0.003377 g	0.005069 g	0.008460 g	0.016975 g
2%	0.000844 g	0.001688 g	0.002532 g	0.004223 g	0.008460 g
5%	0.000337 g	0.000675 g	0.001012 g	0.001688 g	0.003377 g

The minimum weight table applies to the fine range of the weighing device.

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

### As Left Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.016975 g	0.034172 g	0.051595 g	0.087139 g	0.180288 g
0.2%	0.008460 g	0.016975 g	0.025545 g	0.042855 g	0.087139 g
0.5%	0.003377 g	0.006764 g	0.010159 g	0.016975 g	0.034172 g
1%	0.001688 g	0.003377 g	0.005069 g	0.008460 g	0.016975 g
2%	0.000844 g	0.001688 g	0.002532 g	0.004223 g	0.008460 g
5%	0.000337 g	0.000675 g	0.001012 g	0.001688 g	0.003377 g

The minimum weight table applies to the fine range of the weighing device.

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with  $k = 2$  and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

#### Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

## Measurement Results

### Results Summary

		Repeatability		Eccentricity		Error of Indication	
		As Found	As Left				
		✓	✓			✓	✓

✓ = Passed  
✗ = Failed  
▲ = Safety Factor not met

### Repeatability

Test Load: 70 g

		Control Limit		As Found		As Left	
		Tolerance	Std. Deviation	Result	Std. Deviation	Result	Result
0.1%		0.000005 g		✓			✗
0.2%		0.000010 g		✓			▲
0.5%		0.000025 g		✓			✓
1%		0.000060 g	0.000007 g	✓		0.000007 g	✓
2%		0.000100 g		✓			✓
5%		0.000250 g		✓			✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

### Eccentricity

Test Load: 100 g

		Control Limit		As Found		As Left	
		Tolerance	Std. Deviation	Result	Std. Deviation	Result	Result
0.1%		0.00000 g		✓			✓
0.2%		0.1000 g		✓			✓
0.5%		0.2500 g		✓			✓
1%		0.5000 g	0.0001 g	✓		0.0001 g	✓
2%		1.0000 g		✓			✓
5%		2.5000 g		✓			✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.



## Error of Indication

As Found

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A
19.99995 g	-0.00001 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.50000 g
49.99998 g	-0.00001 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	1.25000 g
100.00000 g	-0.0001 g	0.0500 g	0.100 g	0.250 g	0.500 g	2.500 g
150.00000 g	-0.0001 g	0.0750 g	0.150 g	0.375 g	0.750 g	3.750 g
199.99998 g	0.0000 g	0.1000 g	0.200 g	0.500 g	1.000 g	5.000 g
Result		✓	✓	✓	✓	✓

As Left

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A
19.99995 g	-0.00001 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.50000 g
49.99998 g	-0.00001 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	1.25000 g
100.00000 g	-0.0001 g	0.0500 g	0.100 g	0.250 g	0.500 g	2.500 g
150.00000 g	-0.0001 g	0.0750 g	0.150 g	0.375 g	0.750 g	3.750 g
199.99998 g	0.0000 g	0.1000 g	0.200 g	0.500 g	1.000 g	5.000 g
Result		✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

## METTLER TOLEDO Service

## Error of Indication

As Found

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A
19.99995 g	-0.00001 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.50000 g
49.99998 g	-0.00001 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	1.25000 g
100.00000 g	-0.0001 g	0.0500 g	0.100 g	0.250 g	0.500 g	2.500 g
150.00000 g	-0.0001 g	0.0750 g	0.150 g	0.375 g	0.750 g	3.750 g
199.99998 g	0.0000 g	0.1000 g	0.200 g	0.500 g	1.000 g	5.000 g
Result		✓	✓	✓	✓	✓

As Left

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A
19.99995 g	-0.00001 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.50000 g
49.99998 g	-0.00001 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	1.25000 g
100.00000 g	-0.0001 g	0.0500 g	0.100 g	0.250 g	0.500 g	2.500 g
150.00000 g	-0.0001 g	0.0750 g	0.150 g	0.375 g	0.750 g	3.750 g
199.99998 g	0.0000 g	0.1000 g	0.200 g	0.500 g	1.000 g	5.000 g
Result		✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

Service Date: 2022-03-18

Document Number: TH2076-028-031822-LABBalanceHR

SGS (THAILAND) CO.,LTD.

1/208, 1/211 Moo 1, Ban Chang, Ban Chang, Rayong 21130

Heinrich Lujke

## METTLER TOLEDO

## Balance Health Report

Device Details		System Details	
Manufacturer:	Mettler Toledo	Accessory 1:	
Model:	XS205DU	Accessory 2:	
Serial number:	B030606980	Weight set for routine testing:	Yes /
Firmware:	1.05.0		
History		Service History	
Instrument in use:	Yes	Last preventive maintenance:	< 1 year
Instrument age:	> 10 years	Last instrument calibration:	< 1 year
Spare parts available:	Yes	Last minimum weight determination:	Never
Regulations:	ISO	Routine testing performed:	Yes
Process tolerance in %:	1%		
Smallest sample net weight:	0.01000g		
Check List		General & Functional Checks	
Room temperature fluctuation	✓	Levelling	✓
Exposure to direct sun	✓	Cleanliness	✓
Vibrations	✓	Completeness - missing parts see additional remarks	✓
Draft	✓	Settings optimized for operating environment	✓
Dirt or dust	✓	Other - objections noted as additional remarks	—
Static	✓	Electrical Component Checks	
		Power supply	✓
		Sliding door drive	✓
		Internal weight drive	✓
		Display	✓
		Other - objections noted as additional remarks	—
Recommendations		Additional Remarks & Recommendations	
Instrument calibration		Uninstall instrument	
Identify safe weighing range		Replace instrument	
GWP verification / risk assessment		Replace / add parts (see additional remarks)	
Preventive maintenance		Onsite repair	
Perform routine testing with test weights		Repair repair	
User training		Use of accessories (see additional remarks)	
Contact	Name: Heinrich Lujke	Position: Chemist	Phone: 0622693909
			Email: enlue@ry.bulland@gs.com
		Engineer Details	
		Date:	18-Mar-2022
		Name:	Srasi Kositcharoenkul
		Signature:	

This is not a certificate.

It should not be used to interpret final results for the testing of these devices.

Legend: ✓ Good/Pass    ✗ Needs Attention    ✗ Bad/Fail    — Not Applicable

SGS (THAILAND) CO.,LTD. 1/208, 1/211 Moo 1, Ban Chang, Ban Chang, Rayong 21130

www.mt.com

METTLER TOLEDO Service

Report Version: 1.13, Software Version 4.27.0.6, Page 1/1, © METTLER TOLEDO



# Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbua Thong, Nonthaburi 11110  
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



## CALIBRATION CERTIFICATE

Date of Issue  
Site Calibration

Jun 28, 2021

Cert No.  
Order No.

21/2393  
21060292

Customer

SGS (Thailand) Limited.

1/209, 1/211 Moo 1, T. Ban Chang, A. Ban Chang Rayong 21130 Thailand.

Place of Calibration

Hot Lab

Description

Oven

Model UFE400

Serial No.

G410.0833

ID.No.

O2010002

Date of Receipt

Jun 24, 2021

Date of Calibration

Jun 24, 2021

Environment

Temperature (Min) 19.8 °C (Max) 23.4 °C

Relative Humidity (Min) 55.8 %RH (Max) 83.9 %RH

Calibration Method

WI-17: The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.  
The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY49007789, Certificate No. QR20-2119, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292.

This certificate is traceable to SI unit.

Page 1 of 5

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.



