

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



Certificate of Calibration



Equipment: Balance
Model: BSA224S-CW
Serial No. (or ID.): 3137910058 (INS/LB-144)
Manufacturer: Sartorius
Condition: In condition

Certificate No.: C01242840
Issued Date: 06 September 2024
Job No.: WO-00040768
Page: 1 of 2

Customer: THAI CHEMICAL & ENGINEERING CO., LTD.
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai,
Prakanong, Bangkok 10260 Thailand

Environment Condition: Temperature 25 °C ± 0.5 °C
Humidity 54 %RH ± 1.7 %RH

Calibration Place: THAI CHEMICAL & ENGINEERING CO., LTD. (Laboratory)
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai,
Prakanong, Bangkok 10260 Thailand

Calibration By: Mr. Chananyu Kongtraiphop

Calibration Date: 04 September 2024

The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02232254



Person in charge



Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C01-14: 12 Sep 2022



Certificate No.: C01242840

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Calibration Results:

Without Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value 100 (g)				
Reference Points (g)							
A	B	C	D	E			
-	0.0001	-0.0001	0.0001	-0.0001			

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00005
200	0.00007

Error of Indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.05	0.05000	0.0500	0.0000	0.00012	2.07
1	1.00000	1.0000	0.0000	0.00012	2.07
2	2.00002	2.0000	0.0000	0.00012	2.07
5	4.99998	5.0000	0.0000	0.00012	2.06
10	10.00000	10.0000	0.0000	0.00012	2.06
20	19.99997	20.0000	0.0000	0.00013	2.05
50	49.99995	49.9999	0.0000	0.00014	2.03
100	99.99995	99.9999	-0.0001	0.00018	2.01
120	119.99992	119.9999	0.0000	0.00021	2.01
150	149.99990	149.9998	-0.0001	0.00024	2.00
200	199.99994	199.9999	0.0000	0.00030	2.00

The End of Certificate

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CAL-FM-C01-14: 12 Sep 2022



Refer to Certificate No.: C01242840

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Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The error of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, UKAS Lab14. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule: ☐ Choice A Binary Statement for Simple Acceptance Rule (w = 0), Specific Risk < 50% PFA.
☒ Choice B Non-binary statement with guard band (w = 1 U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band (w = r U).
; PFA - Probability of False Accept



Authorized signatory

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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C01-14: 12 Sep 2022



Refer to Certificate No.: C01242840

Page: 2 of 2

Statements of conformity:

Without Adjustment

Readability: 0.0001 g

Tolerances : 0.0005 g

Nominal Value (g)	Error of Indication (g)	Guard band (w) (g)	Tolerance (±) (g)	Conformity
0.05	0.0000	0.00012	0.0005	Pass
1	0.0000	0.00012	0.0005	Pass
2	0.0000	0.00012	0.0005	Pass
5	0.0000	0.00012	0.0005	Pass
10	0.0000	0.00012	0.0005	Pass
20	0.0000	0.00013	0.0005	Pass
50	0.0000	0.00014	0.0005	Pass
100	-0.0001	0.00018	0.0005	Pass
120	0.0000	0.00021	0.0005	Pass
150	-0.0001	0.00024	0.0005	Pass
200	0.0000	0.00030	0.0005	Pass

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of conformity

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C01-14: 12 Sep 2022

Preventive Maintenance Kjeldahl

Service No. PM25-S08-046

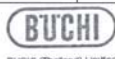
1. Customer Information

Customer Name	Instrument	Serial Number	Service Date
บริษัท วิศวกรรมเคมี จำกัด 1048/2 ซอย สุขุมวิท 66/1 แขวงพระโขนงใต้ เขตพระโขนง กรุงเทพมหานคร 10260	K-350	0700000546	27 Feb 2025 PM 1/2
คุณชัยภูมวรัตน์ Tel: 084-463-8741 Fax:			

2. Instrument

2.1 Cooling water (if it connected)	OK	NOT OK	Remark
- Temperature 15 – 20 °C	/		
- Cooling water inlet	/		
- Cooling water outlet	/		
- Control Temperature	/		

2.2 Cleaning	DONE	NOT DONE	Remark
- Outside Instrument	/		
- Inside Instrument	/		
- Splash protector	/		
- Condenser	/		



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PM Distillation_Kjeldahl system

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Preventive Maintenance Kjeldahl

2.3 Visual Test	OK	NOT OK	Remark
- Screw Coupling (between splash protector and condenser)	/		
- Condenser	/		
- Splash protector	/		
- Hypalon connection (connection tube)	/		
- Rubber bung	/		
- Ventilation valve	/		
- PTFE tube	/		
- Cooling water inlet	/		
- Cooling water outlet	/		
- Magnetic valve	/		

2.4 System control	OK	NOT OK	Remark
- Key board	/		
- Display	/		
- Program	/		
- Adding H ₂ O	-		
- Adding NaOH	/		
- Adding H ₃ BO ₃	-		
- Aspiration	-		



BUCHI (Thailand) Limited

PM Distillation_Kjeldahl system

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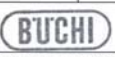
Preventive Maintenance Kjeldahl

2.5 System Distillation	OK	NOT OK	Remark
- Boiler	/		
- Water level sensor	/		
- One way valve	/		
- Pressure switch	/		
- Thermostat	/		
- Steam valve1 (Y4)	/		
- Steam valve2 (Y5)	/		
- Drain valve (Y3)	-		
- Water 3/2 way valve (Y1)	-		

2.6 Hose	OK	NOT OK	Remark
- Unisil hose	/		
- Hypalon hose	/		
- Drain hose	-		
- Viton hose	/		
- Silicone hose	/		

2.7 Diaphragm pump	OK	NOT OK	Remark
- Diaphragm pump for H ₂ O	-		
- Diaphragm pump for NaOH	/		
- Diaphragm pump for H ₃ BO ₃	-		

2.8 Program test	OK	NOT OK	Remark
- Distillation	/		
- Aspiration	-		
- Preheating	/		
- Cleaning	/		



BUCHI (Thailand) Limited

PM Distillation_Kjeldahl system

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Preventive Maintenance Kjeldahl

