CALIBRATION LABORATORY CO., LTD.
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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com

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CALIBRATION AND DIMENSIONAL MEASUREMENT
ACDM-2814

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	REFRIGERATOR
MANUFACTURER	:	ACCUPLUS
MODEL / TYPE	:	P1010
SERIAL NO.	:	P1010-1020-0005[TNP.LAB.01]
CLID. NO.	:	332504332
JOB CONTROL NO.	:	251024125983
CALIBRATION SERVICE	:	☐ IN-LABORATORY ☑ ON-SITE

CUSTOMER : TNP ENVIRONMENT CO., LTD.
332/173 MOO 3 TAMBON BANG RAK PHATTANA,
AMPHOE BANG BUA THONG, NONTHABURI 11110

DATE OF RECEIVED : 24 October 2025

DATE OF ISSUED : 30 October 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Wenick Inchaisri
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
30 October 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

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REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	**REFRIGERATOR**
MANUFACTURER	:	**ACCUPLUS**
MODEL / TYPE	:	**P1010**
SERIAL NO.	:	**P1010-1020-0005[TNP.LAB.01]**
LOCATION SITE	:	**LABORATORY FLOOR 1**
DATE OF CALIBRATION	:	**28 October 2025**

ENVIRONMENT CONDITIONS :

Temperature : 29 °C to 30 °C **Relative Humidity : 56 % to 57 %**

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPTH-07** based on **TLAS G-20** as calibration guidelines.

The calibration was performed by using Hydra Data Bucket which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Hydra Data Bucket, Fluke Model 2635A S/N. 6496317.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.

Certificate No.Q25070485, Due Date 23 June 2026.

UNCERTAINTY :

The reported 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 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

@clccalibration

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring refrigerator.

CALIBRATION DATA

1. REFRIGERATOR PERFORMANCE

DUC		Measured Uniformity	Measured Stability	Measured Overall
Setting (°C)	Indicating (°C)	(°C)	(°C)	Variation (°C)
3.0	3.0	0.69	1.27	3.02

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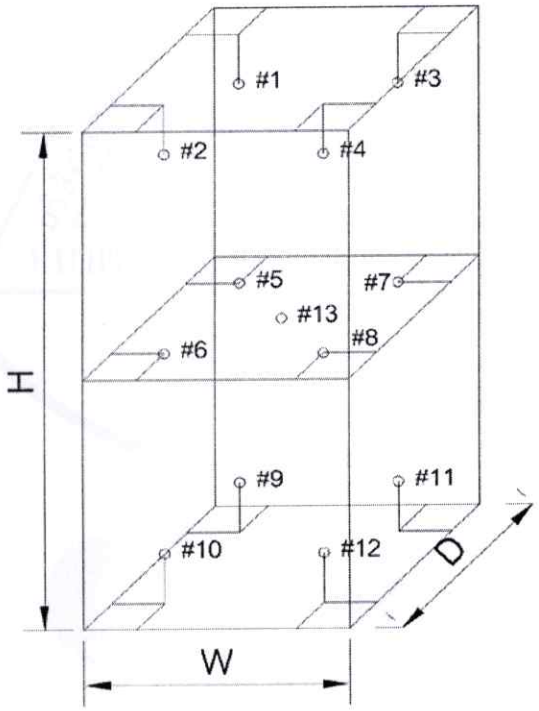
CALIBRATION DATA

2. TEMPERATURE DISTRIBUTION

DUC		Measured Temperature (°C)@Probe No.13 is Ref.													Uncertainty
Setting (°C)	Indicating (°C)	1	2	3	4	5	6	7	8	9	10	11	12	13	±(°C)
3.0	3.0	3.81	4.10	3.84	4.07	3.53	3.29	3.31	3.35	3.63	3.81	3.40	3.60	3.61	1.49

Technical Note : W = 157 cm, D = 46 cm, H = 145 cm.

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 016 Page 63 of 73



This report is valid for the above stated instrument/s only.

End of Certificate

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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Certificate

Certificate No.: 2502859-001-01
Client name: TNP ENVIRONMENT CO., LTD.
Address: 332/173 Moo 3 Tambon Bang Rak Phatthana,
Amphone Bang Bua Thong, Nonthaburi 11110

Equipment: pH Meter

Manufacturer: HORIBA

Model: LAQUA-PH1100

Serial No.: B80A0042

ID No.: TNP.LAB.02

Order No.: 2502859

Operation No.: 2502859-001

Date of Receipt: 8 May 2025

Date of Calibration: 8 May 2025

Calibrated by Mr.Manas Somsak
Specialist

Approved by
(Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 13 May 2025

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Report

Certificate No.: 2502859-001-01

Equipment: pH Meter — **Resolution:** 0.01 pH ; 0.1 mV

Manufacturer: HORIBA — **Model:** LAQUA-PH1100

Serial No.: B80A0042 — **Type:** Bench top

ID No.: TNP.LAB.02

Date of Calibration: 8 May 2025

Location: Laboratory 1, TNP ENVIRONMENT CO., LTD.

Environment Condition: **Ambient Temperature:** (23.4 ± 1.5) °C **Relative Humidity:** (55 ± 3) %

Condition of Equipment: Good Condition

Condition of this Results of Calibration

1.Calibration Method: W-CC-002 : In house method based on direct measurement by using standard voltage calibrator and certified reference material (CRM)

2. Reference Standards / Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fluke	24E1752	30 May 2025
2.2 Digital Thermometer	2709007	Fluke	2500376-002-01	29 October 2025
2.3 Thermo-Hygro Meter	NFI.BTH 013/23	testo	CC 670420-01	21 May 2025
Certified Reference Material	**Lot. No.**	**Manufacturer**	**Ref N**	**Expire Date**
2.4 pH buffer 4.008 (Primary pH buffer Solution)	1016435	CPAchem	PH216.L5	25 July 2026
2.5 pH buffer 6.865 (Primary pH buffer Solution)	949186	CPAchem	PH217.L5	30 November 2025
2.6 pH buffer 10.01 (Primary pH buffer Solution)	1016437	CPAchem	PH220.L5	25 July 2025
2.7 pH buffer 7.00 (Standard pH buffer Solution)	C03109	HACH LANGE GmbH	S11M004	16 October 2025

3. This certification is traceable to The International System of Unit (SI Unit)

3.1 Instruments No.2.1	through	NSC-TISI-TIS 17025 Laboratory Accredition of Calibration No.0008
3.2 Instruments No.2.2 to 2.3	through	NSC-TISI-TIS 17025 Laboratory Accredition of Calibration No.0061
3.3 Certified Reference Material No.2.4 to 2.6	traceable to	Primary measurement method- Harned cell using calibrated thermometer, barometer, and nanovoltmeter.The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
3.4 Certified Reference Material No.2.7	traceable to	PTB Certificate Nr. PTB-PHOA-563/30504/23 and Certificate Nr. PTB-PHOB-555/30620/22 (PTB: Physikalish-Thechnische Bundesanstalt, Braunschweig, Germany)

4. This certificate was certified only for the instrument we calibrated.

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

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NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Report

Certificate No.: 2502859-001-01

Equipment: pH Meter

Manufacturer: HORIBA

Serial No.: B80A0042

ID No.: TNP.LAB.02

Resolution: 0.01 pH ; 0.1 mV

Model: LAQUA-PH1100

Type: Bench top

Date of Calibration: 8 May 2025

Calibration Results:

1. Calibration of pH Meter (Manual Temperature Compensation at 25 °C)

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (±mV)	Coverage Factor (*k*)
		mV	pH		
0	414.122	414.1	0.00	0.063	2.00
2	295.815	295.8	2.00	0.063	2.00
4	177.463	177.4	4.00	0.063	2.00
6	59.160	59.1	6.00	0.063	2.00
7	0.001	-0.1	7.00	0.063	2.00
8	-59.159	-59.2	8.00	0.063	2.00
10	-177.462	-177.6	10.00	0.063	2.00
12	-295.813	-295.9	12.00	0.063	2.00
14	-414.121	-414.2	14.00	0.063	2.00

2. Calibration of pH Meter with Electrode (Manual Temperature Compensation at 25 °C)

Equipment: pH Electrode

Manufacturer: HORIBA

Serial No.: 9X4J0711

Type: Combined Electrode

Model: LAQUA 9615S

ID.No. N/A

Performance of Electrode system (Three-Point Calibration at pH 4, 7 and 10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (*k*)
	pH	mV			
4.008	4.01	157.0	-	0.0071	2.00
7.001	7.00	-18.8	99.4	0.0086	2.00
10.010	10.01	-194.2	98.5	0.0086	2.00
6.876	6.88	10.9	-	0.0074	2.00

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

---------- End ----------

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CALIBRATION AND DIMENSIONAL MEASUREMENT
ACDM-2814

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	DIGITAL THERMO-HYGROMETER
MANUFACTURER	:	EXTECH INSTRUMENTS
MODEL / TYPE	:	445814
SERIAL NO.	:	PONPE5816745[TNP.LAB.04]
CLID. NO.	:	232303263
JOB CONTROL NO.	:	250904104412
CALIBRATION SERVICE	:	☑ IN-LABORATORY ☐ ON-SITE

CUSTOMER : TNP ENVIRONMENT CO., LTD.
332/173 MOO 3 TAMBON BANG RAK PHATTANA,
AMPHOE BANG BUA THONG, NONTHABURI 11110

DATE OF RECEIVED : 04 September 2025 DATE OF ISSUED : 10 September 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Oranut Kamchatphai
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
10 September 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q25104412

@clccalibration

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ACDM-2814

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	**DIGITAL THERMO-HYGROMETER**
MANUFACTURER	:	**EXTECH INSTRUMENTS**
MODEL / TYPE	:	**445814**
SERIAL NO.	:	**PONPE5816745[TNP.LAB.04]**
DATE OF CALIBRATION	:	**09 September 2025**

ENVIRONMENT CONDITIONS :

Temperature : **(23 ± 2) °C** **Relative Humidity :** **(55 ± 10) %RH**

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPTH-11.** The calibration was performed by using Chilled Mirror Hygrometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, Edgetech Model Dew Master S/N. 44602.

Temperature & Humidity Chamber, PGC Model 9141-5116 S/N. 1304261.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Thunder Scientific Corporation.

Certificate No. 22724, Due Date 03 October 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2{,}00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

@clccalibration

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring digital thermo-hygrometer.

CALIBRATION DATA

1. CORRECTION OF TEMPERATURE

Test point (°C)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty ±(°C)
20.0	20.00	19.9	+0.10	0.27
25.0	25.00	25.2	-0.20	
30.0	30.00	30.4	-0.40	

2. CORRECTION OF HUMIDITY

STD Temperature (°C)	STD Reading (%RH)	DUC Reading (%RH)	Correction (%RH)	Uncertainty ± (%RH)
25	40.0	34	+6.0	0.8
25	50.0	46	+4.0	0.8
25	60.0	55	+5.0	0.8

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 60 of 68

This report is valid for the above stated instrument/s only.

End of Certificate

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THAILAND
NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Certificate

Certificate No.: 2601058-001-01

Equipment:	**CHAMBER (Hot Air Oven)**
Manufacturer:	MEMMERT
Model:	UF75
Serial No.:	B320.0251
ID No.:	TNP.LAB.07
Order No.:	2601058
Operation No.:	2601058-001
Date of Receipt:	15 December 2025
Date of Calibration:	15 December 2025

Customer Name: TNP ENVIRONMENT CO., LTD.
Address: 332/173 Moo 3 Tambon Bang Rak Phatthana, Amphoe Bang Bua Thong, Nonthaburi 11110

Metrological traceability:

1. Calibration Method:
   - This instrument was calibrated by inserting 9 standard thermometers into its chamber, in accordance with W-TE-014. based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
   - The temperature scale used in this laboratory is the International Temperature Scale of 1990 (ITS-90).
   - All data shown below are final values, and the initial data may be obtained upon request.
2. Reference Standard Instrument:

Instrument	Model/Type	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	DAQ973A RTD	MY59008964 CH#101-109/ RTD#101-109	2502244-001-01	29 March 2026	NATIONAL FOOD INSTITUTE

3. This certificate is traceable to the International System of Units (SI).
4. This certificate is valid only for the instrument that was calibrated.
5. The result of this calibration was found to be accurate only on the date and at the place of calibration shown.

Calibrated by Mr.Nuttapol Niyomchat
Specialist

Approved by
(Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 17 December 2025

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

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NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Certificate

Certificate No.: 2601058-001-01

Calibration Condition:

Equipment: **CHAMBER (Hot Air Oven)**

UUC* Resolution: 0.1 °C

Condition of the item: Normal & Good

Without adjustment / As Found

- Time of record 1 hour 9 minute / point

Place of Calibration: Laboratory Room 2

TNP ENVIRONMENT CO., LTD.

Environment Conditions: Ambient Temperature (34.0 ± 2) °C

Relative Humidity (38.5 ± 4) %

Line Voltage (223 ± 3) V.

Calibration Results:

Table1 : Reporting of Temperature

Calibration Point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Measurement Uncertainty (±°C)
	Std.#1	Std.#2	Std.#3	Std.#4	Std.#5	Std.#6	Std.#7	Std.#8	Std.#9	
85.0	85.13	85.06	85.17	84.76	84.89	84.74	84.68	85.02	85.00	0.46
104.0	104.01	104.05	104.05	103.70	103.80	103.66	103.64	104.02	104.07	0.53
180.0	179.76	180.28	179.52	179.30	179.40	179.32	179.44	180.08	179.95	0.90

Table 2 : Reporting of Characterization Results

UUC* Setting (°C)	UUC* Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	Max	Min	Average			
85.0	85.1	85.0	85.0	0.059	0.32	0.60
104.0	104.1	104.0	104.0	0.055	0.42	0.51
180.0	180.0	179.9	180.0	0.220	0.65	1.23

Note

- UUC* : Unit Under Calibration

-The quoted uncertainty includes contributions from 'Stability' and 'Loading Effect (20% of Temperature Uniformity).

- Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

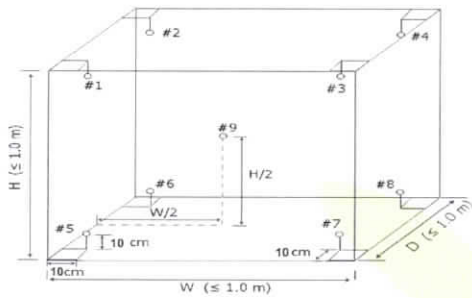
- Uniformity = The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.

- Overall Variation = The difference of The maximum and minimum measured temperatures througout observation time.

For more information, details of the sensor installation should be reported.

Fresh air Damper	-	Open	-	Position
	X	Close	100%	Fan speed
	-	Not Available		

Dimension of inside chamber and sensor installation location (cm)						
W x H x D	40	x	56	x	33	
a x b x c	10	x	10	x	10	



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

--------- End of Report ---------

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ACDM-2814

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	INCUBATOR
MANUFACTURER	:	ACCUPLUS
MODEL / TYPE	:	SMART i250
SERIAL NO.	:	0410-0121-0003[TNP.LAB.08]
CLID. NO.	:	332504333
JOB CONTROL NO.	:	251024125984
CALIBRATION SERVICE	:	☐ IN-LABORATORY ☑ ON-SITE

CUSTOMER : TNP ENVIRONMENT CO., LTD.
332/173 MOO 3 TAMBON BANG RAK PHATTANA,
AMPHOE BANG BUA THONG, NONTHABURI 11110

DATE OF RECEIVED : 24 October 2025

DATE OF ISSUED : 30 October 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Wenick Inchaisri
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
30 October 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q25125984

@clccalibration

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2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com

CLC Accredited ISO/IEC 17025

ilac-MRA

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	**INCUBATOR**
MANUFACTURER	:	**ACCUPLUS**
MODEL / TYPE	:	**SMART i250**
SERIAL NO.	:	**0410-0121-0003[TNP.LAB.08]**
LOCATION SITE	:	**LABORATORY ROOM 1 FLOOR 2**
DATE OF CALIBRATION	:	**28 October 2025**

ENVIRONMENT CONDITIONS :

Temperature : 19 °C to 20 °C **Relative Humidity : 48% to 49 %**

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPTH-07** based on **TLAS G-20** as calibration guidelines.

The calibration was performed by using Hydra Series II which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Hydra Series II, Fluke Model 2635A S/N. 9253024.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.

Certificate No. Q25059629, Due Date 02 June 2026.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

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CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring incubator.

CALIBRATION DATA

1. INCUBATOR PERFORMANCE

DUC		Measured Uniformity	Measured Stability	Measured Overall
Setting (°C)	Indicating (°C)	(°C)	(°C)	Variation (°C)
20.0	20.0	0.19	0.44	0.88

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CLC Accredited ISO/IEC 17025

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

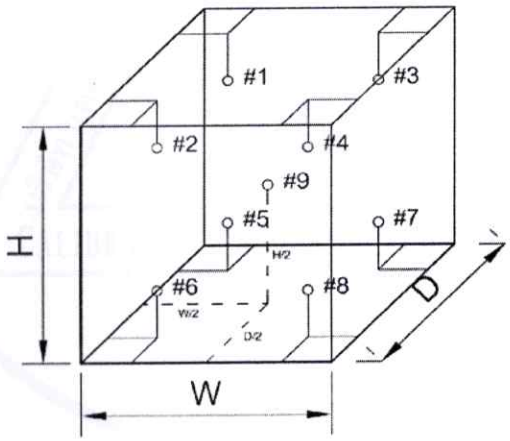
CALIBRATION DATA

2. TEMPERATURE DISTRIBUTION

DUC		Measured Temperature (°C)@Probe No.9 is Ref.									Uncertainty ±(°C)	Coverage factor *k*
Setting (° C)	Indicating (° C)	1	2	3	4	5	6	7	8	9		
20.0	20.0	19.88	19.80	19.80	19.87	19.87	19.90	19.83	19.84	19.81	0.52	2,00

Technical Note : W = 50 cm, D = 48 cm, H = 110 cm.

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 016 Page 63 of 73



This report is valid for the above stated instrument/s only.

End of Certificate

@clccalibration

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NSC-TISI-TIS 17025
CALIBRATION 0260

CERTIFICATE OF CALIBRATION

Certificate No. : 25-0753-025

Issue Date : 12 June 2025

Work Order No. : 25/0753

Customer Name : TNP ENVIRONMENT CO.,LTD.
332/173 Moo 3 Bang Rak Phatthana,
Bang Bua Thong, Nonthaburi 11110

Date of Received : 12 June 2025

Date of Calibration : 12 June 2025

Instrument Details :

Description	:	Electronic Balance
Manufacturer	:	SHIMADZU
Model	:	AP225WD
Serial No.	:	D316301848
ID No.	:	TNP.LAB.30
Resolution	:	0.00001 g / 0.0001 g
Capacity	:	102 g / 220 g
Location	:	ห้องปฏิบัติการ 2 ชั้น 3

Calibration Method : This calibration was conducted by using in-house method according to calibration procedure no. CWI-B-01 based on UKAS LAB14 edition 6, October 2019

Environmental Condition

Temperature	:	Maximum 25.5°C / Minimum 25.2°C
Humidity	:	Maximum 48%R.H. / Minimum 45%R.H.
Air Pressure	:	Maximum 999.2hPa / Minimum 999.1hPa

Traceability of Measurement

: This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI)

Calibrated by : Mr. Itsara Sawanbancha
Calibration Engineer

Approved by : _____
(Mr. Thichakorn Srisupob)
Asst. Laboratory Manager

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NSC-TISI-TIS 17025
CALIBRATION 0260

CERTIFICATE OF CALIBRATION

Certificate No. : 25-0753-025

Issue Date : 12 June 2025

Work Order No. : 25/0753

Details of Calibration

1. Reference Standards Instrument

Instrument	Capacity of Weight	Serial No. / ID No.	Certificate No.	Due date
Weight Set E2	1mg to 200g	B744909236	22-130801	6 December 2025

2. Certificate traceable : This certificate traceable to The International System of Unit refer to Asia Medical and Agricultural Laboratory and Research center Co., Ltd. , NSC-ONSC Calibration No. 0152

3. Condition of item : Used

4. Calibration site : On-site

Result of Calibration

1. Calibration result : Check performance before calibration

Applied Weight g	Balance Reading g	Correction Value g	Uncertainty (±) g	Coverage Factor (k)
50.00005	50.00009	-0.00004	0.000080	2.00
99.99996	100.00004	-0.00008	0.00016	2.00
200.0000	200.0007	-0.0007	0.00032	2.00

2. The result of check performance in frist step has to Reset span

3. Calibration result : After set span by External Reset span by weight 100 g ID No. WE2-02

3.1 Repeatability number of repeatability is 10 times

Norminal Value (g)	Standard Deviation of Reading (g)
50	0.00000480
100	0.00000480
200	0.0000422

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

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

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NSC-TISI-TIS 17025
CALIBRATION 0260

CERTIFICATE OF CALIBRATION

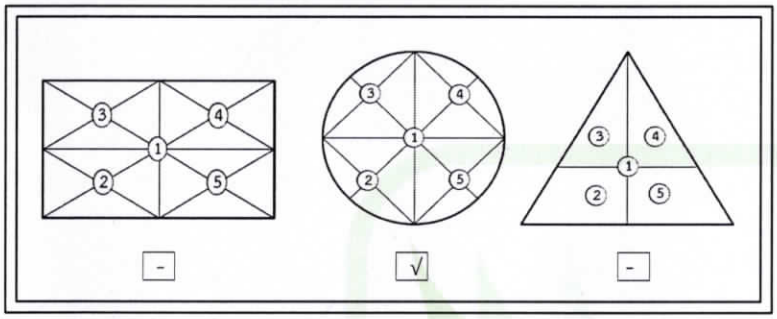
Certificate No. : 25-0753-025

Issue Date : 12 June 2025

Work Order No. : 25/0753

3. Calibration result : After set span by External Reset span by weight 100 g ID No. WE2-02 (continued)

3.2 Eccentric or Off-center Error A mass of 100 g was placed and moved to various position on pan.



Result of Eccentric Error		
Position 1	99.99997	g
Position 2	100.00001	g
Position 3	100.00002	g
Position 4	99.99999	g
Position 5	99.99998	g
(Maximum Difference)	0.00005	g

3.3 Departure of indication from nominal value

Applied Weight g	Balance Reading g	Correction Value g	Uncertainty (±) g	Coverage Factor *(k)*
Unload	0.00000	0.00000	0.000020	2.00
0.10001	0.10001	0.00000	0.000020	2.00
0.50001	0.50003	-0.00002	0.000020	2.00
1.00001	1.00000	0.00001	0.000020	2.00
5.00002	5.00001	0.00001	0.000020	2.00
10.00001	10.00001	0.00000	0.000040	2.00
19.99999	19.99997	0.00002	0.000050	2.00
50.00005	50.00005	0.00000	0.000080	2.00
99.99996	99.99997	-0.00001	0.00016	2.00
200.0000	200.0000	0.0000	0.00032	2.00

Note

Calibrate items it good condition and this report customer request and accepted in certificate

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

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

--END--

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Statements of conformity report

Refer to Certificate No. : 25-0753-025

Issue Date : 12 June 2025

Work Order No. : 25/0753

Detail of Equipment

Description : Electronic Balance

Manufacturer : SHIMADZU

ID No. : TNP.LAB.30

Model : AP225WD

Resolution : 0.00001 g / 0.0001 g

Serial no. : D316301848

Capacity : 102 g / 220 g

Result of Calibration

This result of calibration : Adjustment

Unit : g

Applied Weight	Balance Reading	Correction Value	Uncertainty	Uncertainty + Correction	Limit of performance	Evaluation
0.10001	0.10001	0.00000	0.000020	0.000020	0.000051	Pass
0.50001	0.50003	-0.00002	0.000020	0.000040	0.000051	Pass
1.00001	1.00000	0.00001	0.000020	0.000030	0.000051	Pass
5.00002	5.00001	0.00001	0.000020	0.000030	0.000051	Pass
10.00001	10.00001	0.00000	0.000040	0.000040	0.000071	Pass
19.99999	19.99997	0.00002	0.000050	0.000070	0.000081	Pass
50.00005	50.00005	0.00000	0.000080	0.000080	0.00011	Pass
99.99996	99.99997	-0.00001	0.00016	0.00017	0.00019	Pass
200.0000	200.0000	0.0000	0.00032	0.00032	0.00035	Pass

The conformity certificate documents validaty following ISO/IEC Giude 98-4 : Role of measurement uncertainty in conformity assessment based on statement with guard band refer to NATA User checks and maintenance of laboratory balances consider expanded measurement uncertainty (k=95%)

The tolerance and decision rules ;

Limit of performance (LoP) = 2.26 sw + |Corr| + U(Cal)

Evaluation of decision = Measurement uncertainty + Absolute correction ; ≤ LoP is pass , > LoP is Fail

Statements of conformity decision by :

(Mr. Thichakorn Srisupob)

Asst. Laboratory Manager

-- END --

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NSC-TISI-TIS 17025
CALIBRATION 0260

CERTIFICATE OF CALIBRATION

Certificate No. : 25-0753-026

Issue Date : 12 June 2025

Work Order No. : 25/0753

Customer Name : TNP ENVIRONMENT CO.,LTD.
332/173 Moo 3 Bang Rak Phatthana,
Bang Bua Thong, Nonthaburi 11110

Date of Received : 12 June 2025

Date of Calibration : 12 June 2025

Instrument Details :

Description	:	Electronic Balance
Manufacturer	:	sartorius
Model	:	SECURA224-1S
Serial No.	:	0041305301
ID No.	:	TNP.LAB.31
Resolution	:	0.0001 g
Capacity	:	220 g
Location	:	ห้องปฏิบัติการ 2 ชั้น 3

Calibration Method : This calibration was conducted by using in-house method according to calibration procedure no. CWI-B-01 based on UKAS LAB14 edition 6, October 2019

Environmental Condition

Temperature	:	Maximum 25.6°C / Minimum 25.2°C
Humidity	:	Maximum 48%R.H. / Minimum 44%R.H.
Air Pressure	:	Maximum 999.3hPa / Minimum 999.2hPa

Traceability of Measurement

: This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI)

Calibrated by : Mr. Itsara Sawanbancha
Calibration Engineer

Approved by : _____
(Mr. Thichakorn Srisupob)
Asst. Laboratory Manager

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NSC-TISI-TIS 17025
CALIBRATION 0260

CERTIFICATE OF CALIBRATION

Certificate No. : 25-0753-026

Issue Date : 12 June 2025

Work Order No. : 25/0753

Details of Calibration

1. Reference Standards Instrument

Instrument	Capacity of Weight	Serial No. / ID No.	Certificate No.	Due date
Weight Set E2	1mg to 200g	B744909236	22-130801	6 December 2025

2. Certificate traceable : This certificate traceable to The International System of Unit refer to Asia Medical and Agricultural Laboratory and Research center Co., Ltd. , NSC-ONSC Calibration No. 0152

3. Condition of item : Used

4. Calibration site : On-site

Result of Calibration

1. Calibration result : Check performance before calibration

Applied Weight g	Balance Reading g	Correction Value g	Uncertainty (±) g	Coverage Factor *(k)*
100.0000	100.0000	0.0000	0.00019	2.00
200.0000	200.0000	0.0000	0.00032	2.00

2. The result of check performance in frist step has to Reset span

3. Calibration result : After set span by Internal Calibration

3.1 Repeatability number of repeatability is 10 times

Norminal Value (g)	Standard Deviation of Reading (g)
100	0.0000316
200	0.0000316

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

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

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NSC-TISI-TIS 17025
CALIBRATION 0260