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## CALIBRATION CERTIFICATE

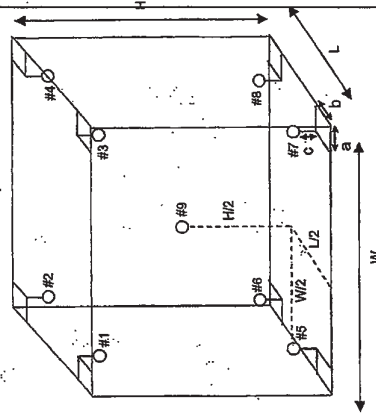
Date of Issue  
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Jun 28, 2021

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21/2393  
21060292

Results (without adjustment)



Position of reference thermometers were placed

Note:

- 1) Dimension (W x L x H) is 40 x 33 x 40 cm
- 2) Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3) Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

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NSC-TSP-TSI7025  
CALIBRATION 0109

## CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2021  
Site Calibration

Cert No. 21/2393  
Order No. 21080292

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)
85.0	85.0	Position 1 85.648	0.051	0.828	0.33
		Position 2 85.385			
		Position 3 85.303			
		Position 4 85.468			
		Position 5 85.020			
		Position 6 84.856			
		Position 7 84.507			
		Position 8 85.200			
		Position 9 85.048			

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)
104.0	104.0	Position 1 104.582	0.088	0.830	0.46
		Position 2 104.260			
		Position 3 104.078			
		Position 4 104.273			
		Position 5 103.745			
		Position 6 103.589			
		Position 7 103.117			
		Position 8 103.985			
		Position 9 103.798			



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CALIBRATION 0109

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Cert No. 21/2393  
Order No. 21080292

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)
150.0	150.0	Position 1 150.308	0.093	1.195	0.50
		Position 2 150.480			
		Position 3 150.146			
		Position 4 150.483			
		Position 5 149.889			
		Position 6 149.484			
		Position 7 148.775			
		Position 8 150.171			
		Position 9 149.785			

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)
180.0	180.0	Position 1 181.408	0.113	1.392	0.53
		Position 2 180.973			
		Position 3 180.494			
		Position 4 180.879			
		Position 5 179.979			
		Position 6 179.794			
		Position 7 178.906			
		Position 8 180.581			
		Position 9 180.088			





**Thermology Co., Ltd.**

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ISO 9001:2015  
CALIBRATION 0109

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21060292

The stability and uniformity was taken into account in the measurement uncertainty stated.

The above results are valid exclusively for calibration samples as mentioned in the report.

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 uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :

(MR. DAMRONG Mulsing)

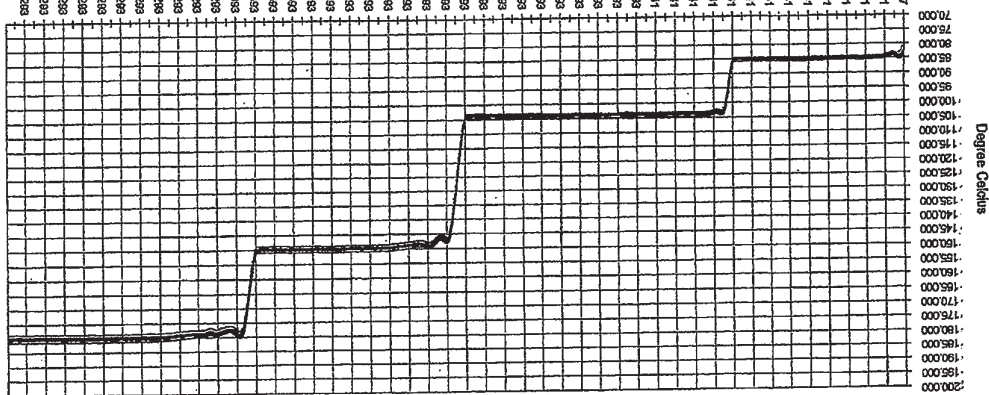
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Cert.No. 21/2393

Oven

Model: UFE400 S/N: G410.0833 ID.No. C2010022

Position-1  
Position-2  
Position-3  
Position-4  
Position-5  
Position-6  
Position-7  
Position-8  
Position-9





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21/2392  
21080292

Customer  
SGS (Thailand) Limited.

1/209, 1/211 Moo 1, T. Ban Chang, A. Ban Chang Rayong 21130 Thailand.

Place of Calibration

Sample Area

Description

Incubator

Model

I250DS

Serial No.

I250402-0810-0319

ID.No.

I2010004

Date of Receipt

Jun 24, 2021

Date of Calibration

Jun 24, 2021

Environment

Temperature	(Min)	22.4	°C	(Max)	23.2	°C
Relative Humidity	(Min)	65.5	%RH	(Max)	77.4	%RH

Calibration Method

WI-17: The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.  
The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A SIN. MY49025696, Certificate No. QP20-0994, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292.

This certificate is traceable to SI unit.

Page 1 of 3

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.



# Thermology Co., Ltd.

96/177-96/178 Moo 6, T. Le-harn, A. Bangbuaithong, Nonthaburi 11110  
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



NSC-TSP-TIS7025  
CALIBRATION 0109

## CALIBRATION CERTIFICATE

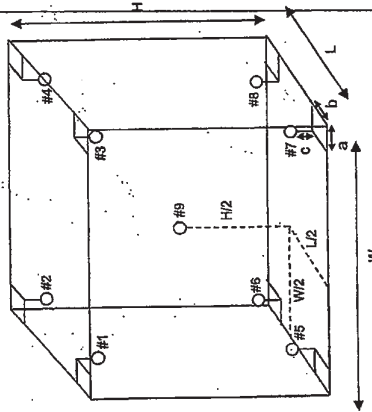
Date of Issue  
Site Calibration

Jun 28, 2021

Cert.No.  
Order No.

21/2392  
21080292

Results (without adjustment)



Position of reference thermometers were placed

### Note.

- 1). Dimension (W x L x H) is 50 x 50 x 105 cm
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

Page 2 of 3



# Thermology Co., Ltd.

90/177-96/178 Moo 6, T. La-harn, A. Bangbuastrong, Nonthaburi 11110  
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



## CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2021  
Site Calibration

Cert No. 21/2392  
Order No. 21060292

Results (without adjustment)

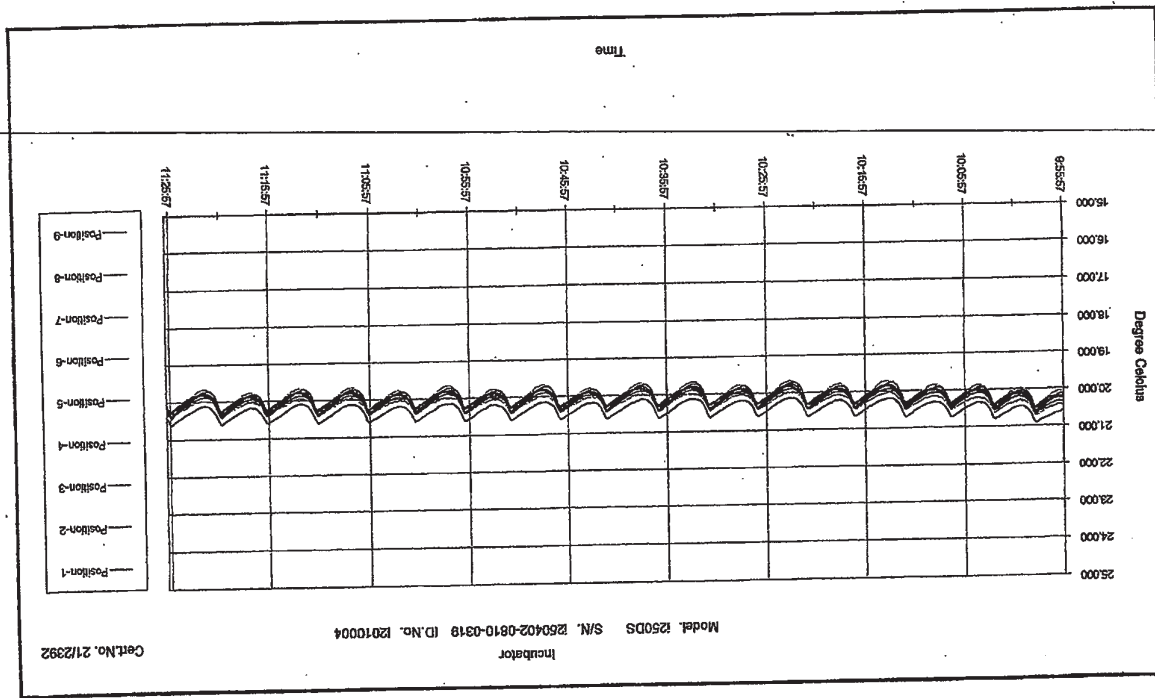
UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)
20.0	20.0	Position 1 20.337	0.353	0.424	0.64
		Position 2 20.050			
		Position 3 20.156			
		Position 4 19.953			
		Position 5 20.037			
		Position 6 20.104			
		Position 7 19.997			
		Position 8 20.021			
		Position 9 20.018			

The stability and uniformity was taken into account in the measurement uncertainty stated.  
The above results are valid exclusively for calibration samples as mentioned in the report.  
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 uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :

(MR. DAMRONG MULSING)

Page 3 of 3





# Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuahtong, Nonthaburi 11110  
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



NSC-TIS-TSI 7025  
CALIBRATION 019

## CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2021  
Site Calibration

Cert No. 21/2395  
Order No. 21060292

Customer SGS (THAILAND) Limited

1/209, 1/211 Moo1, T. Ban Chang, A. Ban Chan, Rayong 21130 Thailand

Place of Calibration Hot Lab

Description Water Bath

Model WNB29

Serial No. L611.0546

ID.No. W2012002

Date of Receipt Jun 24, 2021

Date of Calibration Jun 24, 2021

Environment

Temperature	(Min)	19.8	°C	(Max)	23.4	°C
Relative Humidity	(Min)	55.8	%RH	(Max)	83.9	%RH
Line Voltage	(Min)	228.5	Vac	(Max)	231.4	Vac

Calibration Method

WI-18 : The reference thermometers were placed into the bath and the measurement was based on ASTM E715-80.  
The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY49007789, Certificate No. QR20-2119, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292.

