

เอกสารแนบ ง
ใบรับรองการสอบเทียบเครื่องมือ

บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด

Agilent CrossLab Start Up Services

Agilent 5100 5110 ICP-OES Preventive Maintenance

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your systems operating at their peak performance.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for regular maintenance and are encouraged to observe the service representative.
- Any parts not included in the Parts Lists section of this document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.
- For customers using HF applications, the instrument should be returned to its standard sample introduction system.

Important Customer Web Links

- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- To access the **Agilent Resource Center** web page, visit <https://www.agilent.com/en-us/agilentresources>. The following information topics are available:
 - Sample Prep and Containment
 - Chemical Standards
 - Analysis
 - Service and Support
 - Application Workflows
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>
- Videos about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>
- **Need to place a service call?** Flexible Repair Options | Agilent

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "**Service not applicable**" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in the most logical order relevant to the individual system service in the order of the tasks listed.
- Complete the **Service Review** section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Completion section
- **Ask the customer to sign the Service Verification section including the customer's and your signature.**

Instrument Maintenance

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID	5110 ICP-OES
Instrument System Site and Location	Integrated Research Center

List System Component Product Numbers	List the Serial Numbers of each Component
1. G8015 A	MY 19351008
2. G3292 A	1907 - 00426
3.	
4.	
5.	
6.	
7.	
8.	
9.	

ICP-OES Configuration Table	Circle the type or write in the type if other
Nebulizer Type	SeaSpray OneNeb Conikal Other
Spray Chamber	Cyclonic Single Pass Cyclonic Double Pass Other
Torch	Radial Dual View Other
Torch Type	One Piece Semi Demountable Fully Demountable Other
Injector Diameter	2.4mm 1.8mm 1.4mm 0.8mm Other
Injector Material	Quartz Ceramic Other

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components and implementation of Service Notes
- ☒ Check for required firmware/software updates and verify with customers if they would like them installed.
- (N/A) ☐ For HF application systems, if standard sample introduction system was not installed, ask the customer to install it.
- ☒ Ask the customer to remove any samples from the ICP-OES sample introduction area, auto sampler or around the ICP-OES.

Preventive Maintenance Procedures

Record Pre-PM instrument performance

- ☒ Run Instrument Performance test.
- ☒ Record results in Instrument Performance Test Results Table – Pre-PM.

Clean and inspect ICP-OES system

- ☒ Look for any obvious external damage or problems.
- ☒ Inspect water cooling hoses, gas lines and power cord for excessive wear or damage.
- ☒ Perform a general internal inspection of the system for excessive dust accumulation, clean if necessary.
- ☒ Inspect sample introduction components and record any required maintenance in the Service Engineer Comments and notify the customer as the required actions required.
- ☒ Record the instrument operating conditions in the ICP-OES Status Results Table.
- ☒ Replace the polychromator purge filter.
- ☒ Replace the radial pre-optics window
- ☒ Replace the axial pre-optics window for SVDV and VDV instruments.
- ☒ Check exhaust flow for the correct positive extraction at the exhaust duct to insure they meet minimum specifications.
- ☒ Replace air inlet dust filter.
- (N/A) ☐ Replace high capacity air inlet dust filter element if installed.
- ☒ Remove and clean instrument water inlet filter.

Agilent Water Recirculator

- ☐ **Service not applicable**
- ☒ Drain cooling fluid and remove any particles from the chiller reservoir
- ☒ Remove, clean and reinstall water inlet metal mesh filter if present.
- ☒ Re fill with Agilent Cool Clear cooling fluid.
- ☒ Clean the cooling system Air filter and the condenser.

SPS 3 Auto Sampler

- ☒ **Service not applicable**
- ☐ Power cycle the autosampler and verify successful initialization.
- ☐ Inspect X and Z axis belts for wear. Replace is necessary.
- ☐ Clean X and Z axis slide shafts.
- ☐ Using customer's racks and the Agilent software move the sample probe to the 4 outermost corners and rinse port, ensure that the probe is approximately centered in the vial.

SPS 4 Auto sampler

- ☒ **Service not applicable**
- ☐ Clean the spill tray, rack location mat, end frames and chassis with a damp soft cloth and diluted mild detergent.
- ☐ Clean the auto sampler cover panels, if cover kit is installed, with domestic window cleaner.
- ☐ Check the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ☐ Check the X-axis, Theta-axis and Z-axis FFC cables for cracks, incorrect positioning, damaged edges or damaged connectors.
- ☐ Pump Tubing Replacement. Replace peristaltic pump tubing. Replace all tubing that goes from the rinse station to the pump and from the pump to the waste/rinse bottles
- ☐ Test using customer's tray and move the sample probe to the sample vial 1, wash vial and rinse port and ensure that the probe is centered in the vial. If not use calibration wizard and calibrate the position.

AVS 4, 6, 7 Advanced Valve System

- ☒ **Service not applicable**
- ☐ Replace valve rotor seal
- ☐ Check fittings for signs of leaks
- ☐ Check tubing including autosampler tubing for kinks or excessive wear
- ☐ Check high flow pump for signs of leaks

ICP-OES adjustment

- ☒ Check position of Zn peak, adjust if required.
- ☒ Check Argon Ratio, adjust to specified value if required.
- ☒ Perform Detector Calibration.
- ☒ Perform Instrument Calibration.

Record Post-PM instrument performance

- ☒ Run Instrument Performance test.
- ☒ Record results in Instrument Performance Test Results Table - Post PM.
- ☒ For systems using ICP Expert version 7.3 and above, run the following Instrument tests
 - ☒ Subsystem Communications Test
 - ☒ Air Flow
 - ☒ Water Flow
 - ☒ Gas Flows
 - ☒ RF Generator
 - ☒ Camera Test
 - ☒ Optics Test
 - ☒ Nebulizer Test
- ☒ Record the result in the Instrument Test Results Table

Restore Instrument

- (N/A) ☐ For HF applications, ask the customer to reinstall their sample introduction system.
- ☒ Leave system in an idle state: on and purging.
- ☒ Guidance: If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box. Systems in a compliant environment may need additional documentation.
- ☒ **Complete the Signature Page with both Service Engineer and Customer signatures.**

Test Results

Instrument Performance Test Results Table

Note: These measurements do not form part of any specification and are for reference only.

	Pre PM Sensitivity Check		Post PM Sensitivity Check	
	Radial	Axial *	Radial	Axial*
Zn 213.857 nm SRBR	1503.1	4353.1	1878.3	6963.0
Mn 257.610 nm SRBR	7167.4	25078.8	8919.6	38366.4
Al 396.152 nm SBR	7.7	19.1	9.0	35.3
K 766.491 nm SBR	7.2	101.4	5.7	118.7

* Axial result is not applicable for G8016AA, G8012AA Radial View instruments.

Instrument Test Results Table

Note: The Instrument Test results are for systems using ICP Expert version 7.3 and above only.

Instrument Test	Result
Subsystem Communications Test	Pass
Air Flow	Pass
Water Flow	Pass
Gas Flows	Pass
RF Generator	Pass
Camera Test	Pass
Optics Test	Pass
Nebulizer test	Pass

ICP-OES Status Results Table

Note: These measurements do not form part of any specification and are for reference only.

Measurement	Standby Mode		Plasma On	
Mains Voltage	231.221	VAC	228.140	VAC
Mains Current	0.083	A	0.108	A
Instrument Temperature	24.2	°C	24.4	°C
RF Air Flow (sensor speed)	15.0	Hz	17.0	Hz
Plasma Exhaust Temperature	No measurement		56.7	°C
Water Flow Oscillator	No measurement		1.48	L/min
Water Flow Detector	0.00	L/min	1.14	L/min
Water Inlet Temperature	21.8	°C	20.5	°C
Polychromator Temperature	35.6	°C	35.0	°C
CCD Temperature	26.7	°C	-39.5	°C
Thermal Stabilizer	35.0	°C	35.0	°C
Argon Supply Pressure	634.52	kPa	574.57	kPa
Purge Gas Supply Pressure*1	633.28	kPa	598.40	kPa
Option Gas Supply Pressure*1	—	kPa	—	kPa
Nebulizer Flow	No measurement		0.70	L/min
Nebulizer Back Pressure	No measurement		297.12	kPa
Plasma Gas Flow	No measurement		14.89	L/min
Auxiliary Gas Flow	No measurement		1.20	L/min
RF Power	No measurement		1196.4	W
RF Supply Current	No measurement		8.100	A
RF Supply Voltage	No measurement		198.790	V

*1 If option installed

Consumed PM Parts

Part Description	Part Number	Product or Model# where used	Quantity consumed
Axial Pre-Optic Window	G8010-68014	G8010A, G8011A, G8014A/G8015A	1
Radial Pre-Optic Window	G8010-68015	All	1
Agilent Cool Clear Coolant Fluid	5799-0037	Agilent Water Recirculator	1
Purge Gas Filter	G8010-60136	All	1
Air inlet filter	G8000-68002	All	1
High Capacity Air Filter	G8010-60189	Optional	
Rotor seal for 6-7 port valve for AVS6/7	G8494-60002	G8494A/G8495	
Rotor seal for 4 port valve for AVS4	G8493-60002	G8493A	
Rinse solution to rinse station 2.5mm id x 1m	G8410-80123	SPS 4	
Barb connector 2.5mm-1.5mm ID	G8410-80124	SPS 4	
PVC waste tubing, 8mm od x 5mm id, 2m	G8410-80122	SPS 4	
Additional Parts may be required from engineer's stock:			
X axis drive belt	5410047500	SPS 3	
Z axis drive belt	5410047400	SPS 3	
Peristaltic pump tubing, PVC SolvaFlex, 3 bridged,	3710049000	SPS 4	

Consumed Parts Reference (Purchased by customer, not included as part of PM)

☒ Section Not Applicable.

Part Description	Part Number	Product or Model# where used	Quantity consumed
------------------	-------------	------------------------------	-------------------

Signature Page

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the installation or other items of interest for the customer, please write in this box.

- Replaced all PM parts .
- Test instrument all parameters >> Passed.
- Found some error of snout purge gas is not active but this part is not ~~nesser~~ necessary for current method run .

Service Verification

Service Request Number:

6007133960

Service Engineer Name:

Uthai Ngamlertsirichai

Service Engineer Signature:

Uthai Ng.

Total number of pages in this document:

14

Date Service Completed:

31 Oct. 2024

Customer Name:

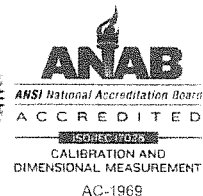
Chonnikan Saensuk

Customer Signature:

Chonnikan_S



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTABURI
NONTABURI 11120 THAILAND
66 2 583 9834



Certificate of Calibration

Date: Nov 11, 2024

Cert No. 5523631031362690

Customer:

DOUBLE A (1991) PUBLIC COMPANY LIMITED

1 MOO2 KLONGRUNG-PRACHINBURI ROAD

THATOOM, SRIMAHAPHOT

PRACHINBURI PRACHINBURI 25140

Work Order #: THAI-PT-00735

MPC Control #: EV3700

Asset ID: WL-056/11

Gage Type: PH METER

Manufacturer: METTLER TOLEDO

Model Number: SEVEN EASY

Size: N/A

Temp/RH: 25.0°C / 52.0%

Location: Calibration performed at Customer's facility

Serial Number: 1232025225

Department: N/A

Performed By: JAKRAPONG ARIYACHAT

Received Condition: IN TOLERANCE

Returned Condition: IN TOLERANCE

Cal. Date: October 31, 2024

Cal. Interval: 12 MONTHS

Cal. Due Date: October 31, 2025

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AW2318	PH BUFFER SOLUTION	PH 4.00	1040525C	REAGECON	Aug 28, 2026	4C23H1 / REAGECON
AW2319	PH BUFFER SOLUTION	PH 7.00	1070525C	REAGECON	Jul 28, 2025	725C23G1 / REAGECON
AW2320	PH BUFFER SOLUTION	PH 10.00	1100525C	REAGECON	May 28, 2025	1125C23E1 / REAGECON

Procedures Used in this Event

Procedure Name

MPC-PHM-001 Rev. 06

Description

pH Meters, General, Rev.06, May-24-2024

Calibrating Technician:

JAKRAPONG ARIYACHAT

QC Approval:

PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCCL Z540.3-2006

THE CALIBRATION REPORT STATUS

PASS: Term used when compliance statement is given, and the measurement result is PASS.

PASS²: Term used when compliance statement is given, and the measurement result is conditional passed or PASS².

FAIL: Term used when compliance statement is given, and the measurement result is FAIL.

FAIL²: Term used when compliance statement is given, and the measurement result is conditional failed or FAIL².

REPORT OF VALUE: Term used when reported measurement is not requiring compliance statement in report.

ADJUSTED: When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.

LIMITED: When an instrument fails calibration but is still functional in a limited manner.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017, ANSI/NCCL Z540.3-2006 and ANSI/NCCL Z540.1-1994. Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. The information on this report pertains only to the instrument identified; this may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.

Calibration Report of Mettler Toledo SEVEN EASY Ph Meter

MPC Control #: EV3700

Serial Number: 1232025225

Asset ID: WL-056/11

Calibration Date: October 31, 2024

Measurement Results

Buffer Solution

STD Test Point @ 25°C	Lower Limit	Measured Value		Upper Limit	Result	Uncertainty (±)
		AS Found	AS Left			
4.01 pH	3.91 pH	4.01 pH	4.01 pH	4.11 pH	PASS	0.013 pH
7.01 pH	6.91 pH	7.01 pH	7.01 pH	7.11 pH	PASS	0.013 pH
10.01 pH	9.91 pH	10.01 pH	10.01 pH	10.11 pH	PASS	0.013 pH

Note : Accuracy by Customer : ± 0.10 pH

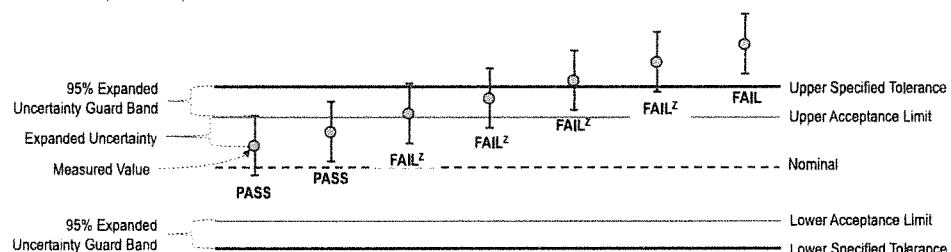
Statements of Pass or Fail Conformance

The uncertainty of measurement has been taken into account when determining compliance with specification.

All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006

The status of compliance with the acceptance criteria is reported as:

PASS	—	Compliant with specification.
FAIL ^z	—	The measured value is not within the acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% is within the specified tolerance.
FAIL	—	Not compliant with specification.



Acceptance limits set using the 95% expanded uncertainty

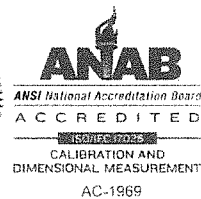
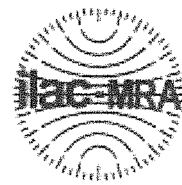
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017 and ANSI/NCSL Z540.3-2006, Method 5 — Guard Bands Based on Expanded Uncertainty.

End of Calibration Report



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NONTABURI 11120 THAILAND
66 2 583 9834



Certificate of Calibration

Date: Nov 11, 2024

Cert No. 5523631031362691

Customer:

DOUBLE A (1991) PUBLIC COMPANY LIMITED
1 MOO2 KLONGRUNG-PRACHINBURI ROAD
THATOOM, SRIMAHAPHOT
PRACHINBURI PRACHINBURI 25140

Work Order #: THAI-PT-00735

MPC Control #: EV3701
Asset ID: WL-058/11
Gage Type: CONDUCTIVITY METER
Manufacturer: METTLER TOLEDO
Model Number: SEVEN EASY
Size: N/A
Temp/RH: 25.0°C / 52.0%
Location: Calibration performed at Customer's facility

Serial Number: 1232025828
Department: N/A
Performed By: JAKRAPONG ARIYACHAT
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 31, 2024
Cal. Interval: 12 MONTHS
Cal. Due Date: October 31, 2025

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AW2456	CONDUCTIVITY SOLUTION	190724	TRM-S-2019	REAGECON	Jan 22, 2025	TRM-S-2019 / NIMT

Procedures Used in this Event

Procedure Name	Description
MPC-PHM-001 Rev. 06	pH Meters, General, Rev.06, May-24-2024

Calibrating Technician:

JAKRAPONG ARIYACHAT

QC Approval:

PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCCL Z540.3-2006.

THE CALIBRATION REPORT STATUS:

PASS: Term used when compliance statement is given, and the measurement result is PASS.

PASS⁺: Term used when compliance statement is given, and the measurement result is conditional passed or PASS⁺.

FAIL: Term used when compliance statement is given, and the measurement result is FAIL.

FAIL⁺: Term used when compliance statement is given, and the measurement result is conditional failed or FAIL⁺.

REPORT OF VALUE: Term used when reported measurement is not requiring compliance statement in report.

ADJUSTED: When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.

LIMITED: When an instrument fails calibration but is still functional in a limited manner.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated. This calibration report complies with ISO/IEC 17025:2017, ANSI/NCCL Z540.3-2006 and ANSI/NCCL Z540.1-1994. Calibration cycles and resuming due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. The information on this report pertains only to the instrument identified; this may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.



Calibration Report of Mettler Toledo SEVEN EASY Conductivity Meter

MPC Control #:	EV3701	Serial Number:	1232025828
Asset ID:	WL-058/11	Calibration Date:	October 31, 2024

Measurement Results

Nominal	Unit	Temp.	STD. Test Point @ Temp	Lower Limit	UUC Reading		Upper Limit	Result	Uncertainty (±)
					As Found	As Left			
1413	µS/cm	25.0°C	1413	1403	1412	1412	1423	PASS ^z	16

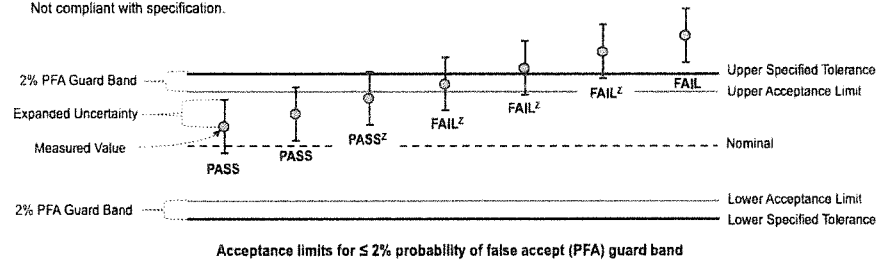
Note : Accuracy by Customer : ± 0.5 %

Statements of Pass or Fail Conformance

The uncertainty of measurement has been taken into account when determining compliance with specification.
All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006

The status of compliance with the acceptance criteria is reported as:

PASS	—	Compliant with specification.
PASS ^z	—	The measured value is within acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% exceeds the specified tolerance.
FAIL ^z	—	The measured value is not within the acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% is within the specified tolerance.
FAIL	—	Not compliant with specification.



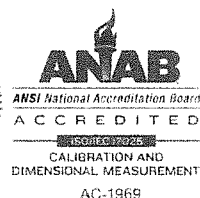
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017 and ANSI/NCSL Z540.3-2006, Method 6 — Guard Bands Based on Test Uncertainty Ratio.

End of Calibration Report



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Certificate of Calibration

Date: Nov 11, 2024

Cert No. 5523631031362694

Customer:

DOUBLE A (1991) PUBLIC COMPANY LIMITED
1 MOO2 KLONGRUNG-PRACHINBURI ROAD
THATOOM, SRIMAHAPHOT
PRACHINBURI PRACHINBURI 25140

Work Order #: THAI-PT-00735

MPC Control #: EV3702
Asset ID: WL-PHM/03
Gage Type: PH/DO METER
Manufacturer: METTLER TOLEDO
Model Number: SEVEN GO DUO
Size: N/A
Temp/RH: 25.0°C / 52.0%
Location: Calibration performed at Customer's facility

Serial Number: B932068736
Department: N/A
Performed By: CHANKIAT PHOLKAM
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 31, 2024
Cal. Interval: 12 MONTHS
Cal. Due Date: October 31, 2025

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AW2318	PH BUFFER SOLUTION	PH 4.00	1040525C	REAGECON	Aug 28, 2026	4C23H1 / REAGECON
AW2319	PH BUFFER SOLUTION	PH 7.00	1070525C	REAGECON	Jul 28, 2025	725C23G1 / REAGECON
AW2320	PH BUFFER SOLUTION	PH 10.00	1100525C	REAGECON	May 28, 2025	1125C23E1 / REAGECON

Procedures Used in this Event

Procedure Name	Description
MPC-PHM-001 Rev. 06	pH Meters, General, Rev.06, May-24-2024

Calibrating Technician:

Chankiat P.
CHANKIAT PHOLKAM

QC Approval:

S. Padung
PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCCL Z540.3-2006.

THE CALIBRATION REPORT STATUS:

PASS - Term used when compliance statement is given, and the measurement result is PASS.

PASS⁺ - Term used when compliance statement is given, and the measurement result is conditional passed or PASS⁺.

FAIL - Term used when compliance statement is given, and the measurement result is FAIL.