CERTIFICATE OF CALIBRATION

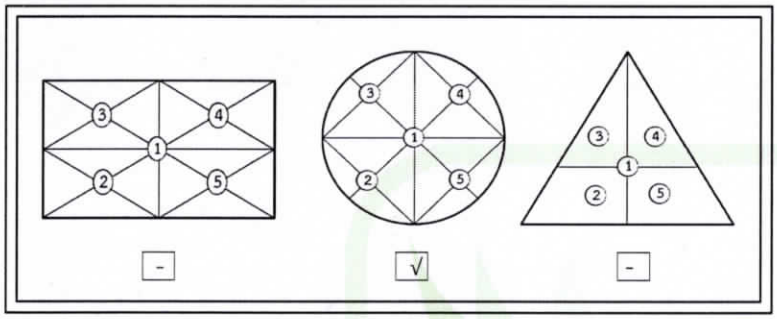
Certificate No. : 25-0753-026

Issue Date : 12 June 2025

Work Order No. : 25/0753

3. Calibration result : After set span by Internal Calibration (continued)

3.2 Eccentric or Off-center Error A mass of 100 g was placed and moved to various position on pan.



Result of Eccentric Error		
Position 1	100.0000	g
Position 2	100.0000	g
Position 3	100.0000	g
Position 4	99.9999	g
Position 5	100.0000	g
(Maximum Difference)	0.0001	g

3.3 Departure of indication from nominal value

Applied Weight g	Balance Reading g	Correction Value g	Uncertainty (±) g	Coverage Factor *(k)*
Unload	0.0000	0.0000	0.000090	2.00
0.1000	0.1000	0.0000	0.000090	2.00
0.5000	0.5000	0.0000	0.000090	2.00
1.0000	1.0000	0.0000	0.000090	2.00
5.0000	5.0000	0.0000	0.000090	2.00
10.0000	10.0000	0.0000	0.00010	2.00
20.0000	20.0000	0.0000	0.00010	2.00
50.0000	50.0000	0.0000	0.00012	2.00
100.0000	100.0000	0.0000	0.00019	2.00
200.0000	200.0000	0.0000	0.00032	2.00

Note

Calibrate items it good condition and this report customer request and accepted in certificate

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

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

--END--

CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.
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Salathammasop, Thawewatthana, Bangkok 10170 Thailand
Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com

Statements of conformity report

Refer to Certificate No. : 25-0753-026

Issue Date : 12 June 2025

Work Order No. : 25/0753

Detail of Equipment

Description : Electronic Balance

Manufacturer : sartorius

ID No. : TNP.LAB.31

Model : SECURA224-1S

Resolution : 0.0001 g

Serial no. : 0041305301

Capacity : 220 g

Result of Calibration

This result of calibration : Adjustment

Unit : g

Applied Weight	Balance Reading	Correction Value	Uncertainty	Uncertainty + Correction	Limit of performance	Evaluation
0.1000	0.1000	0.0000	0.000090	0.000090	0.00016	Pass
0.5000	0.5000	0.0000	0.000090	0.000090	0.00016	Pass
1.0000	1.0000	0.0000	0.000090	0.000090	0.00016	Pass
5.0000	5.0000	0.0000	0.000090	0.000090	0.00016	Pass
10.0000	10.0000	0.0000	0.00010	0.00010	0.00017	Pass
20.0000	20.0000	0.0000	0.00010	0.00010	0.00017	Pass
50.0000	50.0000	0.0000	0.00012	0.00012	0.00019	Pass
100.0000	100.0000	0.0000	0.00019	0.00019	0.00026	Pass
200.0000	200.0000	0.0000	0.00032	0.00032	0.00039	Pass

The conformity certificate documents validaty following ISO/IEC Giude 98-4 : Role of measurement uncertainty in conformity assessment based on statement with guard band refer to NATA User checks and maintenance of laboratory balances consider expanded measurement uncertainty (k=95%)

The tolerance and decision rules ;

Limit of performance (LoP) = 2.26 sw + |Corr| + U(Cal)

Evaluation of decision = Measurement uncertainty + Absolute correction ; ≤ LoP is pass , > LoP is Fail

Statements of conformity decision by :

(Mr. Thichakorn Srisupob)

Asst. Laboratory Manager

-- END --

Harikul Science Co.,Ltd.
694 Soi Ratchadanivet 24, Pracharatbamphen,
Samsaennok, Huaikhwang, Bangkok 10310
Tel: 0-2274-2456 Fax: 0-2274-2443
Email: info@harikul.com www.harikul.com

CERT.No.: HS-V050G

Certificate of Calibration

Calibration Date : 17 Jul 25

Submitted by : TNP ENVIRONMENT COMPANY LIMITED
332/173 Moo.3, Tambon Bang Rak Phatthana,
Amphoe Bang Bua Thong, Nonthaburi 11110

Avg Room Temp : 20 °C
Avg Water Temp : 20 °C
Air Pressure : 760.00 mmHg
Salinity : 0 ppt

Model : HI 5421
S/N : 07210004101
Probe : HI 76408W
S/N : KC1N32W9P
ID NO. :
Air Temp ref : S/N. F8065C26
Barometric ref : S/N. F8065C26
Water Temp ref : -
HS001
Technician : Kittipong M.

Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.08 mg/l)	(status)		(status)
Measurement 1 (mg/l)	9.05	(PASS)	-	-
Measurement 2 (mg/l)	9.04	(PASS)	-	-
Measurement 3 (mg/l)	9.04	(PASS)	-	-
Measurement 4 (mg/l)	9.05	(PASS)	-	-
Measurement 5 (mg/l)	9.06	(PASS)	-	-
Measurement 6 (mg/l)	9.05	(PASS)	-	-
Measurement 7 (mg/l)	9.06	(PASS)	-	-
Measurement 8 (mg/l)	9.07	(PASS)	-	-
Measurement 9 (mg/l)	9.05	(PASS)		-
Measurement 10 (mg/l)	9.05	(PASS)	-	-
Mean Measurement	9.05	mg/l	-	-
Inaccuracy	0.03	mg/l	-	-
Overall Status	(PASS)			

Manufacturer Specification

Accuracy = +/- 0.15 mg/l

1) This certificate is issued based on the result that are found as shown on date and place of test only.
2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
3) This result shall not be used for advertising purpose.

Technician Signature
(Kittipong Maekwong)

Laboratory Manager
(Natenapha Pisatkunchon)

SCIMET Co., Ltd.
818/124 Udomsuk Rd., Bangna-Nuea,
Bangna, Bangkok 10260 Thailand
Email:scimet2022@gmail.com, Tel: 02 460 9239
https://www.scimet.co.th

NSC-TISI-TIS 17025
CALIBRATION 0454

Certificate No. C07260022

Calibration Certificate

Equipment:	SPECTROPHOTOMETER		
Model:	T6U	Job No.:	KSMT2600611
Serial No.(or ID):	31-1654-01-1055 (TNP.LAB.48)	Received Date:	10 February 2026
Manufacturer:	PERSEE	Issued Date:	10 February 2026
Condition:	In Condition	Page:	1 of 3

Customer

TNP ENVIRONMENT CO., LTD.
332/173 Village No. 3, Bangrak Phatthana Subdistrict,
Bang Bua Thong District, Nonthaburi Province 11110

Calibration Place

TNP ENVIRONMENT CO., LTD. (ห้องปฏิบัติการ 2)
332/173 Village No. 3, Bangrak Phatthana Subdistrict,
Bang Bua Thong District, Nonthaburi Province 11110

Calibration Date

10 February 2026

Environment Condition

Temperature:	25.7 °C	±	0.5 °C
Humidity:	51.3 %RH	±	1.6 %RH

The Method used

In-house method, WI07, based 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. 125472 and 125471

The standard for Photometric Certificate No. 125567 and 125517

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 SCIMET Co., Ltd.

(Mr. Siwapan Srijan)
Person in charge

SCIMET CO.,LTD
บริษัท ซายน์เมท จำกัด

(Mr. Thalerngkeat Poungngam)
Authorized signatory

Condition of reference standards Instruments / CRM:

Instruments	Set No.	Certificate No.	Due date
Didymium Oxide Glass Reference	131033	125472	16-Sep-26
Holmium Oxide Glass Reference	136650	125471	16-Sep-26
Neutral Density Filter Reference	45329	125567	17-Sep-26
Potassium Dichromate Solution References	45328	125517	17-Sep-26

Calibration Results:

Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm

Standard Wavelength (nm)	Unit Under Calibration (nm)	Correction (nm)	Uncertainty of Measurement (± nm)
219.30	220.2	-0.90	0.16
241.29	241.8	-0.51	0.16
287.62	287.8	-0.18	0.16
360.43	360.4	0.03	0.16
417.72	418.4	-0.68	0.16
431.57	431.0	0.57	0.16
472.47	473.0	-0.53	0.16
513.41	513.8	-0.39	0.16
528.83	528.4	0.43	0.16
537.13	537.2	-0.07	0.16
573.33	573.2	0.13	0.16
585.29	585.6	-0.31	0.16
640.94	641.0	-0.06	0.16
684.49	684.6	-0.11	0.19
740.18	739.8	0.38	0.16
748.48	748.8	-0.32	0.16
807.03	806.4	0.63	0.19
879.27	879.2	0.07	0.16

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance (Abs)	Unit Under Calibration (Abs)	Correction (Abs)	Uncertainty of Measurement(± Abs)
235 nm	0.0000	0.000	0.0000	0.0080
	0.7328	0.735	-0.0022	0.0080
257 nm	0.0000	0.000	0.0000	0.0080
	0.8537	0.851	0.0027	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2855	0.286	-0.0005	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6338	0.625	0.0088	0.0080

Calibration Results:

Without Adjustment

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance (Abs)	Unit Under Calibration (Abs)	Correction (Abs)	Uncertainty of Measurement(± Abs)
420 nm	0.0000	0.000	0.0000	0.0045
	0.2352	0.236	-0.0008	0.0045
	0.5716	0.572	-0.0004	0.0045
	0.7146	0.714	0.0006	0.0045
	1.0179	1.019	-0.0011	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2314	0.231	0.0004	0.0045
	0.5566	0.557	-0.0004	0.0045
	0.7028	0.702	0.0008	0.0045
	1.0016	1.001	0.0006	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.2107	0.212	-0.0013	0.0045
	0.5192	0.520	-0.0008	0.0045
	0.6638	0.663	0.0008	0.0045
	0.9447	0.946	-0.0013	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.2187	0.219	-0.0003	0.0045
	0.5207	0.521	-0.0003	0.0045
	0.7002	0.699	0.0012	0.0045
	1.0001	0.999	0.0011	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.2430	0.244	-0.0010	0.0045
	0.5546	0.555	-0.0004	0.0045
	0.7756	0.774	0.0016	0.0045
	1.1117	1.111	0.0007	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2635	0.263	0.0005	0.0045
	0.5622	0.562	0.0002	0.0045
	0.7651	0.764	0.0011	0.0045
	1.0974	1.097	0.0004	0.0045

The End of Certificate

บริษัท ซายน์เมท จำกัด (SCIMET CO., LTD.)
818/124 Udomsuk rd., Bangna-Nuea, Bangna, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 02 460 9239

Statements of conformity:

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

The error of temperature determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, ASTM E 275-08 and ASTM E 387-04. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

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

Decision rule :

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

; PFA – Probability of False Accept

SCIMET CO.,LTD
บริษัท ซายน์เมท จำกัด

(Mr. Thalerngkeat Poungngam)

Authorized signatory

บริษัท ซายน์เมท จำกัด (SCIMET CO., LTD.)
818/124 Udomsuk rd., Bangna-Nuea, Bangna, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 02 460 9239

Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm

Unit Under Calibration	Correction	Guard Band (w)	Tolerance (±)	Conformity
220.2	-0.90	0.16	1.5	Pass
241.8	-0.51	0.16	1.5	Pass
287.8	-0.18	0.16	1.5	Pass
360.4	0.03	0.16	1.5	Pass
418.4	-0.68	0.16	1.5	Pass
431.0	0.57	0.16	1.5	Pass
473.0	-0.53	0.16	1.5	Pass
513.8	-0.39	0.16	1.5	Pass
528.4	0.43	0.16	1.5	Pass
537.2	-0.07	0.16	1.5	Pass
573.2	0.13	0.16	1.5	Pass
585.6	-0.31	0.16	1.5	Pass
641.0	-0.06	0.16	1.5	Pass
684.6	-0.11	0.19	1.5	Pass
739.8	0.38	0.16	1.5	Pass
748.8	-0.32	0.16	1.5	Pass
806.4	0.63	0.19	1.5	Pass
879.2	0.07	0.16	1.5	Pass

Photometric Accuracy (Absorbance)

Wavelength	Unit Under Calibration	Correction	Guard Band (w)	Tolerance (±)	Conformity
235 nm	0.000	0.0000	0.0080	0.020	Pass
	0.735	-0.0022	0.0080	0.020	Pass
257 nm	0.000	0.0000	0.0080	0.020	Pass
	0.851	0.0027	0.0080	0.020	Pass
313 nm	0.000	0.0000	0.0080	0.020	Pass
	0.286	-0.0005	0.0080	0.020	Pass
350 nm	0.000	0.0000	0.0080	0.020	Pass
	0.625	0.0088	0.0080	0.020	Pass

Without Adjustment

Photometric Accuracy (Absorbance)