3. Function Test

Addition H ₂ O	0 ml	Reaction time	0 min
Addition NaOH	0 ml	Distillation time	5 min
Addition H ₃ BO ₃	0 ml	Steam capacity	100%
		Aspiration	SAM
Result: Water in receiving vessel now approximately 172 ml, 174 ml			

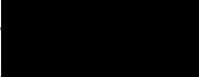
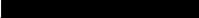
4. Summary

All specifications OK	Specification not OK
OK	

Comments

PM 1/2
เครื่องไม่ทำงานได้ปกติ

Signature BUCHI

- Service by  Date 27 Feb 2025
- Approve by  Date 28 Feb 2025



BUCHI (Thailand) Limited

PM Distillation_Kjeldahl system

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Preventive Maintenance Scrubber

Service No. PM25-S08-046

1. Customer Information

Customer Name	Instrument	Serial Number	Service Date
บริษัท วิศวกรรมเคมี จำกัด 1048/2 ซอย สุขุมวิท 66/1 แขวงพระโขนงใต้ เขตพระโขนง กรุงเทพมหานคร 10260	B-414	0700002972	27 Feb 2025 PM 1/2
คุณชัยภูวรัตน์			
Tel: 084-463-8741			
Fax:			

2. Instrument

2.1 Cooling water (if it connected)	OK	NOT OK	Remark
- Temperature 10-20 °C	/		
- Cooling water inlet	/		
- Cooling water outlet	/		

2.2 Cleaning	DONE	NOT DONE	Remark
- Housing	/		
- Condenser	/		
- Swirl disc	/		



BUCHI (Thailand) Limited

PM Scrubber

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Preventive Maintenance Scrubber

2.3 Visual Check	OK	NOT OK	Remark
- Hose connection to suction	/		
- Glassware	/		
- Lip gasket	/		
- GL-14 connector	/		
- Activated charcoal	/		

2.4 Flush Pump

- Make sure, the bypass valve is closed completely (for maximum suction power).
- Disconnect the silencer, move it down (or take it away from the instrument), and flush out the pump with at least 500 mL of distilled water through the pump inlet, until the collected washing water is clean.
 - Switch on the instrument and collect the waste water from the pump output in a suitable vessel.

Flush pump ☒ OK ☐ NOT OK

2.5 Washing Solution

- Sodium hydroxide 8-10 %, max. 20 %
- Sodium carbonate
 - dissolve 600 g Na₂CO₃ in 3 L distilled warm water, or
 - dissolve 1.7 kg Na₂CO₃ in 10 H₂O in 3 L distilled warm water

Washing solution ☒ OK ☐ NOT OK



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PM Scrubber

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Preventive Maintenance Scrubber

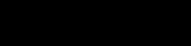
3. Summary

All specifications OK	Specification not OK
OK	

Comments

PM 1/2
เครื่องใช้งานได้ปกติ

Signature BUCHI

- Service by  Date 27 Feb 2025

- Approve by  Date 28 Feb 2025



BUCHI (Thailand) Limited

PM Scrubber

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BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

99/9 Moo 2, Maha Sawet, Phutthamonthon, Nakhon Pathom 73170, Thailand. Tel: +66 3424 5299 Fax: +66 3424 5250
E-mail: bkk@becthai.com Website: www.becthai.com

Certificate No.: CAL-24-194



Page : 1 of 4

CERTIFICATE OF CALIBRATION

Equipment	: Spectrophotometer
Manufacturer	: Thermo Scientific
Model	: Genesys 50 UV-VIS
Serial No.	: 9A3C110015
ID No.	: N/A
Customer	: Thai Chemical & Engineering Co., Ltd. 1048/2 Sukhumvit 66/1 Rd., Phra Khanong Tai, Prakanong, Bangkok 10260
Location	: Becthai Laboratory
Date of Receipt	: 4 June 2024
Date of Calibration	: 4 June 2024
Date of Issue	: 5 June 2024
Ambient Temperature	: (25±10) °C
Relative Humidity	: (60±20) %
Condition As-Received	: New Item

Calibrated by

Ms. Nopparat Suntarotayan

Calibration Engineer

Calibration Manager

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

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Indicated values are valid for the state of the Spectrophotometer at the time of calibration only.



Certificate No.: CAL-24-194

Page: 2 of 4

CALIBRATION REPORT

Conditions of this result of calibration

1. Reference Standard Material:

Material	Model	Serial No.	Cert. No.	Due date
Holmium Glass Filter	RM-HG	12705	117342	13 December 2025
Didymium Glass Filter	RM-DG	13498	117323	13 December 2025
Neutral Density Filter	RM-1N2N3N	8323	117341	13 December 2025
Potassium Dichromate Solution	RM-06	23429	117347	13 December 2025

2. Traceability: This certification is traceable to the International System of Unit maintained at:

The Starna Scientific Ltd. Accredited Calibration Laboratory No. 0659.

3. Method of calibration:

The calibration procedure was carried out according to ASTM E275-08 (2022) and ASTM E925-09 (2014).

4. Result of calibration:

(✓) without adjustment () after adjustment

5. Equipment Specifications:

Spectral Bandwidth:	2	nm
Data Interval:	0.2	nm
Scan speed:	Slow	nm/min

ISSUE: 6 REV:5

FM-CAL-33/2

20/02/24



Certificate No.: CAL-24-194

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CALIBRATION REPORT

Wavelength Calibration

Certified Values of Reference Material (nm)	Nominal Value (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty of Measurement (± nm)	k Factor
418.40	418.40	418.528	0.128	0.16	2.00
513.75	513.75	513.624	-0.126	0.17	2.00
537.00	537.00	536.835	-0.165	0.16	2.00
585.56	585.56	585.634	0.074	0.18	2.00
879.68	879.68	879.212	-0.468	0.17	2.00