FAIL⁺ - Term used when compliance statement is given, and the measurement result is conditional failed or FAIL⁺.

REPORT OF VALUE - Term used when reported measurement is not requiring compliance statement in report.

ADJUSTED - When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.

LIMITED - When an instrument fails calibration but is still functional in a limited manner.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated. This calibration report complies with ISO/IEC 17025:2017, ANSI/NCCL Z540.3-2006 and ANSI/NCCL Z540.1-1994. Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. The information on this report pertains only to the instrument mentioned; this may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.

Calibration Report of Mettler Toledo SEVEN GO DUO Ph/Do Meter

MPC Control #: EV3702
Asset ID: WL-PHM/03

Serial Number: B932068736
Calibration Date: October 31, 2024

Measurement Results

Buffer Solution

STD Test Point @ 25°C	Lower Limit	Measured Value		Upper Limit	Result	Uncertainty (±)
		AS Found	AS Left			
4.01 pH	3.91 pH	4.00 pH	4.00 pH	4.11 pH	PASS	0.013 pH
7.01 pH	6.91 pH	6.95 pH	6.95 pH	7.11 pH	PASS	0.013 pH
10.01 pH	9.91 pH	10.00 pH	10.00 pH	10.11 pH	PASS	0.013 pH

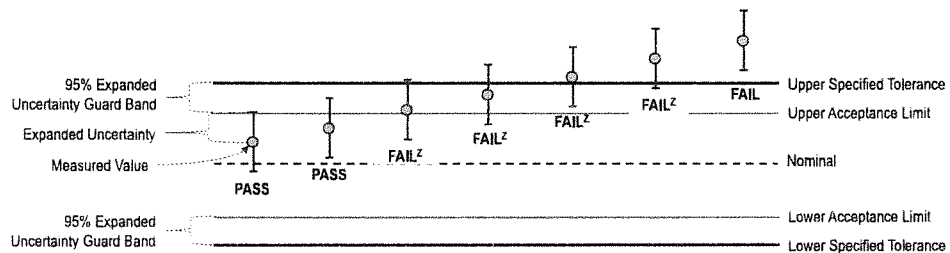
Note : Accuracy by Customer : ± 0.10 pH

Statements of Pass or Fail Conformance

The uncertainty of measurement has been taken into account when determining compliance with specification.
All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006

The status of compliance with the acceptance criteria is reported as:

PASS	—	Compliant with specification.
FAIL ^z	—	The measured value is not within the acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% is within the specified tolerance.
FAIL	—	Not compliant with specification.



Acceptance limits set using the 95% expanded uncertainty

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017 and ANSI/NCSL Z540.3-2006, Method 5 — Guard Bands Based on Expanded Uncertainty.

End of Calibration Report



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTABURI
NONTABURI 11120 THAILAND
66 2 583 9834



Certificate of Calibration

Date: Nov 11, 2024

Cert No. 5523631031362695

Customer:

DOUBLE A (1991) PUBLIC COMPANY LIMITED
1 MOO2 KLONGRUNG-PRACHINBURI ROAD
THATOOM, SRIMAHAPHOT
PRACHINBURI PRACHINBURI 25140

Work Order #: THAI-PT-00735

MPC Control #: EV3703
Asset ID: WL-WTB/02
Gage Type: WATER BATH
Manufacturer: MEMMERT
Model Number: WNB22
Size: N/A
Temp/RH: 25.0°C / 52.0%
Location: Calibration performed at Customer's facility

Serial Number: L518.0690
Department: N/A
Performed By: CHANKIAT PHOLKAM
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 31, 2024
Cal. Interval: 12 MONTHS
Cal. Due Date: October 31, 2025

Calibration Notes:

Please refer to the attached Calibration Report (2 pages)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
EQ6188	DATA ACQUISITION/SWITCH UNIT	34970A	MY345289	AGILENT	Mar 13, 2025	5523631030779306 / MP-TH

Procedures Used in this Event

Procedure Name	Description
THAI LAB ACC G-20	Guidelines for Calibration and Checks of Temperature Controlled Enclosures Publication Reference

Calibrating Technician:

Chankiat P.

CHANKIAT PHOLKAM

QC Approval:

S. Padung

PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006.

THE CALIBRATION REPORT STATUS:

PASS - Term used when compliance statement is given, and the measurement result is PASS.

PASS* - Term used when compliance statement is given, and the measurement result is conditional passed or PASS*.

FAIL - Term used when compliance statement is given, and the measurement result is FAIL.

FAIL* - Term used when compliance statement is given, and the measurement result is conditional failed or FAIL*.

REPORT OF VALUE - Term used when reported measurement is not requiring compliance statement in report.

ADJUSTED - When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.

LIMITED - When an instrument fails calibration but is still functional in a limited manner.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated. This calibration report complies with ISO/IEC 17025:2017, ANSI/NCSL Z540.3-2006 and ANSI/NCSL Z540.1-1994. Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. The information on this report pertains only to the instrument identified; this may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.



Calibration Report of Memmert WNB22 Water Bath

MPC Control #:	EV3703	Serial Number:	L518.0690
Asset ID:	WL-WTB/02	Calibration Date:	October 31, 2024

Measurement Results

Section 1 : Temperature Distribution

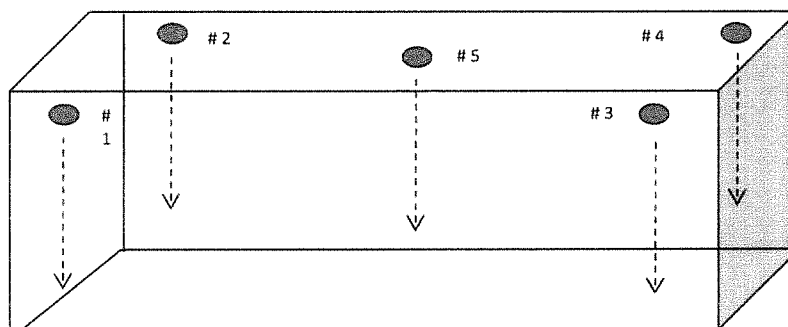
Temperature @ 85 °C

Sensor No.	UUC Setting (°C)	Lower Limit (°C)	STD Reading (°C)		Upper Limit (°C)	Result	Uncertainty (°C)
			As Found	As Left			
Sensor#1	85.00	84.00	84.79	84.79	86.00	PASS	± 0.35
Sensor#2	85.00	84.00	84.91	84.91	86.00	PASS	± 0.35
Sensor#3	85.00	84.00	85.13	85.13	86.00	PASS	± 0.35
Sensor#4	85.00	84.00	85.16	85.16	86.00	PASS	± 0.35
Sensor#5	85.00	84.00	85.26	85.26	86.00	PASS	± 0.35

Section 2 : Chamber Performance

Setting Temp (°C)	Indicating Temp (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
85.0	85.0	1.40	0.9	1.9

Accuracy By : Customer Specification $\pm 1^{\circ}\text{C}$





Calibration Report of Memmert WNB22 Water Bath

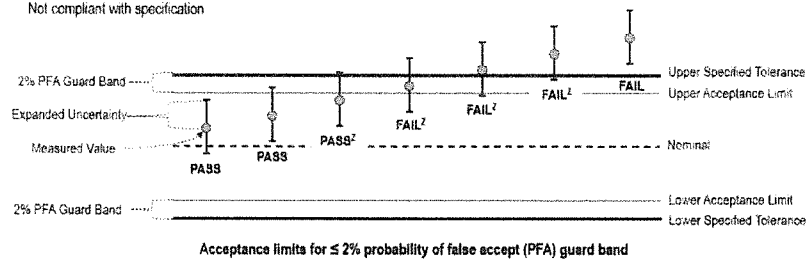
MPC Control #:	EV3703	Serial Number:	L518.0690
Asset ID:	WL-WTB/02	Calibration Date:	October 31, 2024

Statements of Pass or Fail Conformance

The uncertainty of measurement has been taken into account when determining compliance with specification.
All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCCL Z540.3-2006

The status of compliance with the acceptance criteria is reported as:

- PASS** — Compliant with specification.
- PASS²** — The measured value is within acceptance limits.
However, a portion of the expanded uncertainty of measurement at 95% exceeds the specified tolerance.
- FAIL²** — The measured value is not within the acceptance limits.
However, a portion of the expanded uncertainty of measurement at 95% is within the specified tolerance.
- FAIL** — Not compliant with specification.



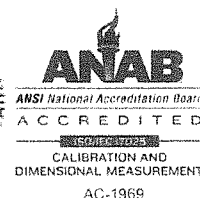
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017 and ANSI/NCCL Z540.3-2006, Method 6 -- Guard Bands Based on Test Uncertainty Ratio.

End of Calibration Report



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
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NONTABURI 11120 THAILAND
66 2 583 9834



Certificate of Calibration

Date: Nov 11, 2024

Cert No. 5523631031362697

Customer:

DOUBLE A (1991) PUBLIC COMPANY LIMITED
1 MOO2 KLONGRUNG-PRACHINBURI ROAD
THATOOM, SRIMAHAPHOT
PRACHINBURI PRACHINBURI 25140

Work Order #: THAI-PT-00735

MPC Control #: EV3704
Asset ID: WL-WTB/01
Gage Type: WATER BATH
Manufacturer: MEMMERT
Model Number: WNB22
Size: N/A
Temp/RH: 25.0°C / 52.0%
Location: Calibration performed at Customer's facility

Serial Number: L508.0973
Department: N/A
Performed By: CHANKIAT PHOLKAM
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 31, 2024
Cal. Interval: 12 MONTHS
Cal. Due Date: October 31, 2025

Calibration Notes:

Please refer to the attached Calibration Report (2 pages)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
EQ6188	DATA ACQUISITION/SWITCH UNIT	34970A	MY345289	AGILENT	Mar 13, 2025	5523631030779306 / MP-TH

Procedures Used in this Event

Procedure Name	Description
THAI LAB ACC G-20	Guidelines for Calibration and Checks of Temperature Controlled Enclosures Publication Reference

Calibrating Technician:

Chankiat P.

CHANKIAT PHOLKAM

QC Approval:

S. Padung.

PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006.

THE CALIBRATION REPORT STATUS:

PASS: Term used when compliance statement is given, and the measurement result is PASS.

PASS⁺: Term used when compliance statement is given, and the measurement result is conditional passed or PASS⁺.

FAIL: Term used when compliance statement is given, and the measurement result is FAIL.

FAIL⁺: Term used when compliance statement is given, and the measurement result is conditional failed or FAIL⁺.

REPORT OF VALUE: Term used when reported measurement is not requiring compliance statement in report.

ADJUSTED: When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.

LIMITED: When an instrument fails calibration but is still functional in a limited manner.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated. This calibration report complies with ISO/IEC 17025:2017, ANSI/NCSL Z540.3-2006 and ANSI/NCSL Z540.1-1994. Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. The information on this report pertains only to the instrument identified; this may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.



Calibration Report of Memmert WNB22 Water Bath

MPC Control #:	EV3704	Serial Number:	L508.0973
Asset ID:	WL-WTB/01	Calibration Date:	October 31, 2024

Measurement Results

Section 1 : Temperature Distribution

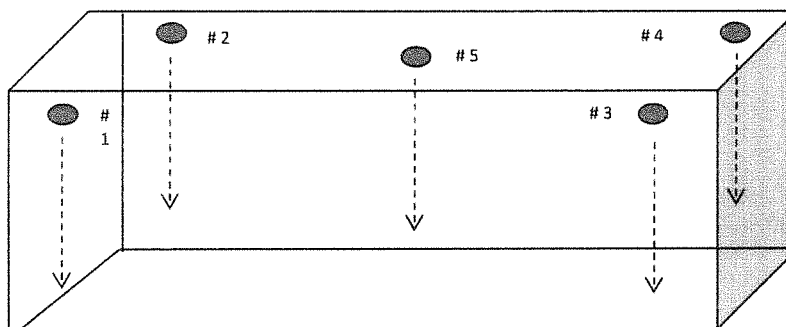
Temperature @ 85 °C

Sensor No.	UUC Setting (°C)	Lower Limit (°C)	STD Reading (°C)		Upper Limit (°C)	Result	Uncertainty (°C)
			As Found	As Left			
Sensor#1	85.00	84.00	85.01	85.01	86.00	PASS	± 0.35
Sensor#2	85.00	84.00	84.75	84.75	86.00	PASS	± 0.35
Sensor#3	85.00	84.00	85.02	85.02	86.00	PASS	± 0.35
Sensor#4	85.00	84.00	85.12	85.12	86.00	PASS	± 0.35
Sensor#5	85.00	84.00	85.21	85.21	86.00	PASS	± 0.35

Section 2 : Chamber Performance

Setting Temp (°C)	Indicating Temp (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
85.0	85.0	1.62	0.7	1.9

Accuracy By : Customer Specification $\pm 1^{\circ}\text{C}$





Calibration Report of Memmert WNB22 Water Bath

MPC Control #:	EV3704	Serial Number:	L508.0973
Asset ID:	WL-WTB/01	Calibration Date:	October 31, 2024

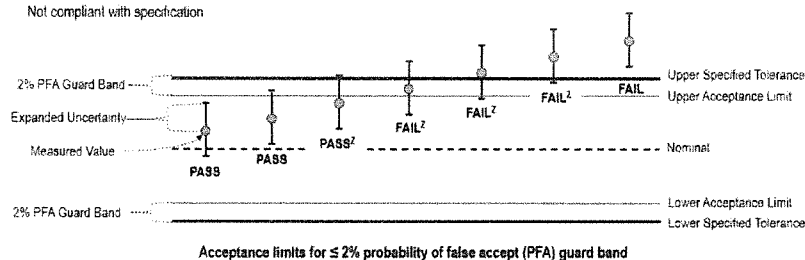
Statements of Pass or Fail Conformance

The uncertainty of measurement has been taken into account when determining compliance with specification

All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCCL Z540.3-2006

The status of compliance with the acceptance criteria is reported as:

- PASS** — Compliant with specification
- PASS²** — The measured value is within acceptance limits. However, a portion of the expanded uncertainty of measurement at 55% exceeds the specified tolerance.
- FAIL²** — The measured value is not within the acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% is within the specified tolerance.
- FAIL** — Not compliant with specification



The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated

This calibration report complies with ISO/IEC 17025:2017 and ANSI/NCCL Z540.3-2006, Method 6 -- Guard Bands Based on Test Uncertainty Ratio

End of Calibration Report



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTHABURI
NONTHABURI 11120 THAILAND
66 2 583 9834

Certificate of Calibration

Date: Nov 11, 2024

Cert No. 5523631031362700

Customer:

DOUBLE A (1991) PUBLIC COMPANY LIMITED
1 MOO2 KLONGRUNG-PRACHINBURI ROAD
THATOOM, SRIMAHAPHOT
PRACHINBURI PRACHINBURI 25140

Work Order #: THAI-PT-00735

MPC Control #: EV3706
Asset ID: DARC-TE15028
Gage Type: COOL ROOM
Manufacturer: DIXELL
Model Number: XR06CX-5N0C2
Size: N/A
Temp/RH: 28.7°C / 58.0%
Location: Calibration performed at Customer's facility

Serial Number: LIOGBXBX500
Department: N/A
Performed By: JAKRAPONG ARIYACHAT
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 31, 2024
Cal. Interval: 12 MONTHS
Cal. Due Date: October 31, 2025

Calibration Notes:

Please refer to the attached Calibration Report (2 pages)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
EQ6188	DATA ACQUISITION/SWITCH UNIT	34970A	MY345289	AGILENT	Mar 13, 2025	5523631030779306 / MP-TH

Procedures Used in this Event

Procedure Name	Description
THAI LAB ACC G-20	Guidelines for Calibration and Checks of Temperature Controlled Enclosures Publication Reference

Calibrating Technician:

JAKRAPONG ARIYACHAT

QC Approval:

PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006.

THE CALIBRATION REPORT STATUS:

PASS - Term used when compliance statement is given, and the measurement result is PASS.

PASS² - Term used when compliance statement is given, and the measurement result is conditional passed or PASS².

FAIL - Term used when compliance statement is given, and the measurement result is FAIL.

FAIL² - Term used when compliance statement is given, and the measurement result is conditional failed or FAIL².

REPORT OF VALUE - Term used when reported measurement is not requiring compliance statement in report.

ADJUSTED - When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.

LIMITED - When an instrument fails calibration but is still functional in a limited manner.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017, ANSI/NCSL Z540.3-2006 and ANSI/NCSL Z540.1-1994. Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. The information on this report pertains only to the instrument identified; this may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.



Calibration Report of Dixell XR06CX-5N0C2 Cool Room

MPC Control #:	EV3706	Serial Number:	LI0GBXB500
Asset ID:	DARC-TE15028	Calibration Date:	October 31, 2024

Measurement Results

Section 1 : Temperature Distribution

Temperature @ 4 °C

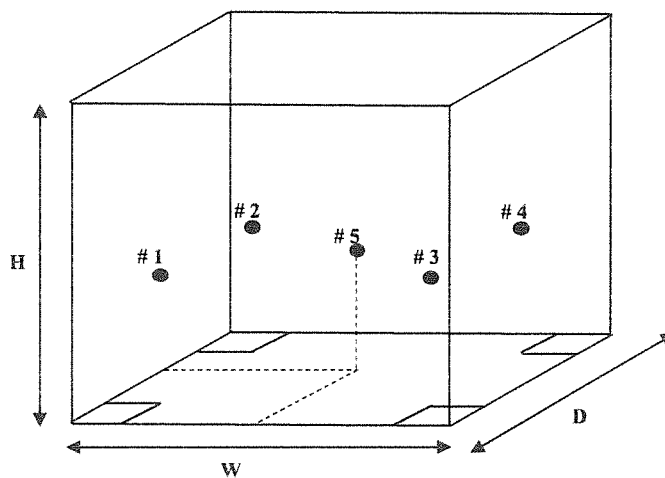
Sensor No.	UUC Setting (°C)	Lower Limit (°C)	STD Reading (°C)		Upper Limit (°C)	Result	Ucertainty (°C)
			As Found	As Left			
Sensor#1	4.00	2.00	4.53	4.53	6.00	PASS	± 0.35
Sensor#2	4.00	2.00	4.66	4.66	6.00	PASS	± 0.35
Sensor#3	4.00	2.00	4.61	4.61	6.00	PASS	± 0.35
Sensor#4	4.00	2.00	4.67	4.67	6.00	PASS	± 0.35
Sensor#5	4.00	2.00	4.62	4.62	6.00	PASS	± 0.35

Section 2 : Chamber Performance

Setting Temp (°C)	Indicating Temp (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
4.0	4.0	0.29	1.2	2.5

Accuracy By : Customer Specification ± 2 °C

Sensor Installation Location





Calibration Report of Dixell XR06CX-5N0C2 Cool Room

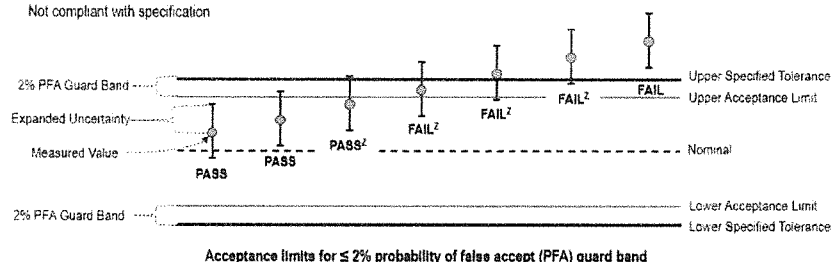
MPC Control #:	EV3706	Serial Number:	LIOGBXB500
Asset ID:	DARC-TE15028	Calibration Date:	October 31, 2024

Statements of Pass or Fail Conformance

The uncertainty of measurement has been taken into account when determining compliance with specification
All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540 3-2006

The status of compliance with the acceptance criteria is reported as:

- | | | |
|-------------------------|---|--|
| PASS | — | Compliant with specification |
| PASS^z | — | The measured value is within acceptance limits.
However, a portion of the expanded uncertainty of measurement at 95% exceeds the specified tolerance. |
| FAIL^z | — | The measured value is not within the acceptance limits
However, a portion of the expanded uncertainty of measurement at 95% is within the specified tolerance |
| FAIL | — | Not compliant with specification |



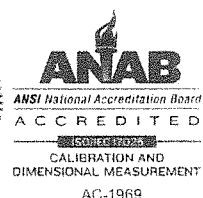
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated

This calibration report complies with ISO/IEC 17025:2017 and ANSI/NCSL Z540 3-2006, Method 6 — Guard Bands Based on Test Uncertainty Ratio

End of Calibration Report



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTHABURI
NONTHABURI 11120 THAILAND
66 2 583 9834



Certificate of Calibration

Date: Nov 11, 2024

Cert No. 5523631031362699

Customer:

DOUBLE A (1991) PUBLIC COMPANY LIMITED
1 MOO2 KLONGRUNG-PRACHINBURI ROAD
THATOOM, SRIMAHAPHOT
PRACHINBURI PRACHINBURI 25140

Work Order #: THAI-PT-00735

MPC Control #: EV3705
Asset ID: WL-INC/02
Gage Type: INCUBATOR
Manufacturer: ACCUPLUS
Model Number: I250
Size: N/A
Temp/RH: 23.5°C / 55.0%
Location: Calibration performed at Customer's facility

Serial Number: 0213-0004
Department: N/A
Performed By: JAKRAPONG ARIYACHAT
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 31, 2024
Cal. Interval: 12 MONTHS
Cal. Due Date: October 31, 2025

Calibration Notes:

Please refer to the attached Calibration Report (3 pages)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
EQ6187	DATA ACQUISITION/SWITCH UNIT	34970A	N/A	AGILENT	Mar 13, 2025	5523631030779300 / MP-TH

Procedures Used in this Event

Procedure Name	Description
THAI LAB ACC G-20	Guidelines for Calibration and Checks of Temperature Controlled Enclosures Publication Reference

Calibrating Technician:

JAKRAPONG ARIYACHAT

QC Approval:

PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% at compliance with ANSI/NCSL Z540.3-2006.