Wavelength	Unit Under Calibration	Correction	Guard Band (w)	Tolerance (±)	Conformity
420 nm	0.000	0.0000	0.0045	0.015	Pass
	0.236	-0.0008	0.0045	0.015	Pass
	0.572	-0.0004	0.0045	0.015	Pass
	0.714	0.0006	0.0045	0.015	Pass
	1.019	-0.0011	0.0045	0.015	Pass
440 nm	0.000	0.0000	0.0045	0.015	Pass
	0.231	0.0004	0.0045	0.015	Pass
	0.557	-0.0004	0.0045	0.015	Pass
	0.702	0.0008	0.0045	0.015	Pass
	1.001	0.0006	0.0045	0.015	Pass
465 nm	0.000	0.0000	0.0045	0.015	Pass
	0.212	-0.0013	0.0045	0.015	Pass
	0.520	-0.0008	0.0045	0.015	Pass
	0.663	0.0008	0.0045	0.015	Pass
	0.946	-0.0013	0.0045	0.015	Pass
546.1 nm	0.000	0.0000	0.0045	0.015	Pass
	0.219	-0.0003	0.0045	0.015	Pass
	0.521	-0.0003	0.0045	0.015	Pass
	0.699	0.0012	0.0045	0.015	Pass
	0.999	0.0011	0.0045	0.015	Pass
590 nm	0.000	0.0000	0.0045	0.015	Pass
	0.244	-0.0010	0.0045	0.015	Pass
	0.555	-0.0004	0.0045	0.015	Pass
	0.774	0.0016	0.0045	0.015	Pass
	1.111	0.0007	0.0045	0.015	Pass
635 nm	0.000	0.0000	0.0045	0.015	Pass
	0.263	0.0005	0.0045	0.015	Pass
	0.562	0.0002	0.0045	0.015	Pass
	0.764	0.0011	0.0045	0.015	Pass
	1.097	0.0004	0.0045	0.015	Pass

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

The End of Statements of Conformity

บริษัท ซายน์เมท จำกัด (SCIMET CO., LTD.)
818/124 Udomsuk rd., Bangna-Nuea, Bangna, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 02 460 9239

ใบตรวจสอบสภาพเครื่อง Spectrophotometer

เลขที่ใบงาน: KSMT2600611

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: T6U หมายเลขเครื่อง: 31-1654-01-1055

ตรวจสอบ (รับ) 10 Feb 2026		รายการตรวจเช็ค	ตรวจสอบ (ส่ง) 10 Feb 2026		หมายเหตุ
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
☑	☐	1. ความสมบูรณ์เครื่อง	☑	☐	
☑	☐	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	☑	☐	
☑	☐	3. สวิทช์ ปิด – เปิด เครื่อง (On-Off Swicth)	☑	☐	
☑	☐	4. ปุ่มกด (Keypad)	☑	☐	
☑	☐	5. หน้าจอ (Display, Screen Contrast)	☑	☐	
☐	☐	6. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	☐	☐	-
☑	☐	7. ความยาวคลื่น (Wavelength Check)	☑	☐	
☑	☐	8. แหล่งกำเนิดแสง (UV < 3,000 hour)	☑	☐	
☑	☐	9. แหล่งกำเนิดแสง (Visible < 5,000 hour)	☑	☐	
☑	☐	10. ช่องวัดหลายตัวอย่าง (Carousel Module)	☑	☐	

เพิ่มเติม/ข้อแนะนำ : _____

_____

_____

Mr. Siwapan Srijan

Service Engineer

บริษัท ซายน์เมท จำกัด (SCIMET CO., LTD.)
818/124 Udomsuk rd., Bangna-Nuea, Bangna, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 02 460 9239

CALIBRATION LABORATORY CO., LTD.
2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Road, Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com

CLC Accredited ISO/IEC 17025

ilac-MRA

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION, DIMENSIONAL MEASUREMENT, AND TESTING

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	WATER QUALITY METER
MANUFACTURER	:	DIGICON
MODEL / TYPE	:	WA-48SD
SERIAL NO.	:	T.075714/TF43846/T.075695/11-05[TNP.LAB.46]
CLID. NO.	:	272500210
JOB CONTROL NO.	:	260212019797
CALIBRATION SERVICE	:	☑ IN-LABORATORY ☐ ON-SITE

CUSTOMER : TNP ENVIRONMENT CO., LTD.
99 MOO 2 TAMBON BANG RAK YAI,
AMPHOE BANG BUA THONG, NONTHABURI 11110

DATE OF RECEIVED : 12 February 2026 DATE OF ISSUED : 23 February 2026

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sukgasem Seehanart
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
23 February 2026

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q26019797

@clccalibration

CALIBRATION LABORATORY CO., LTD.
2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Road, Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	**WATER QUALITY METER**
MANUFACTURER	:	**DIGICON**
MODEL / TYPE	:	**WA-48SD**
SERIAL NO.	:	**T.075714/TF43846/T.075695/11-05[TNP.LAB.46]**
DATE OF CALIBRATION	:	**20 February 2026**

ENVIRONMENT CONDITIONS :

Temperature : (25 ± 2.5) °C **Relative Humidity :** (50 ± 15) % RH

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPCH-01** [pH Meter]. The calibration was performed by direct measurement with Certified Reference Material (CRM).

This instrument was calibrated under procedure No. **CLC-CPCH-02** [Conductivity Meter].

The calibration was performed by direct measurement with Certified Reference Material (CRM) and Reference Material (RM) .

This instrument [Sodium chloride] was calibrated by direct measurement with Sodium chloride

which maintained by the Calibration Laboratory Co., Ltd.

This instrument was calibrated under procedure No. **CLC-CPCH-06** [Oxygen Meter].

The calibration was performed by direct measurement with Certified Reference Material (CRM).

REFERENCE STANDARD USED :

1. pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Control Company Catalog Number 06664263,11784256, Lot Number CC818772.
3. Conductivity Standard , Hanna Product Code HI7033L Lot Number 0101.
4. Potassium Chloride Solution, Sigma-Aldrich Canada Co Product No. 1.01203.0500.
5. Potassium Chloride Solution, Sigma-Aldrich Canada Co Product No. 1.01254.0500.
6. Sodium chloride, Code 82089719 Lot Number 948692.
7. Dissolved Oxygen, Sigma-Alorich Product ID QC3077-500ML .

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).
Lot Number. 191025 , 241025. Due Date 24 December 2026.

2. The measurements are traceable to International System of Units (SI) , through Control Company.
Certificate No. 4288-15743843 , Due Date 27 February 2027.

3. The measurements are traceable to International System of Units (SI) , through Hanna instruments.
Certificate No. 07D45, Due Date April 2027.

4. The measurements are traceable to International System of Units (SI) , through Sigma-Aldrich Canada Co.
Lot Number. HC56384703, Due Date 31 January 2028.

5. The measurements are traceable to International System of Units (SI) , through Sigma-Aldrich Canada Co.
Lot Number. HC33528554, Due Date 30 November 2026.

6. The measurements are traceable to International System of Units (SI), through CPA chem Ltd.
Ref. No. PSNACLC.50G, Due Date 12 January 2027.

7. The measurements are traceable to International System of Units (SI) , through Merck Co., Ltd.
Lot LRAD8571 , Due Date April 2026.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

The table in the following gives the calibration results and associated measurement uncertainties of water quality meter.

CALIBRATION DATA

1. pH METER RESULT @ 25 °C

Standard pH Buffer Solution (pH)	pH Meter Reading (pH)	pH Meter Reading (mV)	Correction (pH)	Uncertainty of pH Measurement (± pH)	*k* Factor
4.012	4.01	170	+0.002	0.010	2,00
6.997	7.00	-8	-0.003	0.015	2,06
9.994	9.99	-170	+0.004	0.016	2,00

Technical Note. Setting function CAL 3 point (4,7,10).

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 018 Page 4 of 73

2. CONDUCTIVITY SOLUTION TEST @ 25 °C

Standard Conductivity Solution	DUC Reading	Uncertainty of Measurement	*k* Factor
*84 µS/cm	84.5 µS/cm	± 1.2 µS/cm	2,00
1.414 mS/cm	1.413 mS/cm	± 0.021 mS/cm	2,00
12.83 mS/cm	12.82 mS/cm	± 0.19 mS/cm	2,00

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 018 Page 4 of 73

* means Calibrations marked "Not ANAB Accredited" in this Certificate have been included for completeness.

*3. SODIUM CHLORIDE RESULT

STD Applied (%NaCl)	Nominal Value (Pcnt)	DUC Reading (Pcnt)	Correction (Pcnt)	Uncertainty ± (Pcnt)	Coverage factor *k*
5.00	5.00	4.97	+0.03	0.010	2,05

Note. * means Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

4. OXYGEN SOLUTION RESULT @ 25°C

Nominal Value (mg/L)	DUC Reading (mg/L)	Correction (mg/L)	Uncertainty (mg/L)	Coverage factor *k*
8.18	8.2	-0.02	± 0.38	2,00

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 018 Page 5 of 73

This report is valid for the above stated instrument/s only.

End of Certificate

national food institute
ministry of industry
อุตสาหกรรมพัฒนามูลนิธิเพื่อสถาบันอาหาร
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Certificate

Certificate No.: 2502859-003-01
Client name: TNP ENVIRONMENT CO., LTD.
Address: 332/173 Moo 3 Tambon Bang Rak Phatthana,
Amphone Bang Bua Thong, Nonthaburi 11110

Equipment: pH Meter
Manufacturer: EUTECH INSTRUMENTS
Model: pH 700
Serial No.: 3178920
ID No.: TNP.LAB.57
Order No.: 2502859
Operation No.: 2502859-003
Date of Receipt: 8 May 2025
Date of Calibration: 8 May 2025

Calibrated by Mr.Manas Somsak
Specialist

Approved by
(Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 13 May 2025

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร 10700
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อุตสาหกรรมพัฒนามูลนิธิเพื่อสถาบันอาหาร
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

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THAILAND
NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Report

Certificate No.: 2502859-003-01

Equipment: pH Meter — **Resolution:** 0.01 pH ; 0.1 mV

Manufacturer: EUTECH INSTRUMENTS — **Model:** pH 700

Serial No.: 3178920 — **Type:** Bench top

ID No.: TNP.LAB.57

Date of Calibration: 8 May 2025

Location: Laboratory 1, TNP ENVIRONMENT CO., LTD.

Environment Condition: **Ambient Temperature:** (23.4 ± 1.5) °C **Relative Humidity:** (55 ± 3) %

Condition of Equipment: Good Condition

Condition of this Results of Calibration

1.Calibration Method: W-CC-002 : In house method based on direct measurement by using standard voltage calibrator and certified reference material (CRM)

2. Reference Standards / Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fluke	24E1752	30 May 2025
2.2 Digital Thermometer	2709007	Fluke	2500376-002-01	29 October 2025
2.3 Thermo-Hygro Meter	NFI.BTH 013/23	testo	CC 670420-01	21 May 2025
Certified Reference Material	**Lot. No.**	**Manufacturer**	**Ref N**	**Expire Date**
2.4 pH buffer 4.008 (Primary pH buffer Solution)	1016435	CPAchem	PH216.L5	25 July 2026
2.5 pH buffer 6.865 (Primary pH buffer Solution)	949186	CPAchem	PH217.L5	30 November 2025
2.6 pH buffer 10.01 (Primary pH buffer Solution)	1016437	CPAchem	PH220.L5	25 July 2025
2.7 pH buffer 7.00 (Standard pH buffer Solution)	C03109	HACH LANGE GmbH	S11M004	16 October 2025

3. This certification is traceable to The International System of Unit (SI Unit)

3.1 Instruments No.2.1	through	NSC-TISI-TIS 17025 Laboratory Accredition of Calibration No.0008
3.2 Instruments No.2.2 to 2.3	through	NSC-TISI-TIS 17025 Laboratory Accredition of Calibration No.0061
3.3 Certified Reference Material No.2.4 to 2.6	traceable to	Primary measurement method- Harned cell using calibrated thermometer, barometer, and nanovoltmeter.The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
3.4 Certified Reference Material No.2.7	traceable to	PTB Certificate Nr. PTB-PHOA-563/30504/23 and Certificate Nr. PTB-PHOB-555/30620/22 (PTB: Physikalish-Thechnische Bundesanstalt, Braunschweig, Germany)

4. This certificate was certified only for the instrument we calibrated.

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

2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร 10700
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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

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THAILAND
NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Report

Certificate No.: 2502859-003-01

Equipment: pH Meter — **Resolution:** 0.01 pH ; 0.1 mV

Manufacturer: EUTECH INSTRUMENTS — **Model:** pH 700

Serial No.: 3178920 — **Type:** Bench top

ID No.: TNP.LAB.57

Date of Calibration: 8 May 2025

Calibration Results:

1. Calibration of pH Meter (Manual Temperature Compensation at 25 °C)

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (±mV)	Coverage Factor (*k*)
		mV	pH		
0	414.122	414	0.00	0.58	2.00
2	295.815	296	2.00	0.58	2.00
4	177.463	177.6	4.00	0.063	2.00
6	59.160	59.3	6.00	0.063	2.00
7	0.001	0.2	7.00	0.063	2.00
8	-59.159	-59.0	8.00	0.063	2.00
10	-177.462	-177.3	10.00	0.063	2.00
12	-295.813	-296	12.00	0.58	2.00
14	-414.121	-414	14.00	0.58	2.00

2. Calibration of pH Meter with Electrode (Manual Temperature Compensation at 25 °C)

Equipment: pH Electrode — **Type:** Combined Electrode

Manufacturer: EUTECH INSTRUMENTS — **Model:** 93X218814

Serial No.: 3231404 (ECFG7350401B) — **ID.No.** N/A

Performance of Electrode system (Three-Point Calibration at pH 4, 7 and 10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (*k*)
	pH	mV			
4.008	4.01	176.2	-	0.0071	2.00
7.001	7.00	0.0	99.6	0.0086	2.00
10.010	10.01	-172.4	96.8	0.0086	2.00
6.876	6.88	8.0	-	0.0074	2.00

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

---------- End ----------

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Food Industrial Laboratory Service Center

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THAILAND
NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Certificate

Certificate No.: 2502859-004-01
Client name: TNP ENVIRONMENT CO., LTD.
Address: 332/173 Moo 3 Tambon Bang Rak Phatthana,
Amphone Bang Bua Thong, Nonthaburi 11110

Equipment: Water Bath
Manufacturer: MEMMERT
Model: WTB24
Serial No.: LD23.0297
ID No.: TNP.LAB.58
Order No.: 2502859
Operation No.: 2502859-004
Date of Receipt: 8 May 2025
Date of Calibration: 8 May 2025

Calibrated by Mr.Worapob Sookthong
Scientist

Approved by
(Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 13 May 2025

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

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NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Report

Certificate No.: 2502859-004-01

Equipment: Water Bath

Model: WTB24 Serial No.: LD23.0297

Resolution: 0.1 °C ID No.: TNP.LAB.58

Manufacturer: MEMMERT

Date of Calibration: 8 May 2025

Location: Floor 3, Laboratory, TNP ENVIRONMENT CO., LTD.