This certificate is traceable to SI unit.

Page 1 of 3

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.



# Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuahtong, Nonthaburi 11110  
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



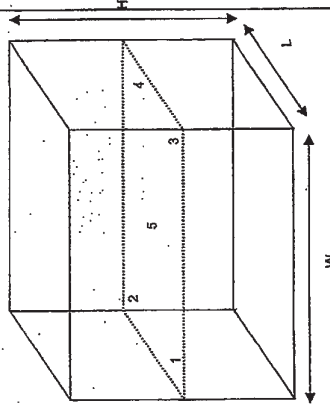
NSC-TIS-TSI 7025  
CALIBRATION 019

## CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2021  
Site Calibration

Cert No. 21/2395  
Order No. 21060292

Results (without adjustment)



Position of reference thermometers were placed

### Note.

- 1). Dimension (W x L x H) is 35 x 28 x 16 cm
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

Page 2 of 3



**Thermology Co., Ltd.**

96/177-96/178 Moo 6, T. Le-harn, A. Bangbuastrong, Nonthaburi 11110  
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



## CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2021  
Site Calibration

Cert No. 21/2395  
Order No. 21060292

Results (without adjustment)

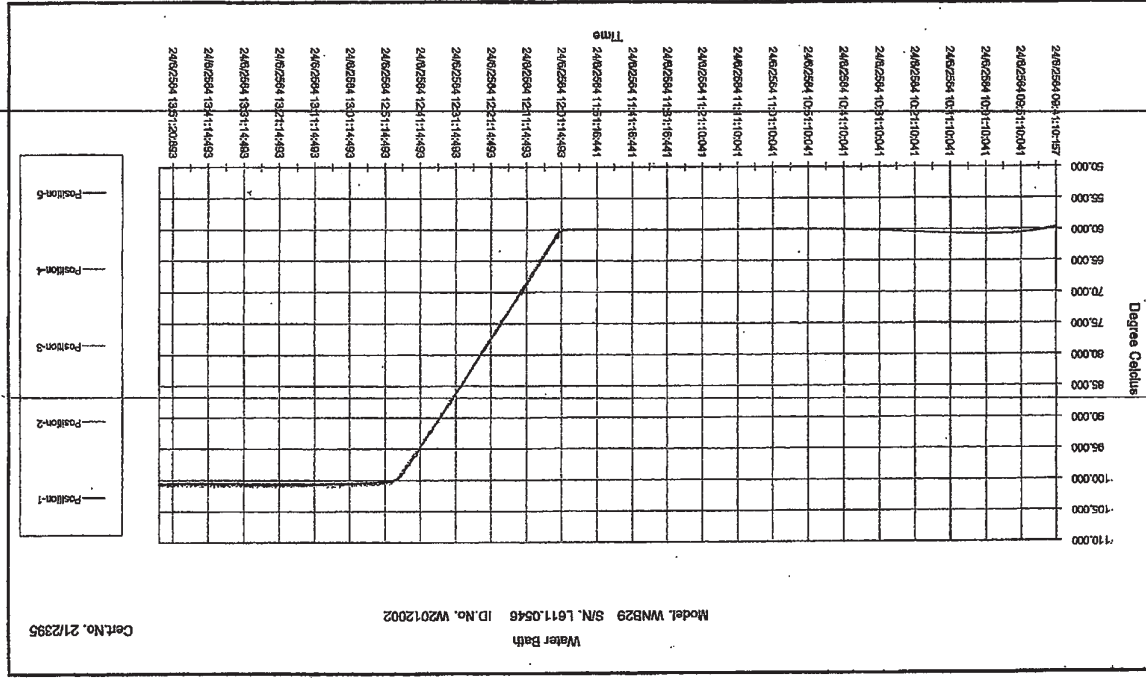
UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)
60.0	60.0	Position 1 59.975	0.051	0.127	0.15
		Position 2 60.013			
		Position 3 60.029			
		Position 4 60.088			
		Position 5 60.047			
UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)
[[[	100.8	Position 1 100.752	0.212	0.473	0.32
		Position 2 100.666			
		Position 3 100.780			
		Position 4 100.620			
		Position 5 100.565			

The stability and uniformity was taken into account in the measurement uncertainty stated.  
The above results are valid exclusively for calibration samples as mentioned in the report.  
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 uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :

(MR. DAMRONG MULSING)

Page 3 of 3







TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



REC-TEST-17225  
CALIBRATION SERVICES

Cert.No.: 21CH93  
Page: 1 of 3

## Certificate of Calibration

Equipment : pH Meter  
Manufacturer : Mettler Toledo  
Model : Seven Easy S20  
Serial No. : 1231235141  
ID No. : P2010024  
Condition As-Received : Used Item  
Received Date : 25 January 2021  
Calibration Date : 27 January 2021  
Reference : 2101-0677WSC-1  
Submitted by : SGS (Thailand) Limited  
1/209, 1/211 Moo 1, T.Banchang,  
A. BanChang Rayong 21130  
Ambient Temperature :  $25 \pm 2.5$  °C  
Relative Humidity :  $(50 \pm 15)$  %  
Calibration Procedure :  
In - house method :  
- CP-CH8 by direct measurement with standard  
voltage calibrator and direct measurement with  
certified reference material (CRM)  
- CP-CH8 by comparison with standard thermometer

Calibrated by :

Warakorn Lemgagrakul

Approved by :

Approved Signatory

( ) Malee Bulkruea  
( ) Saithip Meangmal  
( ) Warakorn Lemgagrakul

Issue Date :

3 February 2021

The Uncertainties are for a confidence probability of approximately 95 %

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



Cert.No.: 21CH93  
Page: 2 of 3

### Condition of this calibration result

1. Reference Standard Instrument : -  
Instrument Serial No. ID No. Cert. No. Due Date  
1) Document Process Calibrator 48530031 130RC098 20E3666 14 Oct 2021  
2) Ref. Standard Thermometer 2188080 130RC044 20I1389 19 Nov 2021  
This certification is traceable to the International System of Unit maintained at:-  
- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,  
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution Manufacturer Lot No. Exp. date  
pH 4.008 CPA chem 693945 21 June 2022  
pH 6.985 CPA chem 706696 06 Sep 2021  
pH 10.008 CPA chem 706695 06 Sep 2021

3. This certificate is valid only to the item calibrated on date and place of calibration.

### Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
			mV	pH		
pH Meter	4.000	177.48	177.6	4.000	0.058	2.00
S/N.: 1231235141	7.000	0.00	0.2	7.000	0.058	2.00
	10.000	-177.48	-177.3	10.000	0.058	2.00

A 0024193

a 1038985



Cert.No.: 21CH93  
Page: 3 of 3

#### Calibration Results

##### Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor $k$
pH Electrode ✓ S/N.: 8446396	4.008	4.008	172.6	0.0046	2.00
	6.985	6.989	-1.9	0.0080	2.00
	10.008	10.009	-178.2	0.013	2.00

##### Function : Temperature Measurement

(\*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLab Expert Pro
- Serial No. : 8449396
- Dimension of probe;
  - Length : 120 mm.
  - Diameter : 12 mm.
  - Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor $k$
25.0	25.002	24.9	-0.102	0.20	2.00

Remark : - UUC\* = Unit Under Calibration

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

-o0o-

a 1038984



### Meter Console Verification


Dry Gas Meter ID. : ENSS 046 Date of Calibration : 23/10/2021  
Instrument Brand : Apex / Model 572 Calibrated By : OC


#### Wet gas meter Information

Wet gas Brand : Shinagawa Wet gas S/N : 544122  
Wet gas Model : W-NK-2.5A Expire Date : 27 July 2022