Photometric Calibration for Visible

Wavelength (nm)	Certified Values of Reference Material (A)	UUC* Reading (A)	Error (A)	Uncertainty of Measurement (± A)	k Factor
420.0	Zero	0.000	0.0000	0.0028	2.00
	0.5703	0.570	-0.0003	0.0045	2.00
	0.7336	0.736	0.0024	0.0045	2.00
	1.0709	1.071	0.0001	0.0045	2.00
440.0	Zero	0.000	0.0000	0.0028	2.00
	0.5592	0.559	-0.0002	0.0045	2.00
	0.716	0.719	0.0030	0.0045	2.00
	1.0454	1.046	0.0006	0.0045	2.00
465.0	Zero	0.000	0.0000	0.0028	2.00
	0.5094	0.510	0.0006	0.0045	2.00
	0.6601	0.663	0.0029	0.0045	2.00
	0.963	0.964	0.0010	0.0045	2.00
546.1	Zero	0.000	0.0000	0.0028	2.00
	0.5206	0.522	0.0014	0.0045	2.00
	0.6677	0.671	0.0033	0.0045	2.00
	0.9763	0.977	0.0007	0.0045	2.00
590.0	Zero	0.000	0.0000	0.0028	2.00
	0.5522	0.553	0.0008	0.0045	2.00
	0.6966	0.699	0.0024	0.0045	2.00
	1.0201	1.021	0.0009	0.0045	2.00
635.0	Zero	0.000	0.0000	0.0028	2.00
	0.5377	0.539	0.0013	0.0045	2.00
	0.6649	0.668	0.0031	0.0045	2.00
	0.9736	0.972	-0.0016	0.0045	2.00

Remark: Each individual filter is measured against the empty filter holder (blank) used to zero the Spectrophotometer.

Note:

UUC*: Unit Under Calibration

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FM-CAL-33/2

20/02/24



Certificate No.: CAL-24-194

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CALIBRATION REPORT

Photometric Calibration for UV

Wavelength (nm)	Certified Values of Reference Material (A)	UUC* Reading (A)	Error (A)	Uncertainty of Measurement (± A)	k Factor
235.0	Zero	0.000	0.0000	0.0050	2.00
	0.7354	0.733	-0.0024	0.0081	2.00
257.0	Zero	0.000	0.0000	0.0050	2.00
	0.8497	0.847	-0.0027	0.0081	2.00
313.0	Zero	0.000	0.0000	0.0050	2.00
	0.2854	0.285	-0.0004	0.0081	2.00
350.0	Zero	0.000	0.0000	0.0050	2.00
	0.6306	0.629	-0.0016	0.0081	2.00

Remark: The Potassium Dichromate Filled cells are measured against a Perchloric acid blank.

Note:

UUC*: Unit Under Calibration

- End of Report -

ISSUE: 6 REV:5

FM-CAL-33/2

20/02/24



Certificate of Calibration

Equipment:	pH METER	Certificate No.:	C07250080
Model:	SevenCompact S220	Issued Date:	14 February 2025
Serial No. (or ID.):	B914466655	Job No.:	WO-00061162
Manufacturer:	Mettler Toledo	Page:	1 of 3
Electrode Serial No.:	3021943	Model:	InLab Expert Pro-ISM Brand: Mettler Toledo
Condition:	In Condition		

Customer: THAI CHEMICAL & ENGINEERING CO., LTD.
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai,
Phrakhanong, Bangkok 10260 Thailand

Environment Condition: Temperature 23 °C ± 2 °C
Humidity 50 %RH ± 15 %RH

Calibration Place: Environment Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr.Pongpisut Suebchantha

Calibration Date: 13 February 2025

The Method used: In house method, CAL-WI-58, base on ASTM E 70-07

Traceability: This certificate is traceable to SI Units, Sample Test is assured through primary measurement method Hamed cell, through CPAchem Ltd. (ISO/IEC 17034) Certificate No. 1034229, 1034230, 1034231 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA20240267EA



Person in charge



Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

Calibration Results:

pH Scale

Input (mV)	pH Meter Reading			Uncertainty of Measurement (mV)	Coverage Factor (k)
	(mV)	Error (mV)	(pH)		
414.12	414.1	-0.02	0.003	0.065	2.00
354.96	354.9	-0.06	1.003	0.065	2.00
295.8	295.8	0.00	2.003	0.065	2.00
236.64	236.7	0.06	3.002	0.065	2.00
177.48	177.5	0.02	4.000	0.065	2.00
118.32	118.4	0.08	5.000	0.065	2.00
59.16	59.3	0.14	6.000	0.065	2.00
0	0.1	0.10	7.000	0.065	2.00
-59.16	-59.0	0.16	8.000	0.065	2.00
-118.32	-118.2	0.12	9.000	0.065	2.00
-177.48	-177.3	0.18	10.000	0.065	2.00
-236.64	-236.5	0.14	11.000	0.065	2.00
-295.8	-295.6	0.20	12.000	0.065	2.00
-354.96	-354.8	0.16	13.000	0.065	2.00
-414.12	-413.9	0.22	14.000	0.065	2.00

Practical slope and zero point*

The three-point calibration using three standard buffer solutions; pH 4.007 , pH 6.976 and pH 10.010
- During calibration, display of pH meter can be adjust to reading: pH 4.007 , pH 6.976 and pH 10.010
The practical slope of the pH electrode; 57.04 (mV/pH), 96.42%
The zero point of the pH electrode; 6.98 (pH)

Sample Test Results

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.007	4.011	0.004	0.0070	2.00
6.976	6.980	0.004	0.0075	2.00
10.010	10.015	0.005	0.0070	2.00

* Calibration Marked " Not TISI Accredited " in this Certificate have been included for completeness.