THE CALIBRATION REPORT STATUS:

PASS - Term used when compliance statement is given, and the measurement result is PASS.

PASS² - Term used when compliance statement is given, and the measurement result is conditional pass or PASS².

FAIL - Term used when compliance statement is given, and the measurement result is FAIL.

FAIL² - Term used when compliance statement is given, and the measurement result is conditional failed or FAIL².

REPORT OF VALUE - Term used when reported measurement is not requiring compliance statement in report.

ADJUSTED - When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.

LIMITED - When an instrument fails calibration but is still functional in a limited manner.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated. This calibration report complies with ISO/IEC 17025:2017, ANSI/NCSL Z540.3-2006 and ANSI/NCSL Z540.1-1994. Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. The information on this report pertains only to the instrument identified; this may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.



Calibration Report of Accuplus I250 Incubator

MPC Control #: EV3705

Serial Number: 0213-0004

Asset ID: WL-INC/02

Calibration Date: October 31, 2024

Measurement Results

Section 1 : Temperature Distribution

Temperature @ 20 °C

Sensor No.	UUC Setting (°C)	Lower Limit (°C)	STD Reading (°C)		Upper Limit (°C)	Result	Uncertainty (°C)
			As Found	As Left			
Sensor#1	20.00	19.00	19.71	19.71	21.00	PASS	± 0.35
Sensor#2	20.00	19.00	19.70	19.70	21.00	PASS	± 0.35
Sensor#3	20.00	19.00	19.75	19.75	21.00	PASS	± 0.35
Sensor#4	20.00	19.00	19.80	19.80	21.00	PASS	± 0.35
Sensor#5	20.00	19.00	19.82	19.82	21.00	PASS	± 0.35
Sensor#6	20.00	19.00	19.77	19.77	21.00	PASS	± 0.35
Sensor#7	20.00	19.00	19.73	19.73	21.00	PASS	± 0.35
Sensor#8	20.00	19.00	19.77	19.77	21.00	PASS	± 0.35
Sensor#9	20.00	19.00	19.71	19.71	21.00	PASS	± 0.35

Temperature @ 29 °C

Sensor No.	UUC Setting (°C)	Lower Limit (°C)	STD Reading (°C)		Upper Limit (°C)	Result	Uncertainty (°C)
			As Found	As Left			
Sensor#1	29.00	28.00	28.45	28.45	30.00	PASS	± 0.35
Sensor#2	29.00	28.00	28.50	28.50	30.00	PASS	± 0.35
Sensor#3	29.00	28.00	28.51	28.51	30.00	PASS	± 0.35
Sensor#4	29.00	28.00	28.52	28.52	30.00	PASS	± 0.35
Sensor#5	29.00	28.00	28.47	28.47	30.00	PASS	± 0.35
Sensor#6	29.00	28.00	28.45	28.45	30.00	PASS	± 0.35
Sensor#7	29.00	28.00	28.50	28.50	30.00	PASS	± 0.35
Sensor#8	29.00	28.00	28.42	28.42	30.00	PASS	± 0.35
Sensor#9	29.00	28.00	28.47	28.47	30.00	PASS	± 0.35



Calibration Report of Accuplus I250 Incubator

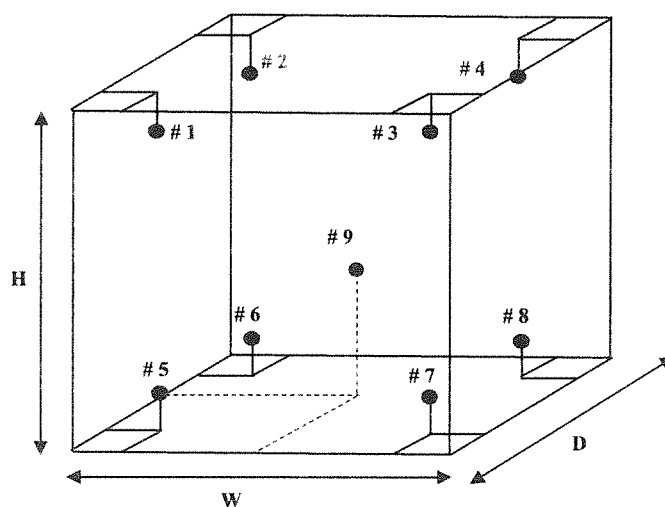
MPC Control #:	EV3705	Serial Number:	0213-0004
Asset ID:	WL-INC/02	Calibration Date:	October 31, 2024

Section 2 : Chamber Performance

Setting Temp (°C)	Indicating Temp (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
20.0	20.0	0.36	0.57	1.15
29.0	29.0	0.21	0.32	0.66

Accuracy By : Customer Specification $\pm 1^{\circ}\text{C}$

Sensor Installation Location





Calibration Report of Accuplus I250 Incubator

MPC Control #:	EV3705	Serial Number:	0213-0004
Asset ID:	WL-INC/02	Calibration Date:	October 31, 2024

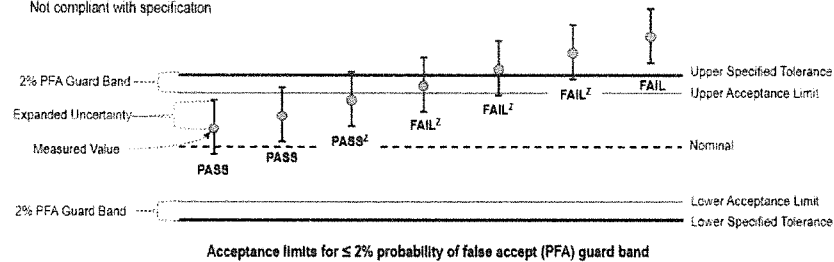
Statements of Pass or Fail Conformance

The uncertainty of measurement has been taken into account when determining compliance with specification.

All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCCL Z540.3-2006

The status of compliance with the acceptance criteria is reported as:

- | | | |
|-------------------|---|---|
| PASS | — | Compliant with specification |
| PASS ^z | — | The measured value is within acceptance limits.
However, a portion of the expanded uncertainty of measurement at 95% exceeds the specified tolerance. |
| FAIL ^z | — | The measured value is not within the acceptance limits.
However, a portion of the expanded uncertainty of measurement at 95% is within the specified tolerance |
| FAIL | — | Not compliant with specification |



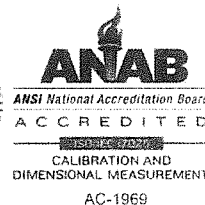
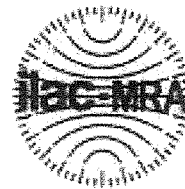
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017 and ANSI/NCCL Z540.3-2006, Method 6 — Guard Bands Based on Test Uncertainty Ratio

End of Calibration Report



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTABURI
NONTABURI 11120 THAILAND
66 2 583 9834



Certificate of Calibration

Date: Nov 7, 2024

Cert No. 5523631031354570

Customer:

DOUBLE A (1991) PUBLIC COMPANY LIMITED
1 MOO2 KLONGRUNG-PRACHINBURI ROAD
THATOOM, SRIMAHAPHOT
PRACHINBURI PRACHINBURI 25140

Work Order #: THAI-32268995

MPC Control #: EV3398
Asset ID: WL-TMM/01
Gage Type: THERMOMETER
Manufacturer: PRECISION
Model Number: N/A
Size: N/A
Temp/RH: 23.0°C / 50.0%
Location: Calibration performed at MPC facility

Serial Number: 19009
Department: N/A
Performed By: KHOMSAN SAENGKAEW
Received Condition: OPERATIONAL
Returned Condition: REPORT OF VALUE
Cal. Date: November 06, 2024
Cal. Interval: 12 MONTHS
Cal. Due Date: November 06, 2025

Calibration Notes:

The user shall determine the suitability of the equipment for its intended use. The calibration status is defined as Report of Value. Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AS9541	PLATINUM RESISTANCE THERMOMETER	162C	957	ROSEMOUNT ANALYTICAL INC	Jun 3, 2026	552363103124625 1 / MP-GV

Procedures Used in this Event

Procedure Name	Description
MPC-TEM-001	Temperature Sensors, Indicators, and Controlled Unenclosed Temperature Devices, Rev.07, May-17-2024

Calibrating Technician:

Khomsan S.

KHOMSAN SAENGKAEW

QC Approval:

S. Padung

PADUNG SRASUAY

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO/IEC 17025:2017, ANSI/NC SL Z540-1-1994, ANSI/NC SL Z540.3-2006, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.



Calibration Report of Precision Thermometer

MPC Control #: EV3398

Serial Number: 19009

Asset ID: WL-TMM/01

Calibration Date: November 6, 2024

Measurement Results

STD Setting (°C)	UUC Reading (°C)		Correction (°C)	Uncertainty (°C)
	As Found	As Left		
0.00	0	0	0.00	± 0.047
50.00	50	50	0.00	± 0.049
100.00	100	100	0.00	± 0.049

UUC : Unit Under Calibration, Immersion Type : Total Immersion

The user shall determine the suitability of the equipment for its intended use. The calibration status is defined as **Report of Value**.

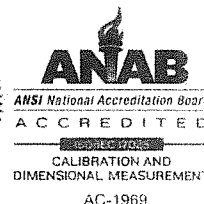
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor

$k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

End of Calibration Report



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTABURI
NONTABURI 11120 THAILAND
66 2 583 9834



Certificate of Calibration

Date: Nov 7, 2024

Cert No. 5523631031354527

Customer:

DOUBLE A (1991) PUBLIC COMPANY LIMITED
1 MOO2 KLONGRUNG-PRACHINBURI ROAD
THATOOM, SRIMAHAPHOT
PRACHINBURI PRACHINBURI 25140

Work Order #: THAI-32268995

MPC Control #: EV3395
Asset ID: WL-DTH/01
Gage Type: DIGITAL HYGRO - THERMOMETER
Manufacturer: N/A
Model Number: N/A
Size: N/A
Temp/RH: 23.0°C / 50.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: KHOMSAN SAENGKAEW
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: November 06, 2024
Cal. Interval: 12 MONTHS
Cal. Due Date: November 06, 2025

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AS9541	PLATINUM RESISTANCE THERMOMETER	162C	957	ROSEMOUNT ANALYTICAL INC	Jun 3, 2026	5523631031246251 / MP-GV
EA0537	HYGROLOG	HL-NT2-D/HC2A-S	61290374/6077948 6	ROTRONIC	Mar 7, 2025	551220085460939 / MP-TH

Procedures Used in this Event

Procedure Name	Description
MPC-THD-001 Rev. 03	Temperature, Humidity and Dew Point Devices, General, Rev.03, Jul-15-2024

Calibrating Technician:

Khomsan S.
KHOMSAN SAENGKAEW

QC Approval:

S. Pradung
PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006.

THE CALIBRATION REPORT STATUS:

PASS: Term used when compliance statement is given, and the measurement result is PASS.

PASS²: Term used when compliance statement is given, and the measurement result is conditional passed or PASS².

FAIL: Term used when compliance statement is given, and the measurement result is FAIL.

FAIL²: Term used when compliance statement is given, and the measurement result is conditional failed or FAIL².

REPORT OF VALUE: Term used when reported measurement is not requiring compliance statement in report.

ADJUSTED: When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.

LIMITED: When an instrument fails calibration but is still functional in a limited manner.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated. This calibration report complies with ISO/IEC 17025:2017, ANSI/NCSL Z540.3-2006 and ANSI/NCSL Z540.1-1994. Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. The information on this report pertains only to the instrument identified, this may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.



Calibration Report of Digital Hygro - Thermometer

MPC Control #: EV3395

Serial Number: N/A

Asset ID: WL-DTH/01

Calibration Date: November 6, 2024

Measurement Results

Section 1 - Temperature Measurement

STD Reading (°C)	Lower Limit (°C)	UUC Reading (°C)		Upper Limit (°C)	Result	Uncertainty (°C)
		As Found	As Left			
20.00	19.00	19.8	19.8	21.00	PASS	± 0.051
25.00	24.00	24.6	24.6	26.00	PASS	± 0.055

Section 2 - Humidity Measurement

STD Reading (%RH)	Lower Limit (%RH)	UUC Reading (%RH)		Upper Limit (%RH)	Result	Uncertainty (%RH)
		As Found	As Left			
30.00	28.00	29	29	32.00	PASS	± 0.75
50.00	48.00	50	50	52.00	PASS	± 1.2
70.00	68.00	70	70	72.00	PASS	± 1.3

UUC : Unit Under Calibration, Temperature @ 25 °C

Accuracy By Manufacturer Specification , Temperature : ± 1 °C, Humidity : ± 2 %RH

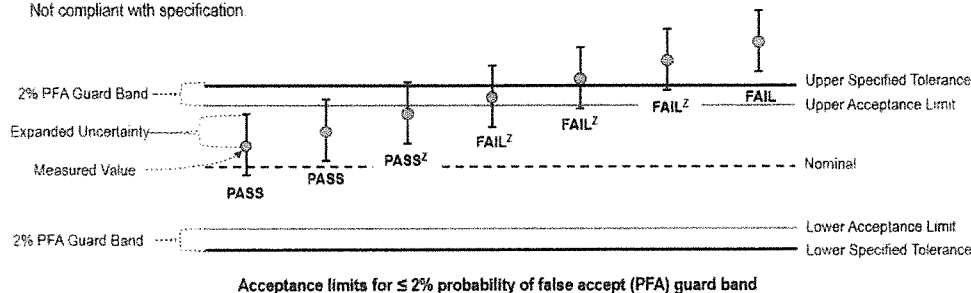
Statements of Pass or Fail Conformance

The uncertainty of measurement has been taken into account when determining compliance with specification.

All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006

The status of compliance with the acceptance criteria is reported as:

PASS	—	Compliant with specification.
PASS ^z	—	The measured value is within acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% exceeds the specified tolerance.
FAIL ^z	—	The measured value is not within the acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% is within the specified tolerance.
FAIL	—	Not compliant with specification.



The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017 and ANSI/NCSL Z540.3-2006, Method 6 — Guard Bands Based on Test Uncertainty Ratio.

End of Calibration Report



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTABURI
NONTABURI 11120 THAILAND
66 2 583 9834



Certificate of Calibration

Date: Nov 7, 2024

Cert No. 5523631031354528

Customer:

DOUBLE A (1991) PUBLIC COMPANY LIMITED
1 MOO2 KLONGRUNG-PRACHINBURI ROAD
THATOOM, SRIMAHAPHOT
PRACHINBURI PRACHINBURI 25140

Work Order #: THAI-32268995

MPC Control #: EV3396
Asset ID: WL-DTH/02
Gage Type: DIGITAL HYGRO - THERMOMETER
Manufacturer: N/A
Model Number: N/A
Size: N/A
Temp/RH: 23.0°C / 50.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: KHOMSAN SAENGKAEW
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: November 06, 2024
Cal. Interval: 12 MONTHS
Cal. Due Date: November 06, 2025

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AS9541	PLATINUM RESISTANCE THERMOMETER	162C	957	ROSEMOUNT ANALYTICAL INC	Jun 3, 2026	5523631031246251 / MP-GV
EA0537	HYGROLOG	HL-NT2-D/HC2A-S	61290374/6077948 6	ROTRONIC	Mar 7, 2025	551220085460939 / MP-TH

Procedures Used in this Event

Procedure Name	Description
MPC-THD-001 Rev. 03	Temperature, Humidity and Dew Point Devices, General, Rev.03, Jul-15-2024

Calibrating Technician:

Khomsan S.
KHOMSAN SAENGKAEW

QC Approval:

S. Pradung
PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006.

THE CALIBRATION REPORT STATUS:

PASS: Term used when compliance statement is given, and the measurement result is PASS.

PASS¹: Term used when compliance statement is given, and the measurement result is conditional passed or PASS¹.

FAIL: Term used when compliance statement is given, and the measurement result is FAIL.

FAIL²: Term used when compliance statement is given, and the measurement result is conditional failed or FAIL².

REPORT OF VALUE: Term used when reported measurement is not requiring compliance statement in report.

ADJUSTED: When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.

LIMITED: When an instrument fails calibration but is still functional in a limited manner.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017, ANSI/NCSL Z540.3-2006 and ANSI/NCSL Z540.1-1994. Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. The information on this report pertains only to the instrument identified, this may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.



Calibration Report of Digital Hygro - Thermometer

MPC Control #: EV3396

Serial Number: N/A

Asset ID: WL-DTH/02

Calibration Date: November 6, 2024

Measurement Results

Section 1 - Temperature Measurement

STD Reading (°C)	Lower Limit (°C)	UUC Reading (°C)		Upper Limit (°C)	Result	Uncertainty (°C)
		As Found	As Left			
20.00	19.00	20.0	20.0	21.00	PASS	± 0.051
25.00	24.00	25.1	25.1	26.00	PASS	± 0.055

Section 2 - Humidity Measurement

STD Reading (%RH)	Lower Limit (%RH)	UUC Reading (%RH)		Upper Limit (%RH)	Result	Uncertainty (%RH)
		As Found	As Left			
30.00	28.00	29	29	32.00	PASS	± 0.75
50.00	48.00	48	48	52.00	FAIL	± 1.2
70.00	68.00	69	69	72.00	FAIL	± 1.3

UUC : Unit Under Calibration, Temperature @ 25 °C

Accuracy By Manufacturer Specification , Temperature : ± 1 °C, Humidity : ± 2 %RH

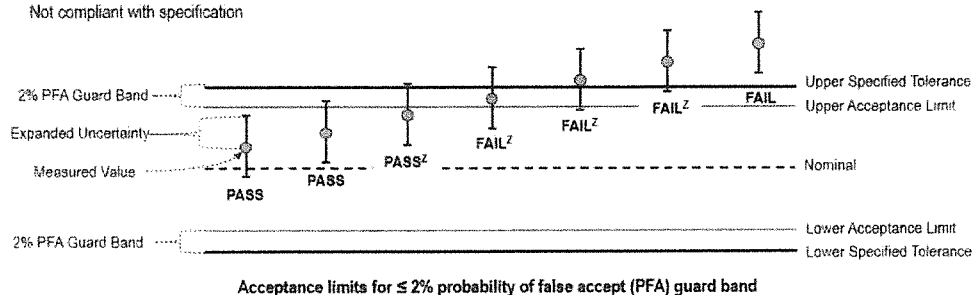
Statements of Pass or Fail Conformance

The uncertainty of measurement has been taken into account when determining compliance with specification

All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006

The status of compliance with the acceptance criteria is reported as:

- PASS** — Compliant with specification.
- PASS^z** — The measured value is within acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% exceeds the specified tolerance.
- FAIL^z** — The measured value is not within the acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% is within the specified tolerance.
- FAIL** — Not compliant with specification



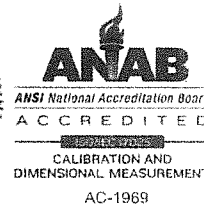
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017 and ANSI/NCSL Z540.3-2006, Method 6 --- Guard Bands Based on Test Uncertainty Ratio.

End of Calibration Report



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTABURI
NONTABURI 11120 THAILAND
66 2 583 9834



Certificate of Calibration

Date: Nov 7, 2024

Cert No. 5523631031354532

Customer:

DOUBLE A (1991) PUBLIC COMPANY LIMITED
1 MOO2 KLONGRUNG-PRACHINBURI ROAD
THATOOM, SRIMAHAPHOT
PRACHINBURI PRACHINBURI 25140

Work Order #: THAI-32268995

MPC Control #: EV3397
Asset ID: WL-DTH/03
Gage Type: DIGITAL HYGRO - THERMOMETER
Manufacturer: ELITECH
Model Number: BT-3
Size: N/A
Temp/RH: 23.0°C / 50.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: KHOMSAN SAENGKAEW
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: November 06, 2024
Cal. Interval: 12 MONTHS
Cal. Due Date: November 06, 2025

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AS9541	PLATINUM RESISTANCE THERMOMETER	162C	957	ROSEMOUNT ANALYTICAL INC	Jun 3, 2026	5523631031246251 / MP-GV
EA0537	HYGROLOG	HL-NT2-D/HC2A-S	61290374/6077948 6	ROTRONIC	Mar 7, 2025	551220085460939 / MP-TH

Procedures Used in this Event

Procedure Name	Description
MPC-THD-001 Rev. 03	Temperature, Humidity and Dew Point Devices, General, Rev.03, Jul-15-2024

Calibrating Technician:

Khomsan S.
KHOMSAN SAENGKAEW

QC Approval:

S. Pradung
PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006.

THE CALIBRATION REPORT STATUS:

PASS - Term used when compliance statement is given, and the measurement result is PASS.

PASS^c - Term used when compliance statement is given, and the measurement result is conditional passed or PASS^c.