Environment Condition:

Ambient Temperature (23 ± 1) °C

Relative Humidity (40 ± 2) %

Line Voltage (230 ± 1) Volt

Condition of this results of Calibration:

1. This instrument was calibrated by insert 5 standard thermometer into its liquid bath and calibration according to W-TE-011 based on ASTM E715-80 (Re-approved-2016): Standard Specification for Gravity-Convection and Forced-Circulation Water Baths.
   - The temperature scale used is ITS - 90.
   - All data show below were final values and the initial data may be obtained upon request.
2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016894	2502528-001-01	19-Apr-26	NATIONAL FOOD INSTITUTE
	RTD	RTD#201-205 / CH#201-205			

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibrated item : Good

   UUC Description:

   Time of Record 1 Hour 9 Minute At 44.5 °C
7. Result of Calibration :
   - [X] Without adjustment
   - [ ] After adjustment

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NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Report

Certificate No.: 2502859-004-01

Equipment: Water Bath

Model: WTB24 Serial No.: LD23.0297

Resolution: 0.1 °C ID No.: TNP.LAB.58

Manufacturer: MEMMERT

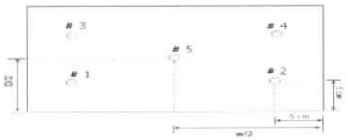
Date of Calibration: 8 May 2025

Calibration point: 44.5 °C

Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
Min	23.0	38.5	229.3
Max	23.5	41.6	231.4

TOP VIEW



SIDE VIEW



Table1 : Reporting of Temperature

Sensor Installation Location

Calibration Point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.5 is REF)					Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	
44.5	44.49	44.52	44.49	44.53	44.51	0.17

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
44.5	44.5	44.5	44.5	0.050	0.022	0.15

Note The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity)"

UUC* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

Uniformity = The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.

Overall Variation = The difference of the maximum and minimum measured temperatures througout observation time.

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

--------- **End** ---------

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THAILAND
NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Certificate

Certificate No.: 2502859-005-01
Client name: TNP ENVIRONMENT CO., LTD.
Address: 332/173 Moo 3 Tambon Bang Rak Phatthana,
Amphone Bang Bua Thong, Nonthaburi 11110

Equipment: CHAMBER (Incubator)
Manufacturer: BIOBASE
Model: BJPX-M100B
Serial No.: BJPXM1002301016
ID No.: TNP.LAB.59
Order No.: 2502859
Operation No.: 2502859-005
Date of Receipt: 8 May 2025
Date of Calibration: 8 May 2025

Calibrated by Mr.Worapob Sookthong
Scientist

Approved by
(Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 13 May 2025

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

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CALIBRATION 0061

Calibration Report

Certificate No.: 2502859-005-01

Equipment: CHAMBER (Incubator)

Model: BJPX-M100B Serial No.: BJPXM1002301016

Resolution: 0.1 °C ID No.: TNP.LAB.59

Manufacturer: BIOBASE

Date of Calibration: 8 May 2025

Location: Floor 3, Laboratory, TNP ENVIRONMENT CO., LTD.

Environment Condition:

Ambient Temperature (22.4 ± 1) °C

Relative Humidity (41 ± 1) %

Line Voltage (232 ± 2) Volt

Condition of this results of Calibration:

1. This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
   - The temperature scale used was based on ITS - 90.
   - All data show below were final values and the initial data may be obtained upon request.
2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016894	2502528-001-01	19 April 2026	NATIONAL FOOD INSTITUTE
	RTD	CH#101-109/ RTD#101-109			

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibrated item : Good

   UUC Description :

   Time of Record 1 Hour 9 Minute At 35.0, 37.0, 41.5 and 42.0 °C

   Fresh air Damper [-] Open Position [-]

   [X] Close Fan [100%]

   [-] Not Available
7. Result of Calibration : [X] Without adjustment [ ] After adjustment

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CALIBRATION 0061

Calibration Report

Certificate No.: 2502859-005-01

Equipment: CHAMBER (Incubator)

Model: BJPX-M100B Serial No.: BJPXM1002301016

Resolution: 0.1 °C ID No.: TNP.LAB.59

Manufacturer: BIOBASE

Date of Calibration: 8 May 2025

Calibration point: 35.0, 37.0, 41.5 and 42.0 °C

Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	21.8	40.3	230.5
MAX	22.7	42.5	233.9

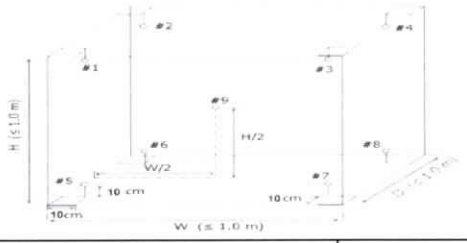


Table1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
35.0	36.49	35.70	34.90	35.13	36.07	35.87	35.35	35.35	35.04	0.56
37.0	38.61	37.85	36.83	37.08	38.15	37.90	37.39	37.38	36.96	0.60
41.5	42.98	42.31	41.31	41.49	42.76	42.42	41.83	41.79	41.40	0.62
42.0	43.74	42.85	41.66	42.02	43.26	42.94	42.35	42.33	41.91	0.65

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
35.0	35.0	35.0	35.0	0.31	1.45	2.08
37.0	37.0	37.0	37.0	0.33	1.65	2.41
41.2	41.2	41.2	41.2	0.36	1.58	2.34
41.7	41.7	41.7	41.7	0.36	1.83	2.64

Note The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

Uniformity = The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.

Overall Variation = The difference of the maximum and minimum measured temperatures througout observation time.

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

--------- End ---------

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NSC-TISI-TIS 17025
CALIBRATION 0260

CERTIFICATE OF CALIBRATION

Certificate No. : 25-0753-006

Issue Date : 16 June 2025

Work Order No. : 25/0753

Customer Name : TNP ENVIRONMENT CO.,LTD.
332/173 Moo 3 Bang Rak Phatthana,
Bang Bua Thong, Nonthaburi 11110

Date of Received : 12 June 2025

Date of Calibration : 16 June 2025

Instrument Details :

Description	:	Volumetric flask
Manufacturer	:	DARAN
Model	:	N/A
Serial No.	:	N/A
ID No.	:	TNP-LAB-G.39
Capacity	:	25 ml
Class	:	A
Location	:	Volumetric and Mass Calibration Laboratory, CCS

Calibration Method : This instrument was calibrated by Gravimetric methods for the determination of measurement error according to calibration procedure no. CWI-V-02 follow up to ASTM E542-01 (2012) Standard Practice for Calibration of Laboratory Volumetric Apparatus

Environmental Condition

Ambient Temperature	:	Control at 20 °C ± 2.5 °C
Relative humidity	:	Control at 50 %RH ± 10 %RH
Atmospheric pressure	:	Monitoring at 1013 hPa ± 8 hPa

Traceability of Measurement

: This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI)

Calibrated by : Miss Lalitphat Thiankaew
Calibration Engineer

Approved by :
(Mr. Thichakorn Srisupob)
Asst. Laboratory Manager

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NSC-TISI-TIS 17025
CALIBRATION 0260

CERTIFICATE OF CALIBRATION

Certificate No. : 25-0753-006

Issue Date : 16 June 2025

Work Order No. : 25/0753

Details of Calibration

1. Reference Standards Instrument

Instrument	ID No.	Certification	Due Date
1.1 Electronic Balance	BAL-11	25--0164-008	14 March 2026
1.2 Digital thermometer with sensor	RTD-10	25-0164-010	28 February 2026
1.3 Thermo-Hygrometer	TH-07	25-01644-016	28 February 2026
1.4 Barometer	BM-05	L202410225-0001	18 October 2025

2. Certificate traceable : This certificate traceable to The International System of Unit refer to
1.1 Crystal Calibration Sales and Service Co., Ltd.,NSC-ONSC Calibration No. 0260
1.2-1.3 Crystal Calibration Sales and Service Co., Ltd., NSC-ONSC Calibration No. 0260
1.4 Miracle international Technology Co., Ltd., NSC-ONSC Calibration No. 0052

3. Condition of item : Used

4. Calibration site : Permanent

Other detail of volumetric ware

Type of calibration : To Contain Designation of standard : N/A

Tolerance : ± 0.04 ml

Result of Calibration

Caibration result without adjustment

Norminal value (ml)	Mean Volume (ml)	Error (ml)	Standard deviation (ml)	Uncertainty (± ml)	Coverage factor (*k*)
25	25.00714	-0.00714	0.000065	0.0065	2.00

Note :

1. The result of repeat the test 10 measurements
2. The standard uncertainty of measurement has been determined in accordance with ISO/TR 20461:2000 and UKAS M3003
3. This report customer request and accepted in detail and data in certificate
4. Calibrate items it good condition and this report customer request and accepted in certificate

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

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

--END--

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Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com

Statements of conformity report

Refer to Certificate No. : 25-0753-006

Issue Date : 16 June 2025

Work Order No. : 25/0753

Detail of Equipment

Description : Volumetric flask

Manufacturer : DARAN

ID No. : TNP-LAB-G.39

Model : N/A

Capacity : 25 ml

Serial no. : N/A

Sub Deviation : 1 ml

Type of calibration : To Contain

Designation of standard : N/A

Tolerance : ± 0.04 ml

Result of Calibration

This result of calibration : Without adustment

Tolerance	0.0400	ml

Volumetric glassware class : A

Norminal volume	Mean volume	Absolute Volume Error	Uncertainty	Uncertainty + volume error	Evaluation
25	25.00714	0.0071	0.0065	0.014	Pass

The conformity certificate documents validaty following ISO/IEC Giude 98-4 : Role of measurement uncertainty in conformity assessment based on statement with guard band refer to specification tolerance limit mark on glassware consider expanded measurement uncertainty (k=95%)

The tolerance and decision rules ;

MPE of Glassware = Measurement uncertainty + Absolute error ; ≤ MPE is pass , > MPE is Fail

Statements of conformity decision by :

(Mr. Thichakorn Srisupob)

Asst. Laboratory Manager

-- END --

GC Clarus 590/690 Preventive Maintenance (PM)

Company Name:	**TNP ENVIRONMENT COMPANY LIMITED**		
Address (Instrument Location):	BANG BUA THONG, NONTHABURI, 36, 11110, TH		
Serial Number:	690S24092302	**Service Tag:**	2CAP1FID1ECD
Customer Name (if applicable):	Kittiphid Plongkeaw	**PM number:**	1 of 2
Service Engineer Name:	Phornpot Pongutta	**Service Order Number:**	WO-06904432
Date PM Performed: (DD-MMM-YYYY)	31-Oct-2025	**Next PM Due Date:** (DD-MMM-YYYY)	30-Apr-2026

Part Number	Release	Publication Date
TH09370090	2.2	Jan 2020

Scope

The purpose of this PM is to ensure the continued functionality of the Clarus 590 and Clarus 690 GC by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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PerkinElmer®

Component List

Component / Specific Model	Serial #	Software Version	Configuration Notes
GC Clarus 690	690S24092302	REV5.2.86	

Parts Lists

Additional Tools Required for PM				
Part Number (if applicable)	**Description**	**Quantity**	**Serial #**	**Calibration Due Date (MM/YY)**
Additional Reagents and Standards Required for PM				
Part Number (if applicable)	**Description**	**Quantity**	**Batch/Lot #**	**Expiration Date (MM/YY)**

PerkinElmer®

Procedure Checklist

Use (✔) to check off those steps in the checklist that have been completed.

1. General:

☑ Review the instrument performance with the customer and document any recent problems.

☑ Check incoming AC line voltage for proper levels and grounding.
L-N 230.1 Volt
L-G 230.4 Volt
N-G 0.3 Volt

**Neutral to ground not more than 0.5 volts peak to peak*

☑ Inspect all gas line filters and traps; Replace if necessary with customer supplied spares.
Carrier gas ☑ Helium ☐ Nitrogen ☐ Hydrogen
Moisture level ☑ Good ☐ Need to replace ☐ Other _____

Detector gas ☑ Air Zero ☑ Hydrogen ☐ Nitrogen ☐ Helium
Moisture level ☑ Good ☐ Need to replace ☐ Other _____

☑ Inspect the customer log book and make any appropriate PM entries.

☑ Leak check all fittings from the gas source to instrument.
Gas leakage ☑ Pass ☐ Fail Comment _____

☑ Perform general inspection of system for cleanliness.

☑ Inspect for functional and clean electronic cooling and oven vent fans
Electronic cooling fan ☑ Yes ☐ No
Oven cooling fan ☑ Yes ☐ No

2. Electronic :

☑ Check oven temperature. Calibrate if necessary.
Oven temperature set point 200 ^{0}C ☑ Pass ☐ Fail

☐ Check sub-ambient option. (If installed).
Oven temperature set point 5 ^{0}C ☐ Pass ☐ Fail

☑ Perform routine maintenance on detector/injector. Replace parts as necessary with customer supplied spares.

☑ Check flows, including split flows if applicable. Calibrate if necessary.
Carrier flow Pass
Split flow Pass

☑ Check detector gas flows and adjust if necessary.
Detector flow N/A

☑ Autosampler installed ☑ Yes ☐ No
Check autosampler sensor for wear and replace if necessary.
Vial sensor Pass
Door sensor Pass
Tower sensor Pass
Plunger sensor Pass
Elevator sensor Pass

☑ Remove syringe, manually flush. Replace with customer supplied spare if necessary.