The End of Certificate

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00061162

ชนิดเครื่องมือ: pH METER

รุ่น: SevenCompact S220 หมายเลขเครื่อง: B914466655

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
13 Feb 2025			13 Feb 2025		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
☒	☐	1. ความสมบูรณ์เครื่อง	☒	☐	
☒	☐	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	☒	☐	
☒	☐	3. สวิตช์ ปิด – เปิด เครื่อง (On-Off Switch)	☒	☐	
☒	☐	4. ปุ่มกด (Keypad)	☒	☐	
☒	☐	5. หน้าจอ (Display, Screen Contrast)	☒	☐	
		Spectrophotometer			
☐	☐	6. แบตเตอรี่สำรอง (Battery Backup) >= 2.5 VDC	☐	☐	
☐	☐	7. ตัวควบคุมเลือกความยาวคลื่น (Wavelength Control)	☐	☐	
☐	☐	8. ความยาวคลื่น (Wavelength Check)	☐	☐	
☐	☐	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	☐	☐	
☐	☐	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	☐	☐	
☐	☐	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	☐	☐	
		pH Meter and Conductivity Meter			
☒	☐	12. อิเล็กโทรด (Electrode and Connection Cable)	☒	☐	
☐	☐	13. ระดับสารละลายใน Electrode (Level KCl)	☐	☐	
☒	☐	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	☒	☐	
☐	☐	15. ขาจับอิเล็กโทรด (Stand)	☐	☐	
		Turbidimeter			
☐	☐	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	☐	☐	
☐	☐	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)	☐	☐	
		Automatic titrator			
☐	☐	18. สภาพ Piston Burettes	☐	☐	
☐	☐	19. Function Rinsing and Dosing	☐	☐	
☐	☐	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	☐	☐	

เพื่อเพิ่มข้อมูล:

Mr.Pongpisut Suebchantha
Service Engineer



Certificate of Calibration

Equipment : Digital Thermometer with Probe
Model : SevenCompact S220
Serial No. : B914466655
Manufacturer : METTLER TOLEDO
ID No. : -

Certificate No.: C15250267
Issued Date : 16 February 2025
Job No.: WO-00061162
Page : 1 of 2
Condition : In Condition

Customer : THAI CHEMICAL & ENGINEERING CO., LTD.
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai,
Prakanong, Bangkok 10260 Thailand

Environment Condition : Temperature: 22 °C ± 3 °C
Humidity: 50 %RH ± 20 %RH
Voltage: 220 VAC ± 10 %

Calibration Place : Thermo-Hygro Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260 Thailand

Calibration By : Mr. Anat Karapitak
Calibration Date : 13 February 2025

The Method used : In house method, CAL-WI-19, by comparison with standard thermometer
Traceability : This certificate is traceable to the International System of Unit maintained by:
Quality Reborn Co.,Ltd. (QR)



Person in charge



Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

Reference standard equipment:

Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR24-0956	02 May 2024	02 May 2025

Calibration Results:

Without Adjustment

Sensor Type: RTD

Channel: -

Diameter (mm): 12

Length (mm): 130

Immersion (mm): 130

Calibrate Point (°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
20.0	20.004	19.9	0.104	0.076
25.0	25.002	25.0	0.002	0.076
30.0	30.008	30.0	0.008	0.076

The End of Certificate

Certificate of Calibration

Equipment:

Liquid Bath

Certificate No.: C13240087

Model:

WNE 14

Issued Date: 01 March 2024

Serial No. (or ID.):

L418.0212 (INS/LB-154)

Job No.: WO-00019023

Manufacturer:

Memmert

Page: 1 of 4

Condition:

In Condition

Forced Circulation:

None

Customer:

THAI CHEMICAL & ENGINEERING CO., LTD.
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai, Prakanong,
Bangkok 10260 Thailand

Environment Condition:

Temperature: 25 °C ± 0.6 °C
Humidity: 49 %RH ± 5.8 %RH
Voltage: 225 VAC ± 1.6 VAC

Calibration Place:

THAI CHEMICAL & ENGINEERING CO., LTD. (Laboratory)
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai, Prakanong,
Bangkok 10260 Thailand

Calibration By:

Mr. Preecha Phooarsai

Calibration Date:

01 March 2024

The Method used:

In house method, CAL-WI-17, base on ASTM E715-80

Traceability:

This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C10230010

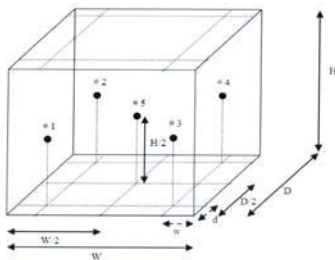


Person in charge



Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standards laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.



Standard Installation Locations

Midway between the diffuser plate and the water surface

Inside bath: W = 36 (cm) D = 32 (cm) H = 16 (cm) Volume = 18 (Liters)

Standard Locations #1: w = 5 (cm) d = 5 (cm)

Standard Locations #2: w = 5 (cm) d = 5 (cm)

Standard Locations #3: w = 5 (cm) d = 5 (cm)

Standard Locations #4: w = 5 (cm) d = 5 (cm)

Standard Locations #5: Center of any probes. (#1 - #4)

Position of Std	#1	#2	#3	#4	#5
Channel of Logger	101	102	103	104	109

Definitions

Indicating Temperature: The average reading of Indicating device which forms the integral part of the bath.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the bath at steady-state. The reference probe is preferably located in the geometric center of the bath.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 60.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	59.92	-0.08	0.17
#2	60.01	0.01	0.21
#3	59.92	-0.08	0.18
#4	59.99	-0.01	0.19
#5	60.01	0.01	0.21

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)					Uncertainty (± °C)*
			#1	#2	#3	#4	#5	
60.0	60.0	60.0	59.92	60.01	59.92	59.99	60.01	0.21

Bath Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
60.0	0.20	0.07	0.24

Note: * Maximum uncertainty of the each position

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 85.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	84.86	-0.14	0.21
#2	84.98	-0.02	0.24
#3	84.82	-0.18	0.23
#4	84.91	-0.09	0.22
#5	84.93	-0.07	0.20

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)					Uncertainty (± °C)*
			#1	#2	#3	#4	#5	
85.0	85.0	85.0	84.86	84.98	84.82	84.91	84.93	0.24

Bath Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
85.0	0.21	0.09	0.36

Note: * Maximum uncertainty of the each position

The End of Certificate

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 สุขุมวิท 66/1 ถนนสุขุมวิท กรุงเทพมหานคร 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C13-13: 12 Sep 2022

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, ASTM E715-80. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule: ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA.
- ☒ Choice B Non-binary statement with guard band ($w = 1$ U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
- ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r$ U).
- : PFA - Probability of False Accept

Authorized signatory

Without adjustment

Desired Temperature : 60.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 60.0 °C

Locations	Measured (°C)	Correction of UUC. (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	59.92	-0.08	0.17	1.0	Pass
#2	60.01	0.01	0.21	1.0	Pass
#3	59.92	-0.08	0.18	1.0	Pass
#4	59.99	-0.01	0.19	1.0	Pass
#5	60.01	0.01	0.21	1.0	Pass

Correction of UUC* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C13-13: 12 Sep 2022

Without adjustment (Cont.)