FAIL - Term used when compliance statement is given, and the measurement result is FAIL.

FAIL^c - Term used when compliance statement is given, and the measurement result is conditional failed or FAIL^c.

REPORT OF VALUE - Term used when reported measurement is not requiring compliance statement in report.

ADJUSTED - When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.

LIMITED - When an instrument fails calibration but is still functional in a limited manner.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017, ANSI/NCSL Z540.3-2006 and ANSI/NCSL Z540.1-1994. Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. The information on this report pertains only to the instrument identified, this may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.

Calibration Report of Elitech BT-3 Digital Hygro - Thermometer

MPC Control #: EV3397

Serial Number: N/A

Asset ID: WL-DTH/03

Calibration Date: November 6, 2024

Measurement Results

Section 1 - Temperature Measurement

STD Reading (°C)	Lower Limit (°C)	UUC Reading (°C)		Upper Limit (°C)	Result	Uncertainty (°C)
		As Found	As Left			
20.00	19.50	19.8	19.8	20.50	PASS	± 0.051
25.00	24.50	24.7	24.7	25.50	PASS	± 0.055

Section 2 - Humidity Measurement

STD Reading (%RH)	Lower Limit (%RH)	UUC Reading (%RH)		Upper Limit (%RH)	Result	Uncertainty (%RH)
		As Found	As Left			
30.00	27.00	29	29	33.00	PASS	± 0.75
50.00	47.00	51	51	53.00	PASS	± 1.2
70.00	67.00	70	70	73.00	PASS	± 1.3

UUC : Unit Under Calibration, Temperature @ 25 °C

Accuracy By Manufacturer Specification , Temperature : ± 0.5 °C, Humidity : ± 3 %RH

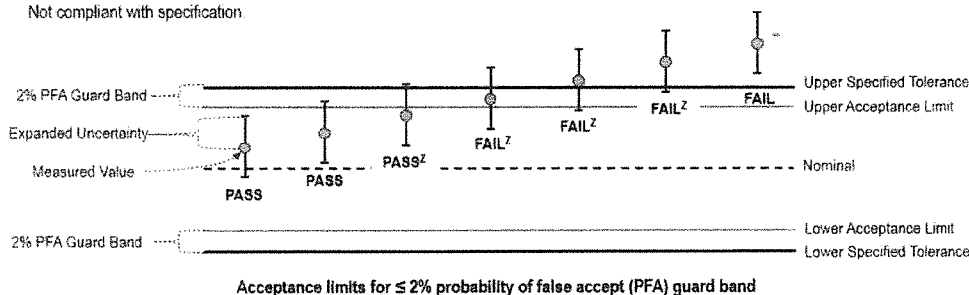
Statements of Pass or Fail Conformance

The uncertainty of measurement has been taken into account when determining compliance with specification.

All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006

The status of compliance with the acceptance criteria is reported as:

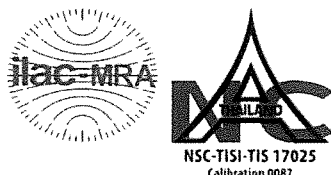
- PASS** — Compliant with specification.
- PASS^z** — The measured value is within acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% exceeds the specified tolerance.
- FAIL^z** — The measured value is not within the acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% is within the specified tolerance.
- FAIL** — Not compliant with specification.



The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017 and ANSI/NCSL Z540.3-2006, Method 6 — Guard Bands Based on Test Uncertainty Ratio.

End of Calibration Report



Certificate of Calibration

Equipment:	Balance	Certificate No.:	C01243398
Model:	BSA224S-CW	Issued Date:	06 November 2024
Serial No. (or ID.):	34490341	Job No.:	WO-00047130
Manufacturer:	Sartorius	Page:	1 of 2
Condition:	In condition		

Customer: Integrated Research Center Co.,Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 24 °C ± 0.4 °C
Humidity 60 %RH ± 3.3 %RH

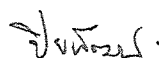
Calibration Place: Double A (1991) Public Company Limited.
(Water Laboratory IP1 (Balance Room))
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr. Piyapat Saidoung

Calibration Date: 30 October 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. C02231944



(Mr. Piyapat Saidoung)

Person in charge



(Mr. Adisai Maknoi)

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.


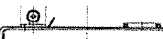

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

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:

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)

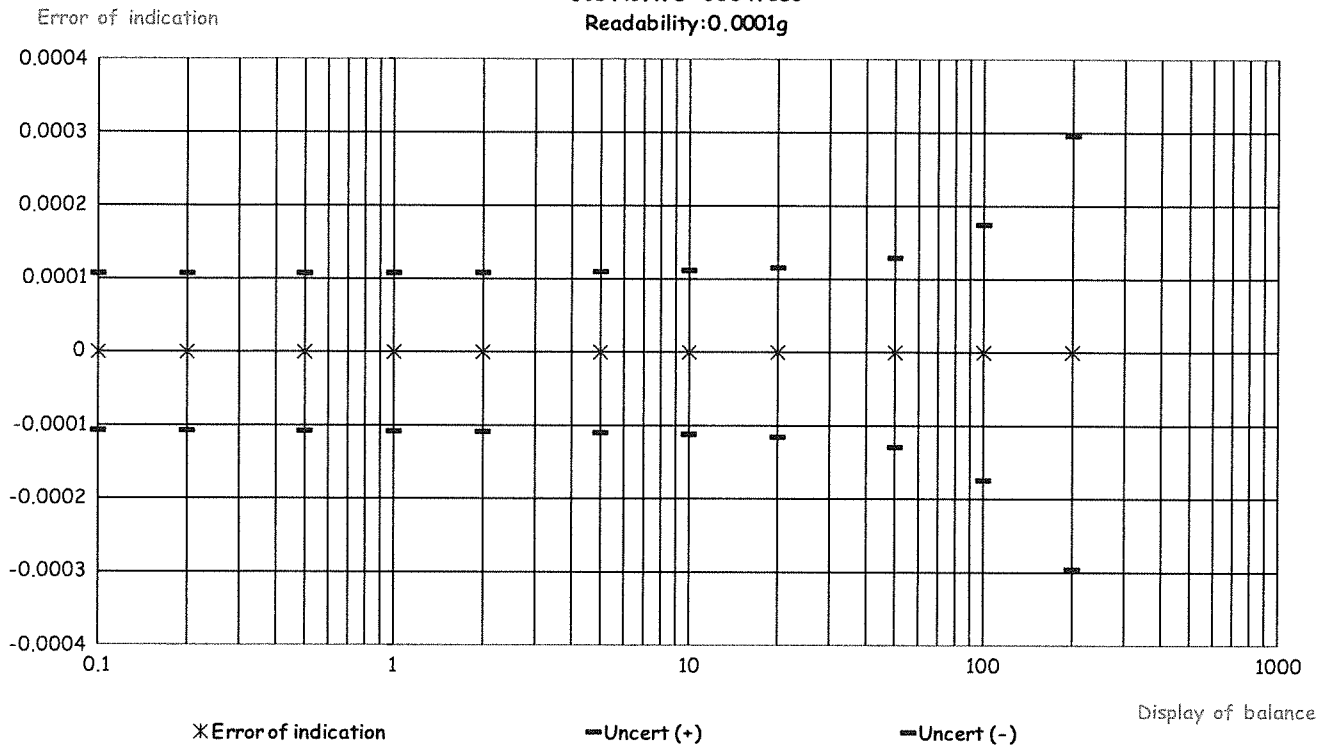
Nominal test value (g)	Standard Deviation
20	0.00004
200	0.00006

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
0.1	0.10001	0.1000	0.0000	0.00011	2.04
0.2	0.20001	0.2000	0.0000	0.00011	2.04
0.5	0.50001	0.5000	0.0000	0.00011	2.04
1	1.00001	1.0000	0.0000	0.00011	2.04
2	2.00002	2.0000	0.0000	0.00011	2.04
5	5.00002	5.0000	0.0000	0.00011	2.04
10	10.00001	10.0000	0.0000	0.00011	2.04
20	20.00001	20.0000	0.0000	0.00012	2.03
50	50.00001	50.0000	0.0000	0.00013	2.02
100	100.00003	100.0000	0.0000	0.00017	2.01
200	200.00000	200.0000	0.0000	0.00030	2.00

The End of Certificate

Without Adjustment
Job No. WO-00047130
Readability: 0.0001g



ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: Balance

รุ่น: BSA224S-CW

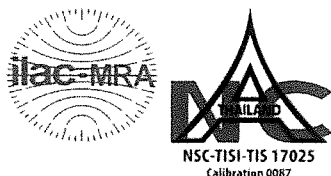
หมายเลขเครื่อง: 34490341

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
30 Oct 2024			30 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระจกกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตอบสนองของปุ่มกด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานชั่ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและแกน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Mr. Piyapat Saidoung

Service Engineer



Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR3900
Serial No. (or ID.): 1918120
Manufacturer: HACH
Condition: In Condition

Certificate No.: C06240473
Issued Date: 06 November 2024
Job No.: WO-00047130
Page: 1 of 3

Customer: Integrated Research Center Co.,Ltd. (Pulp Laboratory)
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition:

Temperature	24.8	°C	±	0.2	°C
Humidity	67.2	%RH	±	1.7	%RH

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr.Piyapat Saidoung

Calibration Date: 29 October 2024

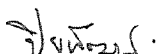
The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04

Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.

The standard for Wavelength Certificate No. 121284 and 121285

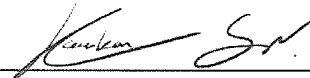
The standard for Photometric Certificate No. 121289

The standard for Stray light Certificate No. 121282



(Mr. Piyapat Saidoung)

Person in charge



(Miss Kaewkan Suradech)

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.

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด

DKSH Technology Limited

2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260

2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

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

Calibration Results:
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.40	418.0	0.40	0.13
459.30	459.0	0.30	0.13
638.00	638.0	0.00	0.13
585.56	586.0	-0.44	0.13
747.61	748.0	-0.39	0.13
807.04	807.0	0.04	0.13

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5895	0.588	0.0015	0.0045
	0.7610	0.761	0.0000	0.0045
	1.0253	1.023	0.0023	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5783	0.578	0.0003	0.0045
	0.7430	0.743	0.0000	0.0045
	1.0022	1.000	0.0022	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5280	0.530	-0.0020	0.0045
	0.6851	0.687	-0.0019	0.0045
	0.9509	0.952	-0.0011	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5446	0.545	-0.0004	0.0045
	0.6932	0.695	-0.0018	0.0045
	0.9952	0.995	0.0002	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5824	0.582	0.0004	0.0045
	0.7208	0.721	-0.0002	0.0045
	1.0917	1.090	0.0017	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5660	0.566	0.0000	0.0045
	0.6882	0.688	0.0002	0.0045
	1.0846	1.084	0.0006	0.0045

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
 DKSH Technology Limited
 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
 2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
 Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Calibration Results:**Without Adjustment****Stray light ***

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
391.57 +/- 0.11 nm	392	3.9	1.409

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

The End of Certificate

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: SPECTROPHOTOMETER

รุ่น: DR3900

หมายเลขเครื่อง: 1918120

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
29 Oct 2024			29 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด – เปิด เครื่อง (On-Off Swicth)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	807nm=807.2nm
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
		pH Meter and Conductivity Meter			
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่เกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพิ่มเติม/ข้อแนะนำ :

Mr.Piyapat Saidoung

Service Engineer



Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR3900
Serial No. (or ID.): 2008400
Manufacturer: HACH
Condition: In Condition

Certificate No.: C06240474
Issued Date: 06 November 2024
Job No.: WO-00047130
Page: 1 of 3

Customer: Integrated Research Center Co.,Ltd. (Pulp Laboratory)
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition:

Temperature	23.4	°C	±	0.3	°C
Humidity	68.2	%RH	±	0.4	%RH

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr.Piyapat Saidoung

Calibration Date: 29 October 2024

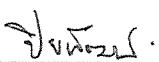
The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04

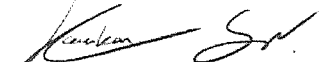
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.

The standard for Wavelength Certificate No. 121284 and 121285

The standard for Photometric Certificate No. 121289

The standard for Stray light Certificate No. 121282


(Mr. Piyapat Saidoung)
Person in charge


(Miss Kaewkan Suradech)
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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บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Calibration Results:

Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.40	418.0	0.40	0.13
459.30	459.0	0.30	0.13
638.00	638.0	0.00	0.13
585.56	586.0	-0.44	0.13
747.61	748.0	-0.39	0.13
807.04	807.0	0.04	0.13

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5895	0.588	0.0015	0.0045
	0.7610	0.759	0.0020	0.0045
	1.0253	1.022	0.0033	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5783	0.577	0.0013	0.0045
	0.7430	0.741	0.0020	0.0045
	1.0022	0.999	0.0032	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5280	0.529	-0.0010	0.0045
	0.6851	0.686	-0.0009	0.0045
	0.9509	0.951	-0.0001	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5446	0.544	0.0006	0.0045
	0.6932	0.694	-0.0008	0.0045
	0.9952	0.994	0.0012	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5824	0.582	0.0004	0.0045
	0.7208	0.721	-0.0002	0.0045
	1.0917	1.090	0.0017	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5660	0.565	0.0010	0.0045
	0.6882	0.688	0.0002	0.0045
	1.0846	1.084	0.0006	0.0045

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
 DKSH Technology Limited
 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
 2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
 Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Calibration Results:**Without Adjustment****Stray light ***

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
391.57 +/- 0.11 nm	392	4.6	1.337

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

The End of Certificate

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: SPECTROPHOTOMETER

รุ่น: DR3900

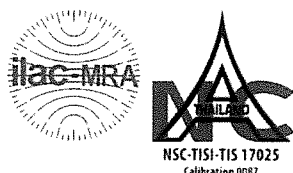
หมายเลขเครื่อง: 2008400

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
29 Oct 2024			29 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด – เปิด เครื่อง (On-Off Swicth)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	807nm=806.7nm
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
		pH Meter and Conductivity Meter			
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่เกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพิ่มเติม/ข้อแนะนำ :

Mr.Piyapat Saidoung

Service Engineer



Certificate of Calibration

Equipment: pH METER
Model: Seven2Go S2
Serial No. (or ID.): B633886757
Manufacturer: Mettler Toledo
Electrode Serial No.: 3474864
Condition: In Condition

Certificate No.: C07240536
Issued Date: 6 November 2024
Job No.: WO-00047130
Page: 1 of 3
Model: InLabExpertGo-ISM **Brand:** Mettler Toledo

Customer: Integrated Research Center Co.,Ltd. (Pulp Laboratory)
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 24.7 °C ± 0.1 °C
Humidity 65.6 %RH ± 0.2 %RH

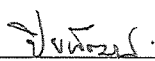
Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

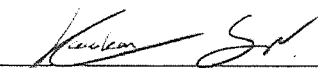
Calibration By: Mr.Piyapat Saidoung

Calibration Date: 30 October 2024

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 Harned cell, through CPAchem Ltd. (ISO/IEC 17034) Certificate No. 980701, 980704, 938378 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. CA20240349EA


(Mr. Piyapat Saidoung)
Person in charge


(Miss Kaewkan Suradech)
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	pH Meter Reading			Uncertainty of Measurement (mV)	Coverage Factor (k)
	(mV)	Error (mV)	(pH)		
414.12	414	-0.12	0.02	0.58	2.00
354.96	355	0.04	1.02	0.58	2.00
295.8	295	-0.80	2.02	0.58	2.00
236.64	236	-0.64	3.02	0.58	2.00
177.48	177	-0.48	4.01	0.58	2.00
118.32	118	-0.32	5.00	0.58	2.00
59.16	60	0.84	6.00	0.58	2.00
0	0	0.00	7.00	0.58	2.00
-59.16	-59	0.16	8.00	0.58	2.00
-118.32	-118	0.32	9.00	0.58	2.00
-177.48	-177	0.48	10.01	0.58	2.00
-236.64	-236	0.64	11.01	0.58	2.00
-295.8	-295	0.80	12.02	0.58	2.00
-354.96	-355	-0.04	13.03	0.58	2.00
-414.12	-414	0.12	14.03	0.58	2.00

Practical slope and zero point*

The three-point calibration using three standard buffer solutions; pH 4.008 , pH 6.986 and pH 9.997

-During calibration, display of pH meter reading; pH 4.01 , pH 7.00 and pH 10.01

The practical slope of the pH electrode; 58.34 (mV/pH), 98.61%

The zero point of the pH electrode; 7.12 (pH)

Sample Test Results

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.008	4.01	0.002	0.0079	2.00
6.986	7.00	0.014	0.010	2.00
9.997	10.01	0.013	0.014	2.00

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

The End of Certificate

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: pH METER

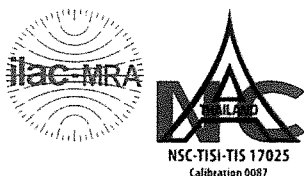
รุ่น: Seven2Go S2

หมายเลขเครื่อง: B633886757

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
30 Oct 2024			30 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด – เปิด เครื่อง (On-Off Swicth)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
		pH Meter and Conductivity Meter			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่เกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพิ่มเติม/ข้อแนะนำ :

Mr.Piyapat Saidoung
Service Engineer



Certificate of Calibration

Equipment : Digital Thermometer with Probe

Model : Seven2Go S2

Serial No. : B633886757

Manufacturer : Mettler Toledo

ID No. : -

Certificate No. : C15241037

Issued Date : 06 November 2024

Job No. : WO-00047130

Page : 1 of 2

Condition : In Condition

Customer : Integrated Research Center Co.,Ltd. (Pulp Laboratory)

122 Moo 2, Tambol Thatoom,

Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition :

Temperature:	30 °C	±	10 °C
Humidity:	55 %RH	±	25 %RH
Voltage:	220 VAC	±	10 %

Calibration Place : Double A (1991) Public Company Limited. (Water Laboratory IP1)

1 Moo 2, Thatoom, Srimahaphot,

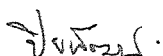
Prachinburi 25140 Thailand.

Calibration By : Mr. Piyapat Saidoung

Calibration Date : 30 October 2024

The Method used : In house method, CAL-WI-69, by comparison with standard thermometer

Traceability : This certificate is traceable to the International System of Unit maintained by:
Quality Reborn Co.,Ltd. (QR)



(Mr. Piyapat Saidoung)

Person in charge



(Mr. Tweewong Thaihiang)

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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Certificate No.: C15241037

Page: 2 of 2

Reference standard equipment:

Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR24-2043	21 August 2024	21 August 2025

Calibration Results:**Without Adjustment**

Sensor Type: RTD

Electrode Serial No.: 3474864

Channel: -

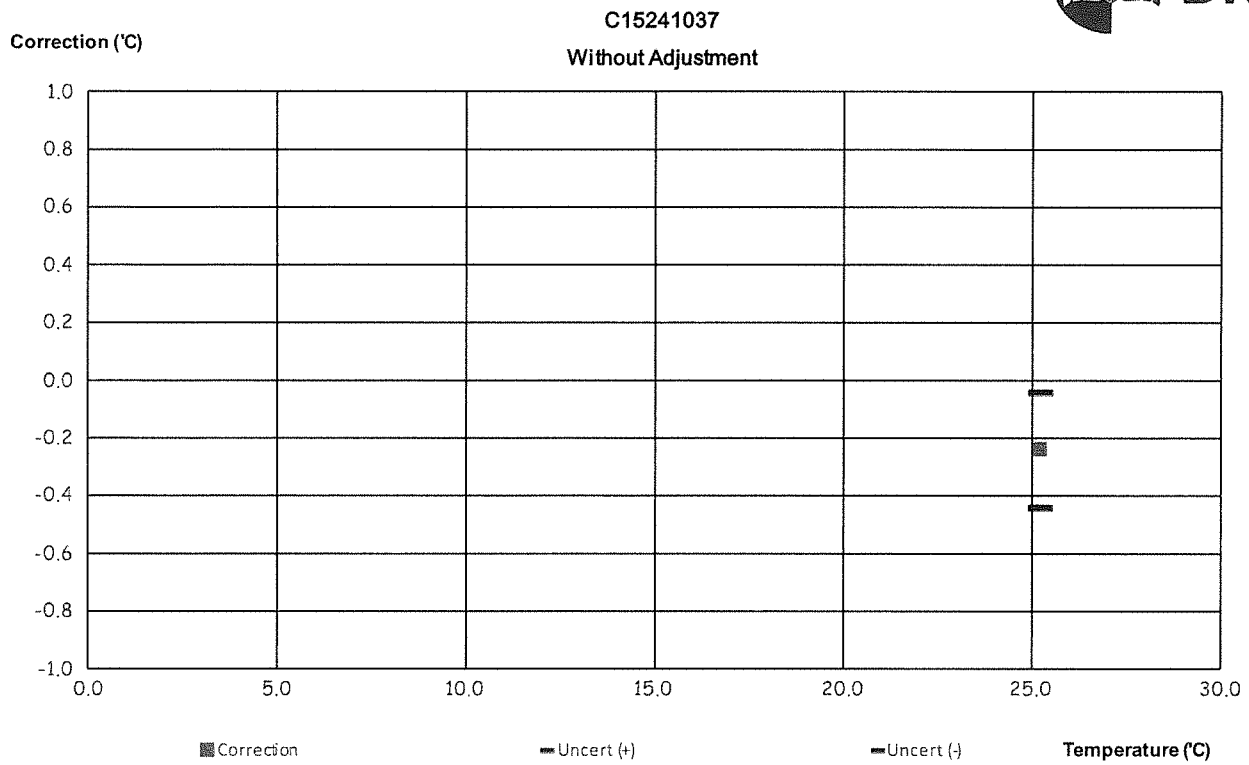
Diameter (mm): 12

Length (mm): 120

Immersion (mm): 110

Calibrate Point.(°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
25.0	24.961	25.2	-0.239	0.20