☑ Check firmware version. Upgrade to current levels if necessary.
Firmware version REV5.2.86

☑ Measure all accessible power supply voltages.
5 Volt Pass
+15 Volt Pass
-15 Volt Pass
24 Volt Pass

☑ Record all detector voltage signal.
Detector Channel A 11.5 mV.
Detector Channel B 1.75 mV.

3. Diagnostics Tests:

☑ Run instrument diagnostics.
☑ BRAM Pass
☑ EPROM Pass

☑ Run Autosampler diagnostics.
☑ BRAM Pass
☑ EPROM Pass

4. Review:

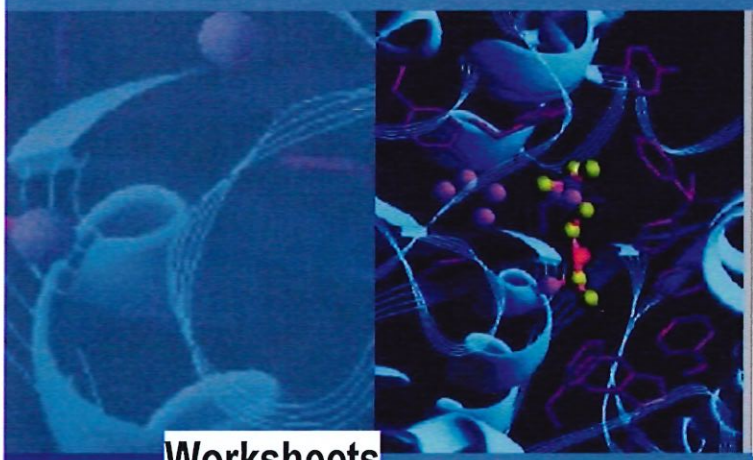
☑ Review with the customer PM work performed.
☑ Review with the customer routine maintenance procedures.
☑ Discuss recommended customer-supplied materials to have on hand
☑ Attach PM sticker.
☑ Update Logbook.

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for Clarus590/690 GC have been completed. ***This Clarus590/690 GC*** **Pass** ***the preventive maintenance.***	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative: Phornpot Pongutta	Date: 31-Oct-2025 (DD-MMM-YYYY)
Authorized Customer Representative:	Date: (DD-MMM-YYYY)



Worksheets

ICP OES
iCAP Pro Series

Installation Report

Thermo
SCIENTIFIC

Installation Report Worksheets

Section1: Engineer Information

Installation Number	2025050428
Engineer Name	Nantawat Wareewanich
Title	Service Engineer
Company	SciSpec Co., Ltd.
	10 Kanchanapisek Rd., Soi 0010 2nd Junction, Bangkae, Bangkok 10160
Signature	Nantawat W.
Date	13 May 2025

Section 2: Customer Information

Company Name	TNP Environment Company Limited
Customer Name	K. Kittiphid Plongkaew
Title	QC Section Manager
Street Address	332/173 Bang Rak Pattana,
Dept/Building/Floor/Room	Laboratory 2nd Floor
City, State, Zip	Bang Bua Thong, Nonthaburi 11110
Phone	087-2073020
Date of Installation	13 May 2025
Are the items on the Sales Order included with the system shipment?	☑ Yes ☐ No ☐ N/A

Section 3: Utility, Facility and Environment Requirements

Requirement	Specification	Meets Specification
Temperature Range	15 to 25°C	☑ Pass ☐ Not Pass
Humidity Range	20% to 80% Relative Humidity	☑ Pass ☐ Not Pass
Water chiller	Deionized water 6.7 liter. Temperature should be set to 5 °C below the ambient temperature and pressure setting 29 to 80 psi. On Service software adjustments water flow (with plasma off) 2.5 L/min Water Flow in l/m 2.48	☑ Pass ☐ Not Pass
Gas Supply	- Argon quality of 99.995 % ,Nitrogen quality of 99.998%. - Set the pressure for instrument Argon 5.5 - 6 bar nitrogen pressure 5.5 - 6 bar additional gas 2.5 bar.	☑ Pass ☐ Not Pass
Waste Storage	Waste will be produced that could be corrosive and toxic.	☑ Pass ☐ Not Pass
Spectrometer Fume Extraction	4.5 to 5.5 meters/second for a Radial system 5.5 to 10.5 meters/second for a Duo system On Service software adjustments extraction flow (exhaust pressure) and –1 to –1.2 mbar Exhaust Pressure in mBar -1.17	☑ Pass ☐ Not Pass
Power	Appropriate number of outlets available at appropriate instrument voltage requirements (See Pre-installation or operators manuals). - Spectrometer 230 (±10%) VAC 4KVA 50/60Hz. - Water chiller 220 VAC 3.5KVA 50Hz. - Autosampler 220 VAC 418VA 50Hz.	☑ Pass ☐ Not Pass
Bench Space	Approximately 2.0-2.5 meters of draft free, vibration free bench space.	☑ Pass ☐ Not Pass

Section 4: System Installation

Item	Status	Meets Specification
ICP OES Spectrometer Shipping box condition	Arrived undamaged	☑ Pass ☐ Not Pass
ICP OES Accessories Module box condition	Arrived undamaged	☑ Pass ☐ Not Pass
Check the packing list supplied with the equipment	Included	☑ Pass ☐ Not Pass
Pre-Installation Requirements	Complete	☑ Pass ☐ Not Pass
Preparation of Parts (see installation manual)	Complete	☑ Pass ☐ Not Pass
Water Chiller Connection	Complete	☑ Pass ☐ Not Pass
Gas Connections	Complete	☑ Pass ☐ Not Pass
Gas Leakage Tests	Complete	☑ Pass ☐ Not Pass
Autosampler Connection	Complete N/A	☑ Pass ☐ Not Pass
Fume Extraction Connection	Complete	☑ Pass ☐ Not Pass
Connecting the Sample Uptake Tube and Drain Tube	Complete	☑ Pass ☐ Not Pass
Earthing (Grounding)	Complete	☑ Pass ☐ Not Pass
Mains Voltage Setting	Complete	☑ Pass ☐ Not Pass
Mains Cable Connections	Complete	☑ Pass ☐ Not Pass
Installing Software	Complete	☑ Pass ☐ Not Pass
Spectrometer Status Indicators	Complete	☑ Pass ☐ Not Pass
System Interconnections	Complete	☑ Pass ☐ Not Pass
Assemble Sample Introduction System	Complete	☑ Pass ☐ Not Pass

Section 5 : ICP OES Spectrometer System Information

ICP OES Spectrometer iCAP PRO Series	
Model:	ICAP PRO X Duo
Module Serial No:	ICAPPRO14176
Gas	☑ Ar ☐ N_2
Voltage Setting:	L/N =..220..... V, L/G =..220..... V, N/G =..0.612... V
Connections:	☑ Lan ☐ USB ☐ RS232
Diagnostic Self Test:	☑ Pass ☐ Not Pass

Water Chiller	
Model:	Lab Tech Smart H150-1000
Module Serial No:	240314465 34
Pressure setting	Set point = ...62....PSI
Temperature setting	Set point = ...20....°C
Voltage Setting	L/N =...220..... V, L/G =...220..... V, N/G =...0.612... V
Diagnostic Self Test:	☑ Pass ☐ Not Pass

Autosampler	
Model:	
Module Serial No:	N/A
Connections:	☐ Lan ☐ USB ☐ RS232
Voltage Setting	L/N =..... V, L/G =..... V, N/G =..... V
Diagnostic Self Test:	☐ Pass ☐ Not Pass

Section 6 : UPS/Stabilizer

UPS/Stabilizer	
Model:	Cleanline T-10K
Module Serial No:	JTA2800239
Connections:	☐ Lan ☐ USB ☐ RS232
Voltage Setting	Input L/N = 232 V, L/G = 232 V, N/G = 0.612 V Output L/N = 220 V, L/G = 220 V, N/G = 0.612 V
Diagnostic Self Test:	☑ Pass ☐ Not Pass

UPS/Stabilizer	
Model:	
Module Serial No:	
Connections:	☐ Lan ☐ USB ☐ RS232 N/A
Voltage Setting	Input L/N = ... V, L/G = ... V, N/G = ... V Output L/N = ... V, L/G = ... V, N/G = ... V
Diagnostic Self Test:	☐ Pass ☐ Not Pass

Section 7 : Other Device

Orther Device	
Model:	
Module Serial No:	N/A
Connections:	☐ Lan ☐ USB ☐ RS232
Voltage Setting	L/N =..... V, L/G =..... V, N/G =..... V
Diagnostic Self Test:	☐ Pass ☐ Not Pass

Orther Device	
Model:	
Module Serial No:	N/A
Connections:	☐ Lan ☐ USB ☐ RS232
Voltage Setting	L/N =..... V, L/G =..... V, N/G =..... V
Diagnostic Self Test:	☐ Pass ☐ Not Pass

Section 8 : Data Work Station System Information

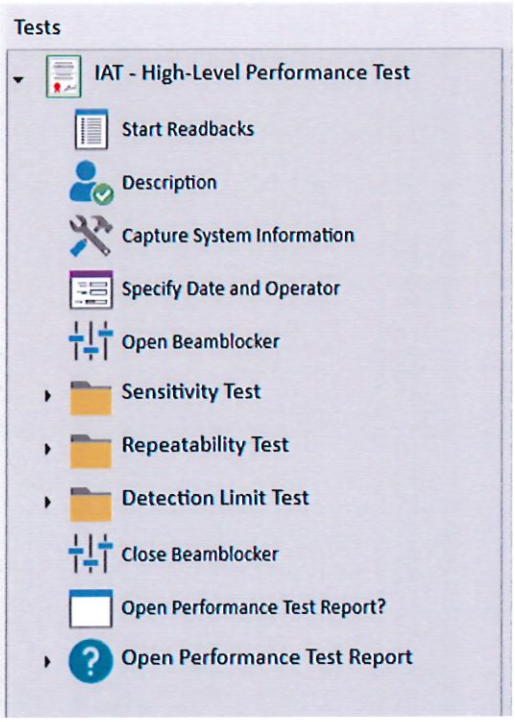
Computer System		
Computer:	Manufacturer/Supplier	Dell OptiPlex XE 4
	System Model	Windows 10 ENT LTSC 2019
	Serial Number	JN80DX3
Monitor:	Manufacturer/Supplier	Dell
	System Model	U2422H
	Serial Number	4QTQQS3
Printer:	Manufacturer/Supplier	Brother
	System Model	DCP-1610W
	Serial Number	E7 426M4L293979
User Network Interface:	Network Interface Card	Network Adapter Name: TNP office 2.4G IP Address: 192.168.1.37
Instrument Interface:	Instrument Interface Card	Network Adapter Name: ICAPPRO IP Address: 192.168.1.100

Section 9 : Performance Check

Test Set High-Level Performance Check

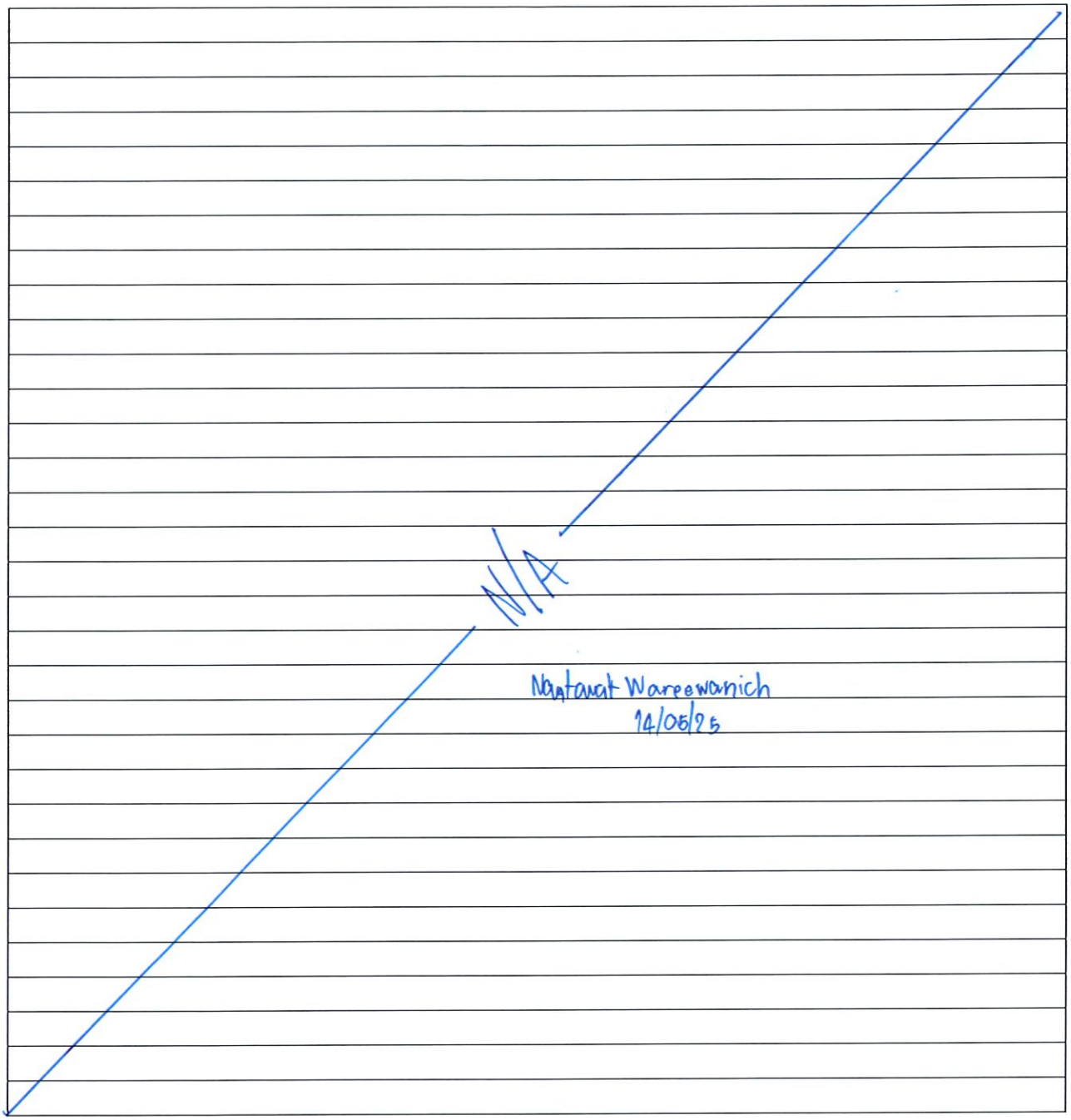
Run **Service Software** > **Test Sets** > **IAT - High-Level Performance Check**.