Desired Temperature : 85.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 85.0 °C

Locations	Measured (°C)	Correction of UUC.* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	84.86	-0.14	0.21	1.0	Pass
#2	84.98	-0.02	0.24	1.0	Pass
#3	84.82	-0.18	0.23	1.0	Pass
#4	84.91	-0.09	0.22	1.0	Pass
#5	84.93	-0.07	0.20	1.0	Pass

Correction of UUC* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use

The End of Statements of Conformity

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 สุขุมวิท 66/1 ถนนสุขุมวิท กรุงเทพมหานคร 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C13-13: 12 Sep 2022



Certificate of Calibration

Equipment: Liquid Bath
Model: WNE 14
Serial No. (or ID.): L418.1374(INS/LB-153)
Manufacturer: Memmert
Condition: In Condition
Forced Circulation: None

Certificate No.: C13240281
Issued Date: 05 September 2024
Job No.: WO-00040768
Page: 1 of 3

Customer: THAI CHEMICAL & ENGINEERING CO., LTD.
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai, Prakanong
Bangkok 10260 Thailand

Environment Condition: Temperature: 24 °C ± 1.0 °C
Humidity: 58 %RH ± 3.8 %RH
Voltage: 228 VAC ± 2.9 VAC

Calibration Place: THAI CHEMICAL & ENGINEERING CO., LTD. (Laboratory)
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai, Prakanong
Bangkok 10260 Thailand

Calibration By: Mr. Ampol Srisumphan
Calibration Date: 04 September 2024
The Method used: In house method, CAL-WI-17, base on ASTM E715-80

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10240006

Person in Charge

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

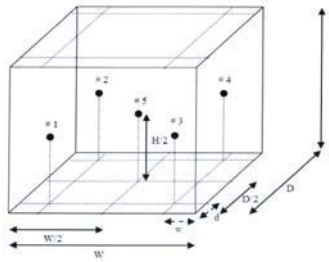
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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**Standard Installation Locations**

Midway between the diffuser plate and the water surface

Inside bath: W = 36 (cm) D = 32 (cm) H = 16 (cm) Volume = 18 (Liters)

Standard Locations #1: w = 5 (cm) d = 5 (cm)

Standard Locations #2: w = 5 (cm) d = 5 (cm)

Standard Locations #3: w = 5 (cm) d = 5 (cm)

Standard Locations #4: w = 5 (cm) d = 5 (cm)

Standard Locations #5: Center of any probes. (#1 - #4)

Position of Std	#1	#2	#3	#4	#5
Channel of Logger	301	302	303	304	305

Definitions**Indicating Temperature:** The average reading of indicating device which forms the integral part of the bath.**Measured Temperature:** The average reading of standards at any positions or location.**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the bath at steady-state. The reference probe is preferably located in the geometric center of the bath.**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

ชื่อย่อ: วิทยาศาสตร์และเทคโนโลยี
DKSH Technology Limited
2533 สุขุมวิท 66/1 ถนน, กรุงเทพมหานคร 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C13-13: 12 Sep 2022

Calibration Results:
Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 85.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	84.94	-0.06	0.24
#2	85.06	0.06	0.26
#3	84.75	-0.25	0.27
#4	84.76	-0.24	0.26
#5	84.85	-0.15	0.23

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)					Uncertainty (± °C)*
85.0	85.0	85.0	#1	#2	#3	#4	#5	0.27
			84.94	85.06	84.75	84.76	84.85	

Bath Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
85.0	0.33	0.10	0.49

Note: * Maximum uncertainty of the each position

The End of Certificate

ชื่อย่อ: วิทยาศาสตร์และเทคโนโลยี
DKSH Technology Limited
2533 สุขุมวิท 66/1 ถนน, กรุงเทพมหานคร 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C13-13: 12 Sep 2022

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, ASTM E715-80. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule:** ☐ Choice A Binary Statement for Simple Acceptance Rule (w = 0), Specific Risk < 50% PFA.
- ☒ Choice B Non-binary statement with guard band (w = 1 U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
- ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band (w = r U).
- : PFA - Probability of False Accept



Authorized signatory

Without adjustment

Desired Temperature : 85.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 85.0 °C

Locations	Measured (°C)	Correction of UUC. (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	84.94	-0.06	0.24	1.0	Pass
#2	85.06	0.06	0.26	1.0	Pass
#3	84.75	-0.25	0.27	1.0	Pass
#4	84.76	-0.24	0.26	1.0	Pass
#5	84.85	-0.15	0.23	1.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity

ชื่อย่อ: วิทยาศาสตร์และเทคโนโลยี
DKSH Technology Limited
2533 สุขุมวิท 66/1 ถนน, กรุงเทพมหานคร 10260
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ภาคผนวก ข - 8

**Certificate of Calibration**

Equipment:	Incubator	Certificate No.:	C31241803
Model:	IN55	Issued Date:	06 September 2024
Serial No.(or ID):	D212.0259 (INS/LB-017)	Job No.:	WO-00040768
Manufacturer:	Memmert	Page:	1 of 3
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	1		

Customer: THAI CHEMICAL & ENGINEERING CO., LTD.
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai, Prakanong Bangkok 10260 Thailand

Environment Condition: Temperature: 25 °C ± 0.9 °C
Humidity: 64 %RH ± 4.6 %RH
Voltage: 228 VAC ± 1.4 VAC

Calibration Place: THAI CHEMICAL & ENGINEERING CO., LTD. (Laboratory)
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai, Prakanong Bangkok 10260 Thailand

Calibration By: Mr. Thanakrit Raksapol
Calibration Date: 04 September 2024

The Method used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10240018



Person in charge



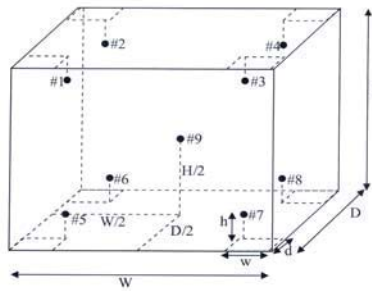
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