The End of Certificate



ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ

Equipment : Digital Thermometer with Probe

Certificate No. : C15241037

Serial No. : B633886757

Model : Seven2Go S2

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
30-Oct-2024			30-Oct-2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	2. Adapter / Power supply 220 / 110 VAC	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. Battery	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Sensor (In / Ex)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Piyapat Saidoung

Service Engineer

Certificate of Calibration

Equipment:	COD Reactor	Certificate No.:	C17240184
Model:	DRB200	Issued Date:	05 November 2024
Serial No. (or ID.):	19070C0337	Job No.:	WO-00047130
Manufacturer:	Hach	Page:	1 of 5
Condition:	In Condition		
Covers: Open (Max)	Locations heating Block: Left and Right		

Customer: Integrated Research Center Co.,Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition:

Temperature:	24 °C	±	0.7 °C
Humidity:	60 %RH	±	5.0 %RH
Voltage:	231 VAC	±	2.2 VAC

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoem

Calibration Date: 29 October 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. C10240013



(Mr. Suphanimit Khamnonphoem)

Person in charge



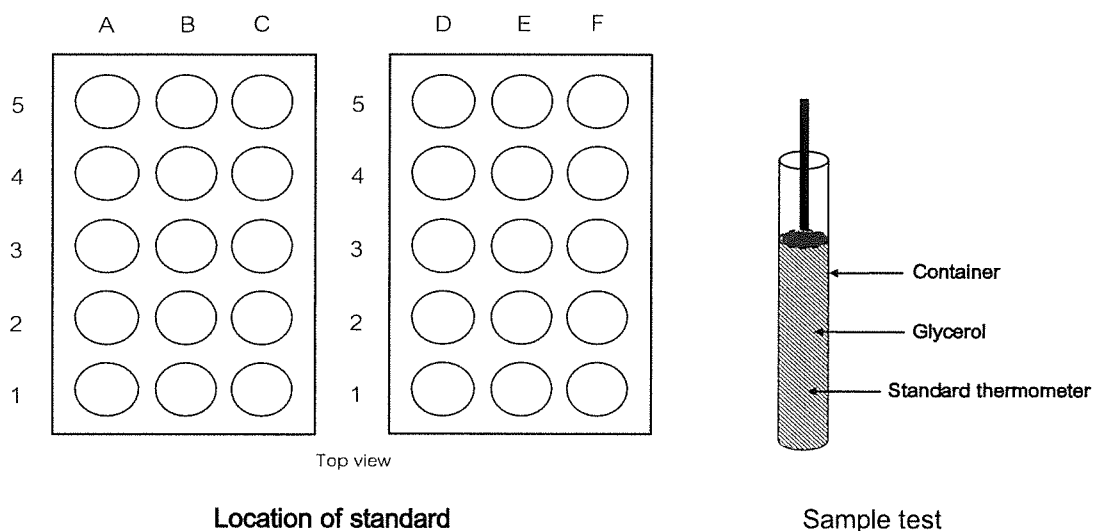
(Mr. Udon Srichana)

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

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:

Pre-Calibration

Locations heating Block:	Setting (°C)	Unit Under Calibration (°C)
<u>Left</u>	150	150
<u>Right</u>	150	150

Location heating Block:	A1	A2	A3	A4	A5
Measured Temperature (°C)	151.35	152.80	152.42	151.74	150.79

Location heating Block:	B1	B2	B3	B4	B5
Measured Temperature (°C)	153.02	151.63	153.12	150.71	151.26

Location heating Block:	C1	C2	C3	C4	C5
Measured Temperature (°C)	153.25	154.09	153.21	152.89	152.97

Location heating Block:	D1	D2	D3	D4	D5
Measured Temperature (°C)	154.68	154.68	153.08	153.12	150.80

Location heating Block:	E1	E2	E3	E4	E5
Measured Temperature (°C)	153.01	152.45	152.84	151.30	150.94

Location heating Block:	F1	F2	F3	F4	F5
Measured Temperature (°C)	151.13	152.61	153.18	150.99	152.40

Calibration Results:

Without Adjustment

Measured temperature at the spread locations:

Locations heating Block:	Setting (°C)	Unit Under Calibration (°C)
<u>Left</u>	150	150
<u>Right</u>	150	150

Location heating Block:	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (\pm °C)
A1	149.29	-0.71	0.66
A2	150.77	0.77	0.66
A3	150.40	0.40	0.65
A4	149.73	-0.27	0.65
A5	148.81	-1.19	0.65
B1	151.00	1.00	0.66
B2	149.56	-0.44	0.66
B3	151.12	1.12	0.65
B4	148.76	-1.24	0.65
B5	149.28	-0.72	0.65
C1	151.20	1.20	0.66
C2	152.05	2.05	0.66
C3	151.21	1.21	0.65
C4	150.89	0.89	0.65
C5	151.00	1.00	0.65
D1	152.65	2.65	0.65
D2	152.65	2.65	0.65
D3	151.07	1.07	0.65
D4	151.12	1.12	0.65
D5	148.79	-1.21	0.65
E1	150.97	0.97	0.66
E2	150.44	0.44	0.65
E3	150.81	0.81	0.65
E4	149.32	-0.68	0.65
E5	148.97	-1.03	0.65
F1	149.13	-0.87	0.65
F2	150.59	0.59	0.65
F3	151.15	1.15	0.65
F4	148.99	-1.01	0.65
F5	150.38	0.38	0.66

Characterization of the unit under calibration:

Locations heating Block	Desired	Unit Under Calibration (°C)		Measured Temperature (°C)
	(°C)	Setting	Reading	Stability (±°C)
Left	150	150	150	0.11
Right	150	150	150	0.13

The End of Certificate

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: COD Reactor

รุ่น: DRB200

หมายเลขเครื่อง: 19070C0337

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
29 Oct 2024			29 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. สภาพ Hole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพฝาปิด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	7. สภาพตัวเครื่อง	<input type="checkbox"/>	<input checked="" type="checkbox"/>	*
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ : *สภาพตัวเครื่อง:มีรอยแตกบริเวณตัวเครื่อง

Mr. Suphanimit Khamnonphoem

Service Engineer

Certificate of Calibration

Equipment:	COD Reactor	Certificate No.:	C17240185
Model:	DRB200	Issued Date:	05 November 2024
Serial No. (or ID.):	19050C0191	Job No.:	WO-00047130
Manufacturer:	Hach	Page:	1 of 5
Condition:	In Condition		
Covers:	Open (Max)	Locations heating Block:	Left and Right

Customer: Integrated Research Center Co.,Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition:

Temperature:	24 °C	±	0.7 °C
Humidity:	60 %RH	±	5.0 %RH
Voltage:	231 VAC	±	2.2 VAC

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoem
Calibration Date: 29 October 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. C10240013



(Mr. Suphanimit Khamnonphoem)

Person in charge



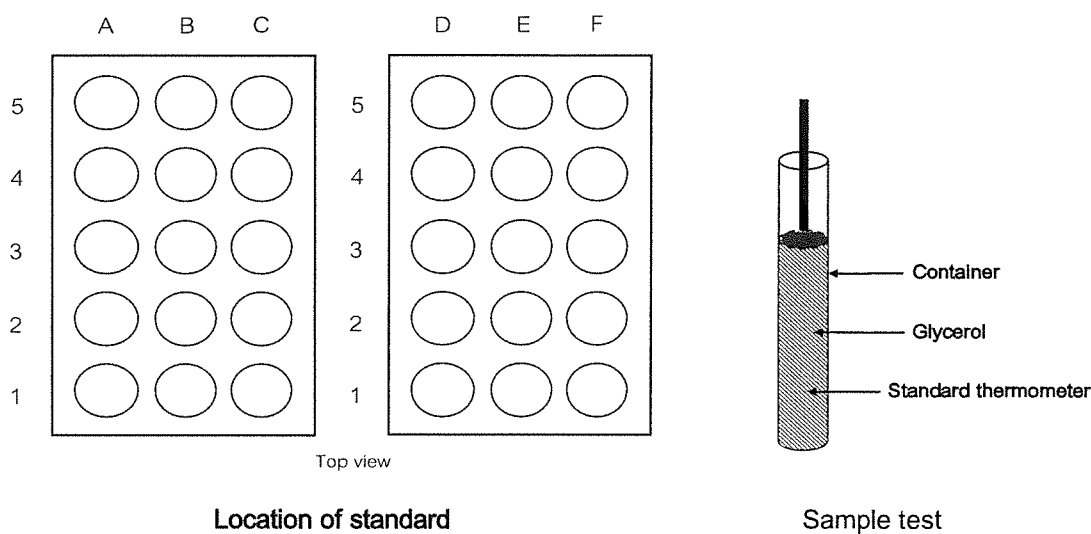
(Mr. Udon Srichana)

Authorized signatory

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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

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:**Pre-Calibration**

Locations heating Block:	Setting (°C)	Unit Under Calibration (°C)
<u>Left</u>	150	150

Location heating Block:	A1	A2	A3	A4	A5
Measured Temperature (°C)	151.75	150.99	151.10	151.04	150.79

Location heating Block:	B1	B2	B3	B4	B5
Measured Temperature (°C)	152.46	151.03	152.21	151.03	151.05

Location heating Block:	C1	C2	C3	C4	C5
Measured Temperature (°C)	151.41	152.96	152.96	152.22	151.47

Calibration Results:

Without Adjustment

Measured temperature at the spread locations:

Locations heating Block:	Setting (°C)	Unit Under Calibration (°C)
<u>Left</u>	150	150
<u>Right</u>	150	150

Location heating Block:	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (\pm °C)
A1	149.69	-0.31	0.66
A2	148.90	-1.10	0.66
A3	148.97	-1.03	0.66
A4	148.92	-1.08	0.66
A5	148.73	-1.27	0.66
B1	150.43	0.43	0.66
B2	148.95	-1.05	0.66
B3	150.11	0.11	0.66
B4	148.97	-1.03	0.66
B5	148.97	-1.03	0.66
C1	149.36	-0.64	0.66
C2	150.93	0.93	0.66
C3	150.93	0.93	0.66
C4	150.14	0.14	0.65
C5	149.42	-0.58	0.66
D1	150.97	0.97	0.66
D2	151.80	1.80	0.65
D3	153.05	3.05	0.66
D4	150.80	0.80	0.66
D5	149.19	-0.81	0.66
E1	150.85	0.85	0.65
E2	149.43	-0.57	0.66
E3	150.20	0.20	0.67
E4	149.08	-0.92	0.67
E5	149.16	-0.84	0.66
F1	148.97	-1.03	0.69
F2	149.54	-0.46	0.66
F3	149.20	-0.80	0.67
F4	149.17	-0.83	0.68
F5	149.94	-0.06	0.66

Characterization of the unit under calibration:

Locations heating Block	Desired	Unit Under Calibration (°C)		Measured Temperature (°C)
	(°C)	Setting	Reading	Stability (\pm °C)
Left	150	150	150	0.11
Right	150	150	150	0.21

The End of Certificate

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: COD Reactor

รุ่น: DRB200

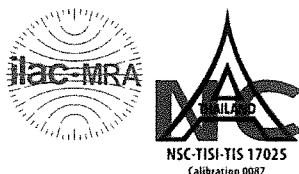
หมายเลขเครื่อง: 19050C0191

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
29 Oct 2024			29 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. สภาพ Hole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพฝาปิด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	7. สภาพตัวเครื่อง	<input type="checkbox"/>	<input checked="" type="checkbox"/>	*
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ : *สภาพตัวเครื่อง:มีรอยแตกบริเวณตัวเครื่อง

Mr. Suphanimit Khamnonphoem

Service Engineer



Certificate of Calibration

Equipment:	Oven	Certificate No.:	C31242209
Model:	ED 115	Issued Date:	05 November 2024
Serial No.(or ID):	950360	Job No.:	WO-00047130
Manufacturer:	Binder	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	2		

Customer: Integrated Research Center Co.,Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition:

Temperature:	24 °C	±	0.6 °C
Humidity:	63 %RH	±	4.5 %RH
Voltage:	231 VAC	±	2.6 VAC

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoem

Calibration Date: 30 October 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. C10240013



(Mr. Suphanimit Khamnonphoem)

Person in charge



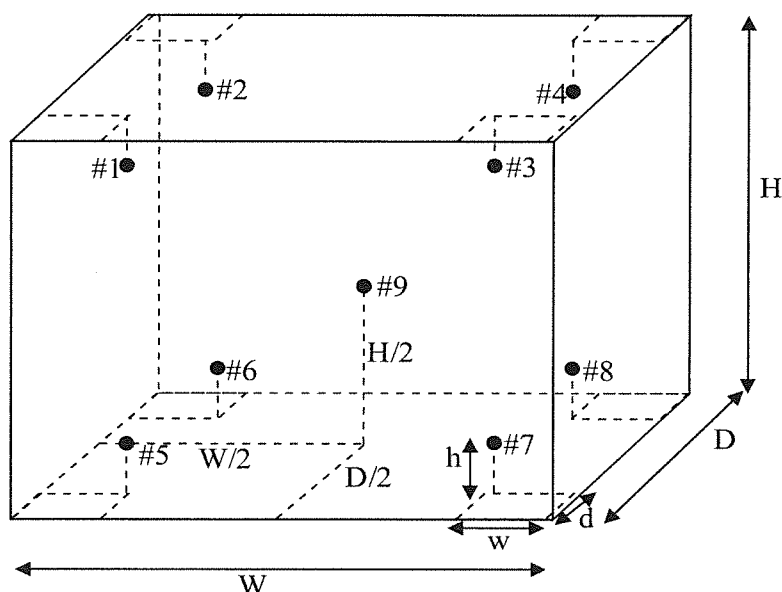
(Mr. Udon Srichana)

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)= 55 (Liters)

Inside chamber: $W = 60$ (cm) $D = 40$ (cm) $H = 48$ (cm)

Standard Locations (#1, #2, #3, #4): $w = 6$ (cm) $d = 5$ (cm) $h = 5$ (cm)

Standard Locations (#5, #6, #7, #8): $w = 6$ (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	201	202	203	204	205	206	207	208	209

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:

Pre-Calibration

Setting: Indicating: #1: #2: #3: #4: #5: #6: #7: #8: #9:

181 181 178.50 178.97 178.64 178.89 178.84 178.97 178.44 178.43 178.26

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	103.92	-0.08	0.67
#2	103.86	-0.14	0.67
#3	104.13	0.13	0.68
#4	104.05	0.05	0.67
#5	103.75	-0.25	0.67
#6	103.82	-0.18	0.75
#7	103.49	-0.51	0.67
#8	103.57	-0.43	0.69
#9	103.83	-0.17	0.67

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104	104	104	103.92	103.86	104.13	104.05	103.75	103.82	103.49	103.57	103.83	0.75

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104	0.41	0.31	0.88

Note: * Maximum uncertainty of the each position

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 182 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	179.50	-2.50	0.71
#2	179.97	-2.03	0.71
#3	179.64	-2.36	0.71
#4	179.89	-2.11	0.74
#5	179.84	-2.16	0.70
#6	179.97	-2.03	0.79
#7	179.44	-2.56	0.70
#8	179.43	-2.57	0.72
#9	179.26	-2.74	0.72

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180	182	182	179.50	179.97	179.64	179.89	179.84	179.97	179.44	179.43	179.26	0.79

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
182	1.07	0.32	1.18

Note: * Maximum uncertainty of the each position

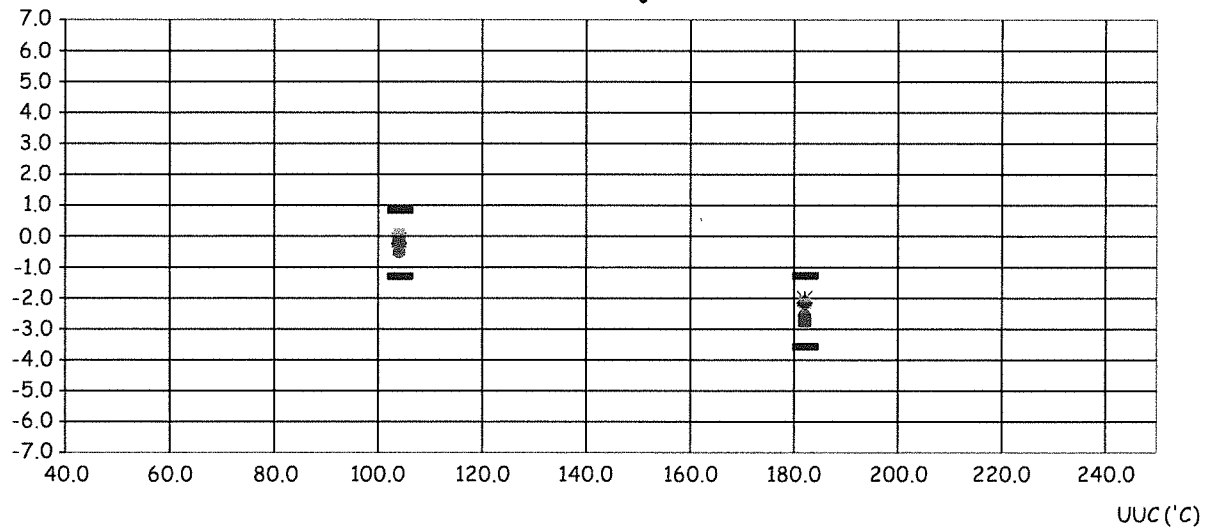
The End of Certificate

Corr_Distribution & Max_Measurement Uncertainty

Job_No. WO-00047130

Without adjustment

Correction ('C)

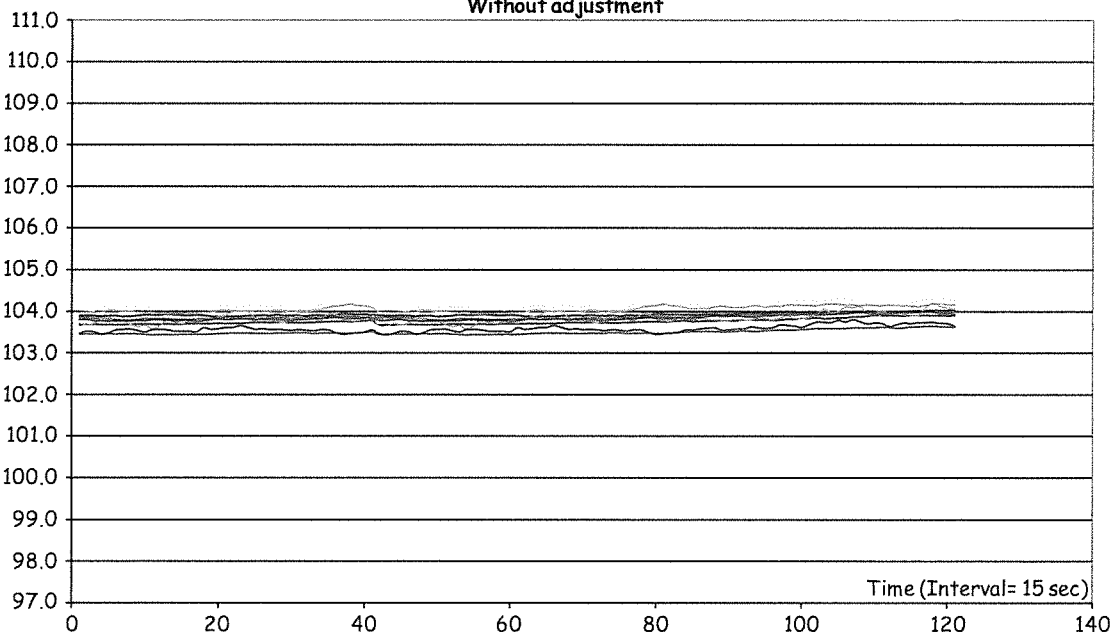


Temperature Distribution @ 104°C

Job_No. WO-00047130

Without adjustment

Std ('C)

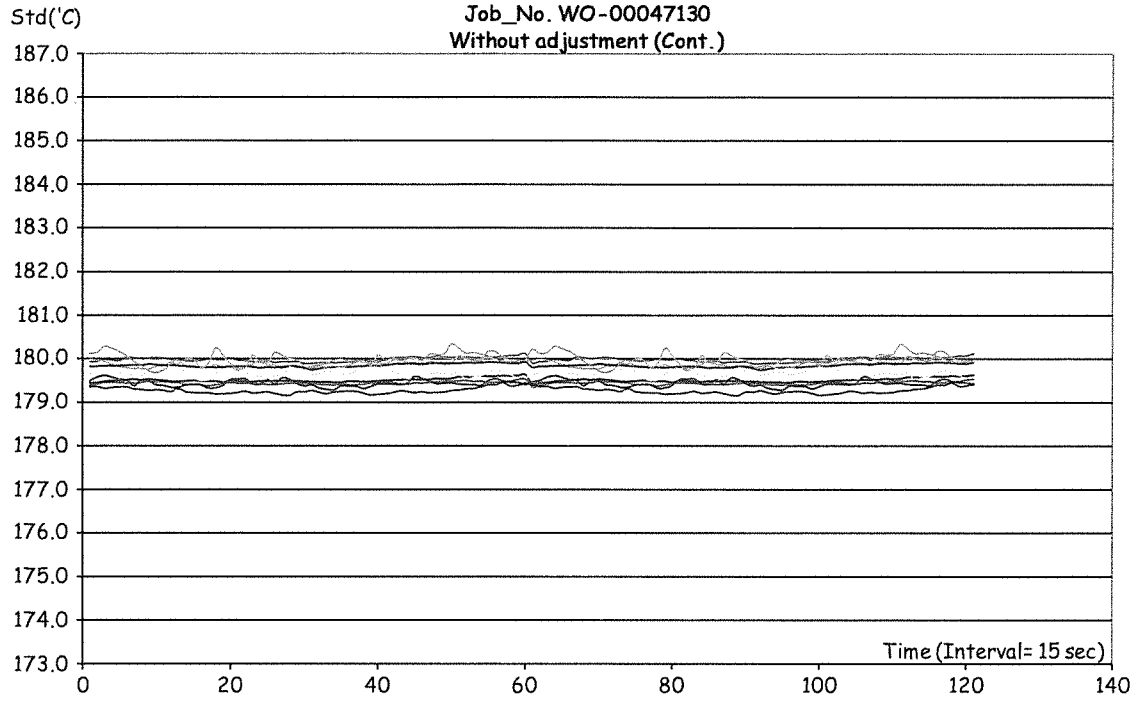


— #1 — #2 — #3 — #4 — #5 — #6 — #7 — #8 — #9

Temperature Distribution @ 180°C

Job_No. WO-00047130

Without adjustment (Cont.)