Orifice Sizing $\Delta H@$ (mm H <sub>2</sub> O)	Wet gas		Metering System		Time ( min )	Yi	$\Delta H@$	
	V <sub>w</sub> ( L )	T <sub>w</sub> ( °C )	V <sub>d</sub> ( L )	T <sub>m</sub> ( °C )				
13	136.08	25.1	140.0	24.0	12:22	0.9673	50.956	
13	136.26	25.0	140.0	24.0	12:22	0.9689	50.787	
26	134.55	24.7	140.0	24.0	8:31	0.9564	49.380	
26	134.27	24.5	140.0	24.0	8:32	0.9552	49.697	
40	270.27	24.3	280.0	24.5	13:53	0.9623	49.869	
40	267.81	24.1	280.0	25.0	13:53	0.9556	50.654	
50	266.99	24.1	280.0	25.0	12:15	0.9518	49.647	
50	266.45	24.0	280.0	24.0	12:15	0.9470	49.983	
70	264.74	24.0	280.0	24.5	10:08	0.9409	48.496	
70	265.83	23.8	280.0	25.0	10:07	0.9468	47.816	
90	263.32	23.8	280.0	24.0	8:55	0.9329	48.928	
90	263.34	23.8	280.0	24.0	8:54	0.9330	48.730	
Average							0.9515	49.579

Remark :  $Y_i \leq \pm 0.02$  from average  
 $Y_i = 1.00 \pm 0.05$   
 $\Delta H@ \leq \pm 5.08$  mm.H<sub>2</sub>O from average  
 $\Delta H@ = 46.7 \pm 6.4$  mm.H<sub>2</sub>O

Checked By :  (Wasagorn Praveschodnunt)  
Position : Operation Manager  
Date : 25 / 10 / 2021

Approved By :  (Thepsan Yommana)  
Position : Technical Manager  
Date : 25 / 10 / 2021



### Manometer Verification

Dry Gas Meter ID. : ENSS 046 Date of Calibration : 23/10/2021  
Instrument Brand : Apex / Model 572 Calibrated By : OC, MW

#### Magnehelic gauge Information

Magnehelic Brand : Dwyer Industries, Inc. Magnehelic S/N : R060822A1109  
Magnehelic Model : 2000-100MM Expire Date : 14/10/2022

Test No.	Manometer data			Reference/Monitoring A/B
	Manometer Reference $\Delta P$ (mm.H <sub>2</sub> O);A	Manometer monitoring $\Delta P$ (mm.H <sub>2</sub> O);B	Difference	
1	2.0	2.0	0.00	1.00
2	6.0	6.0	0.00	1.00
3	10.0	10.5	0.50	0.95
4	16.0	16.5	0.50	0.97
5	20.0	20.5	0.50	0.98
Average			0.30	0.98

Remark : [ Reference(Avg) / Monitoring(Avg) ] must be = 0.95 to 1.05

Checked By :  (Wasagorn Praveschodnunt)  
Position : Operation Manager  
Date : 25 / 10 / 2021

Approved By :  (Thepsan Yommana)  
Position : Technical Manager  
Date : 25 / 10 / 2021



## Temperature Display Verification

Dry Gas Meter ID. : ENS5 046 Date of Calibration : 23/10/2021  
Instrument Brand : Apex / Model 572 Calibrated By : MW

### Temperature Simulator Information

Simulator Brand : Handy Cal Simulator S/N : T1L1015  
Simulator Model : CA11E Expire Date : 15/06/2022

Standard Value	Instrument Display			
	Stack	Probe	Filter	Exit
300	300	300	300	-
200	200	200	200	-
150	150	150	150	-
100	100	100	100	101
50	50	50	49	50
0	0	0	0	0
Difference	0.0%	0.0	1.0	0.0

Remark : Stack  $\leq \pm 1.5\%$  Absolute  
Probe  $\leq \pm 3.0\text{ }^{\circ}\text{C}$   
Filter  $\leq \pm 3.0\text{ }^{\circ}\text{C}$

Aux  $\leq \pm 3.0\text{ }^{\circ}\text{C}$   
Exit  $\leq \pm 3.0\text{ }^{\circ}\text{C}$

Checked By :

(Wasagorn Praveschotinunt)

Position :

Operation Manager

Date :

25 / 10 / 2021

Approved By :

(Thepsin Yommana)

Position :

Technical Manager

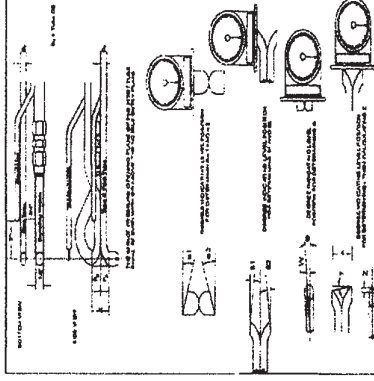
Date :

25 / 10 / 2021



## Certificate of Calibration

S-Type Geometric Pitot Tube Calibration  
See the Code of Federal Regulations, Title 40, Part 60, Appendix A,  
Method 2, Item 4



Pitot tube/Probe No. No.5

Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes or Y	PASS
Ports Damaged?	N	No or n	PASS
$\alpha 1$	2.2	$-10^{\circ} < \alpha 1 < +10^{\circ}$	PASS
$\alpha 2$	1.3	$-10^{\circ} < \alpha 1 < +10^{\circ}$	PASS
$\beta 1$	2.1	$-5^{\circ} < \alpha 1 < +5^{\circ}$	PASS
$\beta 2$	0.3	$-5^{\circ} < \alpha 1 < +5^{\circ}$	PASS
$\gamma$	1.8	N/A	-
$\theta$	1.2	N/A	-
$D_1$	0.375	0.188" to 0.375"	PASS
A	0.874	$2.10 \leq A \leq 3.00$	PASS
A/2D <sub>1</sub>	1.165	$1.05 \leq P_1/D_1 \leq 1.5$	PASS
Z = A tan $\gamma$	0.027	$Z \leq 0.125$ "	PASS
W = A tan $\theta$	0.018	$W \leq 0.031$ "	PASS

I certify that pitot tube/probe

No.5

meets or exceeds all specifications, criteria and/or applicable design features

and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App A, EPA Method 2

Standard Device

Device Name Digital Inclinerometer

Manufacturer BASELINE

Model 12-1057

ID No. QC-1824

Certified by

6 / 01 / 2022

Date

Expiration data

ENSS No.

07-Dec-22

ENSS 22159

Approved by

25 / 10 / 2021

Date

SGS

Prob Nozzle Diameter Calibration Data Sheet

Date 17/05/2022 Personal [Signature]  
Vernier (Digital) 0.0161mm Reference 0.05mm  
Nozzle ID 00000001 Nozzle Set (Stainless Steel)

Nozzle No.	Nozzle Diameter (mm)			Hi-Lo ΔD	D <sub>avg</sub>
	D1	D2	D3		
1	3.03	3.07	3.04	0.04	3.04
2	4.54	4.57	4.50	0.06	4.57
3	6.03	6.06	6.04	0.08	6.03
4	6.19	6.16	6.22	0.06	6.19
5	7.43	7.41	7.50	0.08	7.45
6	9.34	9.38	9.30	0.06	9.35
7	12.56	12.60	12.53	0.06	12.57

Remark : ΔD = Maximum distance between any two diameters, must be ≤ 0.100 mm  
D<sub>avg</sub> = (D1+D2+D3)/3

Checked By : [Signature]  
(Wasagorn Praveschotinunt)  
Position : Operations Manager  
Date : 20/5/2022

Approved By : [Signature]  
(Naris Phongviratchai)  
Position : Technical Manager  
Date : 23/05/2022

SGS

Prob Nozzle Diameter Calibration Data Sheet

Date 17/05/2022 Personal [Signature]  
Vernier (Digital) 0.0161mm Reference 0.05mm  
Nozzle ID 00000001 Nozzle Set (Stainless Steel)

Nozzle No.	Nozzle Diameter (mm)			Hi-Lo ΔD	D <sub>avg</sub>
	D1	D2	D3		
1	3.03	3.07	3.04	0.08	3.21
2	4.54	4.57	4.50	0.04	3.52
3	6.03	6.06	6.20	0.02	4.69
4	6.19	6.06	6.60	0.08	5.91
5	7.43	7.40	7.66	0.08	7.61
6	9.34	9.36	9.30	0.08	9.33
7	12.56	12.60	12.66	0.04	12.66

Remark : ΔD = Maximum distance between any two diameters, must be ≤ 0.100 mm  
D<sub>avg</sub> = (D1+D2+D3)/3

Checked By : [Signature]  
(Wasagorn Praveschotinunt)  
Position : Operations Manager  
Date : 20/5/2022

Approved By : [Signature]  
(Naris Phongviratchai)  
Position : Technical Manager  
Date : 23/05/2022



SGS

PEX SOURCE TESTING EQUIPMENT  
INSTRUMENTS  
Revised: 20200916

Certificate of Calibration  
S-Type Geometric Pitot Tube Calibration

See the Code of Federal Regulations, Title 40, Part 60, Appendix A,  
Method 2, Item 4.

ENSS 22164

Prob Nozzle Diameter Calibration Data Sheet

Date: 21/05/2022 Personal: [Signature]

Vernier (Digital): 1001631607 Reference: GS 22164

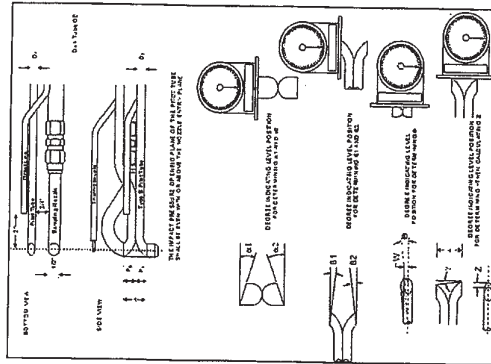
Nozzle ID: ENSS 0023 Nozzle Set (Stainless Steel)

Nozzle No.	Nozzle Diameter (mm)			HI-Lo	D <sub>avg</sub>
	D1	D2	D3	AD	
1	5.921	5.921	5.921	0.02	3.03
2	5.927	5.927	5.927	0.06	4.45
3	5.936	5.936	5.936	0.08	5.66
4	5.940	5.940	5.940	0.08	6.15
5	5.942	5.942	5.942	0.08	6.27
6	5.946	5.946	5.946	0.06	9.16
7	5.948	5.948	5.948	0.08	10.91

Remark: AD = Maximum distance between any two diameters, must be  $\leq 0.100$  mm  
 $D_{avg} = (D1+D2+D3)/3$

Checked By: (Wasagorn PraVesChotimunt)  
Position: Operations Manager  
Date: 20/5/2022

Approved By: (Naris Phongviratchai)  
Position: Technical Manager  
Date: 23/5/2022



PITOT TUBE/PROBE #			A10393	
Parameter	Value	Allowable Range	Check	
Assembly Level?	Y	Yes, Y	PASS	
Ports Damaged?	n	No, N	PASS	
$\alpha 1$	0	$-10^\circ < \alpha 1 < +10^\circ$	PASS	
$\alpha 2$	0	$-10^\circ < \alpha 2 < +10^\circ$	PASS	
$\beta 1$	1	$-5^\circ < \beta 1 < +5^\circ$	PASS	
$\beta 2$	0	$-5^\circ < \beta 2 < +5^\circ$	PASS	
$\gamma$	0	N/A	-	
$\theta$	1	N/A	-	
Dt	0.375	.18" to .375"	PASS	
A	0.938	$2.1D \leq A \leq 3D$	PASS	
AZDt	1.251	$1.05 \leq P_{AD} \leq 1.5$	PASS	
$Z = A \tan \gamma$	0.000	$Z \leq .125"$	PASS	
$W = A \tan \theta$	0.016	$W \leq .031"$	PASS	

Certified by: [Signature] Technician Signature 9/23/2021 Calibration Date

I certify that pitot tube/probe number A10393 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR PL 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuring annual calibrations. A geometric calibration should be performed following each subsequent field use.

Purchase Date

Apex Instruments - Address: 204 Technology Park Ln., Fuquay-Varina, NC 27526 USA | Tel: (919) 557-7300 Web: www.apexinst.com

VERIFIED

BY

DATE Jan 11, 2021

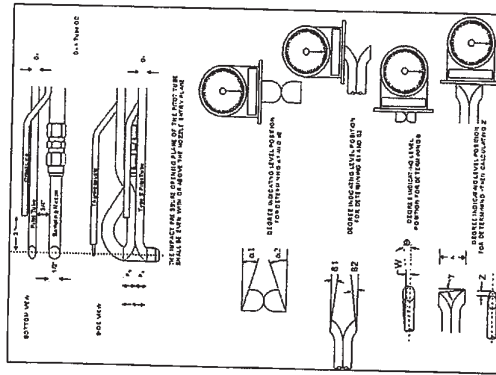


# Certificate of Calibration

S-Type Geometric Pitot Tube Calibration

See the Code of Federal Regulations, Title 40, Part 80, Appendix A, Method 2, Item 4.

ENSS 22165



PITOT TUBE/PROBE # A10394			
Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes, Y	PASS
Ports Damaged?	N	No, N	PASS
$\alpha 1$	0	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	0	$-10^\circ < \alpha 2 < +10^\circ$	PASS
$\beta 1$	1	$-5^\circ < \beta 1 < +5^\circ$	PASS
$\beta 2$	0	$-5^\circ < \beta 2 < +5^\circ$	PASS
$\gamma$	0	N/A	-
$\theta$	1	N/A	-
Dt	0.375	.188" to .375"	PASS
A	0.926	$2.1D_t \leq A \leq 3D_t$	PASS
A/2Dt	1.235	$1.05 \leq P_A/D_t \leq 1.5$	PASS
Z = A tan $\gamma$	0.000	Z $\leq .125"$	PASS
W = A tan $\theta$	0.016	W $\leq .031"$	PASS

Certified by:

Technician

Signature

9/23/2021

Calibration Date

I certify that pitot tube/probe number A10394 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR PL 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuring annual calibrations. A geometric calibration should be performed following each subsequent field use.

Apex Instruments - Address: 204 Technology Park Ln., Fuquay-Varina, NC 27526 USA | Tel: (919) 557-7300 Web: www.apexinst.com

VERIFIED

DATE Jan 11, 2022

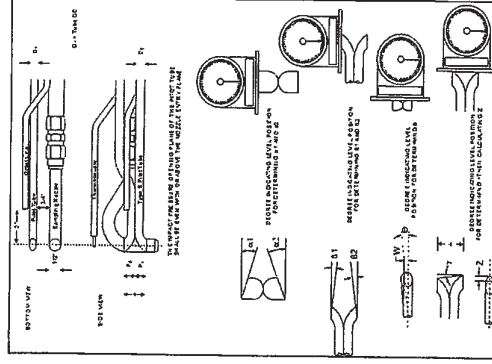


# Certificate of Calibration

S-Type Geometric Pitot Tube Calibration

See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.

ENSS 22166



PITOT TUBE/PROBE # A10401			
Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes, Y	PASS
Ports Damaged?	N	No, N	PASS
$\alpha 1$	1	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	0	$-10^\circ < \alpha 2 < +10^\circ$	PASS
$\beta 1$	0	$-5^\circ < \beta 1 < +5^\circ$	PASS
$\beta 2$	0	$-5^\circ < \beta 2 < +5^\circ$	PASS
$\gamma$	1	N/A	-
$\theta$	1	N/A	-
Dt	0.375	.188" to .375"	PASS
A	0.963	$2.1D_t \leq A \leq 3D_t$	PASS
A/2Dt	1.271	$1.05 \leq P_A/D_t \leq 1.5$	PASS
Z = A tan $\gamma$	0.017	Z $\leq .125"$	PASS
W = A tan $\theta$	0.017	W $\leq .031"$	PASS

Certified by:

Technician

Signature

9/23/2021

Calibration Date

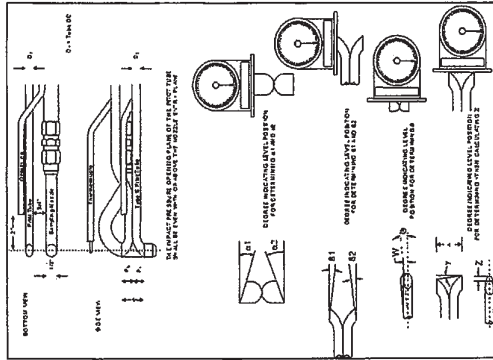
I certify that pitot tube/probe number A10401 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuring annual calibrations. A geometric calibration should be performed following each subsequent field use.

Apex Instruments - Address: 204 Technology Park Ln., Fuquay-Varina, NC 27526 USA | Tel: (919) 557-7300 Web: www.apexinst.com

VERIFIED

DATE Jan 11, 2022

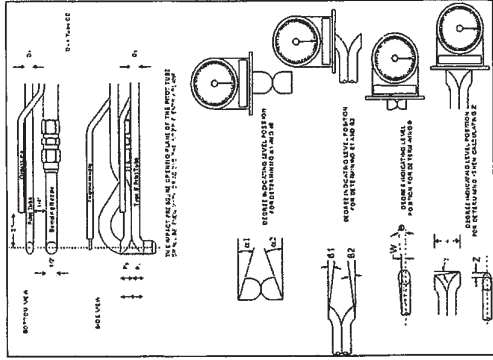


PITOT TUBE/PROBE #		A10402	
Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes, Y	PASS
Ports Damaged?	N	No, N	PASS
$\alpha 1$	1	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	0	$-10^\circ < \alpha 2 < +10^\circ$	PASS
$\beta 1$	0	$-5^\circ < \beta 1 < +5^\circ$	PASS
$\beta 2$	0	$-5^\circ < \beta 2 < +5^\circ$	PASS
$\gamma$	1	N/A	-
$\theta$	0	N/A	-
Dt	0.375	.188" to .375"	PASS
A	0.944	$2.1D_t \leq A \leq 3D_t$	PASS
A/2Dt	1.259	$1.05 \leq P_d/D_t \leq 1.5$	PASS
$Z = A \tan \gamma$	0.016	$Z \leq .125"$	PASS
$W = A \tan \theta$	0.000	$W \leq .031"$	PASS

Certified by: \_\_\_\_\_ Technician \_\_\_\_\_ Signature \_\_\_\_\_

I certify that pitot tube/probe number A10402 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuring annual calibrations. A geometric calibration should be performed following each subsequent field use.



PITOT TUBE/PROBE #		A10403	
Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes, Y	PASS
Ports Damaged?	N	No, N	PASS
$\alpha 1$	0	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	0	$-10^\circ < \alpha 2 < +10^\circ$	PASS
$\beta 1$	1	$-5^\circ < \beta 1 < +5^\circ$	PASS
$\beta 2$	0	$-5^\circ < \beta 2 < +5^\circ$	PASS
$\gamma$	1	N/A	-
$\theta$	0	N/A	-
Dt	0.375	.188" to .375"	PASS
A	0.940	$2.1D_t \leq A \leq 3D_t$	PASS
A/2Dt	1.253	$1.05 \leq P_d/D_t \leq 1.5$	PASS
$Z = A \tan \gamma$	0.016	$Z \leq .125"$	PASS
$W = A \tan \theta$	0.000	$W \leq .031"$	PASS

Certified by: \_\_\_\_\_ Technician \_\_\_\_\_ Signature \_\_\_\_\_

I certify that pitot tube/probe number A10403 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuring annual calibrations. A geometric calibration should be performed following each subsequent field use.



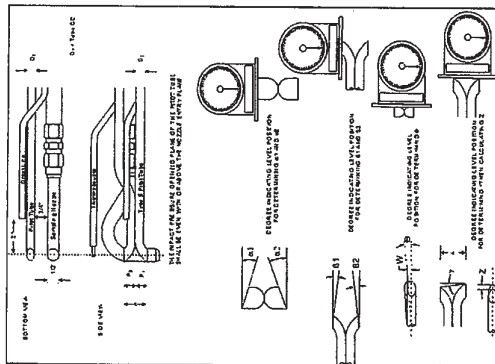
ENSS 22169



### Certificate of Calibration

S-Type Geometric Pitot Tube Calibration

See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.



PITOT TUBE/PROBE # A10404			
Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes, Y	PASS
Ports Damaged?	n	No, N	PASS
$\alpha 1$	0	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	0	$-10^\circ < \alpha 2 < +10^\circ$	PASS
$\beta 1$	1	$-5^\circ < \beta 1 < +5^\circ$	PASS
$\beta 2$	0	$-5^\circ < \beta 2 < +5^\circ$	PASS
$\gamma$	1	N/A	-
$\theta$	0	N/A	-
Dt	0.375	.188" to .375"	PASS
A	0.948	$2.1D_1 \leq A \leq 3D_1$	PASS
A/2D1	1.264	$1.05 \leq P_2/D_1 \leq 1.5$	PASS
$Z = A \tan \gamma$	0.017	$Z \leq .125"$	PASS
$W = A \tan \theta$	0.000	$W \leq .031"$	PASS

Certified by:

Technician

Signature

9/23/2021

Calibration Date

I certify that pitot tube/probe number A10404 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuring annual calibrations. A geometric calibration should be performed following each subsequent field use.

Apex Instruments - Address: 204 Technology Park Ln., Fuquay-Varina, NC 27526 USA | Tel: (919) 557-7300 Web: www.apexinst.com

VERIFIED

DATE 9/21/2022

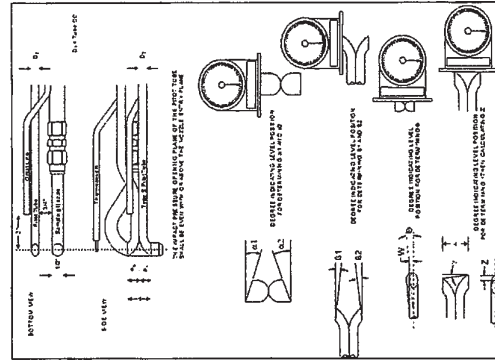
ENSS 22170



### Certificate of Calibration

S-Type Geometric Pitot Tube Calibration

See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.



PITOT TUBE/PROBE # A10407			
Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes, Y	PASS
Ports Damaged?	n	No, N	PASS
$\alpha 1$	1	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	0	$-10^\circ < \alpha 2 < +10^\circ$	PASS
$\beta 1$	0	$-5^\circ < \beta 1 < +5^\circ$	PASS
$\beta 2$	0	$-5^\circ < \beta 2 < +5^\circ$	PASS
$\gamma$	0	N/A	-
$\theta$	1	N/A	-
Dt	0.375	.188" to .375"	PASS
A	0.940	$2.1D_1 \leq A \leq 3D_1$	PASS
A/2D1	1.265	$1.05 \leq P_2/D_1 \leq 1.5$	PASS
$Z = A \tan \gamma$	0.000	$Z \leq .125"$	PASS
$W = A \tan \theta$	0.017	$W \leq .031"$	PASS

Certified by:

Technician

Signature

9/23/2021

Calibration Date

I certify that pitot tube/probe number A10407 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuring annual calibrations. A geometric calibration should be performed following each subsequent field use.

Apex Instruments - Address: 204 Technology Park Ln., Fuquay-Varina, NC 27526 USA | Tel: (919) 557-7300 Web: www.apexinst.com

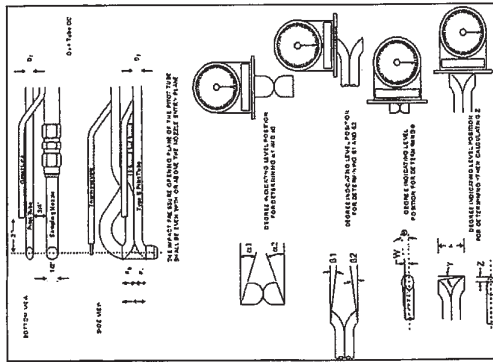
VERIFIED

DATE 9/20/2019

# Certificate of Calibration

S-Type Geometric Pitot Tube Calibration  
See the Code of Federal Regulations, Title 40, Part 60, Appendix A,  
Method 2, Item 4.

ENSS 22171



PITOT TUBE/PROBE # A10408			
Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes, Y	PASS
Ports Damaged?	N	No, N	PASS
$\alpha 1$	1	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	0	$-10^\circ < \alpha 2 < +10^\circ$	PASS
$\beta 1$	0	$-5^\circ < \beta 1 < +5^\circ$	PASS
$\beta 2$	0	$-5^\circ < \beta 2 < +5^\circ$	PASS
$\gamma$	0	N/A	-
$\theta$	1	N/A	-
Dt	0.375	.188" to .375"	PASS
A	0.931	$2.1D_t \leq A \leq 3D_t$	PASS
A/2Dt	1.241	$1.05 \leq P_1/D_t \leq 1.5$	PASS
Z = A tan $\theta$	0.000	$Z \leq .125"$	PASS
W = A tan $\theta$	0.016	$W \leq .031"$	PASS

Certified by: Technician

Signature

9/23/2021

Calibration Date

I certify that pitot tube/probe number A10408 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuing annual calibrations. A geometric calibration should be performed following each subsequent field use.

Apex Instruments - Address: 204 Technology Park Ln., Fuquay-Varina, NC 27526 USA | Tel: (919) 557-7300 Web: www.apexinst.com

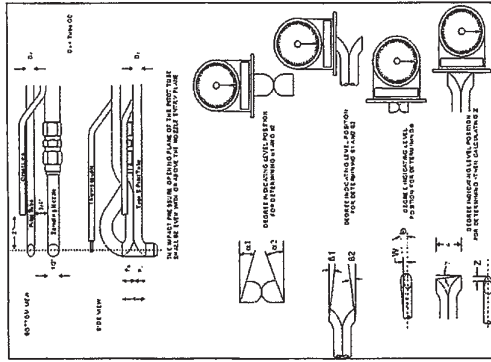
VERIFIED

DATE Jan 31, 2022

# Certificate of Calibration

S-Type Geometric Pitot Tube Calibration  
See the Code of Federal Regulations, Title 40, Part 60, Appendix A,  
Method 2, Item 4.

ENSS 22172



PITOT TUBE/PROBE # A10409			
Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes, Y	PASS
Ports Damaged?	N	No, N	PASS
$\alpha 1$	0	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	0	$-10^\circ < \alpha 2 < +10^\circ$	PASS
$\beta 1$	1	$-5^\circ < \beta 1 < +5^\circ$	PASS
$\beta 2$	0	$-5^\circ < \beta 2 < +5^\circ$	PASS
$\gamma$	1	N/A	-
$\theta$	0	N/A	-
Dt	0.375	.188" to .375"	PASS
A	0.946	$2.1D_t \leq A \leq 3D_t$	PASS
A/2Dt	1.260	$1.05 \leq P_1/D_t \leq 1.5$	PASS
Z = A tan $\theta$	0.016	$Z \leq .125"$	PASS
W = A tan $\theta$	0.000	$W \leq .031"$	PASS

Certified by: Technician

Signature

9/23/2021

Calibration Date

I certify that pitot tube/probe number A10409 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuing annual calibrations. A geometric calibration should be performed following each subsequent field use.

Apex Instruments - Address: 204 Technology Park Ln., Fuquay-Varina, NC 27526 USA | Tel: (919) 557-7300 Web: www.apexinst.com

VERIFIED

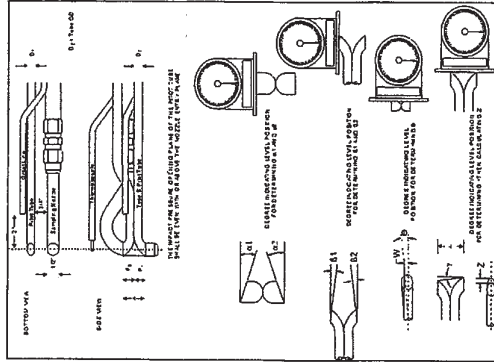
DATE Jan 31, 2022



Certificate of Calibration  
S-Type Geometric Pitot Tube Calibration

See the Code of Federal Regulations, Title 40, Part 60, Appendix A,  
Method 2, Item 4.

ENSS 22193



PITOT TUBE/PROBE # A10410			
Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes, Y	PASS
Ports Damaged?	N	No, N	PASS
$\alpha 1$	1	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	0	$-10^\circ < \alpha 2 < +10^\circ$	PASS
$\beta 1$	1	$-5^\circ < \beta 1 < +5^\circ$	PASS
$\beta 2$	1	$-5^\circ < \beta 2 < +5^\circ$	PASS
$\gamma$	0	N/A	-
$\theta$	1	N/A	-
Dt	0.375	.188" to .375"	PASS
A	0.947	$2.1D_t \leq A \leq 3D_t$	PASS
A/2Dt	1.263	$1.05 \leq P_1/D_t \leq 1.15$	PASS
$Z = A \tan \gamma$	0.000	$Z \leq .125"$	PASS
$W = A \tan \theta$	0.017	$W \leq .031"$	PASS

Certified by: Technician

Signature

9/23/2021

Calibration Date

I certify that pitot tube/probe number A10410 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuing annual calibrations. A geometric calibration should be performed following each subsequent field use.

Apex Instruments - Address: 204 Technology Park Ln., Fuquay-Varina, NC 27526 USA | Tel: (919) 557-7300 Web: www.apexinst.com

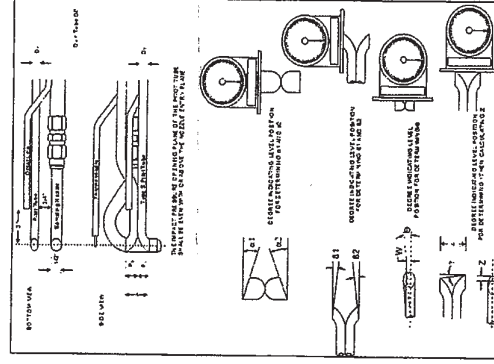
VERIFIED

DATE 09/23/2021

Certificate of Calibration  
S-Type Geometric Pitot Tube Calibration

See the Code of Federal Regulations, Title 40, Part 60, Appendix A,  
Method 2, Item 4.

ENSS 22194



PITOT TUBE/PROBE # A10411			
Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes, Y	PASS
Ports Damaged?	N	No, N	PASS
$\alpha 1$	1	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	0	$-10^\circ < \alpha 2 < +10^\circ$	PASS
$\beta 1$	0	$-5^\circ < \beta 1 < +5^\circ$	PASS
$\beta 2$	0	$-5^\circ < \beta 2 < +5^\circ$	PASS
$\gamma$	0	N/A	-
$\theta$	0	N/A	-
Dt	0.375	.188" to .375"	PASS
A	0.984	$2.1D_t \leq A \leq 3D_t$	PASS
A/2Dt	1.272	$1.05 \leq P_1/D_t \leq 1.15$	PASS
$Z = A \tan \gamma$	0.000	$Z \leq .125"$	PASS
$W = A \tan \theta$	0.000	$W \leq .031"$	PASS

Certified by: Technician

Signature

9/23/2021

Calibration Date

I certify that pitot tube/probe number A10411 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuing annual calibrations. A geometric calibration should be performed following each subsequent field use.

Apex Instruments - Address: 204 Technology Park Ln., Fuquay-Varina, NC 27526 USA | Tel: (919) 557-7300 Web: www.apexinst.com

VERIFIED

DATE 09/23/2021

### Certificate of Calibration

**Customer**  
Name : SGS (Thailand) Limited  
Address : 100 Nanglinches Road, Chongnonsi, Yennawa Bangkok 10120

Certificate No : 22-TPM-070  
Request No : Req-2022-0296  
Page : 1/2

#### Unit Under Calibration Details

Calibration Parameter : Temperature  
Instrument Name : Area Heat Stress Monitor  
Manufacturer : 3M  
Model : QT-34  
Serial Number : TEM030023  
Resolution : 0.1 °C  
ID Number : -

Range Calibration : 25 °C to 45 °C  
Type of Sensor : RTD  
Sensor Diameter (mm) : 4.5  
Calibration Position (mm) : 67.5  
Instrument Status : Used

#### Calibration Environment and Details

Temperature : 23 °C ± 3 °C  
Humidity : 55 %RH ± 15 %RH  
Received Date : 4 February 2022  
Calibrated Date : 17 February 2022  
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

**Reference Standard** : Digital Thermometer with Sensor, Manufacturer: GINGO/GINGO, Model: GT11/RTD100, SN: 12000077, ID: AR-TPM Which was calibrated on 30 March 2021, Calibration Certificate No. : QR21-0719

**Traceability** : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

#### Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k=2$ , providing a level of confidence approximately 95 %.



**Approved By :** Mr. Pacit Madiavorn  
Calibration Engineer Supervisor  
**Issue Date :** 17 February 2022

Calibration Note : Certificate No : 22-TPM-070

UUC Adjustment : Not Adjust Request No : Req-2022-0296

Page : 2/2

#### Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (k=2)
WET	25.004	24.7	+ 0.3	0.14
	35.003	34.7	+ 0.3	0.14
	45.007	44.7	+ 0.3	0.14
DRY	25.006	24.7	+ 0.3	0.14
	35.003	34.7	+ 0.3	0.14
	45.005	44.7	+ 0.3	0.14
GLOBE	25.003	24.7	+ 0.3	0.14
	35.005	34.7	+ 0.3	0.14
	45.003	44.7	+ 0.3	0.14

End of Certificate

Calibrated By :

Mr. Sitichok Jirapukdeesakun



INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7 139 MOO 13, SOI SINTINAKORN 11 TAMBON BANG KAE0,  
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140



### Certificate of Calibration

**Customer**  
Name : SGS (Thailand) Limited.  
Address : 100 Nanglinchee Road, Chongnonsi, Yamaswa Bangkok  
10120

**Certificate No :** 22-TPM-069  
**Request No :** Req-2022-0295  
**Page :** 1/2

#### Unit Under Calibration Details

**Calibration Parameter :** Temperature  
**Instrument Name :** Area Heat Stress Monitor  
**Manufacturer :** 3M  
**Model :** QT-34  
**Serial Number :** TEM030028  
**Resolution :** 0.1 °C  
**ID Number :** -

**Range Calibration :** 25 °C to 45 °C  
**Type of Sensor :** RTD  
**Sensor Diameter (mm) :** 4.5  
**Calibration Position (mm) :** 67.5  
**Instrument Status :** Used

#### Calibration Environment and Details

**Temperature :** 23 °C ± 3 °C  
**Humidity :** 55 %RH ± 15 %RH  
**Received Date :** 4 February 2022  
**Calibrated Date :** 17 February 2022  
**Calibration Procedure :** In-house method CP-TPM-01 by Comparison with Standard Thermometer.

**Reference Standard :** Digital Thermometer with Sensor, Manufacturer: GINGO/INGO, Model: GT11/RTD100, SN: 12000077, ID: AR-TPM Which was calibrated on 30 March 2021, Calibration Certificate No. : QR21-0719

**Traceability :** This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

#### Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k=2$ , providing a level of confidence approximately 95 %.



**Approved By :** Mr. Pait Mathavorn  
Calibration Engineer Supervisor  
**Issue Date :** 17 February 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.  
FM-708-TPM-01 Rev.01 Issue date 13/02/20

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7 139 MOO 13, SOI SINTINAKORN 11 TAMBON BANG KAE0,  
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140



**Calibration Note**  
UUC Adjustment : Not Adjust  
**Certificate No :** 22-TPM-069  
**Request No :** Req-2022-0295  
**Page :** 2/2

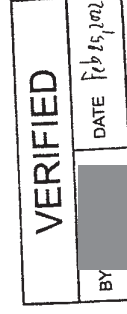
#### Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
WET	25.003	24.7	+ 0.3	0.14
	35.005	34.7	+ 0.3	0.14
	45.008	44.7	+ 0.3	0.14
DRY	25.006	24.7	+ 0.3	0.14
	35.003	34.7	+ 0.3	0.14
	45.006	44.7	+ 0.3	0.14
GLOBE	25.008	24.7	+ 0.3	0.14
	35.004	34.7	+ 0.3	0.14
	45.003	44.7	+ 0.3	0.14

End of Certificate

Calibrated By :

Mr. Sirichok Jimpaladeesakun



The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.  
FM-708-TPM-01 Rev.01 Issue date 13/02/20

## Certificate of Calibration

Equipment : LED Light Meter  
Manufacturer : EXTECH  
Model / Type : LT40  
Serial No. : 171100792  
ID No. : ENWP18194  
Customer : SGS (Thailand) Limited.  
100 Nanglinchtee Road, Chongnonsee, Yannawa, Bangkok 10120.

C.S.R. No. : L0000972-21  
Received Date : 13 July 2021  
Calibration Date : 14 July 2021

Calibrated By : NATTAPOL KINGKAEW  
Approved By : NATTAPOL KINGKAEW

Issue Date : 15 July 2021

VERIFIED	
BY	DATE 15 Jul 2021

The uncertainties are for a level of confidence of approximately 95%.  
This certificate may not be reproduced except in full unless permission for the reproduction has been obtained in writing from the laboratory.

## CALIBRATION REPORT

### Condition of this calibration result :

1. Environment :  
Temperature : (23 ± 3) °C  
Relative Humidity : (50 ± 15) %

### 2. Reference / Procedure Used :

- This instrument was calibrated by substitution with reference illuminance meter, the instrument and reference illuminance meter were mounted with the plane of its diffuser vertical and normal to the direction of measurement  
Calibration was illuminated by the luminous standard lamp (operated at colour temperature 2856K) according to  
GIIC Calibration Laboratory calibration procedure No.GIICLAB-CP-L01.

### 3. Reference Standard Instrument :

Instrument	Model	Serial No	Certificate No	Due Dated
Illuminance meter	PMA2200 / PMA2130	17323 / 26664	TP-1031-20	16 Oct 21

### 4. This Certification is traceable to the SI unit through :

- The National Institute of Metrology (Thailand) .

### 5. Uncertainty :

- The reported uncertainty of measurement was estimated and based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.

VERIFIED	
	DATE 16 Jul 2021

## CALIBRATION REPORT

All data shown below were as received value : After adjustment

Before Adjustment Condition :

Standard (lux)	UUC (lux)
1000	789.5

### Calibration result :

Function: Illuminance Measurement

U.U.C. Range (lux)	Standard Setting (lux)	U.U.C. Reading (lux)	Error (lux)	Uncertainty of measurement $\pm$ (lux)
AUTO RANGE	0	0.0	0.0	0.60
	50	48.5	-1.5	1.6
	250	247.0	-3.0	6.5
	500	495.2	-4.8	13
	1000	990.0	-10.0	26
	1500	1488	-12	36
	2000	1987	-13	48
	2999	2974	-25	72
	4000	3965	-35	96
	4999	4958	-41	0.12 klux

- U.U.C. = Unit Under Calibration

This result of calibration was found accurate as show on data and place of calibration only.

- END -

**VERIFIED**

DATE Jul 29, 2021

700/20-21 Phaholyothin Rd., Samsennai, Phayathai,  
Bangkok 10400 Thailand

Tel : +66 (02) 615 4999

Fax : +66 (02) 615 4644

E-mail : cal@gilcal.co.th



NSC-TIS-TIS 17025  
CALIBRATION ISO

## Certificate of Calibration

Equipment : DIGITAL LIGHT METER

Manufacturer : Testo

Model / Type : testo 540

Serial No. : 391064710902

ID No. : ENWP20204

Customer : SGS (Thailand) Limited.

100 Nenglinchee Road, Chongnonsee, Yannawa, Bangkok 10120.

C.S.R. No. : L0000035-22

Received Date : 10 January 2022

Calibration Date : 11 January 2022

Calibrated By : TONTRAKARN SRIKACHA

Approved By : WIWAT CHAMNANDEE

Issue Date : 11 January 2022

**VERIFIED**

BY DATE

The uncertainties are for a level of confidence of approximately 95%.

This certificate may not be reproduced except in full unless permission for the reproduction has been  
obtained in writing from the laboratory.



## CALIBRATION REPORT

### Condition of this calibration result:

1. Environment :  
 Temperature : (23 ± 3) °C  
 Relative Humidity : (50 ± 15) %

### 2. Reference / Procedure Used :

- This Instrument was calibrated by substitution with reference illuminance meter, the Instrument and reference illuminance meter were mounted with the plane of its diffuser vertical and normal to the direction of measurement  
 Calibration was illuminated by the luminous standard lamp (operated at colour temperature 2856K) according to  
 GILC Calibration Laboratory calibration procedure No.GILCLAB-CP-L01.

### 3. Reference Standard Instrument :

Instrument	Model	Serial No	Certificate No	Due Dated
Illuminance meter	PMA2200 / PMA2130	25531 / 025000	TP-1010-21	27 May 22

### 4. This Certification is traceable to the SI unit through :

- The National Institute of Metrology (Thailand) .

### 5. Uncertainty :

- The reported uncertainty of measurement was estimated and based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.

## CALIBRATION REPORT

All data shown below were as received value : Without adjustment

### Calibration result :

Function: Illuminance Measurement

U.U.C. Range (lux)	Standard Setting (lux)	U.U.C. Reading (lux)	Error (lux)	Uncertainty of measurement ± (lux)
AUTO RANGE				
0	0	0	0	0.82
50	49	49	-1	1.6
250	239	239	-11	6.5
500	486	486	-14	13
1000	995	995	-5	26
1500	1497	1497	-3	36
2000	1998	1998	-2	48
3000	3077	3077	77	72
4000	4107	4107	107	96
5000	5138	5138	138	0.12 klux

- U.U.C. = Unit Under Calibration

This result of calibration was found accurate as show on data and place of calibration only.

- END -

**SGS (Thailand) Limited**

100 Nanglinchee Road Chongnonsee  
Yannawa Bangkok 10120  
t : + 66 (0)2 678 18 13  
f : + 66 (0)2 678 13 62  
e : sgs.thailand@sgs.com

**Rama 3 Branch :**

Laboratory Services  
41/23 Soi 59 Rama 3 Road  
Chongnonsee Yannawa Bangkok 10120  
t : + 66 (0)2 683 05 41 294 74 85-90  
f : + 66 (0)2 683 07 58 294 74 84  
e : lab.thailand@sgs.com

**Rayong Branch :**

1/209, 1/211 Moo 1  
Tambon Ban Chang  
A. Ban chang Rayong 21130  
t : + 66 (0)38 685 260 - 4  
f : + 66 (0)38 685 258

**Hatyai Branch :**

59, 61 Soi 10 Phetkasem Road  
Hatyai Songkhla 90110  
t : + 66 (0)74 345 876 - 8  
f : + 66 (0)74 345 880

**Sriracha Office :**

144 - 146 Sriracha Nakorn 1 Road  
Sriracha Chonburi 20110  
t : + 66 (0)38 770 721-2 770 926-30  
f : + 66 (0)38 324 786

**Chiangmai Office :**

Room No. S107 The Office Plus Building  
55 Moo 7 T. Suthep A. Muang  
Chaingmai 50200  
t : + 66 (0)53 807 042 807 028-9  
f : + 66 (0)53 807 029

**Nakhorn Ratchasima Office :**

1340/46 Suranaree Road  
Tambon Nai-Muang A. Muang  
Nakhornratchasima 30000  
t : + 66 (0)44 922 521-2  
f : + 66 (0)44 922 520

**WHEN YOU NEED TO BE SURE**