ชื่อย่อ: วิทยาศาสตร์และเทคโนโลยี
DKSH Technology Limited
2533 สุขุมวิท 66/1 ถนน, กรุงเทพมหานคร 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C13-13: 12 Sep 2022



Standard Installation Locations

Volume (Calibration Zone) = 21 (Liters)

Inside chamber: W = 40 (cm) D = 33 (cm) H = 40 (cm)

Standard Locations (#1, #2, #3, #4): w = 5 (cm) d = 5 (cm) h = 5 (cm)

Standard Locations (#5, #6, #7, #8): w = 5 (cm) d = 5 (cm) h = 5 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	301	302	303	304	305	306	307	308	309

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

DKSH Technology Limited
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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C31-10: 12 Sep 2022

Calibration Results: Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 35.0 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	35.09	0.09	0.23
#2	35.25	0.25	0.23
#3	35.16	0.16	0.23
#4	35.05	0.05	0.23
#5	34.91	-0.09	0.23
#6	34.82	-0.18	0.23
#7	34.93	-0.07	0.23
#8	34.82	-0.18	0.23
#9	35.00	0.00	0.23

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
35.0	35.0	35.0	#1	#2	#3	#4	#5	#6	#7	#8	#9	0.23
			35.09	35.25	35.16	35.05	34.91	34.82	34.93	34.82	35.00	

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
35.0	0.31	0.06	0.51

Note: * Maximum uncertainty of the each position

The End of Certificate

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule: ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA.
- ☒ Choice B Non-binary statement with guard band ($w = 1$ U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
- ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r$ U).
- ; PFA - Probability of False Accept



Authorized signatory

Without adjustment

Desired Temperature : 35.0 °C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 35.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	35.09	0.09	0.23	1.0	Pass
#2	35.25	0.25	0.23	1.0	Pass
#3	35.16	0.16	0.23	1.0	Pass
#4	35.05	0.05	0.23	1.0	Pass
#5	34.91	-0.09	0.23	1.0	Pass
#6	34.82	-0.18	0.23	1.0	Pass
#7	34.93	-0.07	0.23	1.0	Pass
#8	34.82	-0.18	0.23	1.0	Pass
#9	35.00	0.00	0.23	1.0	Pass

Correction* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity

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CAL-FM-C31-10: 12 Sep 2022

เอกสาร - 9



Certificate of Calibration

Equipment: Hot Air Oven
Model: UF55
Serial No.(or ID): B218.3817 (INS/LB-134)
Manufacturer: Memmert
Condition: In Condition
Shelves(pc.): 2

Certificate No.: C31241805
Issued Date: 09 September 2024
Job No.: WO-00040768
Page: 1 of 4
Ventilation Valve: Closed

Customer: THAI CHEMICAL & ENGINEERING CO., LTD.
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai,
Prakanong, Bangkok 10260 Thailand

Environment Condition: Temperature: 20 °C ± 1.2 °C
Humidity: 63 %RH ± 5.2 %RH
Voltage: 226 VAC ± 2.4 VAC

Calibration Place: THAI CHEMICAL & ENGINEERING CO., LTD. (Laboratory)
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai,
Prakanong, Bangkok 10260 Thailand

Calibration By: Mr. Suphanimit Khamnonphoom
Calibration Date: 04 September 2024

The Method used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10240005



Person in charge



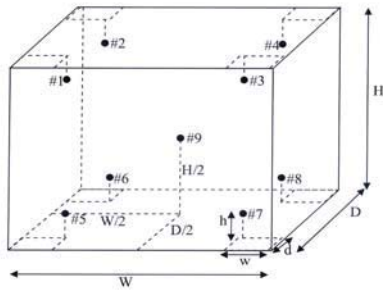
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
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Standard Installation Locations

Volume (Calibration Zone) = 16 (Liters)

Inside chamber: W = 40 (cm) D = 33 (cm) H = 40 (cm)

Standard Locations (#1, #2, #3, #4): w = 5 (cm) d = 5 (cm) h = 5 (cm)

Standard Locations (#5, #6, #7, #8): w = 5 (cm) d = 5 (cm) h = 12 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	101	102	103	104	105	106	107	108	109

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

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Calibration Results: Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	103.82	-0.18	0.39
#2	103.63	-0.37	0.39
#3	103.92	-0.08	0.39
#4	104.03	0.03	0.39
#5	104.07	0.07	0.39
#6	103.57	-0.43	0.39
#7	104.22	0.22	0.39
#8	103.57	-0.43	0.39
#9	103.67	-0.33	0.39

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
104.0	104.0	104.0	103.82	103.63	103.92	104.03	104.07	103.57	104.22	103.57	103.67	0.39

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.61	0.08	0.80

Note: * Maximum uncertainty of the each position

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Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	179.77	-0.23	0.42
#2	179.40	-0.60	0.42
#3	180.04	0.04	0.42
#4	180.39	0.39	0.42
#5	180.28	0.28	0.42
#6	179.47	-0.53	0.42
#7	180.77	0.77	0.42
#8	179.34	-0.66	0.42
#9	179.74	-0.26	0.42

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
180.0	180.0	180.0	179.77	179.40	180.04	180.39	180.28	179.47	180.77	179.34	179.74	0.42

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.11	0.11	1.59

Note: * Maximum uncertainty of the each position

The End of Certificate

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Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule:
- ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA
 - ☒ Choice B Non-binary statement with guard band ($w = 1$ U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA
 - ☐ Choice C Customer defined, Customers may define arbitrary multiple of t to have applied as guard band ($w = r$ U), PFA - Probability of False Accept

Authorized signatory

Without adjustment

Desired Temperature : 104.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	103.82	-0.18	0.39	1.0	Pass
#2	103.63	-0.37	0.39	1.0	Pass
#3	103.92	-0.08	0.39	1.0	Pass
#4	104.03	0.03	0.39	1.0	Pass
#5	104.07	0.07	0.39	1.0	Pass
#6	103.57	-0.43	0.39	1.0	Pass
#7	104.22	0.22	0.39	1.0	Pass
#8	103.57	-0.43	0.39	1.0	Pass
#9	103.67	-0.33	0.39	1.0	Pass

Correction* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

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Statements of conformity:(Cont.)
Without adjustment (Cont.)