— #1 — #2 — #3 — #4 — #5 — #6 — #7 — #8 — #9

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: Oven

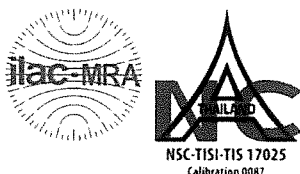
รุ่น: ED 115

หมายเลขเครื่อง: 950360

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
30 Oct 2024			30 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความชื้น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input checked="" type="checkbox"/>	12. สภาพตัวเครื่อง	<input type="checkbox"/>	<input checked="" type="checkbox"/>	*
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ : *สภาพตัวเครื่อง:พื้นผนังภายในเครื่องโค้งงอ

Mr. Suphanimit Khamnonphoem
Service Engineer



Certificate of Calibration

Equipment:	Oven	Certificate No.:	C31242210
Model:	ED 115	Issued Date:	05 November 2024
Serial No.(or ID):	20190000012946	Job No.:	WO-00047130
Manufacturer:	Binder	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	2		

Customer: Integrated Research Center Co.,Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition:

Temperature:	24 °C	±	0.8 °C
Humidity:	63 %RH	±	4.5 %RH
Voltage:	231 VAC	±	2.6 VAC


Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoem


Calibration Date: 31 October 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. C10240013


(Mr. Suphanimit Khamnonphoem)

Person in charge

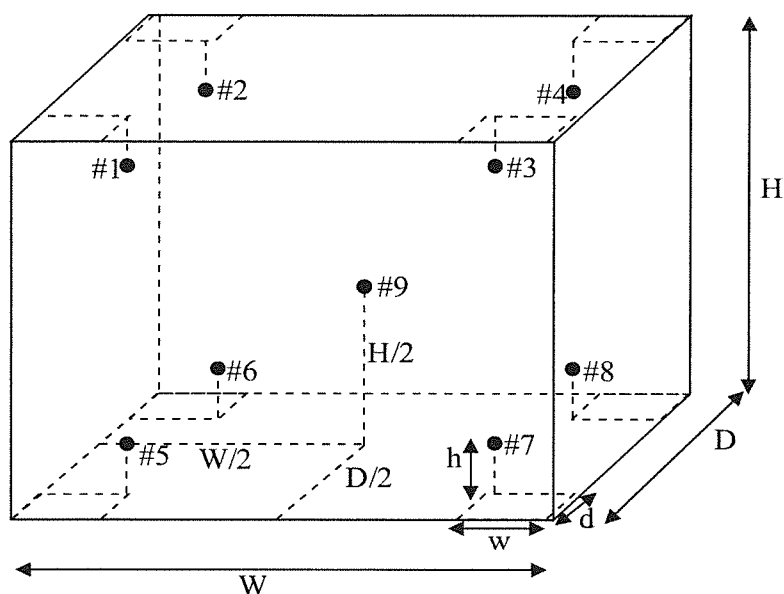

(Mr. Udon Srichana)

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)= 48 (Liters)

Inside chamber:	W = 52 (cm)	D = 40 (cm)	H = 48 (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:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	105.54	1.54	0.82
#2	105.79	1.79	0.82
#3	105.77	1.77	0.82
#4	106.02	2.02	0.82
#5	104.16	0.16	0.82
#6	104.08	0.08	0.87
#7	103.95	-0.05	0.86
#8	103.88	-0.12	0.83
#9	103.93	-0.07	0.83

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104	104	104	105.54	105.79	105.77	106.02	104.16	104.08	103.95	103.88	103.93	0.87

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104	2.16	0.24	2.35

Note: * Maximum uncertainty of the each position

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	180.52	0.52	0.91
#2	181.41	1.41	0.91
#3	180.98	0.98	0.91
#4	181.63	1.63	0.91
#5	180.23	0.23	0.94
#6	180.20	0.20	0.94
#7	179.15	-0.85	0.95
#8	179.03	-0.97	0.96
#9	179.12	-0.88	0.95

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180	180	180	180.52	181.41	180.98	181.63	180.23	180.20	179.15	179.03	179.12	0.96

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180	2.67	0.29	3.01

Note: * Maximum uncertainty of the each position

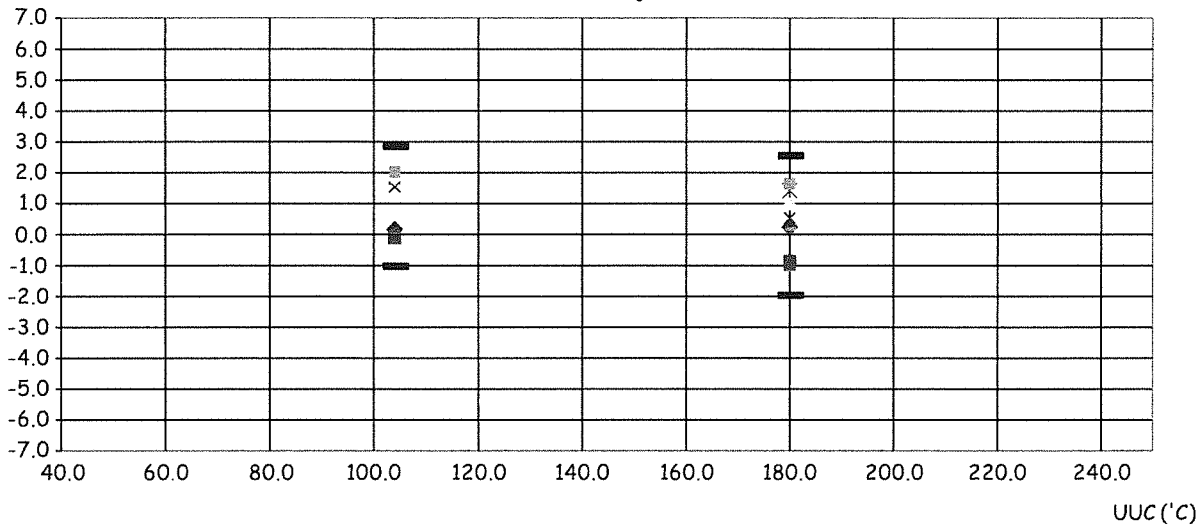
The End of Certificate

Corr_Distribution & Max_Measurement Uncertainty

Job_No. WO-00047130

Correction ('C)

Without adjustment

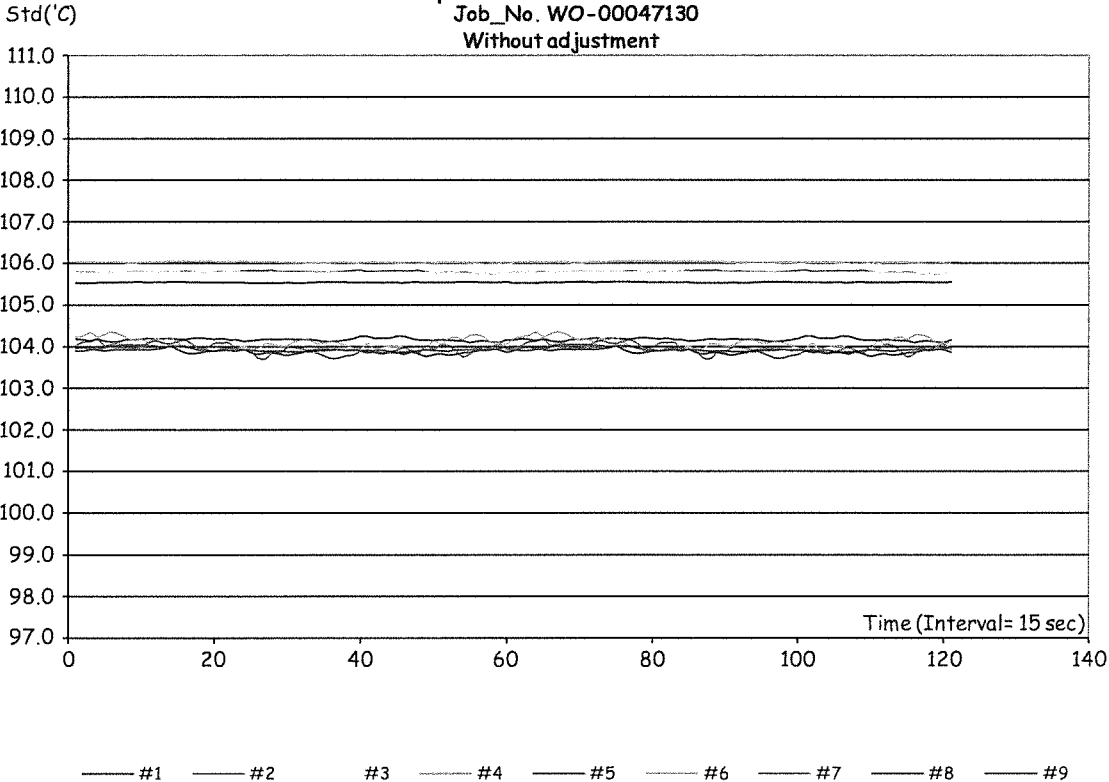


× #1 × #2 #3 #4 #5 #6 #7 #8 #9 — Uncer (+) — Uncer (-)

Temperature Distribution @ 104°C

Job_No. WO-00047130

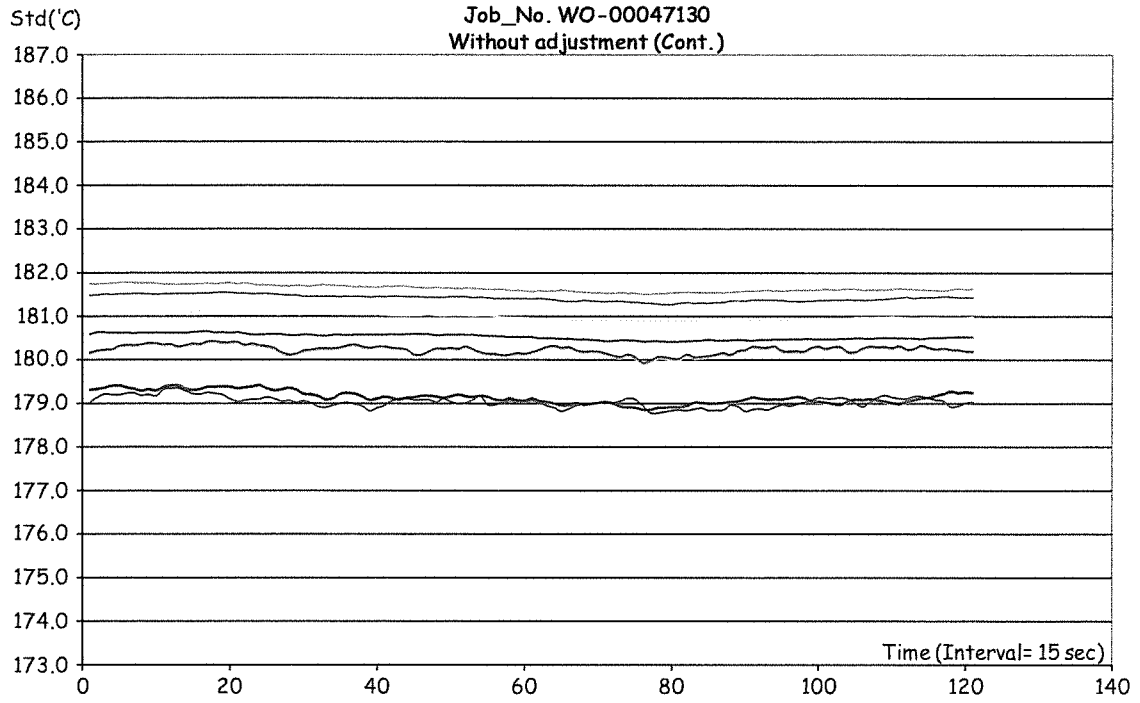
Without adjustment



Temperature Distribution @ 180°C

Job_No. WO-00047130

Without adjustment (Cont.)



— #1 — #2 — #3 — #4 — #5 — #6 — #7 — #8 — #9

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: Oven

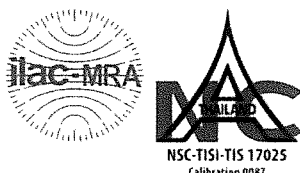
รุ่น: ED 115

หมายเลขเครื่อง: 20190000012946

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31 Oct 2024			31 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความชื้น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Suphanimit Khamnonphoem
Service Engineer



Certificate of Calibration

Equipment:	Hot Air Oven	Certificate No.:	C31242211
Model:	UF110	Issued Date:	05 November 2024
Serial No.(or ID):	B417.1014	Job No.:	WO-00047130
Manufacturer:	Memmert	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	2		

Customer: Integrated Research Center Co.,Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition:

Temperature:	24 °C	±	0.9 °C
Humidity:	63 %RH	±	4.5 %RH
Voltage:	231 VAC	±	2.6 VAC

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoem

Calibration Date: 31 October 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. C10240013



(Mr. Suphanimit Khamnonphoem)

Person in charge



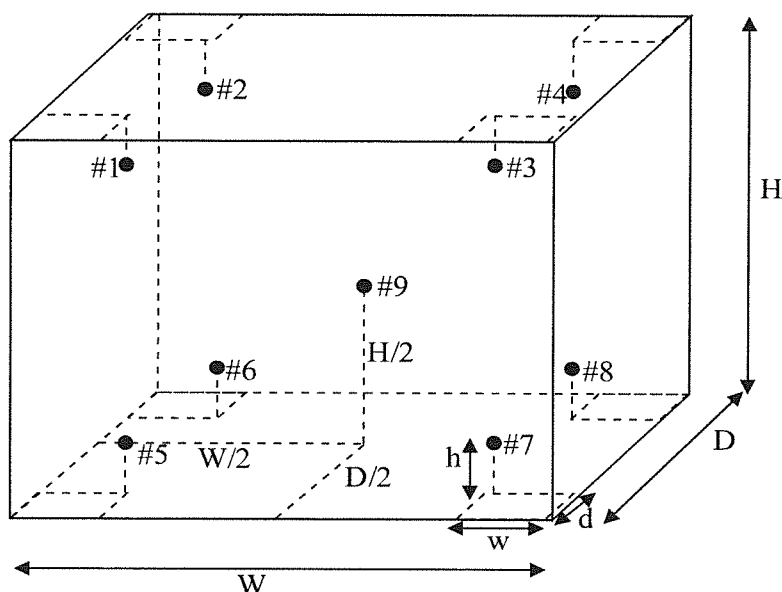
(Mr. Udon Srichana)

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)= 48 (Liters)

Inside chamber:	W = 52 (cm)	D = 40 (cm)	H = 48 (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	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.

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	104.55	0.55	0.39
#2	104.30	0.30	0.39
#3	104.40	0.40	0.39
#4	103.95	-0.05	0.39
#5	103.70	-0.30	0.39
#6	103.80	-0.20	0.39
#7	103.40	-0.60	0.39
#8	104.49	0.49	0.39
#9	103.84	-0.16	0.39

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.0	104.55	104.30	104.40	103.95	103.70	103.80	103.40	104.49	103.84	0.39

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.76	0.10	1.26

Note: * Maximum uncertainty of the each position

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	180.98	0.98	0.59
#2	180.32	0.32	0.60
#3	181.27	1.27	0.60
#4	179.67	-0.33	0.58
#5	179.05	-0.95	0.59
#6	179.19	-0.81	0.59
#7	178.67	-1.33	0.59
#8	179.99	-0.01	0.59
#9	179.34	-0.66	0.59

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180.0	180.0	180.0	180.98	180.32	181.27	179.67	179.05	179.19	178.67	179.99	179.34	0.60

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	2.07	0.17	2.94

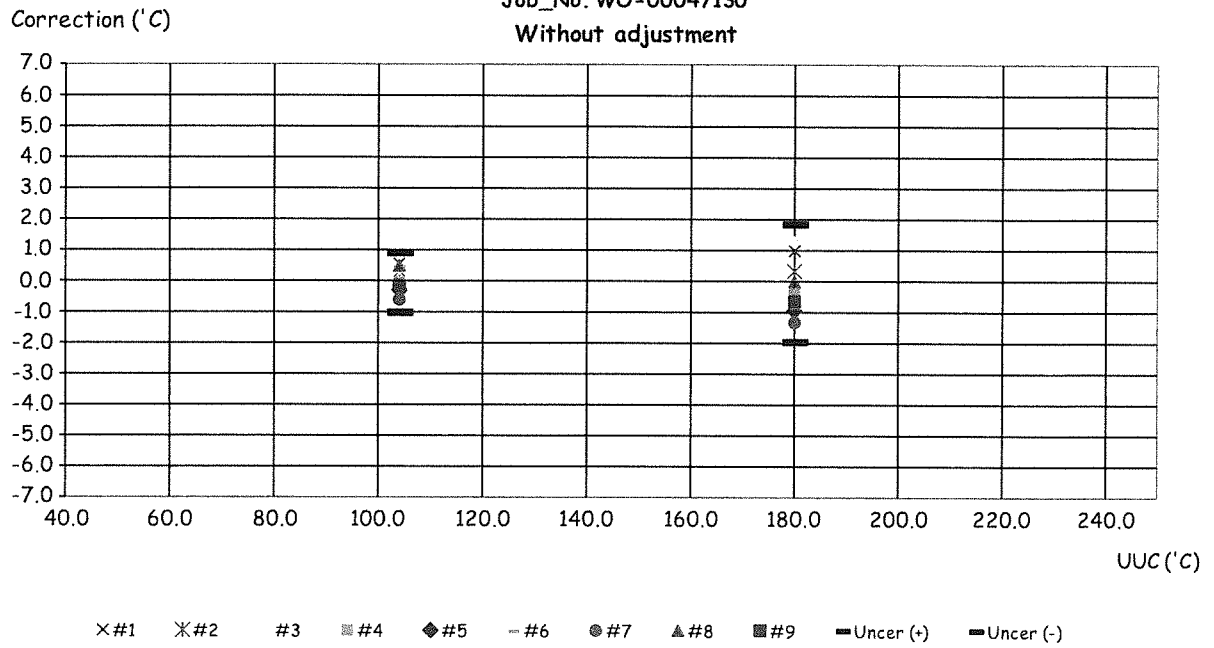
Note: * Maximum uncertainty of the each position

The End of Certificate

Corr_Distribution & Max_Measurement Uncertainty

Job_No. WO-00047130

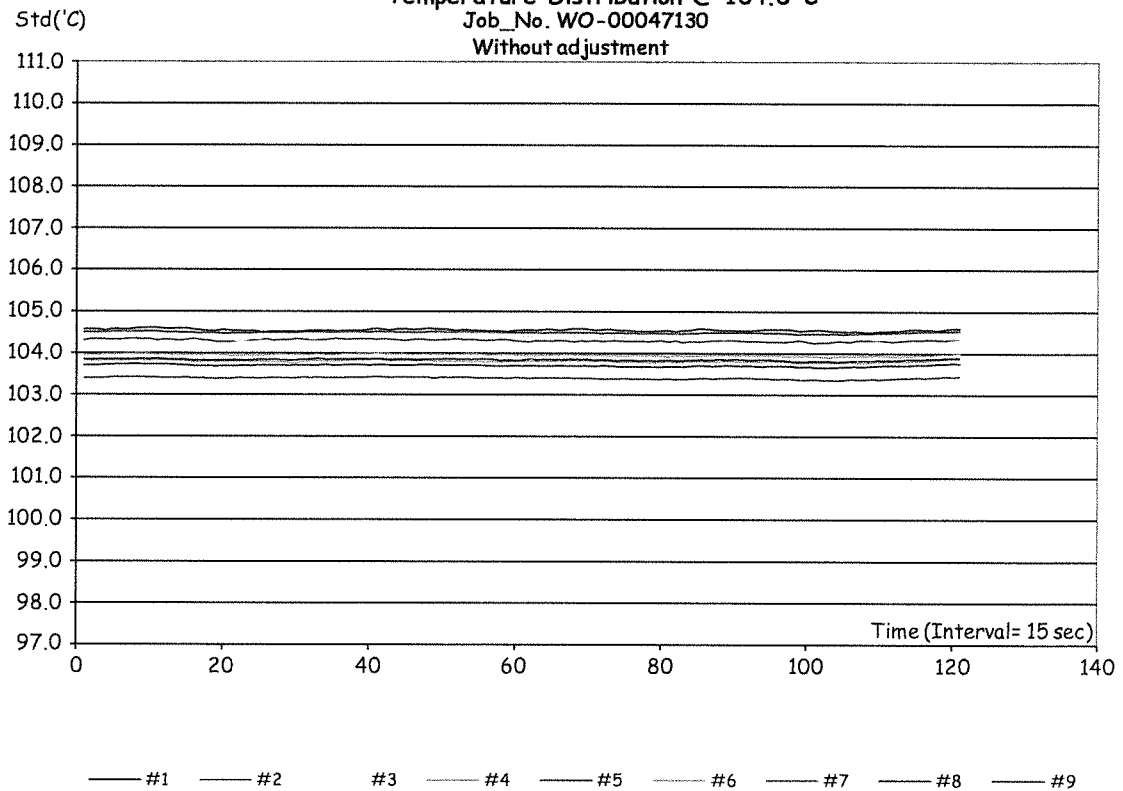
Without adjustment



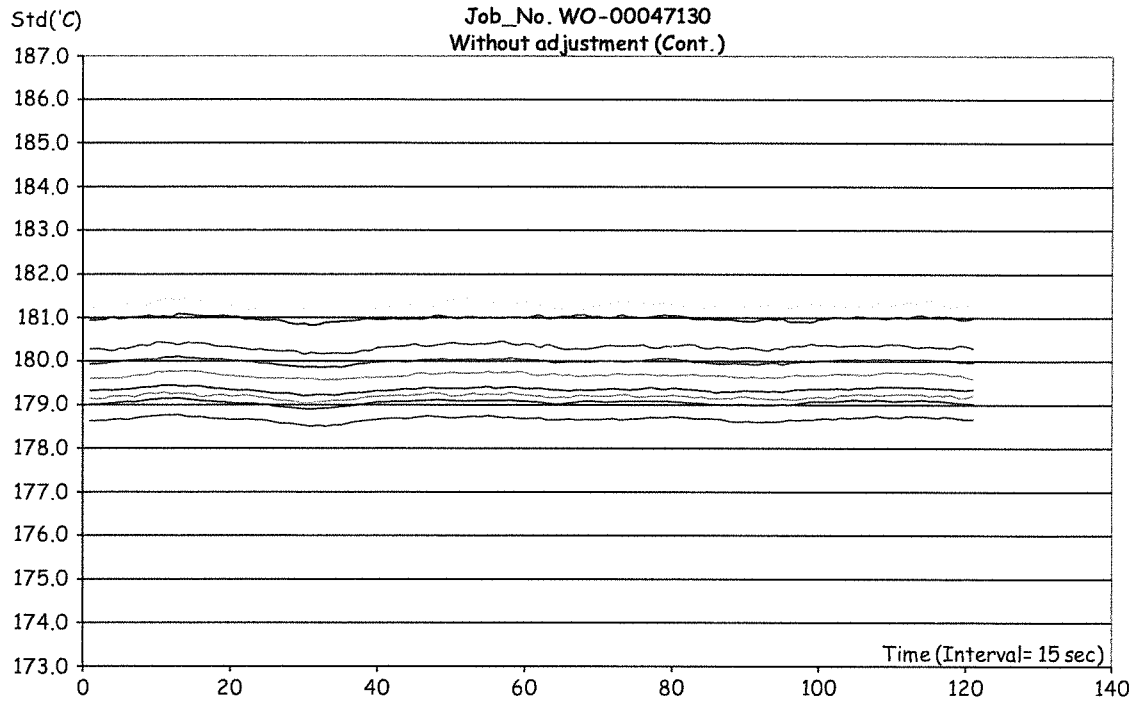
Temperature Distribution @ 104.0°C

Job_No. WO-00047130

Without adjustment



Temperature Distribution @ 180.0°C
Job_No. WO-00047130
Without adjustment (Cont.)



— #1 — #2 — #3 — #4 — #5 — #6 — #7 — #8 — #9

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: Hot Air Oven

รุ่น: UF110

หมายเลขเครื่อง: B417.1014

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31 Oct 2024			31 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความชื้น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Suphanimit Khamnonphoem
Service Engineer

Certificate of Calibration

Equipment:	Block Digestion Unit	Certificate No.:	C29240033
Model:	SC2100-35V240	Issued Date:	05 November 2024
Serial No. (or ID.):	2021CEP296	Job No.:	WO-00047130
Manufacturer:	Environmental Express	Page:	1 of 4
Condition:	In Condition	Digestion Block:	18 holes.

Customer: Integrated Research Center Co.,Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 24 °C ± 0.7 °C
Humidity: 60 %RH ± 5.2 %RH
Voltage: 231 VAC ± 2.5 VAC

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoem

Calibration Date: 31 October 2024

The Method used: In house method, base on by comparison with standard

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through N.M. Technical Center Laboratory (NTL)
Certificate No.: TC24/0061



(Mr. Suphanimit Khamnonphoem)

Person in charge



(Mr. Udon Srichana)

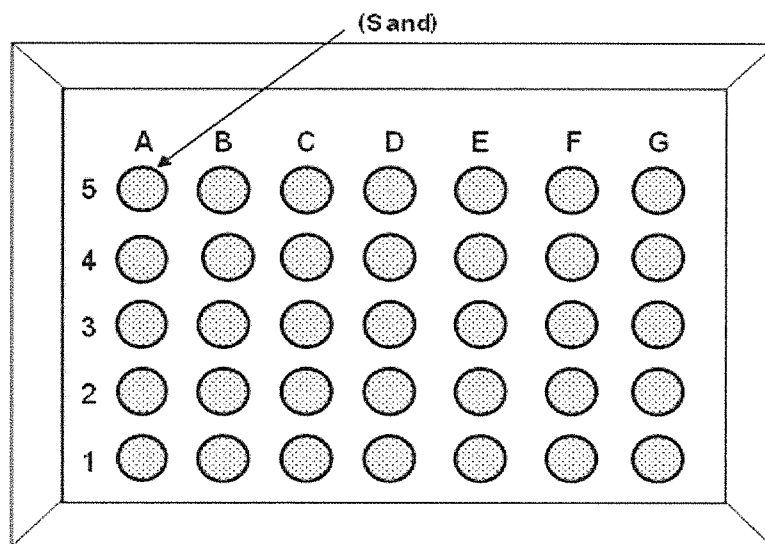
Authorized signatory

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.

Fig. 1.: Top view



Location of standard

Definitions

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

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

Calibration Results:

Before adjustment

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
A1	104.0	104.0	104.0	102.2	-1.8	1.4
A3				102.8	-1.2	1.4
A5				102.4	-1.6	1.4
B2				101.9	-2.1	1.4
B4				101.7	-2.3	1.4
C1				101.9	-2.1	1.4
C3				101.7	-2.3	1.4
C5				102.9	-1.1	1.4
D2				102.7	-1.3	1.4
D4				101.8	-2.2	1.4
E1				102.0	-2.0	1.4
E3				102.1	-1.9	1.4
E5				102.8	-1.2	1.4
F2				103.1	-0.9	1.4
F4				102.9	-1.1	1.4
G1				102.5	-1.5	1.4
G3				101.8	-2.2	1.4
G5				102.2	-1.8	1.4

The End of Certificate

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
 DKSH Technology Limited
 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
 2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
 Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Calibration Results:
After adjustment

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
A1	95.0	95.0	95.0	95.5	0.5	1.4
A3				94.8	-0.2	1.4
A5				96.0	1.0	1.4
B2				94.9	-0.1	1.4
B4				95.1	0.1	1.4
C1				95.0	0.0	1.4
C3				95.0	0.0	1.4
C5				95.4	0.4	1.4
D2				95.2	0.2	1.4
D4				94.9	-0.1	1.4
E1				95.1	0.1	1.4
E3				95.6	0.6	1.4
E5				95.5	0.5	1.4
F2				95.7	0.7	1.4
F4				95.2	0.2	1.4
G1				95.0	0.0	1.4
G3				94.7	-0.3	1.4
G5				94.9	-0.1	1.4

The End of Certificate

Calibration Results:
After adjustment

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
A1	104.0	104.0	104.0	104.2	0.2	1.4
A3				104.8	0.8	1.4
A5				104.4	0.4	1.4
B2				103.9	-0.1	1.4
B4				103.7	-0.3	1.4
C1				103.9	-0.1	1.4
C3				103.7	-0.3	1.4
C5				104.9	0.9	1.4
D2				104.7	0.7	1.4
D4				103.8	-0.2	1.4
E1				104.0	0.0	1.4
E3				104.1	0.1	1.4
E5				104.8	0.8	1.4
F2				105.1	1.1	1.4
F4				104.9	0.9	1.4
G1				104.5	0.5	1.4
G3				103.8	-0.2	1.4
G5				104.2	0.2	1.4

The End of Certificate

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: Block Digestion Unit

รุ่น: SC2100-35V240

หมายเลขเครื่อง: 2021CEP296

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31 Oct 2024			31 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. สภาพ Hole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพฝาปิด	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อเสนอแนะ :

Mr. Suphanimit Khamnonphoem
Service Engineer

Certificate of Calibration

Equipment:	Block Digestion Unit	Certificate No.:	C29240034
Model:	KT 20s-BS	Issued Date:	05 November 2024
Serial No. (or ID.):	GER5720190108	Job No.:	WO-00047130
Manufacturer:	Gerhardt	Page:	1 of 3
Condition:	In Condition	Digestion Block:	20 holes.

Customer: Integrated Research Center Co.,Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 25 °C ± 1.0 °C
Humidity: 65 %RH ± 5.1 %RH
Voltage: 230 VAC ± 2.6 VAC

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoem

Calibration Date: 31 October 2024

The Method used: In house method, base on by comparison with standard

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through N.M. Technical Center Laboratory (NTL)
Certificate No.: TC24/0061



(Mr. Suphanimit Khamnonphoem)

Person in charge



(Mr. Udon Srichana)

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.

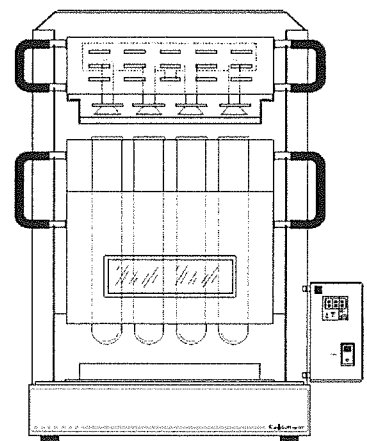


Fig. 1.: Front view

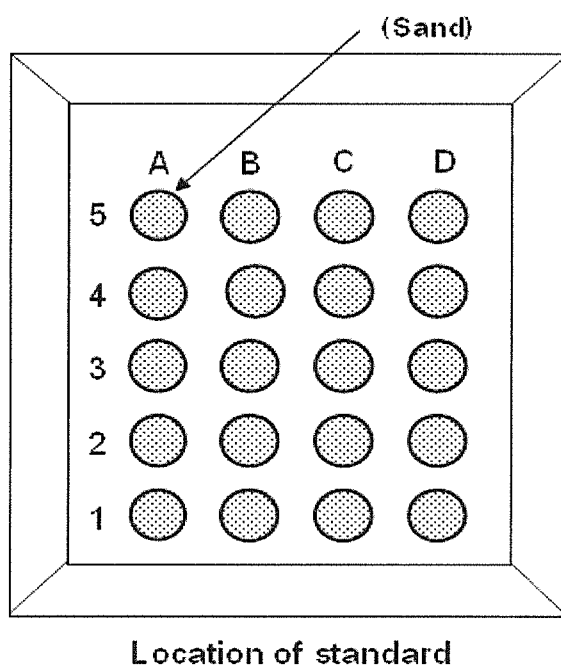


Fig. 2.: Digestion block

Definitions

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

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

Calibration Results:
Without adjustment

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
A1	380	380	380	379.6	-0.4	1.5
A2				380.1	0.1	1.5
A3				381.9	1.9	1.5
A4				382.4	2.4	1.5
A5				382.7	2.7	1.5
B1				380.6	0.6	1.5
B2				382.3	2.3	1.5
B3				382.0	2.0	1.5
B4				379.6	-0.4	1.5
B5				380.4	0.4	1.5
C1				378.3	-1.7	1.5
C2				381.4	1.4	1.5
C3				380.5	0.5	1.5
C4				378.5	-1.5	1.5
C5				379.4	-0.6	1.5
D1				375.6	-4.4	1.5
D2				375.2	-4.8	1.5
D3				379.1	-0.9	1.5
D4				378.7	-1.3	1.5
D5				378.9	-1.1	1.5

The End of Certificate

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

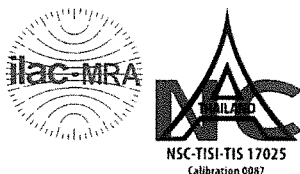
เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: Block Digestion Unit รุ่น: KT 20s-BS
หมายเลขเครื่อง: GER5720190108

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31 Oct 2024			31 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. สภาพ Hole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพฝาปิด	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Suphanimit Khamnonphoem
Service Engineer



Certificate of Calibration

Equipment:	Cooled Incubator	Certificate No.:	C31242212
Model:	E5CC	Issued Date:	05 November 2024
Serial No.(or ID):	03021	Job No.:	WO-00047130
Manufacturer:	OmRon	Page:	1 of 3
Condition:	In Condition	Ventilation Valve:	None
Shelves(pc.):	9		

Customer: Integrated Research Center Co.,Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition:

Temperature:	24 °C	±	0.3 °C
Humidity:	64 %RH	±	4.3 %RH
Voltage:	231 VAC	±	2.6 VAC

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoem

Calibration Date: 30 October 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. C10240013



(Mr. Suphanimit Khamnonphoem)

Person in charge



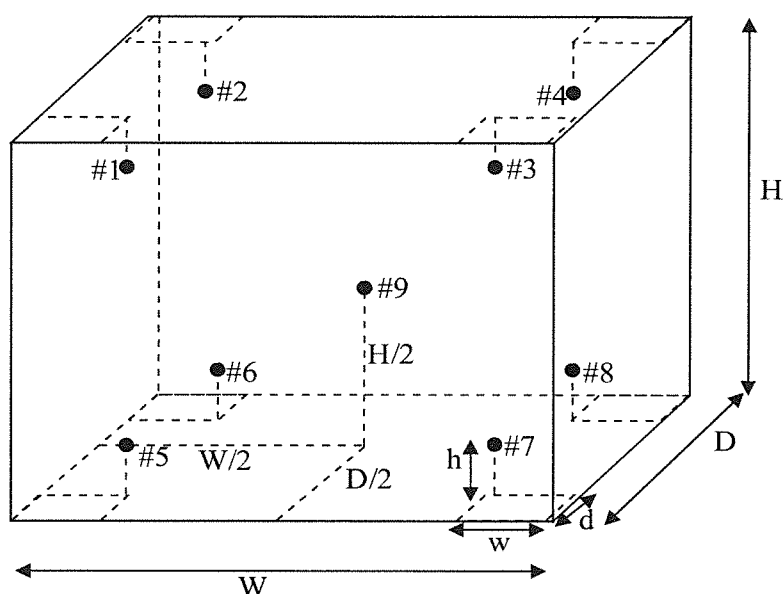
(Mr. Udon Srichana)

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)= 422 (Liters)

Inside chamber:	W = 110 (cm)	D = 60 (cm)	H = 160 (cm)
Standard Locations (#1, #2, #3, #4):	w = 11 (cm)	d = 6 (cm)	h = 30 (cm)
Standard Locations (#5, #6, #7, #8):	w = 11 (cm)	d = 6 (cm)	h = 30 (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.

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	20.23	0.23	0.67
#2	20.20	0.20	0.68
#3	20.51	0.51	0.66
#4	20.38	0.38	0.66
#5	20.06	0.06	0.77
#6	20.09	0.09	0.70
#7	20.21	0.21	0.73
#8	20.56	0.56	0.67
#9	20.18	0.18	0.73

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
20	20	20	20.23	20.20	20.51	20.38	20.06	20.09	20.21	20.56	20.18	0.77

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20	0.65	0.38	1.08

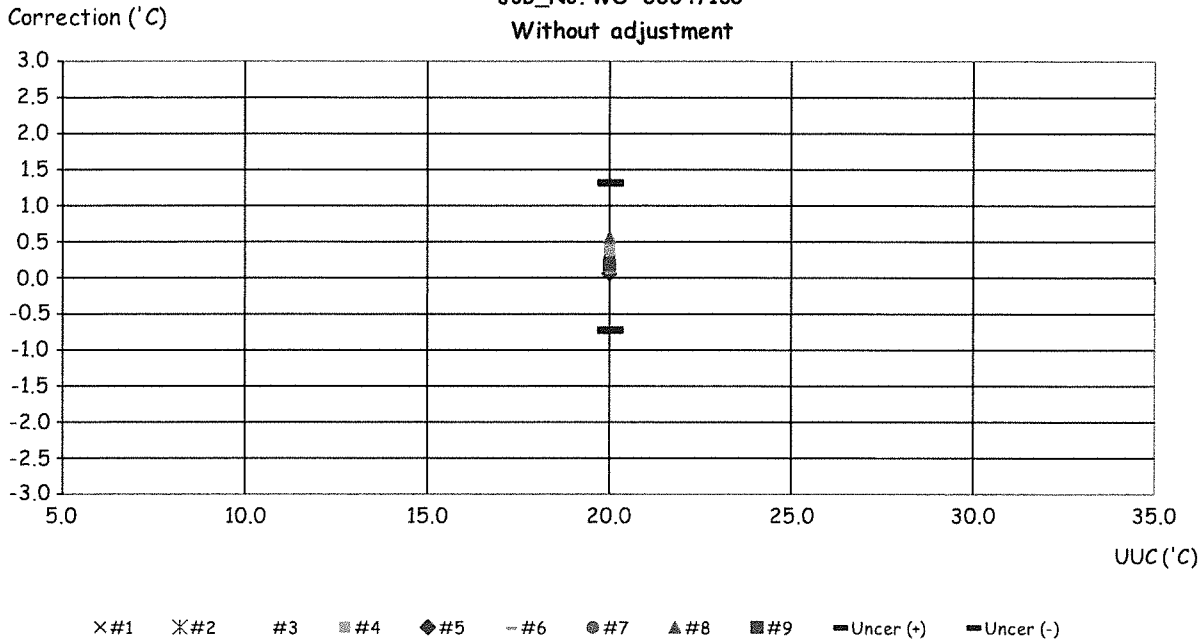
Note: * Maximum uncertainty of the each position

The End of Certificate

Corr_Distribution & Max_Measurement Uncertainty

Job_No. WO-00047130

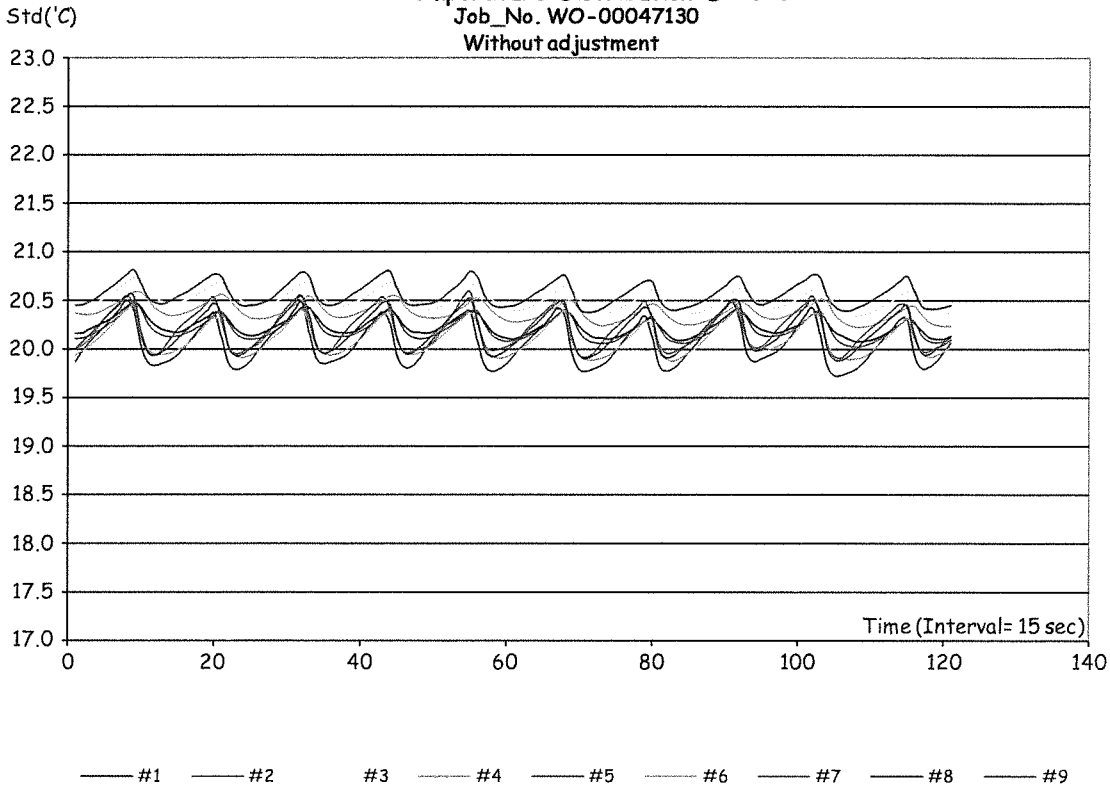
Without adjustment



Temperature Distribution @ 20°C

Job_No. WO-00047130

Without adjustment



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: Cooled Incubator

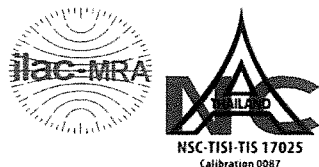
รุ่น: E5CC

หมายเลขเครื่อง: 03021

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
30 Oct 2024			30 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความชื้น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Suphanimit Khamnonphoem
Service Engineer



Certificate of Calibration

Equipment:	Standard Weight	Certificate No.:	C02241986
Model:	1 g	Issued Date:	5 November 2024
Serial No. (or ID.):	Weight 001	Job No.:	WO-00047137
Manufacturer:	LS	Page:	1 of 2
Condition:	In condition	Class:	-

Customer: Integrated Research Center Co.,Ltd. (Pulp Laboratory)
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 22 °C ± 2 °C
Relative Humidity 50 %RH ± 10 %RH
Atmospheric Pressure 980-1030 mbar

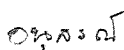
Calibration Place: Mass Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr. Anusorn Jitborikhon

Calibration Date: 05 November 2024

The Method used: In house method, CAL-WI-48, base on OIML R111-1

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (Thailand), NIMT through DKSH Technology Limited. Certificate No. C02241860.



(Mr. Anusorn Jitborikhon)

Person in charge



(Miss Saowaruk Klaysuwan)

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).

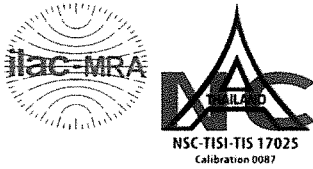
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

Calibration Results:

Nominal Value	Marking	Conventional Mass	Uncertainty (± mg)	MPE Class (± mg)	
1 g	None	1 g + 0.046 mg	0.030	0.10	F1

Note : These MPE Class are only conventional mass.

The End of Certificate



Certificate of Calibration

Equipment:	Standard Weight	Certificate No.:	C02241987
Model:	100 g	Issued Date:	5 November 2024
Serial No. (or ID.):	Weight 002	Job No.:	WO-00047137
Manufacturer:	LS	Page:	1 of 2
Condition:	In condition	Class:	-

Customer: Integrated Research Center Co.,Ltd. (Pulp Laboratory)
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 22 °C ± 2 °C
Relative Humidity 50 %RH ± 10 %RH
Atmospheric Pressure 980-1030 mbar

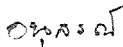
Calibration Place: Mass Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr. Anusorn Jitborikhon

Calibration Date: 05 November 2024

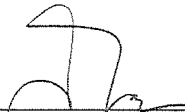
The Method used: In house method, CAL-WI-48, base on OIML R111-1

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (Thailand), NIMT through DKSH Technology Limited. Certificate No. C02241860.



(Mr. Anusorn Jitborikhon)

Person in charge



(Miss Saowaruk Klaysuwan)

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Calibration Results:

Nominal Value	Marking	Conventional Mass	Uncertainty (± mg)	MPE Class (± mg)	
100 g	None	100 g - 0.08 mg	0.16	0.5	F1

Note : These MPE Class are only conventional mass.

The End of Certificate



Certificate of Calibration

Equipment:	Standard Weight	Certificate No.:	C02241988
Model:	200 g	Issued Date:	5 November 2024
Serial No. (or ID.):	Weight 003	Job No.:	WO-00047137
Manufacturer:	LS	Page:	1 of 2
Condition:	In condition	Class:	-

Customer: Integrated Research Center Co.,Ltd. (Pulp Laboratory)
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 22 °C ± 2 °C
Relative Humidity 50 %RH ± 10 %RH
Atmospheric Pressure 980-1030 mbar

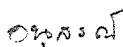
Calibration Place: Mass Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr. Anusorn Jitborikhon

Calibration Date: 05 November 2024

The Method used: In house method, CAL-WI-48, base on OIML R111-1

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (Thailand), NIMT through DKSH Technology Limited. Certificate No. C02241860.



(Mr. Anusorn Jitborikhon)

Person in charge



(Miss Saowaruk Klaysuwan)

Authorized signatory

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Calibration Results:

Nominal Value	Marking	Conventional Mass		Uncertainty (± mg)	MPE Class (± mg)	
200 g	None	200 g	- 0.45 mg	0.30	1.0	F1

Note : These MPE Class are only conventional mass.

The End of Certificate



Certificate of Calibration

Equipment:	Furnace	Certificate No.:	C14240250
Model:	CWF 12/5	Issued Date:	05 November 2024
Serial No. (or ID):	2/96/521	Job No.:	WO-00047130
Manufacturer:	Carbolite Gero	Page:	1 of 3
Condition:	In Condition	Furnace type:	Chamber Furnace
Voltage type:	230 VAC		

Customer: Integrated Research Center Co.,Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition:

Temperature:	25 °C	±	1.0 °C
Humidity:	65 %RH	±	4.8 %RH
Voltage:	230 VAC	±	2.3 VAC

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoem

Calibration Date: 30 October 2024

The Method used: In house method, CAL-WI-68, base on BS 4309

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through N.M. Techical center laboratory Co., Ltd.
Certificate No. TC24/0061



(Mr. Suphanimit Khamnonphoem)

Person in charge



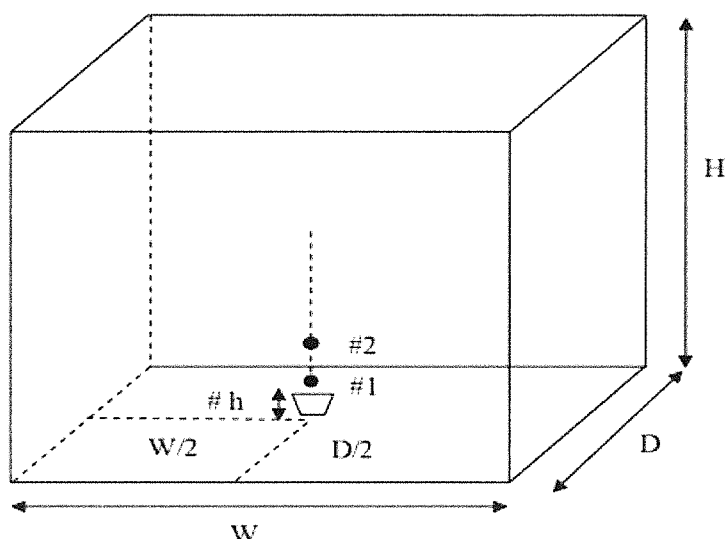
(Mr. Udon Srichana)

Authorized signatory

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Standard Installation Locations

Volume	6	(Liters)	W	D	H
Inside chamber		(cm)	15	26	15
Standard Locations			w/2	d/2	h
#1, #2		(cm)	8	13	4

Note : #1 reference, #2 cross check

Definitions

Indicating Temperature : The temperature indicated by a suitable device installed by the manufacturer or in accordance with his instructions.

Measured Temperature : The arithmetic mean of the average temperature determined over the same specified number of temperature cycles.

Temperature variation : The difference between the mean temperatures at any two points in the working space, determined over the same specified number of temperature cycles.

Temperature fluctuation : The one-half of difference between maximum temperature and minimum temperatures of reference temperature.

Calibration Results:**Before Adjustment**

Setting	Indicating	#1	#2
550	550	543.8	542.9

After Adjustment**Measured temperature at the spread locations:**

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (±°C)*	Cross check (°C)
550	550	550	550.2	0.2	4.0	549.0

Characterization of the unit under calibration:

Indicating (°C)	Temperature Variation (°C)	Temperature fluctuation (±°C)**
550	1.2	1.1

Note: * Maximum uncertainty of the each position

** Channel 1 is reference temperature.

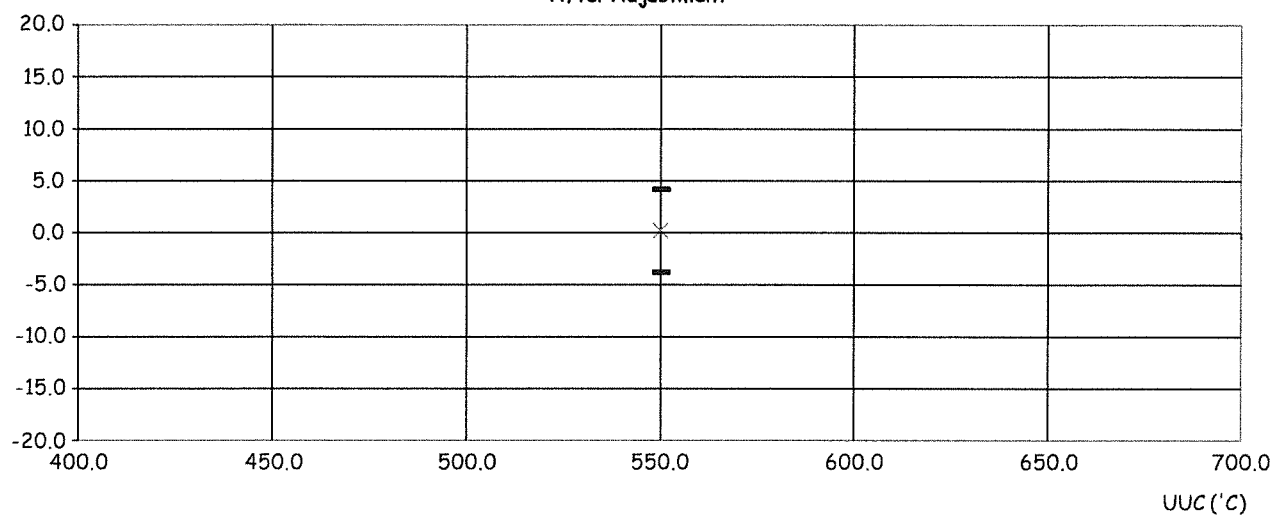
The End of Certificate

Correction Distribution & Max_Measurement Uncertainty

Job No. : WO-00047130

Correction ('C)

After Adjustment



× #1

— Uncert (+)

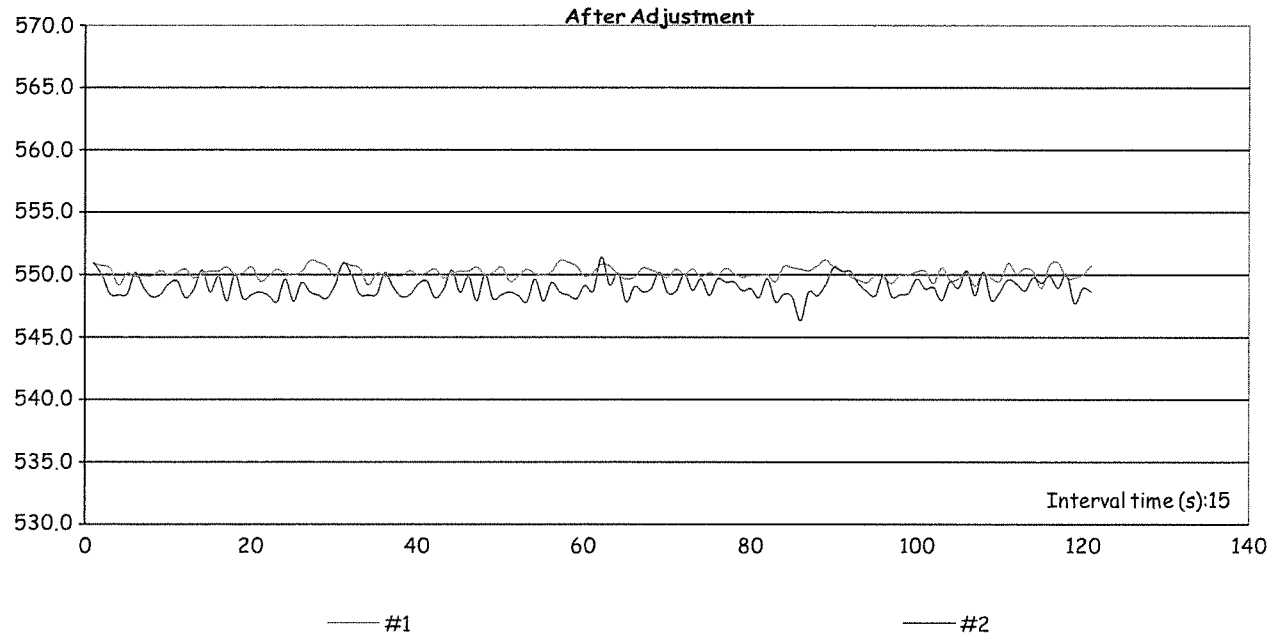
— Uncert (-)

Std('C)

Temperature Distribution @ 550°C

Job No. : WO-00047130

After Adjustment



— #1

— #2

ใบตรวจสอบสภาพเตาเผาควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: Chamber Furnace

รุ่น: CWF 12/5

หมายเลขเครื่อง: 2/96/521

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
30 Oct 2024			30 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	6. สภาพผนังภายในตัวเครื่อง	<input type="checkbox"/>	<input checked="" type="checkbox"/>	*
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพประตูเปิด/ ปิดเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ : *สภาพผนังภายในตัวเครื่อง:ผนังด้านในผุกร่อน

Mr. Suphanimit Khamnonphoem

Service Engineer



Certificate of Calibration

Equipment:	Moisture Balance	Certificate No.:	C01243399
Model:	MA35	Issued Date:	06 November 2024
Serial No. (or ID.):	26303311	Job No.:	WO-00047130
Manufacturer:	Sartorius	Page:	1 of 2
Condition:	In condition		

Customer: Integrated Research Center Co.,Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 26 °C ± 0.6 °C
Humidity 68 %RH ± 2.4 %RH

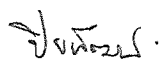
Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr. Piyapat Saidoung

Calibration Date: 31 October 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. C02231944



(Mr. Piyapat Saidoung)

Person in charge



(Mr. Adisai Maknoi)

Authorized signatory

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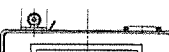
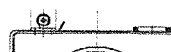

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Calibration Results:

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		20	(g)
Reference Points (g)												
A		B		C		D		E				
-		0.000		0.000		0.000		0.000				

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.001 (g)

Nominal test value (g)	Standard Deviation
2	0.0003
20	0.0004

Error of indication from nominal or conventional mass value., Readability 0.001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of indication (g)	Uncertainty (g)	k
1	1.0000	1.000	0.000	0.00096	2.02
2	2.0000	2.000	0.000	0.00096	2.02
5	5.0000	5.000	0.000	0.00096	2.02
10	10.0000	10.000	0.000	0.00096	2.02
12	12.0000	12.000	0.000	0.00096	2.02
15	15.0000	15.000	0.000	0.00096	2.02
20	20.0000	20.000	0.000	0.00096	2.02
22	22.0000	22.000	0.000	0.00096	2.02
25	25.0000	25.000	0.000	0.00096	2.02
30	30.0000	30.000	0.000	0.00096	2.02
35	35.0000	35.000	0.000	0.00097	2.02

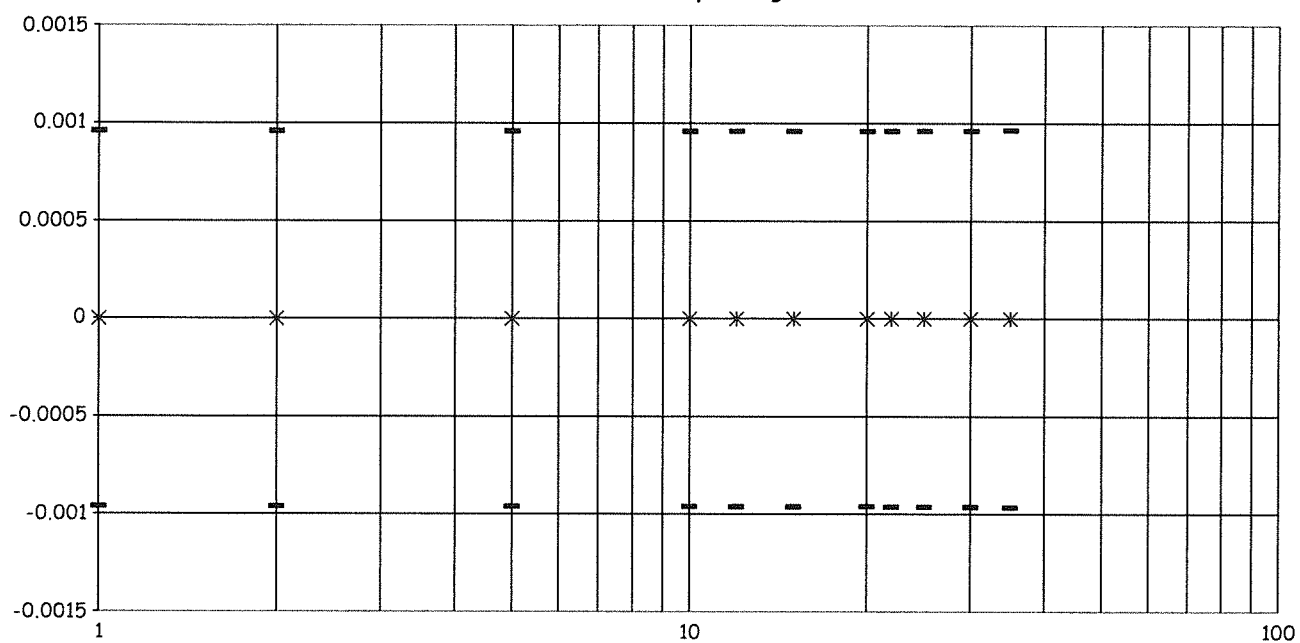
The End of Certificate

Without Adjustment

Job No. WO-00047130

Readability: 0.001g

Error of indication



*Error of indication

—Uncert (+)

—Uncert (-)

Display of balance

ใบตรวจสอบสภาพเครื่องชั่งวิเคราะห์ความชื้น

เลขที่ใบงาน: WO-00047130

ชนิดเครื่องมือ: Moisture Balance

รุ่น: MA35

หมายเลขเครื่อง: 26303311

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31 Oct 2024			31 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระจกกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตอบสนองของปุ่มกด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานชั่ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและแกน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Mr. Piyapat Saidoung

Service Engineer



Certificate of Calibration

Equipment:	Moisture Balance	Certificate No.:	C30240608
Model:	MA35	Issued Date:	07 November 2024
Serial No. (or ID.):	26303311	Job No.:	WO-00047130
Manufacturer:	Sartorius	Page:	1 of 3
Condition:	In condition		

Customer: Integrated Research Center Co.,Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 27 °C ± 0.9 °C
Humidity 68 %RH ± 2.4 %RH


Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.

Calibration By: Mr. Piyapat Saidoung

Calibration Date: 31 October 2024

The Method used: In-house method, CAL-WI-56, temperature measure in the sample chamber

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (Thailand), NIMT through DKSH Technology Co., Ltd. Certificate No. C15240321



(Mr. Piyapat Saidoung)

Person in charge



(Mr. Adisai Maknoi)

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:**Temperature Test****Without Adjustment**

Unit Under Calibration			Measurement	Error	Measurement
Desired (°C)	Setting (°C)	Reading (°C)	Temperature (°C)	Temperature (°C)	Uncertainty (±°C)
75	75	-	74.8	0.2	1.6
105	105	-	104.6	0.4	1.7

Error Temperature = UUC Setting - Measurement Temperature

Black body sensor of STD thermometer size; \varnothing ~2.5 cm

Sample Test *

Determination Moisture by Standard Solution (NaCl)

Standard solution for sample test made from salt and distilled water ; 90.00% \pm 0.015%

UUC Setting		UUC Reading		Standard (NaCl)	Error	SD	Measurement Uncertainty
Temperature (°C)	End of Analysis Mode	Time (mm.ss)	Moisture (%)**				
160	Automatic	8.48	90.01	90.00	0.01	0.10	0.15

Determination Moisture by Reference Material Sample (RM)

Reference Material Moisture in Flour assigned value ; 12.37% \pm 0.12% Standard deviation ; 0.49

Lot No. RMFF-FL01-2401-III Expired Date: June 2025

UUC Setting		UUC Reading		Standard (RM)	Error	SD	Measurement Uncertainty
Temperature (°C)	End of Analysis Mode	Time (mm.ss)	Moisture (%)**				
120	Automatic	8.00	12.56	12.37	0.19	0.04	0.14

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

** 1% = 10mg / g

The End of Certificate

Without Adjustment
Job No.: WO-00047130
Tolerance (\pm) : -°C

Correction of Temp.