Follow the user instructions on screen. During the workflow of the Test Set, the instrument model will be detected automatically to decide about the required views and slit modes for the tests. All three-test level (Sensitivity, Repeatability, Detection Limit) must be fulfilled successfully. PASS for all lines, views, and slits:



High-Level Performance Check	Status
Sensitivity Test (on Multi Element Test Solution)	☑ Pass ☐ Not Pass
Repeatability Test (on 20 repeats on Multi Element Test Solution)	☑ Pass ☐ Not Pass
Detection Limit Test (on 20 repeats on Loaded Blank Solution)	☑ Pass ☐ Not Pass

Section 10 : Installation Comments



Section 11 : Installation Report Completion

Required Documents

The following documents must be part of the Installation submitted for customer review:

- This document with the completed Installation Worksheets.
- Copy of reports/logs/attachments printed during Installation.

Customer Review

- The Installation results should be reviewed by the Customer. If the qualification is accepted, both the Customer and the Engineer should sign the Installation Results, below.
- The Installation documentation becomes the property of the Customer

Based upon the actual results obtained, this installation:	☑ Passed	☐ Failed

Engineer

I have completed all aspects of the installation qualification and have concluded that the system has been successfully verified to be installed as required.

Printed Name	Signature	Date
Nantawat Wareewanich	Nantawat W.	14 May 2025

Customer

I agree that all aspects of the installation have been completed and that the system has been successfully verified to be installed as required.

Printed Name	Signature	Date
[illegible]	[illegible]	14/5/68

Performance Tests

5/14/2025 10:15:13 AM

Test Set	IAT - High-Level Performance Test
Started at	5/14/2025 9:45:11 AM
Finished at	5/14/2025 10:14:55 AM

Instrument Serial Number	iCAPPRO14176
Qtegra Version	2.22.6087.102
Instrument Serial Number	iCAPPRO14176
Qtegra Version	2.22.6087.102

Tune Set	Aqueous-Radial-iFR
Tune Set	Aqueous-Axial-iFR
Tune Set	Aqueous-Axial-iFR
Tune Set	Aqueous-Radial-iFR

Sensitivity Test	Passed
Sensitivity Test	Passed

Repeatability Test	Passed
Repeatability Test	Passed

Detection Limit Test	Passed
Detection Limit Test	Passed

Sensitivity Test Results

Analyte	Limit	Measured value	Test Result	Active Tune Set
Al 167.079		17 cps	NoLimitDefinedForLine	Aqueous-Radial-iFR
Al 396.152	180 cps	502 cps	Passed	Aqueous-Radial-iFR
Ba 455.403	1890 cps	6,045 cps	Passed	Aqueous-Radial-iFR
Cu 324.754	180 cps	845 cps	Passed	Aqueous-Radial-iFR
K 766.490	540 cps	1,140 cps	Passed	Aqueous-Radial-iFR
Mg 279.553	3600 cps	8,589 cps	Passed	Aqueous-Radial-iFR
Mn 257.610	2250 cps	6,055 cps	Passed	Aqueous-Radial-iFR
Ni 221.647	808 cps	1,921 cps	Passed	Aqueous-Radial-iFR
P 177.495		94 cps	NoLimitDefinedForLine	Aqueous-Radial-iFR
P 185.942		93 cps	NoLimitDefinedForLine	Aqueous-Radial-iFR
Zn 213.856		171 cps	NoLimitDefinedForLine	Aqueous-Radial-iFR
Al 167.079		378 cps	NoLimitDefinedForLine	Aqueous-Axial-iFR
Al 396.152	3600 cps	9,480 cps	Passed	Aqueous-Axial-iFR
Ba 455.403	20700 cps	68,163 cps	Passed	Aqueous-Axial-iFR
Cu 324.754	2250 cps	8,947 cps	Passed	Aqueous-Axial-iFR
K 766.490	55800 cps	121,720 cps	Passed	Aqueous-Axial-iFR
Mg 279.553	27000 cps	79,334 cps	Passed	Aqueous-Axial-iFR
Mn 257.610	27000 cps	58,769 cps	Passed	Aqueous-Axial-iFR
Ni 221.647	8000 cps	20,633 cps	Passed	Aqueous-Axial-iFR
P 177.495		937 cps	NoLimitDefinedForLine	Aqueous-Axial-iFR
P 185.942		774 cps	NoLimitDefinedForLine	Aqueous-Axial-iFR
Zn 213.856		1,511 cps	NoLimitDefinedForLine	Aqueous-Axial-iFR

Repeatability Test Results

Analyte	Limit	Measured value	Test Result	Active Tune Set
Al 167.079		1.75 %	NoLimitDefinedForLine	Aqueous-Axial-iFR
Al 396.152	2 %	0.38 %	Passed	Aqueous-Axial-iFR
Ba 455.403	2 %	0.33 %	Passed	Aqueous-Axial-iFR
Cu 324.754	2 %	0.36 %	Passed	Aqueous-Axial-iFR
K 766.490		0.32 %	NoLimitDefinedForLine	Aqueous-Axial-iFR
Mg 279.553	2 %	0.35 %	Passed	Aqueous-Axial-iFR
Mn 257.610	2 %	0.47 %	Passed	Aqueous-Axial-iFR
Ni 221.647	2 %	0.67 %	Passed	Aqueous-Axial-iFR
P 177.495		1.04 %	NoLimitDefinedForLine	Aqueous-Axial-iFR
P 185.942		0.39 %	NoLimitDefinedForLine	Aqueous-Axial-iFR
Zn 213.856		0.72 %	NoLimitDefinedForLine	Aqueous-Axial-iFR
Al 167.079		2.20 %	NoLimitDefinedForLine	Aqueous-Radial-iFR
Al 396.152	2 %	0.43 %	Passed	Aqueous-Radial-iFR
Ba 455.403	2 %	0.58 %	Passed	Aqueous-Radial-iFR
Cu 324.754	2 %	0.43 %	Passed	Aqueous-Radial-iFR
K 766.490		0.29 %	NoLimitDefinedForLine	Aqueous-Radial-iFR
Mg 279.553	2 %	0.31 %	Passed	Aqueous-Radial-iFR
Mn 257.610	2 %	0.29 %	Passed	Aqueous-Radial-iFR
Ni 221.647	2 %	0.40 %	Passed	Aqueous-Radial-iFR
P 177.495		1.03 %	NoLimitDefinedForLine	Aqueous-Radial-iFR
P 185.942		0.45 %	NoLimitDefinedForLine	Aqueous-Radial-iFR
Zn 213.856		0.56 %	NoLimitDefinedForLine	Aqueous-Radial-iFR

Detection Limit Test Results

Analyte	Limit	Measured value	Test Result	Active Tune Set
Al 167.079		1.125µg/L	NoLimitDefinedForLine	Aqueous-Axial-iFR
Al 396.152	1.87 µg/L	0.680µg/L	Passed	Aqueous-Axial-iFR
Ba 455.403	0.083 µg/L	0.023µg/L	Passed	Aqueous-Axial-iFR
Cu 324.754	0.858 µg/L	0.418µg/L	Passed	Aqueous-Axial-iFR
K 766.490		1.869µg/L	NoLimitDefinedForLine	Aqueous-Axial-iFR
Mg 279.553	0.0418 µg/L	0.038µg/L	Passed	Aqueous-Axial-iFR
Mn 257.610	0.154 µg/L	0.037µg/L	Passed	Aqueous-Axial-iFR
Ni 221.647	0.8 µg/L	0.383µg/L	Passed	Aqueous-Axial-iFR
P 177.495		6.085µg/L	NoLimitDefinedForLine	Aqueous-Axial-iFR
P 185.942		10.414µg/L	NoLimitDefinedForLine	Aqueous-Axial-iFR
Zn 213.856		19.667µg/L	NoLimitDefinedForLine	Aqueous-Axial-iFR
Al 167.079		19.894µg/L	NoLimitDefinedForLine	Aqueous-Radial-iFR
Al 396.152	14.3 µg/L	5.056µg/L	Passed	Aqueous-Radial-iFR
Ba 455.403	0.297 µg/L	0.086µg/L	Passed	Aqueous-Radial-iFR
Cu 324.754	3.74 µg/L	1.903µg/L	Passed	Aqueous-Radial-iFR
K 766.490	71.5 µg/L	20.535µg/L	Passed	Aqueous-Radial-iFR
Mg 279.553	0.0781 µg/L	0.028µg/L	Passed	Aqueous-Radial-iFR
Mn 257.610	0.352 µg/L	0.193µg/L	Passed	Aqueous-Radial-iFR
Ni 221.647	2.7 µg/L	1.386µg/L	Passed	Aqueous-Radial-iFR
P 177.495		36.227µg/L	NoLimitDefinedForLine	Aqueous-Radial-iFR
P 185.942		49.437µg/L	NoLimitDefinedForLine	Aqueous-Radial-iFR
Zn 213.856		19.923µg/L	NoLimitDefinedForLine	Aqueous-Radial-iFR


QTEGRA

Thermo Fisher Scientific
Chromatography and Mass Spectrometry
Hanna-Kunath-Strasse 11
28199 Bremen, Germany
Telephone: +49 (04 21) 54 93-0
Fax: +49 (04 21) 54 93-3 96

ThermoFisher SCIENTIFIC

Test Certificate

Thermo Fisher Scientific confirms that this optical emission spectrometer has been tested according to our factory specifications and passed all necessary and final performance checks successfully:

Thermo Fisher Scientific iCAP PRO Series

Instrument Model	Instrument Serial Number	Qtegra Version	Timestamp
XDuo	iCAPPRO14176	2.22.6087.102	5/14/2025 9:46:57 AM
XDuo	iCAPPRO14176	2.22.6087.102	5/14/2025 10:14:47 AM

Field Service Engineer	Nantawat
Date	14/05/2025

Nantawat W.

Signature (TFS representative)

Signature (Customer)

T71-6, No.211, Qin Qiao Road
Jing Qiao Export Processing Zone.
Pu Dong Shanghai China 201206
Tel +86(21) 5050 4588

ThermoFisher SCIENTIFIC

Test Certificate

Thermo Fisher Scientific confirms that this optical emission spectrometer has been produced in accordance with our ISO9001:2015 quality system documentation and passed all necessary and final tests successfully:

Thermo Scientific iCAP PRO Series

Instrument Serial Number
iCAPPRO14176

Qtegra Version
2.22.6087.102

Tester / Prüfer / 测试员
Wengjiajun
Date / Datum / 日期
01/24/2025

徐杰峰 01. 24. 2025

Signature

ThermoFisher
SCIENTIFIC

Catalog Number: 430122821401 **Lot No.** 63-263CR

Description: iCAP Series Multi-Element Test Solution

Matrix: 0.2% HNO_3

This solution is prepared from high purity single element concentrates of individual elements using Class A laboratory ware to give precise concentration.

Instrumental Analysis by ICP Spectrometer:

Analyte	Labeled	SRM	Analyte	Labeled	SRM
P	10 µg/mL	3139a*	Mn	1 µg/mL	3132*
K	5 µg/mL	3141a*	Ba	0.2 µg/mL	3104a*
Ni	5 µg/mL	3136*	Ca	0.2 µg/mL	3109a*
Al	1 µg/mL	3101a*	Mg	0.2 µg/mL	3131a*
Cu	1 µg/mL	3114*	Zn	0.2 µg/mL	3168a*

* - indicates NIST SRM † - indicates CRM (when NIST SRM is not available)

Reference Multi: Lot# 63-070CR, 63-176CR, 63-262CR

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others.
This CRM is guaranteed stable and accurate to ±0.5% on all the labeled concentrations at or above 1ppm. For concentrations below 1ppm, it is accurate to ±1%. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: NOV -- 2024 Certifying Officer: Brijender S Tonk

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 23.02.2023 Version number 1 Revision: 23.02.2023

SECTION 1: Identification of the substance/mixture and of the company/undertaking

· **1.1 Product identifier**

· **Product Name: iCAP Series Multi-Element Test Solution**

· **Part Number:** 430122821401
· **1.2 Relevant identified uses of the substance or mixture and uses advised against** No further relevant information available.
· **Application of the substance / the mixture** Certified Reference Material

· **1.3 Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Thermo Fisher Scientific
T71-6, No. 211, Qin Qiao Road
Pudong, Shanghai P.R., 201206
China

· **Further information obtainable from:** product safety department
· **1.4 Emergency telephone number:**
Emergency Phone Number (24 hours)
CHEMTREC (800-424-9300)
Outside US: 703-527-3887

SECTION 2: Hazards identification

· **2.1 Classification of the substance or mixture**
· **Classification according to Regulation (EC) No 1272/2008** The product is not classified, according to the CLP regulation.