Desired Temperature : 180.0 °C Tolerances : 2.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	179.77	-0.23	0.42	2.0	Pass
#2	179.40	-0.60	0.42	2.0	Pass
#3	180.04	0.04	0.42	2.0	Pass
#4	180.39	0.39	0.42	2.0	Pass
#5	180.28	0.28	0.42	2.0	Pass
#6	179.47	-0.53	0.42	2.0	Pass
#7	180.77	0.77	0.42	2.0	Pass
#8	179.34	-0.66	0.42	2.0	Pass
#9	179.74	-0.26	0.42	2.0	Pass

Correction* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity



Certificate of Calibration

Equipment: Hot Air Oven
Model: UF 55
Serial No.(or ID): B219.1995 (LB 149)
Manufacturer: Memmert
Condition: In Condition
Shelves(pc.): 1

Certificate No.: C31242248
Issued Date: 12 November 2024
Job No.: WO-00047852
Page: 1 of 4
Ventilation Valve: Closed

Customer: THAI CHEMICAL & ENGINEERING CO., LTD
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai,
Prakanong, Bangkok 10260 Thailand

Environment Condition: Temperature: 23 °C ± 0.8 °C
Humidity: 51 %RH ± 5.8 %RH
Voltage: 225 VAC ± 1.4 VAC

Calibration Place: THAI CHEMICAL & ENGINEERING CO., LTD (Laboratory)
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai,
Prakanong, Bangkok 10260 Thailand

Calibration By: Mr. Thanakrit Raksapol

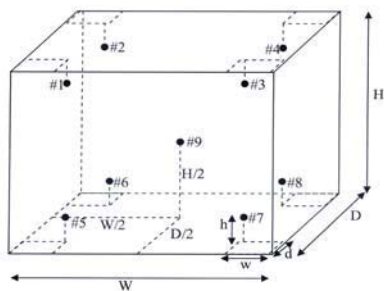
Calibration Date: 06 November 2024

The Method used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10230023

Person in charge
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.



Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber: W = 40 (cm) D = 33 (cm) H = 40 (cm)

Standard Locations (#1, #2, #3, #4): w = 5 (cm) d = 5 (cm) h = 5 (cm)

Standard Locations (#5, #6, #7, #8): w = 5 (cm) d = 5 (cm) h = 5 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	301	302	303	304	305	306	307	308	309

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

Calibration Results:

Before adjustment

Setting: Indicating: #1: #2: #3: #4: #5: #6: #7: #8: #9:
104.0 104.0 104.06 103.92 104.53 104.37 104.48 104.04 103.93 104.22 104.25

After adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC, (°C)	Uncertainty (± °C)
#1	103.86	-0.14	0.39
#2	103.72	-0.28	0.39
#3	104.33	0.33	0.39
#4	104.17	0.17	0.39
#5	104.28	0.28	0.39
#6	103.84	-0.16	0.39
#7	103.73	-0.27	0.39
#8	104.02	0.02	0.39
#9	104.05	0.05	0.39

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
104.0	104.0	104.0	#1	#2	#3	#4	#5	#6	#7	#8	#9	0.39
			103.86	103.72	104.33	104.17	104.28	103.84	103.73	104.02	104.05	

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.39	0.07	0.72

Note: * Maximum uncertainty of the each position

After adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	180.65	0.65	0.42
#2	179.59	-0.41	0.42
#3	180.73	0.73	0.42
#4	180.24	0.24	0.42
#5	179.85	-0.15	0.42
#6	179.46	-0.54	0.42
#7	179.67	-0.33	0.42
#8	179.65	-0.35	0.42
#9	179.85	-0.15	0.42

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
180.0	180.0	180.0	#1	#2	#3	#4	#5	#6	#7	#8	#9	
180.0	180.0	180.0	180.65	179.59	180.73	180.24	179.85	179.46	179.67	179.65	179.85	0.42

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	0.92	0.12	1.40

Note: * Maximum uncertainty of the each position

The End of Certificate

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Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule: ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA.
- ☒ Choice B Non-binary statement with guard band ($w = 1$ U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
- ☐ Choice C Customer defined. Customers may define arbitrary multiple of r to have applied as guard band ($w = r$ U). ; PFA - Probability of False Accept

Authorized signatory

After adjustment

Desired Temperature : 104.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	103.86	-0.14	0.39	1.0	Pass
#2	103.72	-0.28	0.39	1.0	Pass
#3	104.33	0.33	0.39	1.0	Pass
#4	104.17	0.17	0.39	1.0	Pass
#5	104.28	0.28	0.39	1.0	Pass
#6	103.84	-0.16	0.39	1.0	Pass
#7	103.73	-0.27	0.39	1.0	Pass
#8	104.02	0.02	0.39	1.0	Pass
#9	104.05	0.05	0.39	1.0	Pass

Correction* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

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Statements of conformity:(Cont.)

After adjustment (Cont.)

Desired Temperature : 180.0°C Tolerances : 2.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	180.65	0.65	0.42	2.0	Pass
#2	179.59	-0.41	0.42	2.0	Pass
#3	180.73	0.73	0.42	2.0	Pass
#4	180.24	0.24	0.42	2.0	Pass
#5	179.85	-0.15	0.42	2.0	Pass
#6	179.46	-0.54	0.42	2.0	Pass
#7	179.67	-0.33	0.42	2.0	Pass
#8	179.65	-0.35	0.42	2.0	Pass
#9	179.85	-0.15	0.42	2.0	Pass

Correction* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity

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Certificate of Calibration

Equipment:	Cooled Incubator	Certificate No.:	C31250586
Model:	IPP750eco	Issued Date:	02 March 2025
Serial No.(or ID):	V821.0094 (INS/LB-158)	Job No.:	WO-00061166
Manufacturer:	Memmert	Page:	1 of 3
Condition:	In Condition	Ventilation Valve:	None
Shelves(pc.):	3		

Customer: THAI CHEMICAL & ENGINEERING CO., LTD.
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai,
Prakanong, Bangkok 10260 Thailand

Environment Condition: Temperature: 20 °C ± 0.9 °C
Humidity: 55 %RH ± 4.7 %RH
Voltage: 230 VAC ± 1.9 VAC

Calibration Place: THAI CHEMICAL & ENGINEERING CO., LTD. (Laboratory)
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai,
Prakanong, Bangkok 10260 Thailand

Calibration By: Mr. Suphanimit Khamnonphoom
Calibration Date: 28 February 2025

The Method used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10250004

Person in charge

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

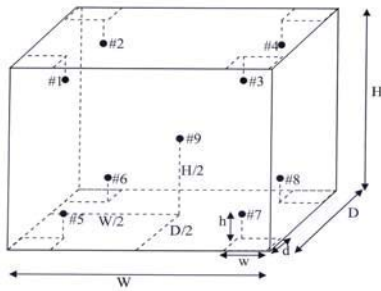
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

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**Standard Installation Locations**

Volume (Calibration Zone)= 369 (Liters)

Inside chamber: W = 100 (cm) D = 60 (cm) H = 120 (cm)

Standard Locations (#1, #2, #3, #4): w = 10 (cm) d = 6 (cm) h = 12 (cm)

Standard Locations (#5, #6, #7, #8): w = 10 (cm) d = 6 (cm) h = 12 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	101	102	103	104	105	106	107	108	109

Definitions**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.**Measured Temperature:** The average reading of standards at any positions or location.**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

บริษัท ดีเคเอส อีเซีย จำกัด
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Calibration Results:
Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	19.71	-0.29	0.23
#2	19.67	-0.33	0.23
#3	19.82	-0.18	0.23
#4	19.97	-0.03	0.23
#5	20.34	0.34	0.23
#6	20.32	0.32	0.23
#7	20.31	0.31	0.24
#8	20.32	0.32	0.23
#9	20.15	0.15	0.24

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
20.0	20.0	20.0	#1	#2	#3	#4	#5	#6	#7	#8	#9	0.24
			19.71	19.67	19.82	19.97	20.34	20.32	20.31	20.32	20.15	

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20.0	0.52	0.03	0.73

Note: * Maximum uncertainty of the each position

The End of Certificate

บริษัท ดีเคเอส อีเซีย จำกัด
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Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule:** ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA.
- ☒ Choice B Non-binary statement with guard band ($w = 1$ U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
- ☐ Choice C Customer defined. Customers may define arbitrary multiple of r to have applied as guard band ($w = r$ U).
- : PFA - Probability of False Accept



Authorized signatory

Without adjustment

Desired Temperature : 20.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	19.71	-0.29	0.23	1.0	Pass
#2	19.67	-0.33	0.23	1.0	Pass
#3	19.82	-0.18	0.23	1.0	Pass
#4	19.97	-0.03	0.23	1.0	Pass
#5	20.34	0.34	0.23	1.0	Pass
#6	20.32	0.32	0.23	1.0	Pass
#7	20.31	0.31	0.24	1.0	Pass
#8	20.32	0.32	0.23	1.0	Pass
#9	20.15	0.15	0.24	1.0	Pass

Correction* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity

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CAL-FM-C31-10: 12 Sep 2022

Certificate of Calibration

Equipment: COD Reactor
Model: DRB 200
Serial No. (or ID.): 19040C0466 (LB-140)
Manufacturer: HACH
Condition: In Condition
Covers: Open (Max) Locations heating Block: Left and Right

Certificate No.: C17240118
Issued Date: 19 July 2024
Job No.: WO-00035466
Page: 1 of 4

Customer: THAI CHEMICAL & ENGINEERING CO., LTD.
1048/2 Sukhumvit 66/1 Rd., Prakanong Tai,
Prakanong, Bangkok 10260 Thailand

Environment Condition: Temperature: 23 °C ± 5.0 °C
Humidity: 50 %RH ± 15.0 %RH
Voltage: 230 VAC ± 11.0 VAC

Calibration Place: Temperature Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr. Vanasapol Lerksanthia
Calibration Date: 19 July 2024
The Method used: In house method, CAL-WI-59, base on Direct Measurement with Standard Thermometer
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited, Certificate No. C10240017



Person in charge



Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

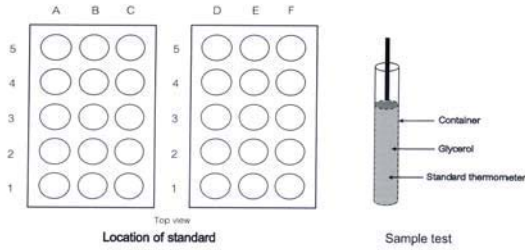
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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CAL-FM-C17-08: 20 Jul 2022



Standard Installation Locations

The standard thermometer touches the lower end of the boring

Definitions

- Indicating Temperature:** The average reading of indicating device which forms the integral part of the unit under calibration.
- Measured Temperature:** The average reading of standards at any positions or location.
- Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

Calibration Results: Before Adjustment

Locations heating Block:	Setting (°C)	Unit Under Calibration (°C)
Left	150	150
Right	150	150

Location heating Block:	A2	A4	B3	C2	C4
Measured Temperature (°C)	149.96	149.33	149.11	149.45	149.51

Location heating Block:	D2	D4	E3	F2	F4
Measured Temperature (°C)	149.34	148.39	147.96	148.74	148.70

After Adjustment

Measured temperature at the spread locations:

Locations heating Block:	Setting (°C)	Unit Under Calibration (°C)
Left	150	150
Right	150	150

Location heating Block:	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
A2	150.46	0.46	0.65
A4	149.83	-0.17	0.65
B3	149.61	-0.39	0.65
C2	149.95	-0.05	0.65
C4	150.01	0.01	0.65
D2	150.64	0.64	0.65
D4	149.69	-0.31	0.65
E3	149.26	-0.74	0.65
F2	150.04	0.04	0.65
F4	150.00	0.00	0.65

Characterization of the unit under calibration:

Locations heating Block	Desired (°C)	Unit Under Calibration (°C)		Measured Temperature (°C)
		Setting	Reading	Stability (± °C)
Left	150	150	150	0.02
Right	150	150	150	0.02

The End of Certificate