· **2.2 Label elements**
· **Labelling according to Regulation (EC) No 1272/2008** Not Regulated
· **Hazard pictograms** Not Regulated
· **Signal word** Not Regulated
· **Hazard statements** Not Regulated
· **2.3 Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

SECTION 3: Composition/information on ingredients

· **3.2 Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:** Not Regulated

· **Chemical identification of the substance/preparation**		
CAS: 7732-18-5 EINECS: 231-791-2	water, distilled, conductivity or of similar purity	99.797%
CAS: 7697-37-2 EINECS: 231-714-2 Index number: 007-030-00-3	nitric acid Ox. Liq. 3, H272; Acute Tox. 3, H331; Skin Corr. 1A, H314, EUH071 ATE: LC50/4 h inhalative: 2.65 mg/l Specific concentration limits: Ox. Liq. 3; H272: C ≥65 % Skin Corr. 1A; H314: C ≥20 % Skin Corr. 1B; H314: 5 % ≤C < 20 %	0.2%
CAS: 7723-14-0 EINECS: 231-764-5	phosphorus	0.001%
CAS: 7440-02-0 EINECS: 231-111-4 Index number: 028-002-00-7	nickel Carc. 2, H351; STOT RE 1, H372; Skin Sens. 1, H317	0.0005%
CAS: 7440-09-7 EINECS: 231-818-8	potassium Ox. Sol. 2, H272	0.0005%
CAS: 7429-90-5 EINECS: 231-072-3 Index number: 013-001-00-6	aluminium Pyr. Sol. 1, H250; Water-react. 2, H261	0.0001%
CAS: 7439-95-4 EINECS: 231-104-6 Index number: 012-001-00-3	magnesium Pyr. Sol. 1, H250; Water-react. 1, H260	<0.0001%
CAS: 7439-96-5 EINECS: 231-105-1	manganese	0.0001%
CAS: 7440-39-3 EINECS: 208-167-3 Index number: 056-003-00-2	barium Acute Tox. 4, H302	<0.0001%

(Contd. on page 2)

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Product Name: iCAP Series Multi-Element Test Solution

(Contd. of page 2)

· **8.2 Exposure controls**
· **Appropriate engineering controls** No further data; see item 7.
· **Individual protection measures, such as personal protective equipment**
· **General protective and hygienic measures:** The usual precautionary measures are to be adhered to when handling chemicals.
· **Respiratory protection:** Not required.
· **Hand protection**
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation
· **Material of gloves**
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
· **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
· **Eye/face protection** Goggles recommended during refilling

SECTION 9: Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Physical state**	Liquid
· **Colour:**	According to product specification
· **Odour:**	Characteristic
· **Odour threshold:**	Not applicable.
· **Melting point/freezing point:**	Undetermined.
· **Boiling point or initial boiling point and boiling range**	100 °C (7732-18-5 water, distilled, conductivity or of similar purity)
· **Flammability**	Not applicable.
· **Lower and upper explosion limit**	
· **Lower:**	Not applicable.
· **Upper:**	Not applicable.
· **Flash point:**	Not applicable.
· **Decomposition temperature:**	Not applicable.
· **pH**	Not determined.
· **Viscosity:**	
· **Kinematic viscosity**	Not applicable.
· **Dynamic:**	Not applicable.
· **Solubility**	
· **water:**	Fully miscible.
· **Partition coefficient n-octanol/water (log value)**	Not applicable.
· **Vapour pressure at 20 °C:**	23 hPa (7732-18-5 water, distilled, conductivity or of similar purity)
· **Density and/or relative density**	
· **Density at 20 °C:**	1.00107 g/cm³
· **Relative density**	Not applicable.
· **Vapour density**	Not applicable.
· **9.2 Other information**	
· **Appearance:**	
· **Form:**	Liquid
· **Important information on protection of health and environment, and on safety.**	
· **Auto-ignition temperature:**	Product is not selfigniting.
· **Explosive properties:**	Product does not present an explosion hazard.
· **Solvent content:**	
· **Water:**	99.8 %
· **VOC (EC)**	0.00 %
· **Solids content:**	0.0 %
· **Change in condition**	
· **Evaporation rate**	Not applicable.
· **Information with regard to physical hazard classes**	
· **Explosives**	Not Regulated
· **Flammable gases**	Not Regulated
· **Aerosols**	Not Regulated
· **Oxidising gases**	Not Regulated
· **Gases under pressure**	Not Regulated
· **Flammable liquids**	Not Regulated
· **Flammable solids**	Not Regulated

(Contd. on page 4)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 23.02.2023 *Version number 1* *Revision: 23.02.2023*

Product Name: iCAP Series Multi-Element Test Solution

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SECTION 13: Disposal considerations

· **13.1 Waste treatment methods**
· **Recommendation** Smaller quantities can be disposed of with household waste.

· **Uncleaned packaging:**
· **Recommendation:** Disposal must be made according to official regulations.
· **Recommended cleansing agents:** Water, if necessary together with cleansing agents.

SECTION 14: Transport information

· **14.1 UN number or ID number**	
· **ADR, ADN, IMDG, IATA**	Not Regulated
· **14.2 UN proper shipping name**	
· **ADR, ADN, IMDG, IATA**	Not Regulated
· **14.3 Transport hazard class(es)**	
· **ADR, ADN, IMDG, IATA**	
· **Class**	Not Regulated
· **14.4 Packing group**	
· **ADR, IMDG, IATA**	Not Regulated
· **14.5 Environmental hazards:**	Not applicable.
· **14.6 Special precautions for user**	Not applicable.
· **14.7 Maritime transport in bulk according to IMO instruments**	Not applicable.
· **UN "Model Regulation":**	Not Regulated

SECTION 15: Regulatory information

· **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

· **Directive 2012/18/EU**
· **Named dangerous substances - ANNEX I** None of the ingredients is listed.

· **DIRECTIVE 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment – Annex II**

None of the ingredients is listed.

· **REGULATION (EU) 2019/1148**

· **Annex I - RESTRICTED EXPLOSIVES PRECURSORS (Upper limit value for the purpose of licensing under Article 5(3))**

None of the ingredients is listed.

· **Annex II - REPORTABLE EXPLOSIVES PRECURSORS**

None of the ingredients is listed.

· **Regulation (EC) No 273/2004 on drug precursors**

7723-14-0	phosphorus	2A

· **Regulation (EC) No 111/2005 laying down rules for the monitoring of trade between the Community and third countries in drug precursors**

7723-14-0	phosphorus	2

· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

SECTION 16: Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Relevant phrases**
H250 Catches fire spontaneously if exposed to air.
H260 In contact with water releases flammable gases which may ignite spontaneously.
H261 In contact with water releases flammable gases.
H272 May intensify fire; oxidiser.
H302 Harmful if swallowed.
H314 Causes severe skin burns and eye damage.
H315 Causes skin irritation.
H317 May cause an allergic skin reaction.
H318 Causes serious eye damage.
H331 Toxic if inhaled.

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Thermo Fisher
SCIENTIFIC

Catalog Number: 430122821411 **Lot No.** 47-76GS

Description: iCAP Series Set Up Solution (Loaded Blank)

Matrix: H_2O / Tr. HNO_3 / 0.01% CH_3OH

This solution is prepared from high purity single element concentrates of individual elements using Class A laboratory ware to give precise concentration.

Instrumental Analysis by ICP Spectrometer:

Analyte	Labeled	SRM
Zn	2 µg/mL	3168a*

* - indicates NIST SRM

† - indicates CRM (when NIST SRM is not available)

Reference Multi: Lot# 47-24GS

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others.
This CRM is guaranteed stable and accurate to ±0.5% on all the labeled concentrations at or above 1ppm. For concentrations below 1ppm, it is accurate to ±1%. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: SEPT -- 2024 Certifying Officer: Brijender S Tank

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SECTION 1: Identification of the substance/mixture and of the company/undertaking

· **1.1 Product identifier**

· **Product Name: iCAP Series Set Up Solution (Loaded Blank)**

· **Part Number:** 430122821411
· **1.2 Relevant identified uses of the substance or mixture and uses advised against** No further relevant information available.
· **Application of the substance / the mixture** Certified Reference Material

· **1.3 Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Thermo Fisher Scientific
T71-6, No. 211, Qin Qiao Road
Pudong, Shanghai P.R., 201206
China

· **Further information obtainable from:** product safety department
· **1.4 Emergency telephone number:**
Emergency Phone Number (24 hours)
CHEMTREC (800-424-9300)
Outside US: 703-527-3887

SECTION 2: Hazards identification

· **2.1 Classification of the substance or mixture**
· **Classification according to Regulation (EC) No 1272/2008** The product is not classified, according to the CLP regulation.

· **2.2 Label elements**
· **Labelling according to Regulation (EC) No 1272/2008** Not Regulated
· **Hazard pictograms** Not Regulated
· **Signal word** Not Regulated
· **Hazard statements** Not Regulated
· **2.3 Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

SECTION 3: Composition/information on ingredients

· **3.2 Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:** Not Regulated

· Chemical identification of the substance/preparation		
CAS: 7732-18-5 EINECS: 231-791-2	water, distilled, conductivity or of similar purity	99.09%
CAS: 7697-37-2 EINECS: 231-714-2 Index number: 007-030-00-3	nitric acid Ox. Liq. 3, H272; Acute Tox. 3, H331; Skin Corr. 1A, H314, EUH071 ATE: LC50/4 h inhalative: 2.65 mg/l Specific concentration limits: Ox. Liq. 3; H272: C ≥65 % Skin Corr. 1A; H314: C ≥20 % Skin Corr. 1B; H314: 5 % ≤C < 20 %	<0.9%
CAS: 67-56-1 EINECS: 200-659-6 Index number: 603-001-00-X	methanol Flam. Liq. 2, H225; Acute Tox. 3, H301; Acute Tox. 3, H311; Acute Tox. 3, H331; STOT SE 1, H370 Specific concentration limits: STOT SE 1; H370: C ≥10 % STOT SE 2; H371: 3 % ≤C < 10 %	0.01%
CAS: 7440-66-6 EINECS: 231-175-3 Index number: 030-002-00-7	zinc Aquatic Acute 1, H400; Aquatic Chronic 1, H410	0.0002%

· **Additional information:** For the wording of the listed hazard phrases refer to section 16.

SECTION 4: First aid measures

· **4.1 Description of first aid measures**
· **General information:** No special measures required.
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:** Generally the product does not irritate the skin.
· **After eye contact:** Rinse opened eye for several minutes under running water.
· **After swallowing:** Do not give anything to eat or drink - Do not induce vomitting
· **4.2 Most important symptoms and effects, both acute and delayed** No further relevant information available.

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Product Name: iCAP Series Set Up Solution (Loaded Blank)

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SECTION 9: Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Physical state**	Liquid
· **Colour:**	According to product specification
· **Odour:**	Characteristic
· **Odour threshold:**	Not applicable.
· **Melting point/freezing point:**	Undetermined.
· **Boiling point or initial boiling point and boiling range**	100 °C (7732-18-5 water, distilled, conductivity or of similar purity)
· **Flammability**	Not applicable.
· **Lower and upper explosion limit**	
· **Lower:**	Not applicable.
· **Upper:**	Not applicable.
· **Flash point:**	Not applicable.
· **Decomposition temperature:**	Not applicable.
· **pH**	Not determined.
· **Viscosity:**	
· **Kinematic viscosity**	Not applicable.
· **Dynamic:**	Not applicable.
· **Solubility**	
· **water:**	Fully miscible.
· **Partition coefficient n-octanol/water (log value)**	Not applicable.
· **Vapour pressure at 20 °C:**	23 hPa (7732-18-5 water, distilled, conductivity or of similar purity)
· **Density and/or relative density**	
· **Density at 20 °C:**	1.00452 g/cm³
· **Relative density**	Not applicable.
· **Vapour density**	Not applicable.

· **9.2 Other information**	
· **Appearance:**	
· **Form:**	Liquid
· **Important information on protection of health and environment, and on safety.**	
· **Auto-ignition temperature:**	Product is not selfigniting.
· **Explosive properties:**	Product does not present an explosion hazard.
· **Solvent content:**	
· **Organic solvents:**	0.0 %
· **Water:**	99.1 %
· **VOC (EC)**	0.01 %
· **Solids content:**	0.0 %
· **Change in condition**	
· **Evaporation rate**	Not applicable.

· **Information with regard to physical hazard classes**	
· **Explosives**	Not Regulated
· **Flammable gases**	Not Regulated
· **Aerosols**	Not Regulated
· **Oxidising gases**	Not Regulated
· **Gases under pressure**	Not Regulated
· **Flammable liquids**	Not Regulated
· **Flammable solids**	Not Regulated
· **Self-reactive substances and mixtures**	Not Regulated
· **Pyrophoric liquids**	Not Regulated
· **Pyrophoric solids**	Not Regulated
· **Self-heating substances and mixtures**	Not Regulated
· **Substances and mixtures, which emit flammable gases in contact with water**	Not Regulated
· **Oxidising liquids**	Not Regulated
· **Oxidising solids**	Not Regulated
· **Organic peroxides**	Not Regulated
· **Corrosive to metals**	Not Regulated
· **Desensitised explosives**	Not Regulated

SECTION 10: Stability and reactivity

· **10.1 Reactivity** No further relevant information available.
· **10.2 Chemical stability**
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.

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· **14.4 Packing group** · **ADR, IMDG, IATA**	Not Regulated
· **14.5 Environmental hazards:**	Not applicable.
· **14.6 Special precautions for user**	Not applicable.
· **14.7 Maritime transport in bulk according to IMO instruments**	Not applicable.
· **UN "Model Regulation":**	Not Regulated

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SECTION 16: Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Relevant phrases**
H225 Highly flammable liquid and vapour.
H272 May intensify fire; oxidiser.
H301 Toxic if swallowed.
H311 Toxic in contact with skin.
H314 Causes severe skin burns and eye damage.
H331 Toxic if inhaled.
H370 Causes damage to organs.
H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.
EUH071 Corrosive to the respiratory tract.

· **Department issuing SDS:** product safety department
· **Contact:**
Thermo Fisher Scientific
(86-21) 5050 4588
· **Date of previous version:** 13.02.2023
· **Abbreviations and acronyms:**
ADR: Accord relatif au transport international des marchandises dangereuses par route (European Agreement Concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
IATA: International Air Transport Association
GHS: Globally Harmonised System of Classification and Labelling of Chemicals
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative