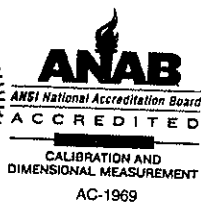




MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTABURI
NONTABURI 11120 THAILAND
66 2 583 9834



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD

245 M.4 T.NONGSAI

A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433506

Work Order #: THAI-32245347

MPC Control #: EA9575
Asset ID: GP.1
Gage Type: GRADUATED PIPETTE
Manufacturer: GLASSCO
Model Number: N/A
Size: 1 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 27, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 27, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name

ASTM E 542-01

Description

Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

Calibration Report of Glassco Graduated Pipette

MPC Control #: EA9575
Asset ID: GP.1

Serial Number: N/A
Calibration Date: October 27, 2022

Measurement Results

Nominal Value (μ l)	Lower Limit (μ l)	Mean Indicated Value of Instrument (μ l)		Upper Limit (μ l)	Result	Uncertainty (μ l)
		As Found	As Left			
100	93.00	100.75	100.75	107.00	PASS	± 0.033
500	493.00	501.95	501.95	507.00	PASS	± 0.086
1000	993.00	1003.65	1003.65	1007.00	PASS	± 0.17

Note: Accuracy ± 0.007 ml.

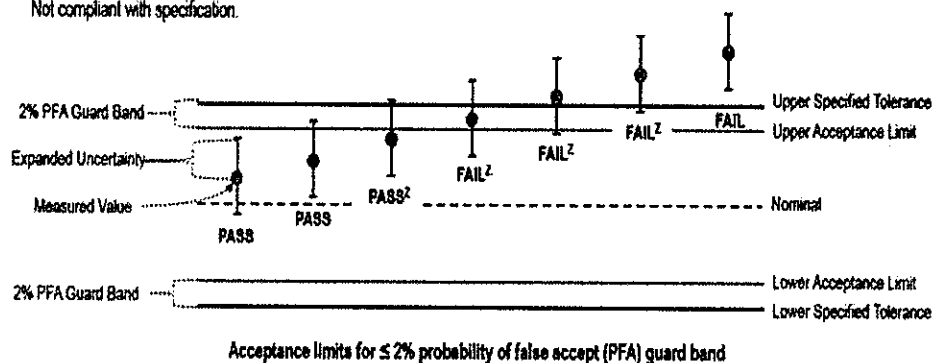
Statements of Pass or Fail Conformance

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

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

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

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



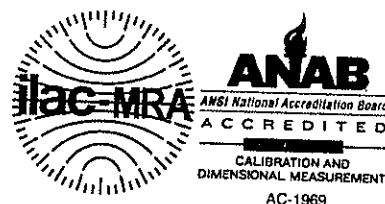
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTHABURI
NONTABURI 11120 THAILAND
66 2 683 9834



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD

245 M.4 T.NONGSAI

A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433511

Work Order #: THAI-32245347

MPC Control #: EA9576
Asset ID: GP.2
Gage Type: GRADUATED PIPETTE
Manufacturer: GLASSCO
Model Number: N/A
Size: 2 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 27, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 27, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name

ASTM E 542-01

Description

Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

Calibration Report of Glassco Graduated Pipette

MPC Control #: EA9576

Asset ID: GP.2

Serial Number: N/A

Calibration Date: October 27, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
0.2	0.1900	0.1999	0.1999	0.2100	PASS	± 0.000039
1.0	0.9900	1.0035	1.0035	1.0100	PASS	± 0.00017
2.0	1.9900	2.0062	2.0062	2.0100	PASS	± 0.00033

Note: Accuracy ± 0.010 ml.

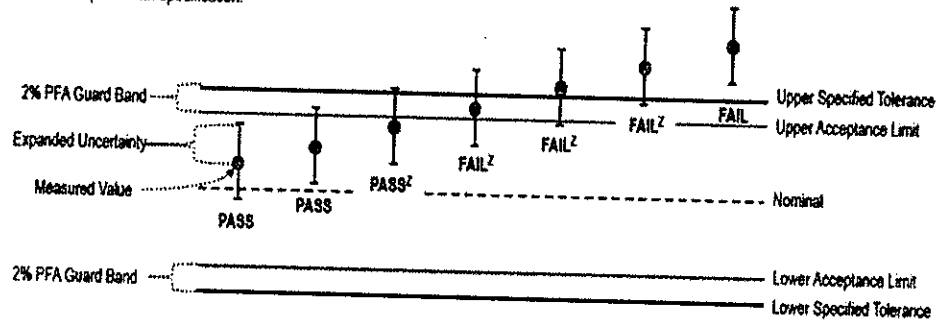
Statements of Pass or Fail Conformance

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

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

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

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



Acceptance limits for $\leq 2\%$ probability of false accept (PFA) guard band

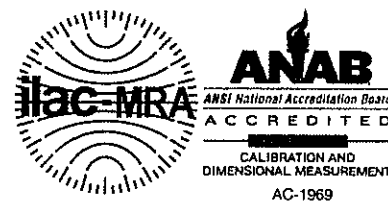
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD

245 M.4 T.NONGSAI

A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433526

MPC Control #: EA9577
Asset ID: GP.5
Gage Type: GRADUATED PIPETTE
Manufacturer: GLASSCO
Model Number: N/A
Size: 5 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Work Order #: THAI-32245347
Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 27, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 27, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AS2418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

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

Calibration Report of Glassco Graduated Pipette

MPC Control #:	<u>EA9577</u>	Serial Number:	<u>N/A</u>
Asset ID:	<u>GP.5</u>	Calibration Date:	<u>October 27, 2022</u>

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
0.5	0.4700	0.5015	0.5015	0.5300	PASS	± 0.00084
2.5	2.4700	2.5071	2.5071	2.5300	PASS	± 0.00041
5.0	4.9700	5.0145	5.0145	5.0300	PASS	± 0.00083

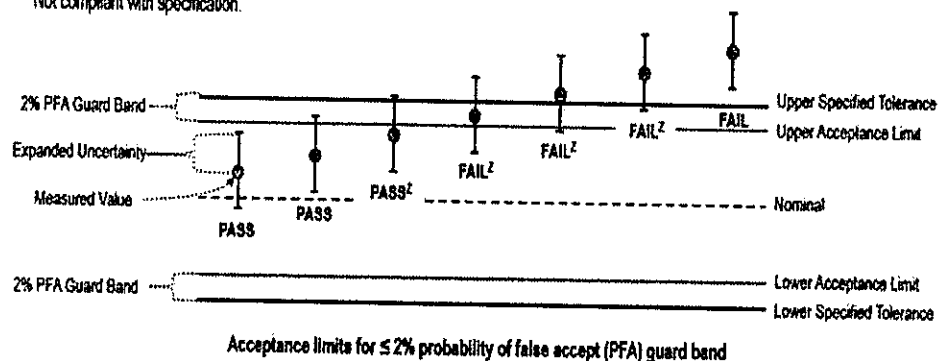
Note: Accuracy ± 0.030 ml.

Statements of Pass or Fail Conformance

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

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

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



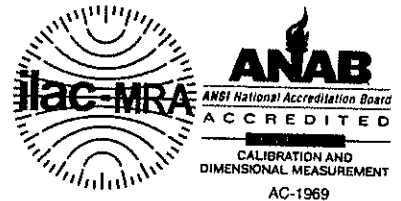
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD

245 M.4 T.NONGSAI

A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433545

Work Order #: THAI-32245347

MPC Control #: EA9579
Asset ID: GP.25
Gage Type: GRADUATED PIPETTE
Manufacturer: GLASSCO
Model Number: N/A
Size: 25 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 27, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 27, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name

ASTM E 542-01

Description

Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

Calibration Report of Glassco Graduated Pipette

MPC Control #:	EA9579	Serial Number:	N/A
Asset ID:	GP.25	Calibration Date:	October 27, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
1	0.900	1.004	1.004	1.100	PASS	± 0.0015
13	12.900	13.038	13.038	13.100	PASS	± 0.0017
25	24.900	25.072	25.072	25.100	PASS	± 0.0032

Note: Accuracy ± 0.10 ml

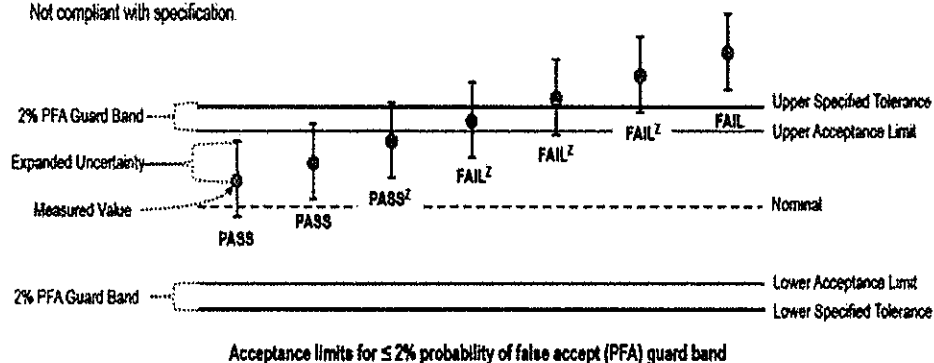
Statements of Pass or Fail Conformance

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

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

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

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



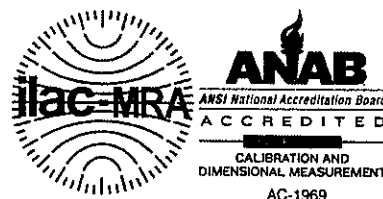
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTABURI
NONTABURI 11120 THAILAND
66 2 583 9634



Certificate of Calibration

Cert No. 551220085433434

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Work Order #: THAI-32245347

MPC Control #: EA9568
Asset ID: GC.10
Gage Type: GRADUATED CYLINDER
Manufacturer: GLASSCO
Model Number: N/A
Size: 10 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

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

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

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

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

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

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

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

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



Calibration Report of Glassco Graduated Cylinder

MPC Control #:	EA9568	Serial Number:	N/A
Asset ID:	GC.10	Calibration Date:	October 26, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
2	1.900	1.998	1.998	2.100	PASS	± 0.0015
4	3.900	4.005	4.005	4.100	PASS	± 0.0015
6	5.900	6.016	6.016	6.100	PASS	± 0.0015
8	7.900	8.025	8.025	8.100	PASS	± 0.0015
10	9.900	10.035	10.035	10.100	PASS	± 0.0015

Note: Accuracy ± 0.10 ml.

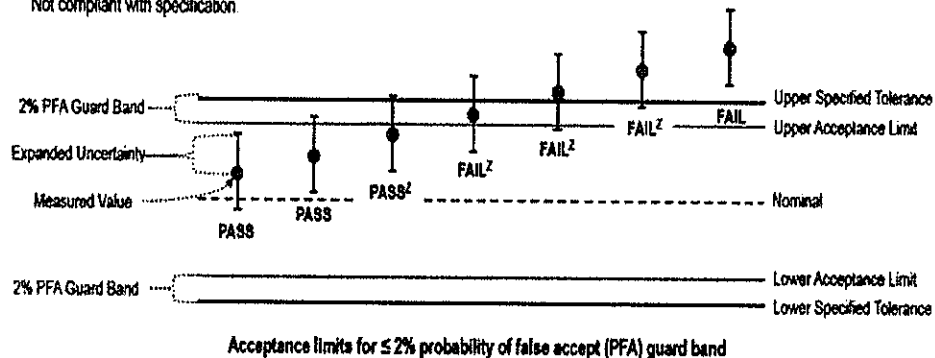
Statements of Pass or Fail Conformance

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

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

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

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



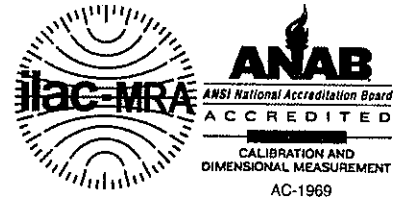
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD

245 M.4 T.NONGSAI

A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433443

Work Order #: THAI-32245347

MPC Control #: EA9569
Asset ID: GC.50
Gage Type: GRADUATED CYLINDER
Manufacturer: GLASSCO
Model Number: N/A
Size: 50 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

Calibration Report of Glassco Graduated Cylinder

MPC Control #: EA9569
Asset ID: GC.50

Serial Number: N/A
Calibration Date: October 26, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
10	9.500	10.022	10.022	10.500	PASS	± 0.0015
20	19.500	20.057	20.057	20.500	PASS	± 0.0028
30	29.500	30.089	30.089	30.500	PASS	± 0.0036
40	39.500	40.121	40.121	40.500	PASS	± 0.0048
50	49.500	50.152	50.152	50.500	PASS	± 0.0060

Note: Accuracy ± 0.50 ml.

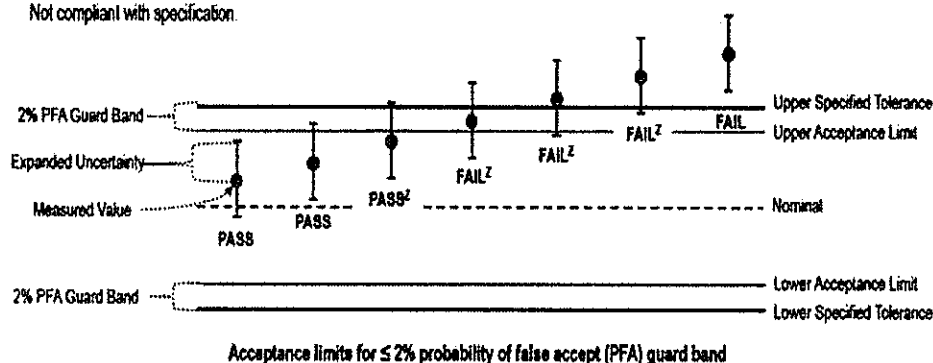
Statements of Pass or Fail Conformance

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

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

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

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



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

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

End of Calibration Report



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



Certificate of Calibration

Cert No. 551220085433457

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Work Order #: THAI-32245347

MPC Control #: EA9570
Asset ID: GC.100
Gage Type: GRADUATED CYLINDER
Manufacturer: GLASSCO
Model Number: N/A
Size: 100 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

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

Calibration Report of Glassco Graduated Cylinder

MPC Control #:	<u>EA9570</u>	Serial Number:	<u>N/A</u>
Asset ID:	<u>GC.100</u>	Calibration Date:	<u>October 26, 2022</u>

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
10	9.500	10.022	10.022	10.500	PASS	± 0.0015
30	29.000	30.088	30.088	31.000	PASS	± 0.0036
50	49.000	50.152	50.152	51.000	PASS	± 0.0060
70	69.000	70.211	70.211	71.000	PASS	± 0.0085
100	99.000	100.301	100.301	101.000	PASS	± 0.012

Note: Accuracy ± 1 ml.

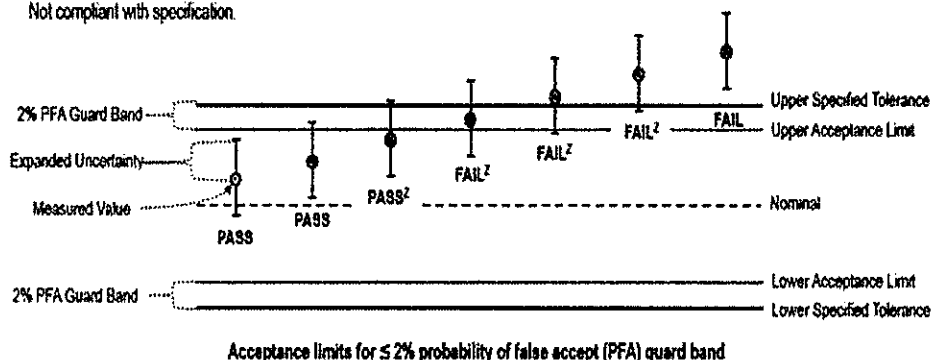
Statements of Pass or Fail Conformance

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

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

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

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



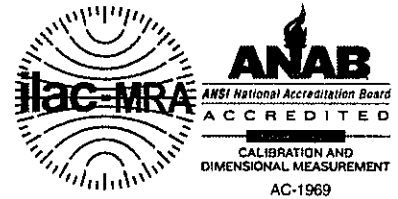
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTHABURI
NONTABURI 11120 THAILAND
66 2 683 9834



Certificate of Calibration

Date: Oct 27, 2022

Cert No. 551220085433598

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Work Order #: THAI-32245347

MPC Control #: EA9571
Asset ID: GC.250
Gage Type: GRADUATED CYLINDER
Manufacturer: SCHOTT DURAN
Model Number: N/A
Size: 250 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
CS7699	ELECTRONIC PRECISION BALANCE	LP 3200D	14805933	SARTORIUS	Feb 11, 2023	551220084823778 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

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

Calibration Report of Schott Duran Graduated Cylinder

MPC Control #:	EA9571	Serial Number:	N/A
Asset ID:	GC.250	Calibration Date:	October 26, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
30	29.000	30.080	30.080	31.000	PASS	± 0.0059
90	89.000	90.162	90.162	91.000	PASS	± 0.012
150	149.000	150.237	150.237	151.000	PASS	± 0.018
210	209.000	210.265	210.265	211.000	PASS	± 0.025
250	249.000	250.330	250.330	251.000	PASS	± 0.030

Note: Accuracy ± 1 ml.

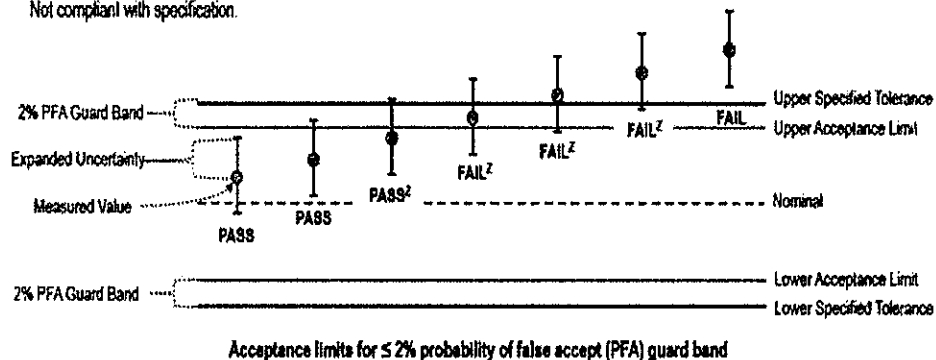
Statements of Pass or Fail Conformance

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

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

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

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



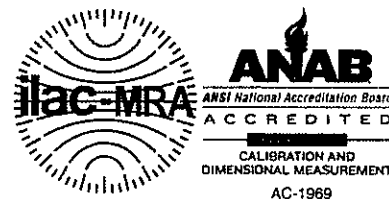
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433499

Work Order #:	THAI-32245347		
MPC Control #:	EA9573	Serial Number:	N/A
Asset ID:	GC.500	Department:	N/A
Gage Type:	GRADUATED CYLINDER	Performed By:	WATTANA TANGCHAROEN
Manufacturer:	GLASSCO	Received Condition:	IN TOLERANCE
Model Number:	N/A	Returned Condition:	IN TOLERANCE
Size:	500 ml	Cal. Date:	October 26, 2022
Temp/RH:	20.3°C / 60.0%	Cal. Interval:	12 MONTHS
Location:	Calibration performed at MPC facility	Cal. Due Date:	October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
CS7699	ELECTRONIC PRECISION BALANCE	LP 3200D	14805933	SARTORIUS	Feb 11, 2023	551220084823778 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

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

Calibration Report of Glassco Graduated Cylinder

MPC Control #:	EA9573	Serial Number:	N/A
Asset ID:	GC.500	Calibration Date:	October 26, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
50	47.500	50.135	50.135	52.500	PASS	± 0.0060
200	197.500	200.444	200.444	202.500	PASS	± 0.024
300	297.500	300.630	300.630	302.500	PASS	± 0.036
400	397.500	400.896	400.896	402.500	PASS	± 0.048
500	497.500	501.112	501.112	502.500	PASS	± 0.060

Note: Accuracy ± 2.5 ml.

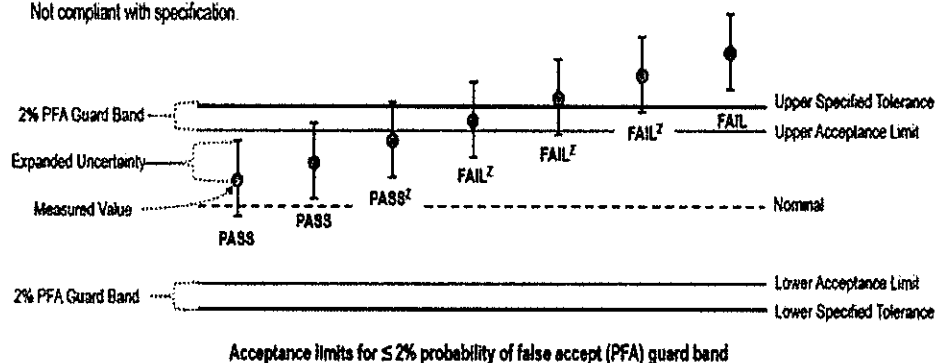
Statements of Pass or Fail Conformance

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

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

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

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



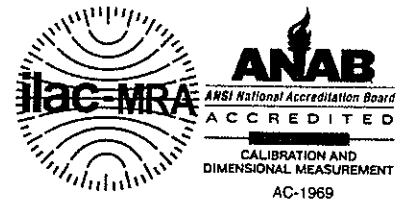
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433503

MPC Control #: EA9574
Asset ID: GC.1000
Gage Type: GRADUATED CYLINDER
Manufacturer: SCI
Model Number: N/A
Size: 1000 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Work Order #: THAI-32245347
Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
CS7699	ELECTRONIC PRECISION BALANCE	LP 3200D	14805933	SARTORIUS	Feb 11, 2023	551220084823778 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

Calibration Report of Sci Graduated Cylinder

MPC Control #: EA9574
Asset ID: GC.1000

Serial Number: N/A
Calibration Date: October 26, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
100	90.00	100.31	100.31	110.00	PASS	± 0.012
300	290.00	300.88	300.88	310.00	PASS	± 0.036
600	590.00	601.09	601.09	610.00	PASS	± 0.072
800	790.00	801.48	801.48	810.00	PASS	± 0.096
1000	990.00	1001.71	1001.71	1010.00	PASS	± 0.12

Note: Accuracy ± 10 ml.

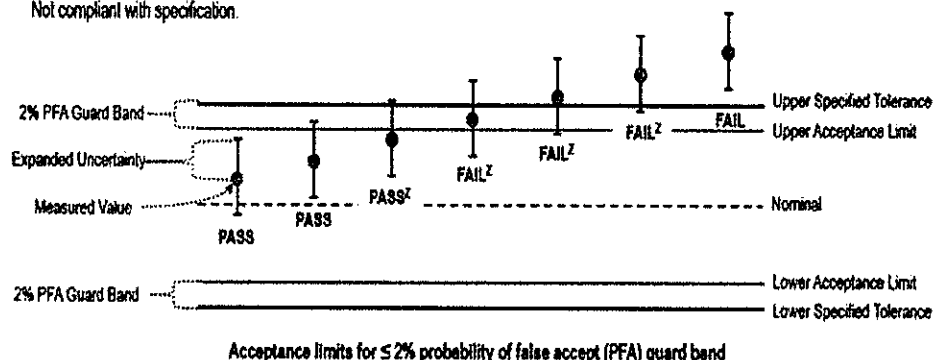
Statements of Pass or Fail Conformance

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

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

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

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



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

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Cert No. 551220085433612

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNHOT NAKHONRATCHASIMA 36220

Work Order #: THAI-32245347

MPC Control #: EA9578
Asset ID: VP.10
Gage Type: VOLUMETRIC PIPETTE
Manufacturer: GLASSCO
Model Number: N/A
Size: 10 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 27, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 27, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

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



Calibration Report of Glassco Volumetric Pipette

MPC Control #:	EA9578	Serial Number:	N/A
Asset ID:	VP.10	Calibration Date:	October 27, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
10	9.9800	9.9953	9.9953	10.0200	PASS	± 0.0015

Note: Accuracy ± 0.02 ml.

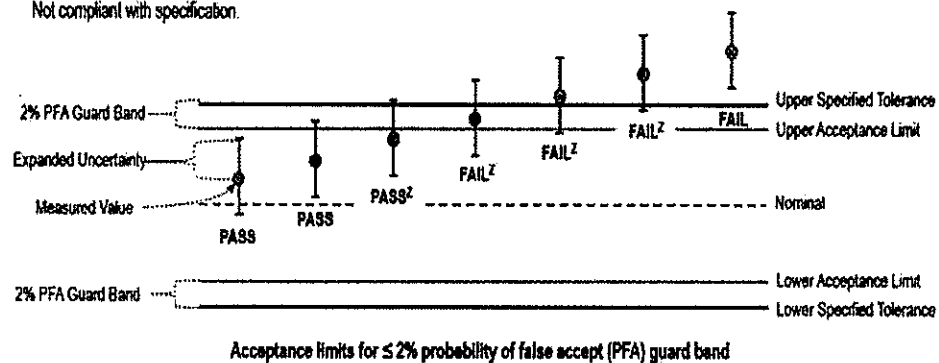
Statements of Pass or Fail Conformance

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

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

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

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



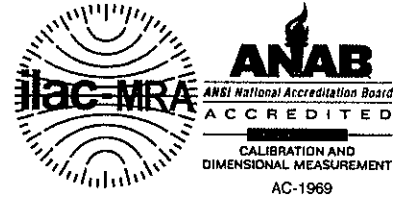
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Cert No. 551220085433348

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Work Order #: THAI-32245347

MPC Control #: EA9561
Asset ID: VF.10
Gage Type: VOLUMETRIC FLASK
Manufacturer: SCI
Model Number: N/A
Size: 10 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name

ASTM E 542-01

Description

Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCCL Z540.3-2008.

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

This calibration report complies with ISO/IEC 17025:2017, ANSI/NCCL Z540.3-2008 and ANSI/NCCL Z540.1-1994. Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. The information on this report pertains only to the instrument identified. This may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.

Calibration Report of Sci Volumetric Flask

MPC Control #:	EA9561	Serial Number:	N/A
Asset ID:	VF.10	Calibration Date:	October 26, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
10	9.9750	10.0238	10.0238	10.0250	PASS	± 0.0012

Note: Accuracy ± 0.025 ml.

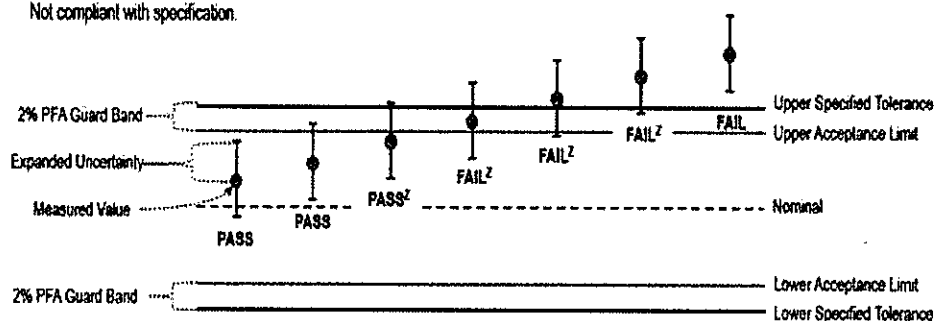
Statements of Pass or Fail Conformance

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

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

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

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



Acceptance limits for $\leq 2\%$ probability of false accept (PFA) guard band

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

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

End of Calibration Report



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTABURI
NONTABURI 11120 THAILAND
66 2 583 9634



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433358

MPC Control #: EA9562
Asset ID: VF.25
Gage Type: VOLUMETRIC FLASK
Manufacturer: SCHOTT DURAN
Model Number: N/A
Size: 25 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Work Order #: THAI-32245347
Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

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Calibration Report of Schott Duran Volumetric Flask

MPC Control #:	EA9562	Serial Number:	N/A
Asset ID:	VF.25	Calibration Date:	October 27, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
25	24.960	25.018	25.018	25.040	PASS	± 0.0029

Note: Accuracy ± 0.04 ml.

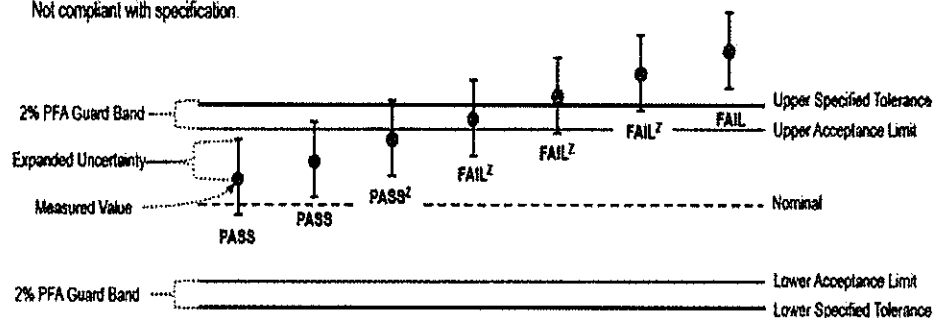
Statements of Pass or Fail Conformance

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

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

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

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



Acceptance limits for $\leq 2\%$ probability of false accept (PFA) guard band

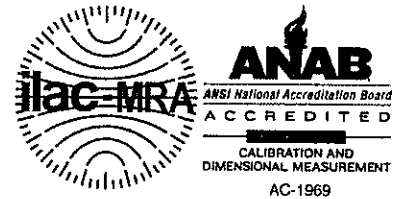
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD

245 M.4 T.NONGSAI

A.DANKHUNHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433370

MPC Control #: EA9563
Asset ID: VF.50
Gage Type: VOLUMETRIC FLASK
Manufacturer: SCHOTT DURAN
Model Number: N/A
Size: 50 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Work Order #: THAI-32245347
Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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Calibration Report of Schott Duran Volumetric Flask

MPC Control #:	EA9563	Serial Number:	N/A
Asset ID:	VF.50	Calibration Date:	October 26, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
50	49.940	49.989	49.989	50.060	PASS	± 0.0063

Note: Accuracy ± 0.06 ml.

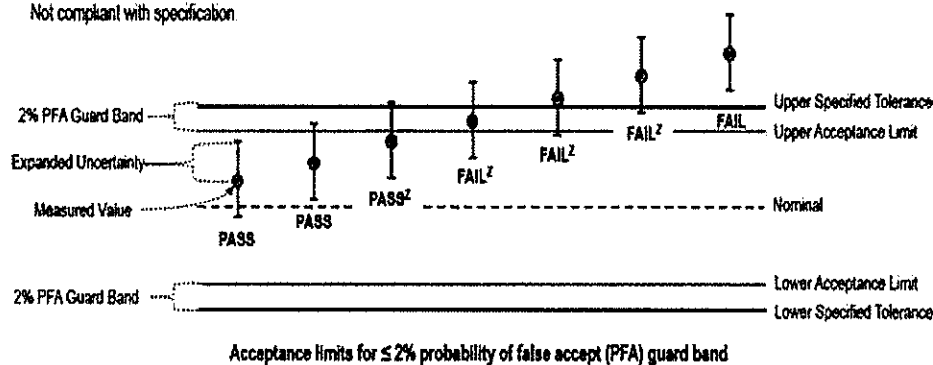
Statements of Pass or Fail Conformance

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

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

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

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



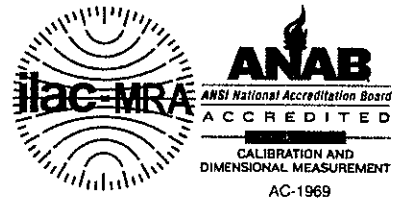
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433379

MPC Control #: EA9564
Asset ID: VF.100
Gage Type: VOLUMETRIC FLASK
Manufacturer: SCHOTT DURAN
Model Number: N/A
Size: 100 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Work Order #: THAI-32245347
Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCCL Z540.3-2008.

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

This calibration report complies with ISO/IEC 17025:2017, ANSI/NCCL Z540.3-2008 and ANSI/NCCL Z540.1-1994. Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. The information on this report pertains only to the instrument identified, this may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.



Calibration Report of Schott Duran Volumetric Flask

MPC Control #: EA9564	Serial Number: N/A
Asset ID: VF.100	Calibration Date: October 26, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
100	99.900	100.019	100.019	100.100	PASS	± 0.012

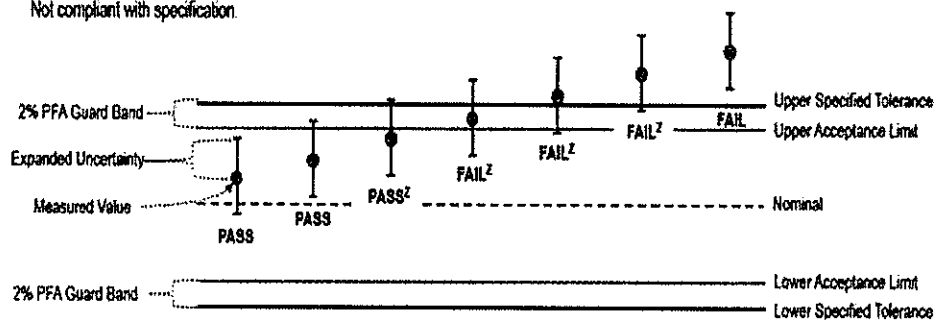
Note: Accuracy ± 0.1 ml.

Statements of Pass or Fail Conformance

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

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

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



Acceptance limits for ≤ 2% probability of false accept (PFA) guard band

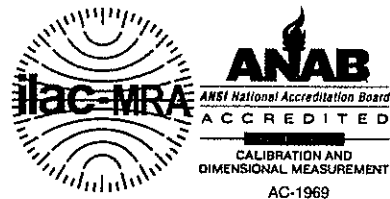
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433388

MPC Control #: EA9565
Asset ID: VF.250
Gage Type: VOLUMETRIC FLASK
Manufacturer: GLASSCO
Model Number: N/A
Size: 250 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Work Order #: THAI-32245347
Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
CS7699	ELECTRONIC PRECISION BALANCE	LP 3200D	14805933	SARTORIUS	Feb 11, 2023	551220084823778 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

FAIL¹- Term used when compliance statement is given, and the measurement result is conditional failed or FAIL¹.

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

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

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

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

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



Calibration Report of Glassco Volumetric Flask

MPC Control #:	EA9565	Serial Number:	N/A
Asset ID:	VF.250	Calibration Date:	October 26, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
250	249.850	250.018	250.018	250.150	PASS	± 0.029

Note: Accuracy ± 0.15 ml.

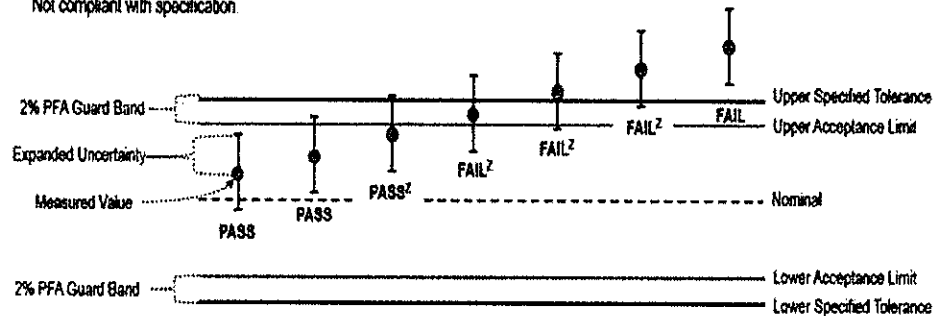
Statements of Pass or Fail Conformance

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

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

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

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



Acceptance limits for $\leq 2\%$ probability of false accept (PFA) guard band

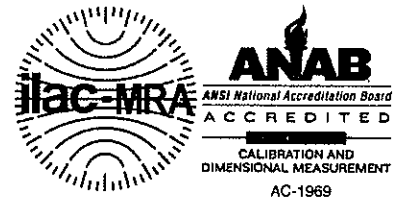
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD

245 M.4 T.NONGSAI

A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433402

Work Order #: THAI-32245347

MPC Control #: EA9566
Asset ID: VF.500
Gage Type: VOLUMETRIC FLASK
Manufacturer: GLASSCO
Model Number: N/A
Size: 500 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
CS7699	ELECTRONIC PRECISION BALANCE	LP 3200D	14805933	SARTORIUS	Feb 11, 2023	551220084823778 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name

Description

ASTM E 542-01

Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2009.

THE CALIBRATION REPORT STATUS:

PASS¹ - Term used when compliance statement is given, and the measurement result is PASS.

PASS² - Term used when compliance statement is given, and the measurement result is conditional passed or PASS¹.

FAIL¹ - Term used when compliance statement is given, and the measurement result is FAIL.

FAIL² - Term used when compliance statement is given, and the measurement result is conditional failed or FAIL¹.

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

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

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

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

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



Calibration Report of Glassco Volumetric Flask

MPC Control #: EA9566 Asset ID: VF.500	Serial Number: N/A Calibration Date: October 26, 2022
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Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
500	499.750	499.922	499.922	500.250	PASS	± 0.059

Note: Accuracy ± 0.25 ml.

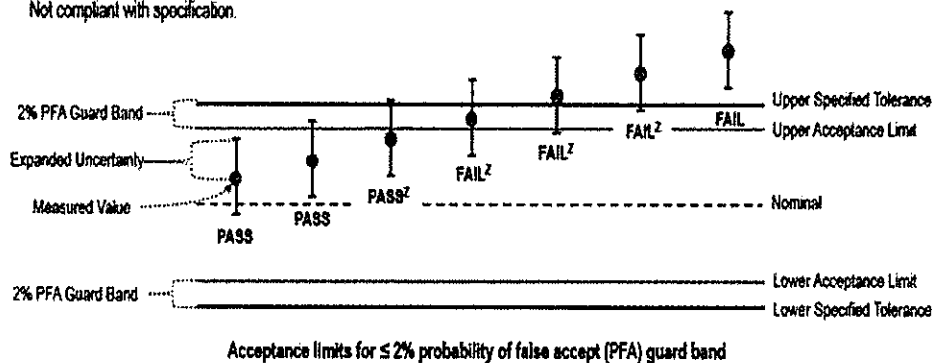
Statements of Pass or Fail Conformance

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

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

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

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



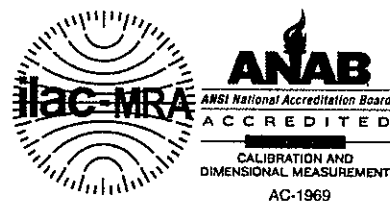
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433423

MPC Control #: EA9567
Asset ID: VF.1000
Gage Type: VOLUMETRIC FLASK
Manufacturer: GLASSCO
Model Number: N/A
Size: 1000 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Work Order #: THAI-32245347
Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
CS7699	ELECTRONIC PRECISION BALANCE	LP 3200D	14805933	SARTORIUS	Feb 11, 2023	551220084823778 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

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

Calibration Report of Glassco Volumetric Flask

MPC Control #:	EA9567	Serial Number:	N/A
Asset ID:	VF.1000	Calibration Date:	October 26, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
1000	999.600	1000.115	1000.115	1000.400	PASS	± 0.12

Note: Accuracy ± 0.4 ml.

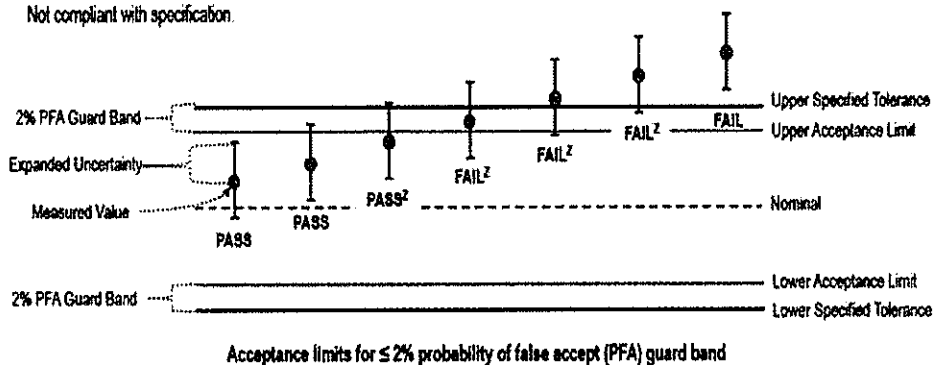
Statements of Pass or Fail Conformance

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

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

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

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



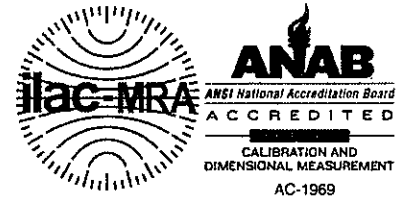
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Cert No. 551220085433568

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Work Order #: THAI-32245347

MPC Control #: EA9585
Asset ID: MP.1
Gage Type: MICROPIPETTE
Manufacturer: N/A
Model Number: N/A
Size: 100-1000 ul
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: YE181AG0199877
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name

ASTM E 542-01

Description

Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

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

Calibration Report of Micropipette

MPC Control #: EA9585
Asset ID: MP.1

Serial Number: YE181AG0199877
Calibration Date: October 26, 2022

Measurement Results

Nominal Value (μl)	Lower Limit (μl)	Mean Indicated Value of Instrument (μl)		Upper Limit (μl)	Result	Uncertainty (μl)
		As Found	As Left			
100	98.00	100.49	100.49	102.00	PASS	± 0.024
500	496.50	502.83	502.83	503.50	PASS	± 0.089
1000	994.00	1005.16	1005.16	1006.00	PASS	± 0.18

Note: Accuracy by manufacturer

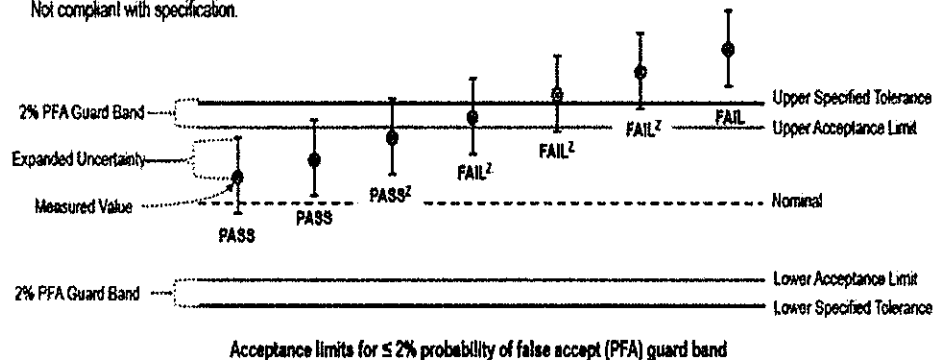
Statements of Pass or Fail Conformance

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

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

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

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



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

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD

245 M.4 T.NONGSAI

A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433562

Work Order #: THAI-32245347

MPC Control #: EA9584
Asset ID: MP.0.2
Gage Type: MICROPIPETTE
Manufacturer: EPPENDORF
Model Number: N/A
Size: 20-200 ul
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: O39672F
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 26, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 26, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name

ASTM E 542-01

Description

Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

Calibration Report of Eppendorf Micropipette

MPC Control #: EA9584
Asset ID: MP.0.2

Serial Number: O39672F
Calibration Date: October 26, 2022

Measurement Results

Nominal Value (μl)	Lower Limit (μl)	Mean Indicated Value of Instrument (μl)		Upper Limit (μl)	Result	Uncertainty (μl)
		As Found	As Left			
20	19.50	20.18	20.18	20.50	PASS	± 0.023
100	99.00	100.32	100.32	101.00	PASS	± 0.030
200	198.80	200.76	200.76	201.20	PASS	± 0.039

Note: Accuracy by manufacturer

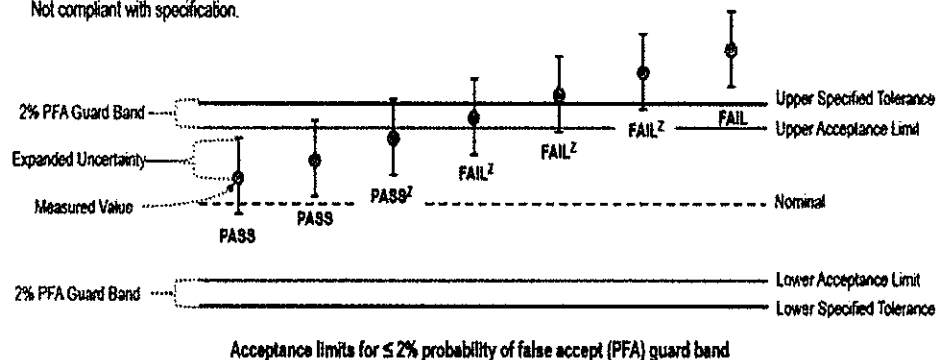
Statements of Pass or Fail Conformance

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

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

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

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



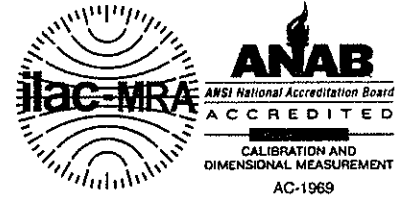
The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Cert No. 551220085433550

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNHOT NAKHONRATCHASIMA 36220

Work Order #: THAI-32245347

MPC Control #: EA9581
Asset ID: BU.25
Gage Type: BURETTE
Manufacturer: GLASSCO
Model Number: N/A
Size: 25 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 27, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 27, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name

Description

ASTM E 542-01

Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

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

Calibration Report of Glassco Burette

MPC Control #: EA9581
Asset ID: BU.25

Serial Number: N/A
Calibration Date: October 27, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
1	0.9500	0.9938	0.9938	1.0500	PASS	± 0.0015
13	12.9500	12.9977	12.9977	13.0500	PASS	± 0.0017
25	24.9500	24.9934	24.9934	25.0500	PASS	± 0.0032

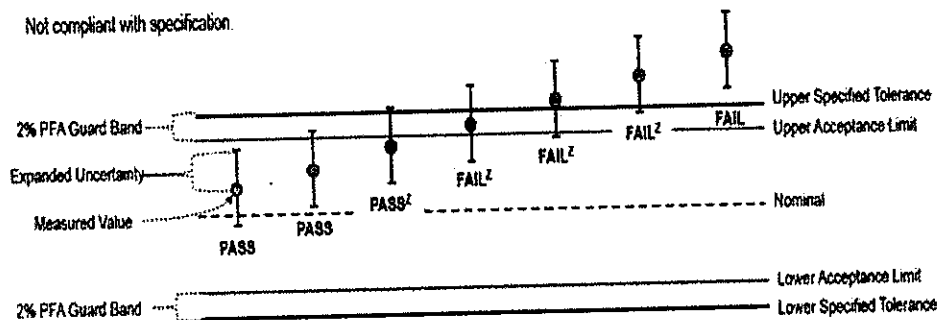
Note: Accuracy ± 0.05 ml

Statements of Pass or Fail Conformance

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

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

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



Acceptance limits for $\leq 2\%$ probability of false accept (PFA) guard band

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

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

End of Calibration Report



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



Certificate of Calibration

Date: Oct 27, 2022

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNHOT NAKHONRATCHASIMA 36220

Cert No. 551220085433553

MPC Control #: EA9583
Asset ID: BU.50
Gage Type: BURETTE
Manufacturer: GLASSCO
Model Number: N/A
Size: 50 ml
Temp/RH: 20.3°C / 60.0%
Location: Calibration performed at MPC facility

Work Order #: THAI-32245347
Serial Number: N/A
Department: N/A
Performed By: WATTANA TANGCHAROEN
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: October 27, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: October 27, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH
CB0480	PLATINUM RESISTANCE THERMOMETER	CTP5000-450-B	W3135471/RAKR-1 0-4	WIKA	Apr 7, 2023	551220084954731 / MP-TH

Procedures Used in this Event

Procedure Name	Description
ASTM E 542-01	Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:

WATTANA TANGCHAROEN

QC Approval:

PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

Calibration Report of Glassco Burette

MPC Control #:	EA9583	Serial Number:	N/A
Asset ID:	BU.50	Calibration Date:	October 27, 2022

Measurement Results

Nominal Value (ml)	Lower Limit (ml)	Mean Indicated Value of Instrument (ml)		Upper Limit (ml)	Result	Uncertainty (ml)
		As Found	As Left			
1	0.9500	0.9933	0.9933	1.0500	PASS	± 0.0015
25	24.9500	24.9868	24.9868	25.0500	PASS	± 0.0032
50	49.9500	49.9813	49.9813	50.0500	PASS	± 0.0060

Note: Accuracy ± 0.05 ml

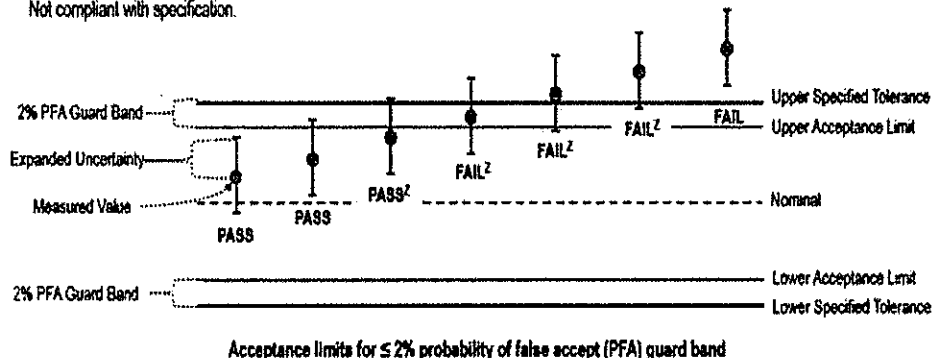
Statements of Pass or Fail Conformance

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

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

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

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



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

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

End of Calibration Report



Professional Calibration & Services Co., Ltd.

50/888, 50/889 Moo 2, Rungsit-Nakornnayok Rd., Bungyeetho, Thunyaburi,
Pathumthani 12130 Thailand
Tel : (+66)2150-6641 (Autoline), (+66)2569-5158 Fax : (+66)2569-5159
Email : info@p-cal.com www.p-cal.com



Certificate of Calibration

Certificate Number : PL12383/22
Control Number : PCAL106549
Customer Control : CE-PHM-001
Description : pH Meter
Manufacturer : Mettler Toledo
Model : Seven Compact S220
Serial Number : B641122532
Customer : C E LAB & CONSULTING CO., LTD.
245 M. 4, T. NONGSAI, A. DANKHUNTHOT,
NAKHONRATCHASIMA ,THAILAND 36220

Page 1 of 3

Date of Receipt : 04-Apr-22
Date of Calibration : 04-Apr-22
Calibration Location : Laboratories 1
Environment : Temperature 23 °C
: Relative Humidity 55 %
Calibration Method : Calibration Procedure Number CP-EL21,ASTM E70
Calibration Results : See data attached

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body 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. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Mr. Nuttawat Suksangeam

Authorized Signature

(Mr. Songpol Nakanuruk)

09-Apr-22

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : PL12383/22

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Hygrolog	61624608	NIMT,NIST	SG-H-00223/65	13-Mar-23
pH Standard Solution	61218185	DKD	744599	02-May-22
pH Standard Solution	61225114	DKD	744600	02-May-22
pH Standard Solution	61230118	DKD	744601	02-May-22

Condition as received : Normal

Definitions :-

- * NIST - National Institute of Standard and Technology
- * NIMT - National Institute of Metrology, Thailand
- * DKD - Deutscher Kalibrierdienst

CALIBRATION REPORT

Professional Calibration & Services Co., Ltd.

Certificate No.: PL12383/22

Page : 3 of 3

Calibration Results

pH Calibration (With Probe @ Temperature 25 °C) (Before)

Standard Value (pH)	UUC Reading (pH)	UUC Error (pH)	Uncertainty (± pH)
4.00	3.77	-0.23	0.0090
6.98	6.97	-0.01	0.010
9.96	9.96	0.00	0.014

pH Calibration (With Probe @ Temperature 25 °C) (After)

Standard Value (pH)	UUC Reading (pH)	UUC Error (pH)	Uncertainty (± pH)
4.00	4.00	0.00	0.0090
6.98	6.99	0.01	0.010
9.96	9.95	-0.01	0.014

Temperature Calibration

Standard Value (°C)	UUC Reading (°C)	UUC Error (°C)	Uncertainty (± °C)
25.0	24.9	-0.1	0.33

...End...



Professional Calibration & Services Co., Ltd.

50/888, 50/889 Moo 2, Rungsit-Nakornnayok Rd., Bungeeetho, Thunyaburi,
Pathumthani 12130 Thailand
Tel : (+66)2150-6641 (Autoline), (+66)2569-5158 Fax : (+66)2569-5159
Email : info@p-cal.com www.p-cal.com



Certificate of Calibration

Certificate Number : EL12389/22
Control Number : PCAL113805
Customer Control : CE-OVE-002
Description : Hot Air Oven
Manufacturer : Memmert
Model : UF55
Serial Number : B220.1879
Customer : C E LAB & CONSULTING CO., LTD.
245 M. 4, T. NONGSAI, A. DANKHUNTHOT,
NAKHONRATCHASIMA ,THAILAND 36220

Page 1 of 3

Date of Receipt : 04-Apr-22
Date of Calibration : 04-Apr-22
Calibration Location : Laboratories 1
Environment : Temperature 28 °C
: Relative Humidity 64 %
Calibration Method : Calibration Procedure Number CP-EL14
Calibration Results : See data attached

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation
granted by the Accreditation Body 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. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval
of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Mr. Worachote Krataychan

Authorized Signature

(Mr. Jumnong Junphong)

09-Apr-22

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : EL12389/22

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Data Acquisition / Switch Unit	MY41016812	NIMT	EL41863/21	07-Dec-22

Condition as received : Normal

Definitions :-

* NIMT - National Institute of Metrology, Thailand

CALIBRATION REPORT

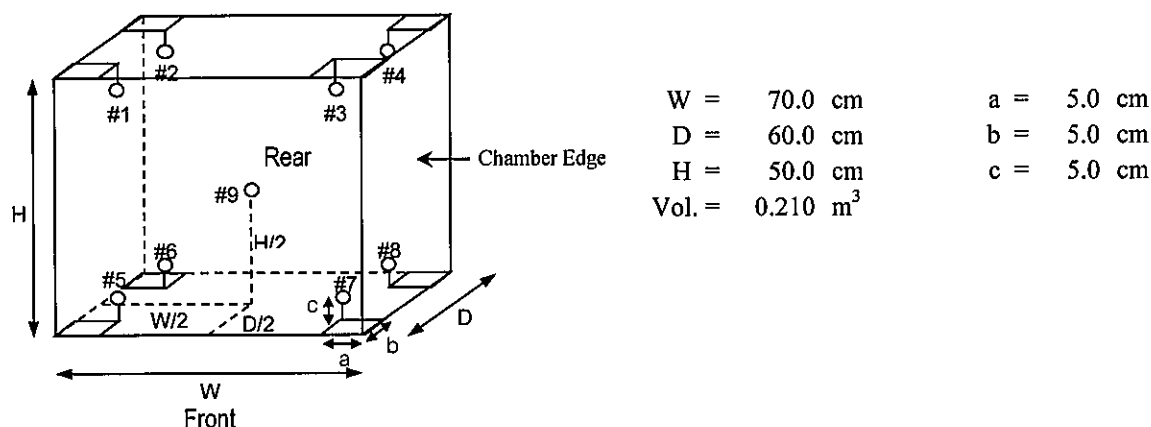
Professional Calibration & Services Co., Ltd.

Certificate No.: EL12389/22

Page : 3 of 3

Calibration Results

The following figure shows the measurement positions of temperature inside the instrument.



Temperature in the Measurement Zone

UUC Setting	Measured Temperature (°C) @ Probe No. (Probe No. 9 is Ref.)									Average
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
104.0 °C	104.3	104.5	105.4	104.9	105.1	104.8	104.1	105.2	103.7	104.7 °C
145.0 °C	145.5	146.5	146.8	146.2	145.5	146.2	144.7	144.7	145.6	145.7 °C
180.0 °C	179.7	181.8	182.1	181.6	182.2	181.6	180.9	182.1	181.5	181.5 °C

Temperature Calibration

UUC Setting	Indicating	Measured Value	UUC Error	Uncertainty (±)
104.0 °C	104.0 °C	104.7 °C	-0.7 °C	0.80 °C
145.0 °C	145.0 °C	145.7 °C	-0.7 °C	0.80 °C
180.0 °C	180.0 °C	181.5 °C	-1.5 °C	0.80 °C

Temperature Uniformity, Stability and Overall Variation

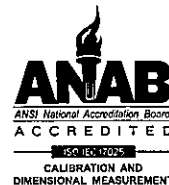
Setting Temperature	Indicating Temperature	Measured Uniformity	Measured Stability (±)	Overall Variation
104.0 °C	104.0 °C	1.80 °C	0.20 °C	2.00 °C
145.0 °C	145.0 °C	1.60 °C	0.20 °C	2.30 °C
180.0 °C	180.0 °C	1.90 °C	0.25 °C	2.72 °C

...End...



Professional Calibration & Services Co., Ltd.

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Email : info@p-cal.com www.p-cal.com



Certificate of Calibration

Certificate Number : PL12388/22
Control Number : PCAL106554
Customer Control : CE-BAL-002
Description : Analytical Balance
Manufacturer : Sartorius
Model : PRACTUM224-1S
Serial Number : 0037309195
Customer : C E LAB & CONSULTING CO., LTD.
245 M. 4, T. NONGSAI, A. DANKHUNTHOT,
NAKHONRATCHASIMA ,THAILAND 36220
Date of Receipt : 04-Apr-22
Date of Calibration : 04-Apr-22
Calibration Location : Laboratories 1
Environment : Temperature 23 °C
: Relative Humidity 54 %
Calibration Method : UKAS LAB 14
Calibration Results : See data attached

Page 1 of 3

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body 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. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Mr. Nuttawat Suksangeam

Authorized Signature

(Mr. Songpol Nakanuruk)

09-Apr-22

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : PL12388/22

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Standard Weight Set 50 mg. to 2 kg.	-	NIMT	C02200994	24-Apr-22

Condition as received : Normal

Definitions :-

* NIMT - National Institute of Metrology, Thailand

CALIBRATION REPORT

Professional Calibration & Services Co., Ltd.

Certificate No. : PL12388/22

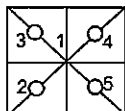
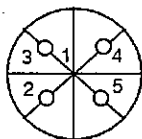
Page 3 of 3

☒ Without adjustment

☐ Before adjustment

☐ After adjustment

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



Nominal Test Value (g)			70	
Reference Points (g)				
2	3	4	5	1
0.0000	0.0000	-0.0001	-0.0001	0.0000

Repeatability: Determination of the standard deviation of weighing balance.

Nominal Test Value (g)	SD
100	0.00003
200	0.00004

Departure of indication from nominal value.

Resolution: 0.0001 g

Nominal Test Weight (g)	Conventional Mass (g)	Display Value (g)	Correction of Balance (g)	Uncertainty (\pm g)
0	0.0000	0.0000	0.0000	0.00033
0.05	0.0500	0.0501	-0.0001	0.00033
0.1	0.1000	0.1001	-0.0001	0.00033
1	1.0000	1.0001	-0.0001	0.00033
2	2.0000	2.0001	-0.0001	0.00033
5	5.0000	5.0001	-0.0001	0.00033
10	10.0001	10.0002	-0.0001	0.00033
20	20.0001	20.0002	-0.0001	0.00033
50	50.0000	50.0002	-0.0002	0.00033
100	100.0000	100.0003	-0.0003	0.00033
200	199.9998	199.9996	0.0002	0.00033

...End...



Professional Calibration & Services Co., Ltd.

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Email : info@p-cal.com www.p-cal.com



Certificate of Calibration

Page 1 of 3

Certificate Number : PL12390/22
Control Number : PCAL113801
Customer Control : CE-BAL-001
Description : Electronic Balance
Manufacturer : Mettler Toledo
Model : ME204
Serial Number : B644218307
Customer : C E LAB & CONSULTING CO., LTD.
245 M. 4, T. NONGSAI, A. DANKHUNTHOT,
NAKHONRATCHASIMA , THAILAND 36220
Date of Receipt : 04-Apr-22
Date of Calibration : 04-Apr-22
Calibration Location : Laboratories 1
Environment : Temperature 24 °C
: Relative Humidity 54 %
Calibration Method : UKAS LAB 14
Calibration Results : See data attached

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body 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. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Mr. Nuttawat Sukseangam

Authorized Signature

(Mr. Songpol Nakanuruk)

09-Apr-22

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : PL12390/22

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Standard Weight Set 50 mg. to 2 kg.	-	NIMT	C02200994	24-Apr-22

Condition as received : Normal

Definitions :-

* NIMT - National Institute of Metrology, Thailand

CALIBRATION REPORT

Professional Calibration & Services Co., Ltd.

Certificate No. : PL12390/22

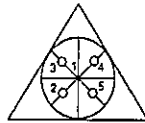
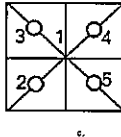
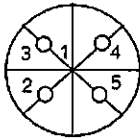
Page 3 of 3

☒ Without adjustment

☐ Before adjustment

☐ After adjustment

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



Nominal Test Value (g)		70		
Reference Points (g)				
2	3	4	5	1
-0.0004	-0.0010	-0.0007	-0.0004	-0.0003

Repeatability: Determination of the standard deviation of weighing balance.

Nominal Test Value (g)	SD
100	0.00000
200	0.00000

Departure of indication from nominal value.

Resolution: 0.0001 g

Nominal Test Weight (g)	Conventional Mass (g)	Display Value (g)	Correction of Balance (g)	Uncertainty (± g)
0	0.0000	0.0000	0.0000	0.00033
20	20.0000	20.0002	-0.0002	0.00033
40	40.0000	40.0003	-0.0003	0.00033
60	60.0000	60.0000	0.0000	0.00033
80	80.0000	80.0001	-0.0001	0.00033
100	100.0000	100.0001	-0.0001	0.00033
120	120.0000	120.0002	-0.0002	0.00033
140	140.0000	140.0003	-0.0003	0.00033
160	160.0000	160.0001	-0.0001	0.00033
180	180.0000	179.9997	0.0003	0.00033
200	200.0000	199.9998	0.0002	0.00033

...End...



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Certificate of Calibration

Certificate Number : EL12483/22
Control Number : PCAL107514
Customer Control : CE-THE-002
Description : Digital Thermo-Hygrometer
Manufacturer : -
Model : HTC-1
Serial Number : -
Customer : C E LAB & CONSULTING CO., LTD.
245 M. 4, T. NONGSAI, A. DANKHUNTHOT,
NAKHONRATCHASIMA ,THAILAND 36220

Page 1 of 3

Date of Receipt : 07-Apr-22
Date of Calibration : 08-Apr-22
Environment : Temperature $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$
Relative Humidity $50\% \pm 20\%$
Calibration Method : Calibration Procedure Number CP-EL21
Calibration Results : See data attached

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body 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. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Mr. Weerapat Khoeromklang

Authorized Signature

(Mr. Jumnong Junphong)

09-Apr-22

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : **EL12483/22**

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Hygrolog	61624608	NIMT,NIST	SG-H-00223/65	13-Mar-23

Condition as received : Normal

Definitions :-

- * NIST - National Institute of Standard and Technology
- * NIMT - National Institute of Metrology, Thailand

CALIBRATION REPORT

Professional Calibration & Services Co., Ltd.

Certificate No.: EL12483/22

Page : 3 of 3

Calibration Results

Temperature Calibration

UUC Range : -10 ~ 50 °C

Calibration Point	Standard Value	UUC Reading	Uncertainty (\pm)	Tolerance Limit Values
20 °C	20.09 °C	20.2 °C	0.33 °C	19.09 ~ 21.09 °C
25 °C	25.07 °C	25.3 °C	0.33 °C	24.07 ~ 26.07 °C
30 °C	30.10 °C	30.6 °C	0.33 °C	29.10 ~ 31.10 °C

Humidity Calibration @ Reference Temperature : 25 °C

UUC Range : 10 ~ 99 %RH

Calibration Point	Standard Value	UUC Reading	Uncertainty (\pm)	Tolerance Limit Values
30 %RH	30.10 %RH	29 %RH	1.6 %RH	25.10 ~ 35.10 %RH
50 %RH	50.03 %RH	47 %RH	1.7 %RH	45.03 ~ 55.03 %RH
70 %RH	70.09 %RH	67 %RH	1.9 %RH	65.09 ~ 75.09 %RH

...End...



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Email : info@p-cal.com www.p-cal.com



Certificate of Calibration

Certificate Number : EL12484/22
Control Number : PCAL107515
Customer Control : CE-THE-001
Description : Digital Thermo-Hygrometer
Manufacturer : KTJ
Model : TA218A
Serial Number : -
Customer : C E LAB & CONSULTING CO., LTD.
245 M. 4, T. NONGSAI, A. DANKHUNTHOT,
NAKHONRATCHASIMA ,THAILAND 36220
Date of Receipt : 07-Apr-22
Date of Calibration : 08-Apr-22
Environment : Temperature 23 °C \pm 2 °C
Relative Humidity 50 % \pm 20 %
Calibration Method : Calibration Procedure Number CP-EL21
Calibration Results : See data attached

Page 1 of 3

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body 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. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Mr. Weerapat Khoeromklang

Authorized Signature

(Mr. Jumnong Junphong)

09-Apr-22

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : EL12484/22

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Hygrolog	61624608	NIMT,NIST	SG-H-00223/65	13-Mar-23

Condition as received : Normal

Definitions :-

- * NIST - National Institute of Standard and Technology
- * NIMT - National Institute of Metrology, Thailand

CALIBRATION REPORT

Professional Calibration & Services Co., Ltd.

Certificate No.: EL12484/22

Page: 3 of 3

Calibration Results

Temperature Calibration

UUC Range : -10 ~ 50 °C

Calibration Point	Standard Value	UUC Reading	Uncertainty (\pm)	Tolerance Limit Values
20 °C	19.97 °C	20.4 °C	0.33 °C	18.97 ~ 20.97 °C
25 °C	24.98 °C	25.1 °C	0.33 °C	23.98 ~ 25.98 °C
30 °C	29.97 °C	30.1 °C	0.33 °C	28.97 ~ 30.97 °C

Humidity Calibration @ Reference Temperature : 25 °C

UUC Range : 10 ~ 99 %RH

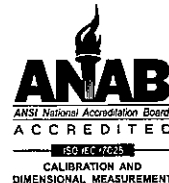
Calibration Point	Standard Value	UUC Reading	Uncertainty (\pm)	Tolerance Limit Values
30 %RH	30.10 %RH	31 %RH	1.6 %RH	25.10 ~ 35.10 %RH
50 %RH	50.12 %RH	49 %RH	1.7 %RH	45.12 ~ 55.12 %RH
70 %RH	70.11 %RH	69 %RH	1.9 %RH	65.11 ~ 75.11 %RH

...End...



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Certificate of Calibration

Page 1 of 3

Certificate Number : PL12485/22
Control Number : PCAL107513
Customer Control : CE-STW-001
Description : Standard Weight Set
Manufacturer : -
Model : 50 mg - 200 g (16 Pcs)
Serial Number : -
Customer : C E LAB & CONSULTING CO., LTD.
245 M. 4, T. NONGSAI, A. DANKHUNTHOT,
NAKHONRATCHASIMA ,THAILAND 36220
Date of Receipt : 07-Apr-22
Date of Calibration : 08-Apr-22
Environment : Temperature $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$
Relative Humidity $50\% \pm 20\%$
Calibration Method : OIML R111-1
Calibration Results : See data attached

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body 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. The results relate only to the item calibrated.

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Calibrated By

Mr. Nuttawat Suksangeam

Authorized Signature

(Mr. Songpol Nakanuruk)

11-Apr-22

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : PL12485/22

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Standard Weight Set 50 mg. to 2 kg.	-	NIMT	C02200994	24-Apr-22

Condition as received : Normal

Definitions :-

* NIMT - National Institute of Metrology, Thailand

CALIBRATION REPORT

Professional Calibration & Services Co., Ltd.

Certificate No. : PL12485/22

Page 3 of 3

Calibration Results

Conventional mass and Maximum Permissible Error (MPE) corresponding to OIML R 111-1 Edition 2004 (E)

Nominal Weight	Marking	Conventional Mass	Uncertainty (\pm)
50 mg	None	50 mg + 0.01 mg	0.090 mg
100 mg	None	100 mg - 0.01 mg	0.090 mg
200 mg	None	200 mg 0.00 mg	0.090 mg
200 mg	Point	200 mg 0.00 mg	0.090 mg
500 mg	None	500 mg + 0.02 mg	0.090 mg
1 g	None	1 g + 0.03 mg	0.090 mg
2 g	None	2 g + 0.05 mg	0.090 mg
2 g	Point	2 g + 0.04 mg	0.090 mg
5 g	None	5 g + 0.05 mg	0.090 mg
10 g	None	10 g + 0.06 mg	0.090 mg
20 g	None	20 g + 0.05 mg	0.10 mg
20 g	Point	20 g + 0.06 mg	0.10 mg
50 g	None	50 g - 0.01 mg	0.10 mg
100 g	None	100 g - 0.02 mg	0.13 mg
200 g	None	200 g - 0.19 mg	0.21 mg
200 g	Point	200 g + 0.22 mg	0.21 mg

...End...



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Certificate of Calibration

Certificate Number : EL12384/22
Control Number : PCAL106550
Customer Control : CE-REF-001
Description : Reagent Refrigerator
Manufacturer : System Form
Model : MCD-10BTM
Serial Number : 94114
Customer : C E LAB & CONSULTING CO., LTD.
245 M. 4, T. NONGSAI, A. DANKHUNTHOT,
NAKHONRATCHASIMA ,THAILAND 36220
Date of Receipt : 04-Apr-22
Date of Calibration : 04-Apr-22
Calibration Location : Laboratories 1
Environment : Temperature 27 °C
: Relative Humidity 51 %
Calibration Method : Calibration Procedure Number CP-EL13
Calibration Results : See data attached

Page 1 of 3

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body 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. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Mr. Worachote Krataychan

Authorized Signature

(Mr. Jumnong Junphong)

09-Apr-22

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : EL12384/22

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Data Acquisition / Switch Unit	US44048831	NIMT	EL03564/22	09-Feb-23

Condition as received : Normal

Definitions :-

* NIMT - National Institute of Metrology, Thailand

CALIBRATION REPORT

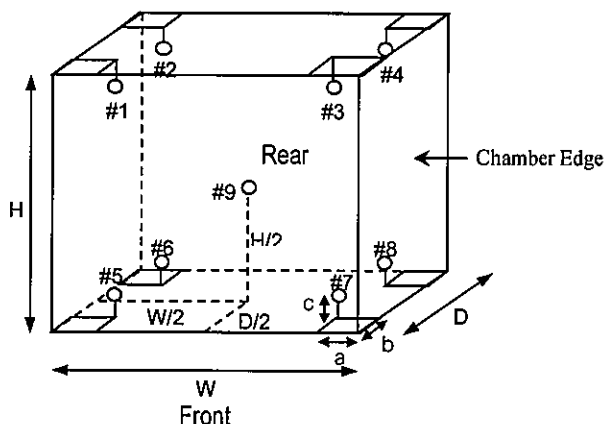
Professional Calibration & Services Co., Ltd.

Certificate No.: EL12384/22

Page : 3 of 3

Calibration Results

The following figure shows the measurement positions of temperature inside the instrument.



W =	50.0 cm	a =	5.0 cm
D =	48.0 cm	b =	5.0 cm
H =	110.0 cm	c =	5.0 cm
Vol. =	0.264 m ³		

Temperature in the Measurement Zone

UUC Setting	Measured Temperature (°C) @ Probe No. (Probe No. 9 is Ref.)									Average
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
4.0 °C	4.146	4.186	4.346	4.226	4.395	4.301	4.454	4.970	4.426	4.383 °C

Temperature Calibration

UUC Setting	Indicating	Measured Value	UUC Error	Uncertainty (±)
4.0 °C	4.0 °C	4.383 °C	-0.383 °C	0.70 °C

Temperature Uniformity, Stability and Overall Variation

Setting Temperature	Indicating Temperature	Measured Uniformity	Measured Stability (±)	Overall Variation
4.0 °C	4.0 °C	1.14 °C	0.94 °C	2.36 °C

...End...



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Certificate of Calibration

Certificate Number : EL12386/22
Control Number : PCAL106552
Customer Control : CE-INC-001
Description : Incubator
Manufacturer : Memmert
Model : IPP55
Serial Number : V216.0305
Customer : C E LAB & CONSULTING CO., LTD.
245 M. 4, T. NONGSAI, A. DANKHUNTHOT,
NAKHONRATCHASIMA ,THAILAND 36220
Date of Receipt : 04-Apr-22
Date of Calibration : 04-Apr-22
Calibration Location : Laboratories 1
Environment : Temperature 26 °C
: Relative Humidity 54 %
Calibration Method : Calibration Procedure Number CP-EL14
Calibration Results : See data attached

Page 1 of 3

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation
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the corresponding national standards laboratory. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval
of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Mr. Worachote Krataychan

Authorized Signature

(Mr. Jumnonng Junphong)

09-Apr-22

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : EL12386/22

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Data Acquisition / Switch Unit	MY41016812	NIMT	EL41863/21	07-Dec-22

Condition as received : Normal

Definitions :-

* NIMT - National Institute of Metrology, Thailand

CALIBRATION REPORT

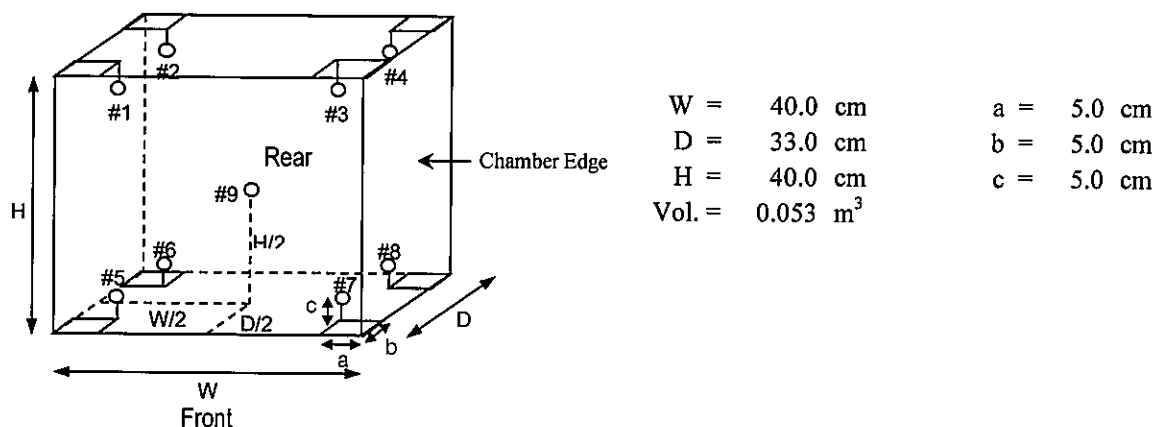
Professional Calibration & Services Co., Ltd.

Certificate No.: EL12386/22

Page : 3 of 3

Calibration Results

The following figure shows the measurement positions of temperature inside the instrument.



Temperature in the Measurement Zone

UUC Setting	Measured Temperature (°C) @ Probe No. (Probe No. 9 is Ref.)									Average
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
20.0 °C	20.8	21.1	20.8	21.0	20.7	20.7	21.0	20.8	20.7	20.9 °C

Temperature Calibration

UUC Setting	Indicating	Measured Value	UUC Error	Uncertainty (±)
20.0 °C	20.0 °C	20.9 °C	-0.9 °C	0.70 °C

Temperature Uniformity, Stability and Overall Variation

Setting Temperature	Indicating Temperature	Measured Uniformity	Measured Stability (±)	Overall Variation
20.0 °C	20.0 °C	0.40 °C	0.10 °C	0.50 °C

...End...



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Email : info@p-cal.com www.p-cal.com



Certificate of Calibration

Certificate Number : EL12385/22
Control Number : PCAL106551
Customer Control : CE-WAT-001
Description : Water Bath
Manufacturer : Memmert
Model : WNB29
Serial Number : L616.0204
Customer : C E LAB & CONSULTING CO., LTD.
245 M. 4, T. NONGSAI, A. DANKHUNTHOT,
NAKHONRATCHASIMA ,THAILAND 36220
Date of Receipt : 04-Apr-22
Date of Calibration : 04-Apr-22
Calibration Location : Laboratories 1
Environment : Temperature 26 °C
Relative Humidity 54 %
Calibration Method : Calibration Procedure Number CP-EL13
Calibration Results : See data attached

Page 1 of 3

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body 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. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Mr. Worachote Krataychan

Authorized Signature

(Mr. Jumnong Junphong)

09-Apr-22

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : EL12385/22

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Black Stack Thermometer Readout	A62328/A62725/A6263 0	NIMT	ER-0134-20	17-Aug-22
Secondary Platinum Resistance Thermometer	04248	NIMT	PSL-T 0691/64	10-May-23
Secondary Platinum Resistance Thermometer	04249	NIMT	PSL-T 0131/65	12-Dec-23

Condition as received : Normal

Definitions :-

* NIMT - National Institute of Metrology, Thailand

CALIBRATION REPORT

Professional Calibration & Services Co., Ltd.

Certificate No.: EL12385/22

Page : 3 of 3

Calibration Results

Temperature in the Measurement Zone

UUC Setting	Measured Temperature (°C) @ Probe No. (Probe No. 5 is Ref.)					Average
	# 1	# 2	# 3	# 4	# 5	
95.0 °C	95.656	95.719	95.558	95.638	95.598	95.634 °C

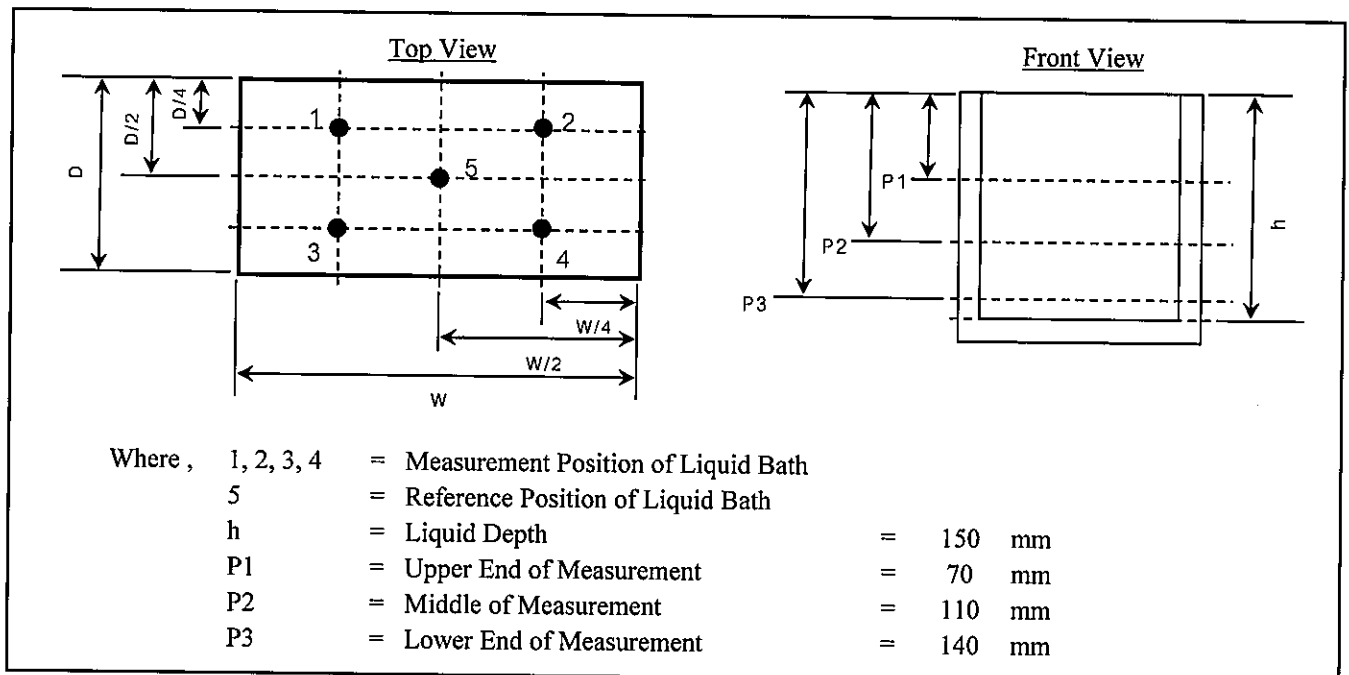
Temperature Calibration

UUC Setting	Indicating	Measured Value	UUC Error	Uncertainty (±)
95.0 °C	95.0 °C	95.634 °C	-0.634 °C	0.14 °C

Evaluation Test

UUC Temperature Setting	UUC Indicating	Uniformity	Stability (±)
95.0 °C	95.0 °C	0.19 °C	0.15 °C

Measurement Layout



...End...



ATTESTATO DI COLLAUDO TEST REPORT

Sensore Vel. Dir. Vento
Wind Speed&Direction Sensor

Modello: DNA121
Model

Matricola: 21100220
Serial nr.

Data: 18/10/2021
Date

Procedura di collaudo: PCP080
Test procedure

1. Ispezione visiva / Visual inspection

Part	Descrizione / Description
1.1	Solo per sensori nuovi: assenza di colature e graffi sulle verniciature; uniformità e consistenza delle anodizzazioni <i>Only for new sensors : absence of flows and scratches on Paintings; uniformity and consistency of anodizations</i>
1.2	Integrità e serraggio delle viti / <i>Screw fixing and integrity</i>
1.3	Congruenza delle indicazioni della targhetta con il documento guida del codice relativo / <i>Compliance between label information and manufacturing documentation</i>

2. Verifica funzionale / Operative test

Part	Descrizione / Description
2.1	Verificare il segnale in uscita: <i>Check the output signal</i> Segnale in uscita della velocità a 0 m/s <i>Wind speed output signal at 0 m/s</i>
2.2	Verificare il segnale in uscita: <i>Check the output signal</i> Segnale in uscita della velocità entro $\pm 0,25$ m/s o 3% VL (0÷ 25 m/s) e 2% VL (>25m/s) rispetto al valore di riferimento. <i>Wind speed signal output within $\pm 0,25$ m/s o 3% RV (0÷ 25 m/s) e 2% RV (>25m/s) reading against reference value</i>
2.3	Verificare il segnale in uscita: <i>Check the output signal</i> Segnale in uscita della direzione entro $\pm 5^\circ$ rispetto al riferimento 0°; 90°; 180°; 270° <i>Wind direction signal output within $\pm 5^\circ$ against the reference value 0°; 90°; 180°; 270°</i>

Verificato da / Verified by		Il Responsabile del Laboratorio Fisico / Laboratory Technical Manager	
Sibilla Andreoli		Ernesto Consiglio	

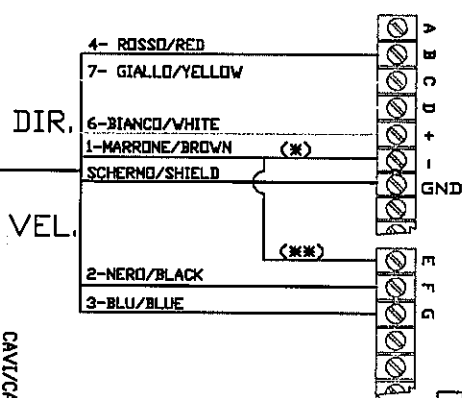
Copia del seguente documento verrà conservata per 5 anni a partire dalla data di emissione.
A copy of this certificate will be available in our files in the next 5 years.

LSI LASTEM S.r.l.

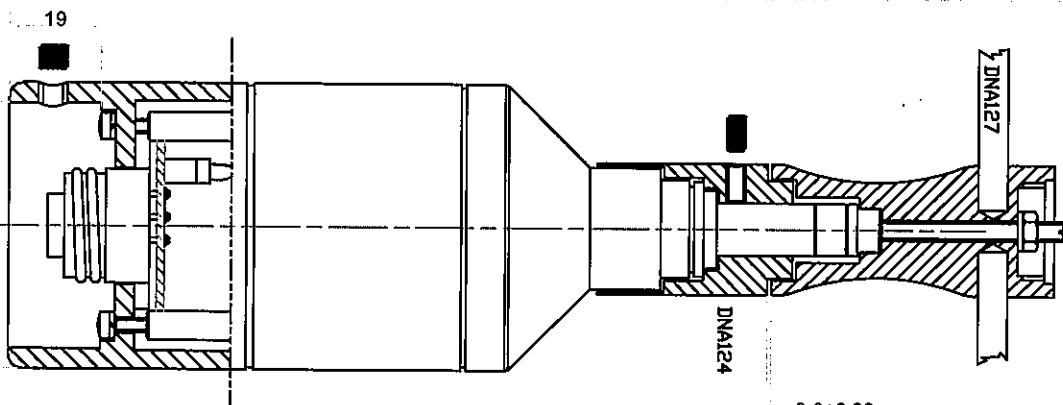
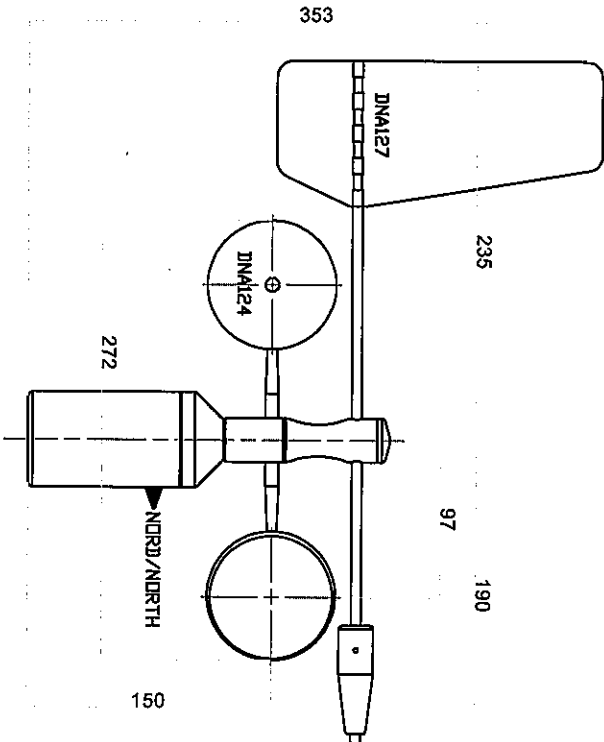
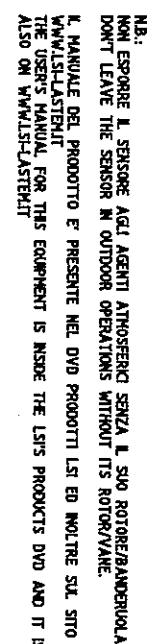
Via Dosso 9, 20090 Settala Premenugo (Milano) Italia Tel: +39 02 954141 Fax: +39 02 95770594 e.mail: info@lsi-lastem.it Web: www.lsi-lastem.com

VEL.VENTO/WIND SPEED: 0..60m/s - 0..882.19Hz
DIR.VENTO/WIND DIRECTION: 0..360° - 0..1V

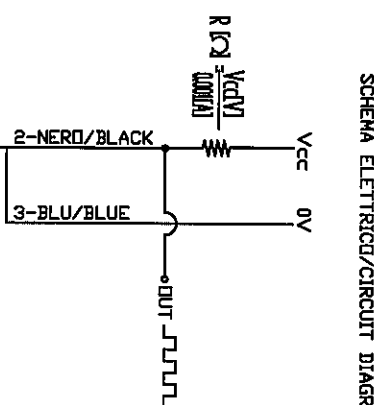
425

 0.8 ± 0.20 

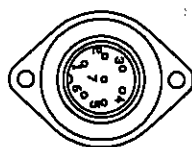
CAVI/CABLES DWAS10-DWAS25-DWAS26-DWAS27




ATTACCO PER TUBI DA $\phi 48.5$ A $\phi 50$ mm
COUPLING FOR PIPE FROM $\phi 48.5$ TO $\phi 50$ mm



SCHEMA ELETTRICO/CIRCUIT DIAGRAM



Velocita' Speed m/s	Frequenza Frequency Hz
0	0
1.001	12.31
3.011	41.12
5.02	70.51
10.026	143.17
20.08	295.04
29.99	435.28
37.714	556.82
50	734.72
60	882.19



PM		SIGNAL	
1	Power in (10...30Vdc/Vac)		
2	Speed freq. (0.9...1mA)		
3	Signals common		
4	Direction (0...1V)		
5	Shield 		
6	Power in (10...30Vdc/Vac)		
7	Signals common		

Indice di revisione	Data	Modifica effettuata	Indice di revisione	Data	Modifica effettuata
a	14-12-11	Modificato connessione a data logger	d	30/01/19	Aggiustaggio e layout disegno
b	30-05-12	Modificato Funzione di Trasciamento	e	----	----
c	30-10-18	Mod. cavo perire da pos. a leg a	f	----	----

A4		RELAIO		COMINOLATO		VERBALE		APPROVAIO	
DATA	UT	R&S	RA	RT					
09/06/11	10-10-11	10-08-11	11-08-11	11-10-11					

QUOTE LINEAR		SINCR	
Topo	Bottom	Topo	Bottom
1...18	±0.1		
>18...80	±0.15		
>80...250	±0.25		
>250	±0.35		

Profilo	Profilo
----	----

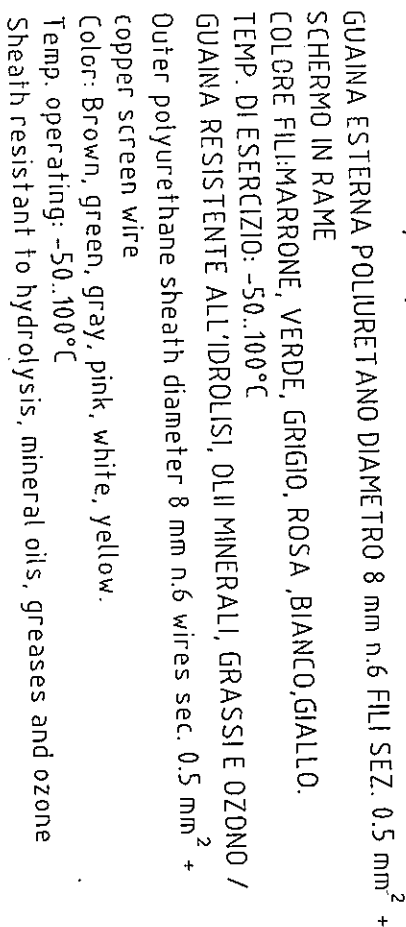





SENSORE TACO-GONIOMETRICO AD USCITA DIRETTA / TACHO-GONIOMETRO WITH DIRECT OUTPUT	Cod. prodotto: DNA12
n° dis.: DISACC19006	

1:1.5 FAATTORE
OM
SCALA

STARTING SIGNAL / Segnale di partenza (mA)	RESISTANCE / Resistenza	RESULTING SIGNAL / Segnale risultante (V)
0..20 mA	15 Ohm	0..300mV
0..20 mA	50 Ohm	0..1V
0..20 mA	200 Ohm	0..5V
0..20 mA	500 Ohm	0..10V
4..20 mA	15 Ohm	60..300mV
4..20 mA	50 Ohm	0..2..1V
4..20 mA	200 Ohm	1..5V



GUAINA ESTERNA POLIURETANO DIAMETRO 8 mm n.6 FILI SEZ. 0.5 mm² +
SCHEMO IN RAME
COLORE FILI:MARRONE, VERDE, GRIGIO, ROSA, BIANCO, GIALLO.
TEMP. DI ESERCIZIO: -50..100°C
GUAINA RESISTENTE ALL'IDROLISI, OLII MINERALI, GRASSI E OZONO /
Outer polyurethane sheath diameter 8 mm n.6 wires sec. 0.5 mm² +
copper screen wire
Color: Brown, green, gray, pink, white, yellow.
Temp. operating: -50..100°C
Sheath resistant to hydrolysis, mineral oils, greases and ozone

GUAINA ESTERNA POLIURETANO DIAMETRO 8 mm n.6 FILI SEZ. 0.5 mm² +
SCHERMO IN RAME
COLORE FILI:MARRONE, VERDE, GRIGIO, ROSA, BIANCO, GIALLO.
TEMP. DI ESERCIZIO: -50..100°C
GUAINA RESISTENTE ALL'IDROLISI, OLII MINERALI, GRASSI E OZONO /
Outer polyurethane sheath diameter 8 mm n.6 wires sec. 0.5 mm² +
copper screen wire
Color: Brown, green, gray, pink, white, yellow.
Temp. operating: -50..100°C
Sheath resistant to hydrolysis, mineral oils, greases and ozone

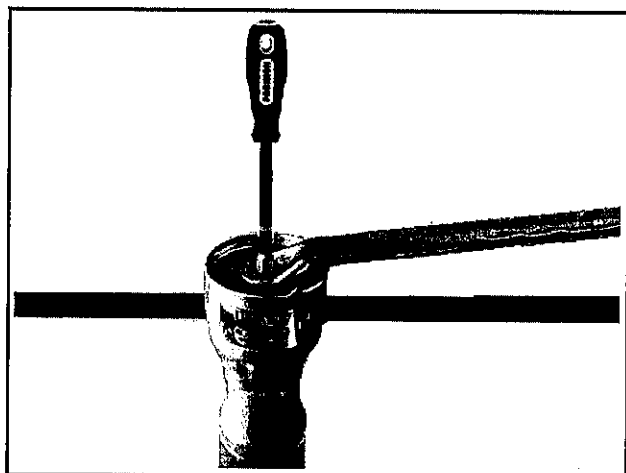
- GUAINA ESTERNA POLIURETANO DIAMETRO 8 mm n.6 FILI SEZ. 0.5 mm² +
SCHEMO IN RAME
COLORE FILI:MARRONE, VERDE, GRIGIO, ROSA, BIANCO, GIALLO.
TEMP. DI ESERCIZIO: -50..100°C
GUAINA RESISTENTE ALL'IDROLISI, OLII MINERALI, GRASSI E OZONO /
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Outer polyurethane sheath diameter 8 mm n.6 wires sec. 0.5 mm² +
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SCHERMO IN RAME
COLORE FILI:MARRONE, VERDE, GRIGIO, ROSA, BIANCO, GIALLO.
TEMP. DI ESERCIZIO: -50..100°C
GUAINA RESISTENTE ALL'IDROLISI, OLII MINERALI, GRASSI E OZONO /
Outer polyurethane sheath diameter 8 mm n.6 wires sec. 0.5 mm² +
copper screen wire
Color: Brown, green, gray, pink, white, yellow.
Temp. operating: -50..100°C
Sheath resistant to hydrolysis, mineral oils, greases and ozone

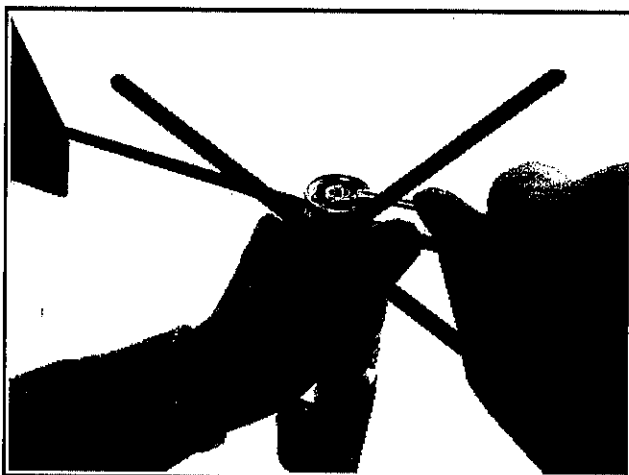
IT – Seguire attentamente le seguenti istruzioni per fissare in modo corretto la banderuola al sensore.

EN – Follow the instructions below in order to correctly fix the wind vane to the sensor.



IT - Inserire la rondella ed il dado sull'albero filettato; quindi stringere il dado con una chiave da 7 mm tenendo fermo l'albero con il cacciavite.

EN - Insert the washer and nut on the threaded shaft; then tighten with a 7 mm wrench while holding the shaft with the screwdriver.



ATTENZIONE! Non avvitare il dado tenendo ferma la banderuola con la mano onde evitare che il sensore si stari.

ATTENTION! Do not tighten the nut by holding the wind vane with your hand to prevent that the sensor loses its setting.

IT - Per maggiori informazioni, fare riferimento al manuale del sensore del vento scaricabile dal sito www.lsi-lastem.com.

EN - For more information, refer to the wind sensor manual downloadable from www.lsi-lastem.com site.



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : C E LAB & CONSULTING COMPANY LIMITED

วันที่ : 30 สิงหาคม 2565

รายชื่ออุปกรณ์ / เครื่องมือ : NO_x Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T200

หมายเลขอุปกรณ์ / เครื่องมือ : 3511

TEST VALUES			
API MODEL T200		BEFORE	AFTER
1	RANGE 50 - 20,000 PPB	500.0	500.0
2	STABILITY ≤ 1 PPB	0.38	0.02
3	SAMPLE FLOW 500 ± 10% cc/min	501	484
4	OZONE FLOW 80 ± 10% cc/min	98	97
5	PMT mV	83.1	43.2
6	NORM PMT mV	21.2	45.2
7	A ZERO -20 To 150 MV	87.5	83.5
8	HPVS 400 - 900 V	722	722
9	RX CELL TEMP 50 ± 1 °C	50.0	50.0
10	BOX TEMP AMBIENT ± 5 °C	31.3	30.6
11	PMT TEMP 7 ± 2 °C	7.0	7.0
12	MOLY TEMP 315 ± 5 °C	314.0	315.2
13	RX CELL PRESSURE <10 in - Hg-A	7.1	7.1
14	SAMPLE PRESSURE 25 - 35 in - Hg-A	28.1	29.3
15	NOX SLOPE 1.0 ± 0.3	1.018	0.980
16	NOX OFFSET -50 To 150	-0.7	0.7
17	NO SLOPE 1.0 ± 0.3	1.007	0.967
18	NO OFFSET -50 To 150	-1.9	0.7
19	NO SAMPLE READING PPB	9.5	14.1
20	NO2 SAMPLE READING PPB	11.9	13.3
21	NOX SAMPLE READING PPB	-2.4	0.9
22	OPTIC TEST 2000 ± 1000 mV	2003.1	2555.8
23	ELECTRICAL TEST 2000 ± 1000 mV	3012.3	2446.8
24	VOLTAGE TEST +5 V +12 V +15 V -15 V	5.23 / 12.16 / 15.85 / -15.21	5.23 / 12.16 / 15.85 / -15.21
25	ZERO GAS NO/NOx 0.00/0.00 PPB	-0.1 / 0.1	0.0 / 0.0
26	SPAN GAS NO/NOx 400.00/400.00 PPB	414.4 / 429.0	399.5 / 400.6

หมายเหตุ

- ทำการเปลี่ยน O-ring 6 ชิ้น , Spring 3 ชิ้น , Sintered Filter 3 ชิ้น



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

(คุณพรชัย ผาติวนารักษ์)

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย ผาติวนารักษ์

โทรศัพท์ : 0-2515-8987

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : Info@kinetics.co.th

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : C E LAB & CONSULTING COMPANY LIMITED

EQUIPMENT NAME : NO_x Analyzer

MANUFACTURER : Teledyne - API MODEL : T200

SERIAL NO : 3511

STANDARD GAS CONCENTRATION (PPM) : 53.40 PPM

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1750

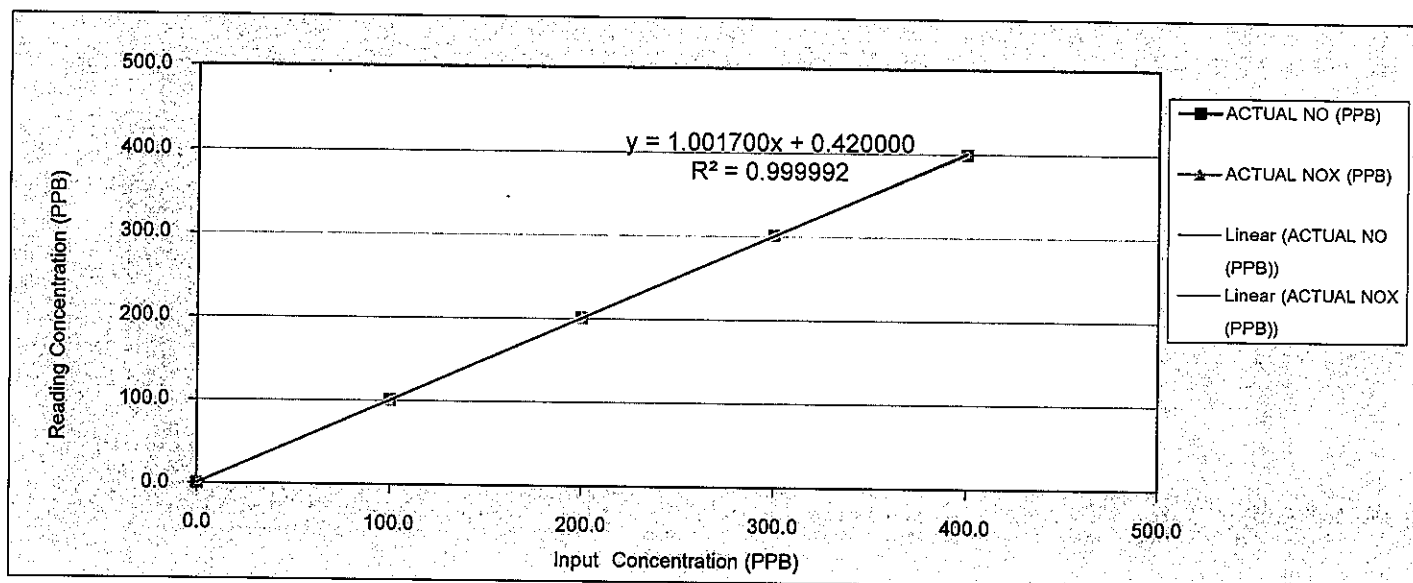
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS						
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	ACTUAL NO _x (PPB)	ERROR NO _x (PPB)	% ERROR NO _x
ZERO	0.0	0.0	0.0	-	0.0	0.0	-
1	100.0	100.9	0.9	0.9	100.9	0.9	0.9
2	200.0	200.8	0.8	0.4	200.9	0.9	0.5
3	300.0	301.2	1.2	0.4	301.4	1.4	0.5
4	400.0	399.5	-0.5	-0.1	400.6	0.6	0.2
AVERAGE (%)				0.5			0.8



KINETICS
บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

CALIBRATED BY : คุณพรชัย ผาติวนารักษ์

DATE : 30 สิงหาคม 2565

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : คุณพรชัย ผาติวนารักษ์ โทรศัพท์ : 02-515-8987

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : Info@kinetics.co.th

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A0622
Cylinder Number: CC745169
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12021
Gas Code: CO,NO,NOX,SO2,BALN

Reference Number: 160-402045691-1
Cylinder Volume: 144.4 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Mar 10, 2021

Expiration Date: Mar 10, 2029

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

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

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/04/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet IS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg
Net Weight: 4.6 Kg



Robert A. Anderson
Approved for Release



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : C E LAB & CONSULTING COMPANY LIMITED

วันที่ : 22 กันยายน 2565

รายชื่ออุปกรณ์ / เครื่องมือ : SO₂ Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T100

หมายเลขอุปกรณ์ / เครื่องมือ : 2961

TEST VALUES			
API MODEL T100		BEFORE	AFTER
1	RANGE 50 - 20,000 PPB	500	500
2	SO ₂ STABILITY ≤ 1 PPB	0.18	0.03
3	PRESSURE 25 - 35 in - Hg-A	26.8	29.8
4	SAMPLE FLOW 650 ± 10% cc/min	660.2	659.7
5	PMT mV	334.3	141.2
6	NORM PMT mV	307.1	91.4
7	UV LAMP 1000 - 4800 mV	3080.6	3230.4
8	LAMP RATIO 30 To 120 %	93.7	100.1
9	STRAY LIGHT ≤ 100 PPB	27.2	47.9
10	DARK PMT -50 ± 200 % mV	75.0	53.2
11	DARK LAMP -50 ± 200 % mV	1.0	1.1
12	SO ₂ SLOPE 1.0 ± 0.3	0.998	1.088
13	SO ₂ OFFSET < 250 mV	79.3	88.1
14	HVPS 400 - 900 V	554	554
15	RX CELL TEMP 50 ± 1 °C	50.0	50.0
16	BOX TEMP AMBIENT ± 5 °C	29.7	29.6
17	PMT TEMP 7 ± 2 °C	8.4	8.4
18	SO ₂ SAMPLE READING PPB	126.3	1.6
19	OPTIC TEST 2000 ± 1000 mV	3156.8	2394.2
20	ELECTRICAL TEST 2000 ± 1000 mV	1398.9	1371.4
21	VOLTAGE TEST +5 V +12 V +15 V -15 V	5.23 / 12.30 / 15.83 / -15.16	5.23 / 12.30 / 15.83 / -15.16
22	ZERO GAS 0.00 PPB	123.4	0.0
23	SPAN GAS 400.00 PPB	199.8	401.3

หมายเหตุ

- ทำการเปลี่ยน เลนส์ CD, Filter 330 nm จำนวน 1 ชิ้น
- ทำการเปลี่ยน Sintered Filter 1 ชิ้น, O-ring 2 ชิ้น, Spring 1 ชิ้น



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

(คุณพรชัย ผาติวนารักษ์)

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย ผาติวนารักษ์

โทรศัพท์ : 0-2515-8987

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : Info@kinetics.co.th

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : C E LAB & CONSULTING COMPANY LIMITED

EQUIPMENT NAME : SO₂ Analyzer

MANUFACTURER : Teledyne - API

MODEL : T100

SERIAL NUMBER : 2961

STANDARD GAS CONCENTRATION (PPM) : 53.79

CYLINDER NO : CC745169

CYLINDER PRESSURE (PSIG) : 1750

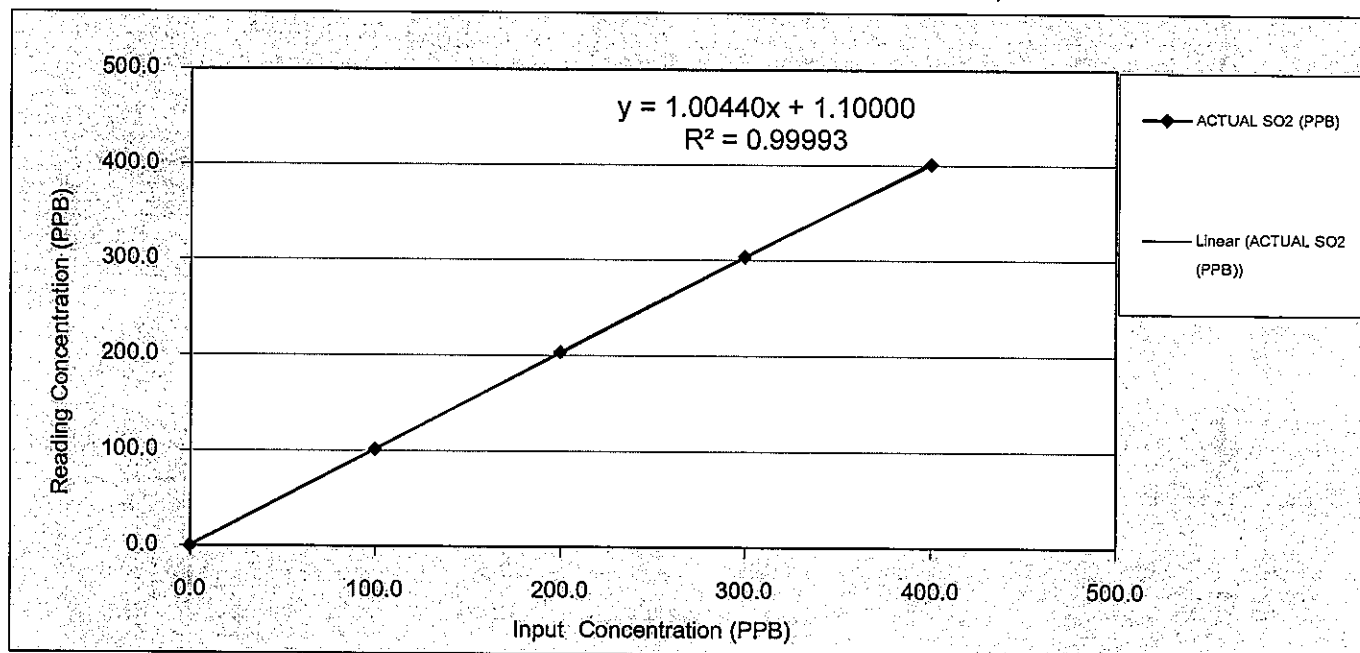
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPB)	ACTUAL SO ₂ (PPB)	ERROR SO ₂ (PPB)	% ERROR SO ₂
ZERO	0.0	0.0	0.0	-
1	100.0	101.8	1.8	1.8
2	200.0	203.2	3.2	1.6
3	300.0	303.6	3.6	1.2
4	400.0	401.3	1.3	0.3
AVERAGE (%)				1.2



KINETICS
บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

CALIBRATED BY : คุณพรชัย ผาติวนารักษ์

DATE : 22 กันยายน 2565

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : คุณพรชัย ผาติวนารักษ์ โทรศัพท์ : 02-515-8987

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : Info@kinetics.co.th

C E LAB & CONSULTING COMPANY LIMITED

Model

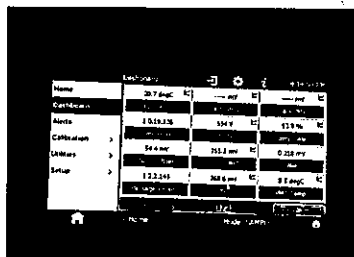
T100

Quotation

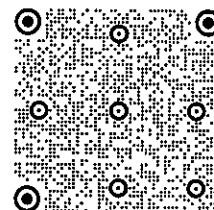
Q-B2-2022-188-SV Rev.01

22/09/2022

- ทำการตรวจเช็คพบว่า ค่า PMT และ Norm PMT มีค่า Reading สูง ส่งผลให้ไม่สามารถทำการ Calibarte ZERO และ SPAN ได้



B2



contact us

1. ทำการเปลี่ยนวัสดุสิ้นเปลือง Sintered Filter , O-ring , Spring
2. ทำการทดสอบการเปลี่ยน CD, FILTER 330 NM
3. จากการทดสอบการเปลี่ยนอะไหล่แล้วลองใช้งานเครื่อง *เครื่องสามารถทำงานปกติ

Sintered Filter 1 ชิ้น , O-ring 2 ชิ้น , Spring 1 ชิ้น
CD, FILTER 330 NM 1 ชิ้น

Mr. Pornchai

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A0622
Cylinder Number: CC745169
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12021
Gas Code: CO,NO,NOX,SO2,BALN

Reference Number: 160-402045691-1
Cylinder Volume: 144.4 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Mar 10, 2021

Expiration Date: Mar 10, 2029

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

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

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/04/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet IS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg
Net Weight: 4.6 Kg



Michael A. Miller
Approved for Release

Certificate of Calibration

Date: Aug 23, 2022

Cert No. 551220085291273

Customer:

C E LAB & CONSULTING CO.LTD
245 M.4 T.NONGSAI
A.DANKHUNTHOT NAKHONRATCHASIMA 36220

Work Order #: THAI-32243306

MPC Control #: EF4771
Asset ID: N/A
Gage Type: MICROPIPETTE
Manufacturer: CAPP BRAVO
Model Number: B5000-1
Size: N/A
Temp/RH: 20.5°C / 55.0%
Location: Calibration performed at MPC facility

Serial Number: QC379903
Department: N/A
Performed By: CHAROENSAK KEAWLOY
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: August 22, 2022
Cal. Interval: 12 MONTHS
Cal. Due Date: August 22, 2023

Calibration Notes:

Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AS9541	PLATINUM RESISTANCE THERMOMETER	162C	957	ROSEMOUNT ANALYTICAL INC	Jun 11, 2023	TT-0047-20 / NIMT
AZ5418	PORTABLE ELECTRONIC BALANCE	WXSS205DU	1123373105	METTLER TOLEDO	May 19, 2023	551220085030089 / MP-TH

Procedures Used in this Event

Procedure Name

Description

ASTM E 542-01

Standard Practice for Calibration of Laboratory Volumetric Apparatus

Calibrating Technician:



CHAROENSAK KEAWLOY

QC Approval:



PADUNG SRASUAY

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

THE CALIBRATION REPORT STATUS:

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

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

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

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

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

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

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

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

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

Calibration Report of Capp Bravo B5000-1 Micropipette

MPC Control #:	<u>EF4771</u>	Serial Number:	<u>QC379903</u>
Asset ID:	<u>N/A</u>	Calibration Date:	<u>August 22, 2022</u>

Measurement Results

Nominal Value (mL)	Lower Limit (mL)	Mean Indicated of Instrument (mL)		Upper Limit (mL)	Result	Uncertainty (mL)
		As Found	As Left			
1.00	0.9880	1.0022	1.0022	1.0120	PASS	± 0.00015
2.50	2.4800	2.5058	2.5058	2.5200	PASS	± 0.00017
5.00	4.9700	5.0086	5.0086	5.0300	PASS	± 0.00018

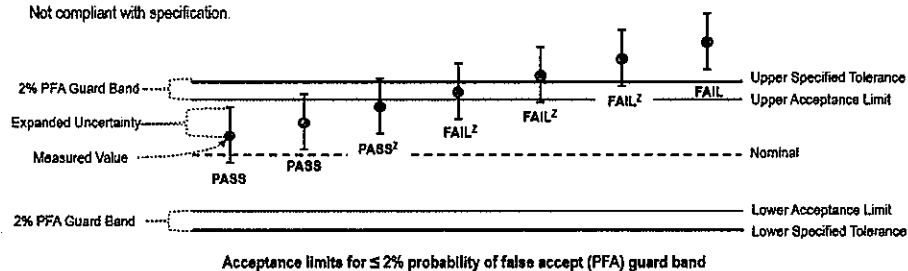
Note: Accuracy by manufacturer

Statements of Pass or Fail Conformance

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

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

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



Acceptance limits for ≤ 2% probability of false accept (PFA) guard band

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

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

End of Calibration Report



Avio200/220Max Preventive Maintenance Report

Company Name: C E LAB&CONSULTING CO., LTD.


Instrument Location: 245 M. 4 T. Nongsai, A. Dan Khunthot,
Nakhon Ratchasima Thailand 36220

Instrument Serial No.: 079S17011701

Date: 5-July-2022

ICP-OES/Avio200 Preventive Maintenance (PM)

Company Name:	C E LAB&CONSULTING CO., LTD.		
Address (Instrument Location):	245 M. 4 T. Nongsai, A. Dan Khunthot, Nakhon Ratchasima 36220		
Serial Number:	079S17011701	PM Number:	1 OF 2
Customer Name (if applicable):	K. Supattha	Telephone Number:	0823424046
Service Engineer Name:	K. Piyawit	Service Order Number:	WO-01710025
Date PM Performed: (DD-MMM-YYYY)	5-July-2022	Next PM Due Date: (DD-MMM-YYYY)	5-Jan-2023
Standard Labor Hours to Complete PM :		4 hours	

Part Number	Release	Publication Date	
09370140 Rev.5	B	January 2018	

Scope

The purpose of this PM is to ensure the continued functionality of the PerkinElmer/Avio200 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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Component List

Component / Specific Model	Serial #	Configuration Notes

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
09995098	Air Filter-Spectrometer	1 <input type="checkbox"/>
N077520	Air Filter-RF Generator	1 <input type="checkbox"/>
09992731	Axial Window	1 <input type="checkbox"/>
B0810377	Radial Window	1 <input type="checkbox"/>
N0770438	O-ring kit, injector support adapter	1 <input type="checkbox"/>
N0780437	O-ring kit, torch	1 <input type="checkbox"/>

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date: (MM/YY)
N0691579	Multi-Element Standard (N069-1579 diluted 10X)	1	57-024CRX1	30-May-2023
N9300221	Instrument Calibration-4 (N9300221 diluted 100X)	1	54-134-CRY1	30-Aug-2022

Procedure Checklist

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

1. General:

- ☒ Ask customer about unit's performance since last visit.
- ☒ Check incoming AC line voltage under load for proper levels and grounding.
- ☒ Is the instrument operational?

2. Mechanical:

- ☒ Inspect and clean all fans and filters.
- ☒ Inspect and replace torch components and necessary.

Torch Components Replaced: ☐ Yes ☒ No

If yes, list components replaced:

- ☒ Inspect all tubing for signs of cracking or leaking and replace as necessary.

Tubing Replaced: ☒ Yes ☐ No

If yes, list tubing replaced:

- ☒ Inspect the peristaltic pump for proper operation.
- ☒ Check and adjust if necessary, the external nitrogen, argon shear gas and water supply pressures.
- ☒ Check and adjust if necessary, the internal nitrogen, main argon, torch argon and shear gas pressures

Regulator	Measured Pressure	Set Pressure
Nitrogen	N/A	NA (calibrated in Factory)
Main Argon	76 psig	76psig
Torch Argon	67 psig	67psig
Shear Gas	65-psig	65psig
Water	35 psig	35psig

- ☒ Check the shear gas nozzle for blockages and proper, uniform flow.
- ☒ Inspect nitrogen Hi/Low purge and shear gas solenoids for proper function.
- ☒ Inspect the function of all spectrometer motors. Drive the motors from the Spectrometer DCM. Check all motors, couplings, set screws, gears or drive assembly located on the spectrometer (prism/grating wavelength drives, slits, shutter, DV mirror, X/Y mirror) if problems are found.
- ☒ Perform preventative maintenance on the chiller as required. Make the customer aware of the importance of maintaining the chiller fluid level and filter replacement.
- ☒ Drain air compressor surge tank.
- ☒ Clean exterior of instrument.

3. Electrical:

- ☒ Visually inspect all PC boards for cleanliness and signs of corrosion.
 - ☒ Check all RF generator and spectrometer power supply voltages.
 - ☒ Run instrument diagnostic checks from the appropriate Device Control Module.

RF Generator:

- ☒ Check the RF generator status screens.
- ☒ Check the function of all interlocks.

Spectrometer:

- ☒ Check the spectrometer status screens.
- ☒ Check for proper function of all motors from the Motor Control window.

4. Optical:

- ☒ Check the neon lamp for proper operation.
- ☒ Ensure that neon initialization passes at power up.
- ☒ Ensure that there is a single, well defined peak of sufficient intensity (approximately 15,000 to 60,000 cts.) for the 703.241nm neon line viewed in the DCM Collect Spectra window. Re-generate the neon correction table if problems are encountered. If problems are still exhibited after the table is re-generated, replace the neon lamp assembly.

Neon Lamp Replaced: ☐ Yes ☒ No

- ☒ Perform the Initialize Optics routine from the Spectrometer Control window.
- ☒ Insure that the routine passes with no error codes. If it fails, run a manual prism scan from the spectrometer DCM.
- ☒ Insure the Dark Current measurement (Detector Calibration) passes at initialization.
- ☒ Check the shutter home sensor position.
- ☒ Check prism/electronics temperature sensor readback values from the DCM. It is normal for these readings to be shown in red. A typical prism temperature is approximately 29.5 degree C. A typical electronics temperature is approximately 35 degree C.
- ☒ Check the detector temperature from the DCM for -7.0 to -8.5 degree C. If outside of this range the detector cooling fan may not be operational. Further inspection may be necessary.
- ☒ Inspect for proper function of the transfer optics. 1) shutter 2) DV mirror 3) X/Y mirror.
- ☒ Clean or replace the axial and radial view windows as necessary.

Axial Window Replaced: ☒ Yes ☐ No

Radial Window Replaced: ☒ Yes ☐ No

5. Post PM Performance Tests:

- ☒ Perform View Align.

5.1 Spectral Resolution:

- ☒ Measure the spectrometers ability to separate two adjacent wavelengths.

Parameter	Specification	Test Result	Pass/Fail
As 193.696 - Resolution	≤ 0.009	0.00793	Passed
Ni 231.604 - Resolution	≤ 0.011	0.01013	Passed
Ni 341.476 - Resolution	≤ 0.015	0.01394	Passed
Ba 455.403 - Resolution	≤ 0.020	0.01867	Passed

5.2 Precision:

- ☒ Test for reproducibility of a set of measurement.

Parameter	Specification	Test Result	Pass/Fail
Zn 213.856	%RSD \leq 1 %	0.49%	Passed
Mg 280.856	%RSD \leq 1 %	0.30%	Passed
Mg 285.207	%RSD \leq 1 %	0.18%	Passed
Ba 455.403	%RSD \leq 1 %	0.11%	Passed

5.4 Mn BEC:

- ☒ Run Axial and Radial BEC according to the A&T spec, or the commissioning test procedure.

Mn Background Equivalent Concentration:

Method "MnBEC" For Samples "IB (2%HNO3)" and "IS (N069-1579/10)", record intensities.

Calculated BEC: $BEC = (IB * Conc\ of\ Std) / (IS - IB)$. Where Conc of Std = 1,000 PPB

Element	Mode	Conc.	IB	IS	
Mn 257.610	Radial	1,000 ppb	11121.8	733429.4	
Mn 257.610	Axial	1,000 ppb	33566.2	2907242.8	
Mn 257.610	IB*Conc.	IS - IB	BEC	Spec	Pass/Fail
Radial	11,121,800	722,307.6	15.40	<30 PPB	Passed
Axial	33,566,200	2,873,676.6	5.84	<30 PPB	Passed

6. Review:

- ☒ Review with the customer PM work performed.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM	

Review

<p><i>The preventive maintenance checks and if applicable performance tests for ICP-OES/Avio200 have been completed.</i></p> <p><i>This ICP-OES/Avio200 Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.</i></p>	
<p>Review of Preventive Maintenance:</p>	
<p>Authorized PerkinElmer Representative:</p> <p><i>Pignatelli</i></p>	<p>Date:</p> <p>5-July-2022</p> <p>(DD-MMM-YYYY)</p>
<p>Authorized Customer Representative:</p>	<p>Date:</p> <p>5-July-2022</p> <p>(DD-MMM-YYYY)</p>

Certificate of Calibration

Calibration Certification Information
Cal. Date: July 6, 2020

Rootsmeter S/N: 438320

Ta: 297

°K
Operator: Jim Tisch

Pa: 749.8

mm Hg
Calibration Model #: TE-5025A

Calibrator S/N: 3294

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4320	3.2	2.00
2	3	4	1	1.0190	6.4	4.00
3	5	6	1	0.9070	8.0	5.00
4	7	8	1	0.8710	8.8	5.50
5	9	10	1	0.7170	12.8	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9857	0.6883	1.4071	0.9957	0.6953	0.8901
0.9815	0.9632	1.9899	0.9915	0.9730	1.2587
0.9793	1.0798	2.2248	0.9893	1.0908	1.4073
0.9783	1.1232	2.3333	0.9883	1.1346	1.4760
0.9730	1.3571	2.8141	0.9829	1.3709	1.7801
QSTD	m=	2.10547	QA	m=	1.31841
	b=	-0.04070		b=	-0.02574
	r=	0.99992		r=	0.99992

Calculations

Vstd =	$\Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)$	Va =	$\Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$
Qstd =	$Vstd / \Delta Time$	Qa =	$Va / \Delta Time$
For subsequent flow rate calculations:			
Qstd =	$1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$	Qa =	$1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$

Standard Conditions
Tstd: 298.15 °K

Pstd: 760 mm Hg

Key
ΔH: calibrator manometer reading (in H2O)

ΔP: rootsmeter manometer reading (mm Hg)

Ta: actual absolute temperature (°K)

Pa: actual barometric pressure (mm Hg)

b: intercept

m: slope

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

Certificate of Calibration

Certificate No.: Cal 024-0720-0276

Order No: 240720-2

Customer:

C E LAB & CONSULTING CO.,LTD
245 M.4 T.Nongsai A.DanKhunThot
Nakorn Ratchasima THAILAND 36220

Date of calibration:

2020-07-24

Date of issue:

2020-07-24

Instrument Calibrated:

Sound Calibrator

Manufacturer:

RION

Type:

NC-74

Serial no:

34178137

Calibration and verification performed:

The performed tests refer to the sections 5.2, 5.3 and 5.5 in IEC 60942 (2003): Electro-acoustics - Sound Calibrators. The calibrator has been tested as described in Annex B of the same standard.

Preconditioning:

The equipment was preconditioned for more than 12 hours at the specified calibration temperature and humidity.

Instruments and Program:

A complete list of instruments, hardware and software, that has been used for this calibration is separately available from the calibration laboratory.

Equipment standards used:

- Sound measuring equipment calibration unit 483B S/N31083
- Digital multimeter Keysight S/N HP34401A
- Ultra low distortion function generator stanford SRS DS360 S/N123625
- Acoustic sound calibrator class 0 Nor1253 S/N32914
- Reference microphone condenser G.R.A.S. 40AU-1 S/N309231
- System software Nor1504A

Traceability

All measured values and conditions are complying with ISO/IEC17025:

Sound Pressure Level: NCL, Norway

Frequency: IKM Laboratorium Norway

Voltage: IKM Laboratorium Norway

Ambient Pressure: Justervesenet, Norway

Temperature: Justervesenet, Norway

Relative Humidity: Justervesenet, Norway

Reference microphone: NCL, Norway

Certificate No.: Cal 024-0720-0276

Order No: 240720-2

Environmental conditions:	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	100.67 ± 0.05 kPa	23.2 ± 0.6 °C	52.1 ± 3.0 %RH

1. Sound pressure level

Specified sound pressure level (dB)	Measured sound pressure level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
Reference microphone 40AU S/N 309231				
94.00	93.98	0.02	± 0.2	± 0.40

2. Frequency

Specified Frequency (Hz)	Measured Frequency (Hz)	Deviated value (%)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
Reference microphone 40AU S/N 309231				
1000 .00	1001.68	0.168	± 0.2	± 1.0%

3. Total distortion

Specified sound pressure level (dB)	Measured Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
Reference microphone 40AU S/N 309231			
94.00	1.20	± 0.2	± 3.0%

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%

Calibrated By: kevin
(Mr. Kevin Rosmolen)

Approved By: [Signature]
(Mr. Pitupong Sarapho)

Date of calibration : 2020-07-24
Date of issue : 2020-07-24

Certificate of Calibration

Order No: 240720-1

Certificate No.: Cal 024-0720-0275

Customer: C E LAB & CONSULTING CO.,LTD
245 M.4 T.Nongsai A.DanKhunThot
Nakorn Ratchasima THAILAND 36220

Date of calibration: 2020-07-24
Date of issue: 2020-07-24
Instrument Calibrated: Sound Level Meter
Manufacturer: RION
Type: NL42
Serial no: 00171586

Calibration and verification performed:

Acoustical levels are stated relative to 20 μ Pa. Other dB levels are relative values.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which with the reported effective degree of freedom corresponds to coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02

The sound level meter instrument submitted for periodic testing did not successfully complete the periodic tests of IEC 61672-3. The sound level meter does therefore not conform to the requirements of IEC 61672-1. See attached measurement results.

Preconditioning:

The equipment was preconditioned for more than 12 hours at the specified calibration temperature and humidity.

Instruments and Program:

A complete list of instruments, hardware and software, that has been used for this calibration is separately available from the calibration laboratory.

Equipment standards used:

- Sound measuring equipment calibration unit 483B S/N31083
- Digital multimeter Keysight S/N HP34401A
- Ultra low distortion function generator stanford SRS DS360 S/N123625
- Acoustic calibrator class 0 Nor1253 S/N32914
- Referent microphone condenser G.R.A.S. 40AU-1 S/N 30923 1
- System software Nor1504A

Traceability

All measured values and conditions are complying with ISO/IEC17025:

Sound Pressure Level: NCL, Norway	Frequency: IKM Laboratorium Norway
Voltage: IKM Laboratorium Norway	Ambient Pressure: Justervesenet, Norway
Temperature: Justervesenet, Norway	Relative Humidity: Justervesenet, Norway
Reference microphone: NCL, Norway	

Certificate No.: Cal 024-0720-0275

Order No: 240720-1

Environmental conditions:	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	100.65 ± 0.05 kPa	23.2 ± 0.6 °C	51.4 ± 3.0 %RH

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
	Before adjust	After adjust			
94.0	93.5	94.0	0.0	±0.2	±1.4

2. Self-generated noise

Frequency Weighting	Measured value (dB)	Uncertainty (dB)
A-Weighting	12.8	±0.2
C-Weighting	17.9	±0.2
Z-Weighting	25.5	±0.2

3. Frequency weightings: A-Network Reference acoustic signal 91 dB

Frequency (Hz)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
63.1	91.0	0.0	±0.2	±2.5
125.9	91.1	0.1	±0.2	±2.0
251.2	91.0	0.0	±0.2	±1.9
501.2	91.0	0.0	±0.2	±1.9
1000.0	91.0	0.0	±0.2	±1.4
1995.3	90.8	-0.2	±0.2	±2.6
3981.1	90.7	-0.3	±0.2	±3.1
7943.3	91.1	0.1	±0.2	±5.6

Date of calibration : 2020-07-24
Date of issue : 2020-07-24

Certificate No.: Cal 024-0720-0275

Order No: 240720-1

4. Frequency weightings: C-Network Reference acoustic signal 91 dB

Frequency (Hz)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
63.1	90.9	-0.1	±0.2	±2.5
125.9	91.1	0.1	±0.2	±2.0
251.2	91.0	0.0	±0.2	±1.9
501.2	91.1	0.1	±0.2	±1.9
1000.0	91.0	0.0	±0.2	±1.4
1995.3	90.9	-0.1	±0.2	±2.6
3981.1	90.7	-0.3	±0.2	±3.1
7943.3	91.1	0.1	±0.2	±5.6

5. Frequency weightings: Z-Network Reference acoustic signal 91 dB

Frequency (Hz)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
63.1	91.0	0.0	±0.2	±2.5
125.9	91.1	0.1	±0.2	±2.0
251.2	91.0	0.0	±0.2	±1.9
501.2	91.0	0.0	±0.2	±1.9
1000.0	91.0	0.0	±0.2	±1.4
1995.3	90.8	-0.2	±0.2	±2.6
3981.1	90.7	-0.3	±0.2	±3.1
7943.3	91.0	0.0	±0.2	±5.6

6. Time weightings at 1kHz

Time weightings	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
Fast	94.0	0.0	±0.2	±0.3
Slow	94.0	0.0	±0.2	±0.3
Leq	94.0	0.0	±0.2	±0.3

Date of calibration : 2020-07-24

Date of issue : 2020-07-24

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7. Frequency weightings at 1kHz

Frequency weightings	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
A	94.0	0.0	±0.2	±0.4
C	94.0	0.0	±0.2	±0.4
Z	94.0	0.0	±0.2	±0.4

8. Level linearity on the reference level range

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94.0	94.0	0.0	±0.2	±1.4
99.0	99.0	0.0	±0.2	±1.4
104.0	104.0	0.0	±0.2	±1.4
109.0	109.0	0.0	±0.2	±1.4
114.0	114.0	0.0	±0.2	±1.4
119.0	119.0	0.0	±0.2	±1.4
124.0	124.0	0.0	±0.2	±1.4
129.0	129.0	0.0	±0.2	±1.4
132.0	132.0	0.0	±0.2	±1.4
133.0	133.0	0.0	±0.2	±1.4
134.0	134.0	0.0	±0.2	±1.4
135.0	135.0	0.0	±0.2	±1.4
136.0	136.0	0.0	±0.2	±1.4
94.0	94.0	0.0	±0.2	±1.4
89.0	89.0	0.0	±0.2	±1.4
84.0	84.0	0.0	±0.2	±1.4
79.0	79.0	0.0	±0.2	±1.4
74.0	74.0	0.0	±0.2	±1.4

Date of calibration : 2020-07-24
Date of issue : 2020-07-24

Certificate No.: Cal 024-0720-0275

Order No: 240720-1

8. Level linearity on the refence level range (continue)

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
69.0	69.0	0.0	±0.2	±1.4
64.0	64.0	0.0	±0.2	±1.4
59.0	59.0	0.0	±0.2	±1.4
54.0	54.0	0.0	±0.2	±1.4
49.0	49.0	0.0	±0.2	±1.4
44.0	44.0	0.0	±0.2	±1.4
40.0	40.0	0.0	±0.2	±1.4
39.0	38.9	-0.1	±0.2	±1.4
38.0	37.9	-0.1	±0.2	±1.4
37.0	36.9	-0.1	±0.2	±1.4
36.0	35.9	-0.1	±0.2	±1.4

9. Tone burst response

Time weightings	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
Fast	200	133.0	0.0	±0.2	±1.0
	2	116.0	0.0	±0.2	+1.0;-2.5
	0.25	106.9	-0.1	±0.2	+1.5;-5.0
Slow	200	127.0	0.0	±0.2	±1.0
	2	107.0	0.0	±0.2	+1.5;-5.0
SEL	200	128.0	0.0	±0.2	±1.0
	2	107.0	0.0	±0.2	+1.0;-2.5
	0.25	97.8	-0.2	±0.2	+1.5;-5.0

Date of calibration : 2020-07-24
Date of issue : 2020-07-24

Certificate No.: Cal 024-0720-0275

Order No: 240720-1

10. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
Positive half cycle	139.1	139.1	0.0	±0.2	±2.0
Negative half cycle	139.1	139.1	0.0	±0.2	±2.0

11. Overload indication

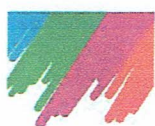
Measured value (dB)		Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
Positive one half cycle	Negative one half cycle			
135.0	135.0	0.0	±0.2	±1.5

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%

Calibrated By: Kevin
(Mr. Kevin Rosmolen)

Approved By: [Signature]
(Mr. Pitupong Sarapho)

Date of calibration : 2020-07-24
Date of issue : 2020-07-24



MILESTONE
H E L P I N G
C H E M I S T S

MILESTONE



ETHOS UP

-

ETHOS EASY

IQ / OQ PLAN

Milestone Ethos UP /Ethos EASY Microwave System

SERVICE PROTOCOL REPORT

Customer information:

Company:	Dr. Thoma AG
Department:	Lab
Person in charge:	Dr. Thoma
Address:	333 St. L. O. Thoma AG
Tel.:	
E-mail:	

Technical data:

MW Unit, type and Serial Number:	Ethos Easy	SN	17051207
Terminal, type and Serial Number:	terminal 480	SN	17051207
Software, type and revision:	Easy control	Rev.	02-B-SP3
Accessories (rotor, reactor...) types:	rotor		SK-15
VAC unit, type and serial number (if present):	-	SN	-
Cooling chiller, type and Serial Number (if present):	-	SN	-
Dosing station, type and Serial Number (if present):	-	SN	-
Installation and last maintenance dates:	Inst. on:	Maint. on:	

NOTE: once concluded the following protocol, a filled in and signed copy of this report should be sent to Milestone srl at: service@milestonesrl.com

1. VISUAL INSPECTION

	OK	Not OK	Corrosion
External chassis – check general conditions	✓		
Internal cavity – check general conditions and integrity Teflon coating	✓		
Door – check general conditions and correct functionality	✓		
Screws – check condition and availability	✓		
Feet – check condition and solidity	✓		
Exhaust hose – check cleaning and proper connection to a suitable exhaust line	✓		
Power supply cord – check integrity, firm plugging and ground connection	✓		
Working site – check clearances, bench and environmental conditions	✓		

2. ELECTRICAL SAFETY TEST

Using a suitable testing device (e.g. SECUTEST SIII), check the below reported parameters and take note of the results.

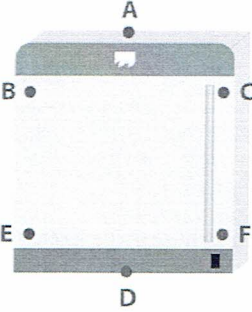
Parameter	Result	OK	Not OK
Insulating resistance: $R_{iso} \geq 0,5M\Omega$	Actual value: 0.5 M Ω	✓	
Grounding resistance: $R_{PE} \leq 100m\Omega$	Actual value: 0 m Ω	✓	

3. MW LEAKAGE TEST

Insert into the cavity a vessel filled in with 275±15ml of water.

Using a MW leak tester, check the MW leakage radiation all around the unit and in particular around the critical points shown in the picture.

Report the measured value in the chart.

	POSITION	RESULT (mW/cm²)
	A	0.00 mW
	B	0.00 mW
	C	0.00 mW
	D	0.00 mW
	E	0.00 mW
	F	0.00 mW
Maximum allowed leakage: 1mW/cm² max (ref. standard: IEC/EN 61010-2-010, IEC/EN 60335-2-90)		

4. MW OUTPUT POWER TEST

Open the “1000” panel on the terminal *Panel Administration* program.

Load a suitable borosilicate glass container (19cm diameter, 9cm height) with 1000ml of water and place it in the cavity.

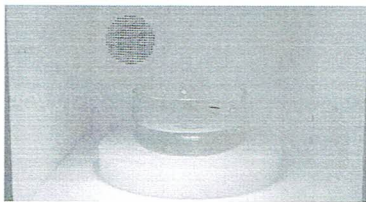
According to normative IEC 60705 the water temperature must be 10°C ±1°C

With an external thermometer measure the *Start temperature* of water and report it on the related field.

Start the test, by heating the water for 1 minute at 100% power (1800W)

With the external thermometer, measure the *End temperature* and report it on the related field.

Take note of the obtained result from the *Calculated Energy* field

	MEASURED MAX POWER		19690	W
	Acceptable result, brand new unit ⁽¹⁾ :	≥ 90 of nominal power		
	Acceptable result, old unit ⁽¹⁾ :	≥ 80% of measured power when unit was new		

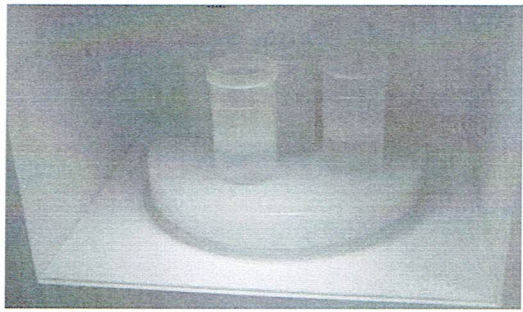
⁽¹⁾Recommended tolerance based on normal power supply testing conditions (230VAC)

5. MW HOMOGENEITY DISTRIBUTION TEST

Fill in with 100ml water n°5 vessels (PN 70625) ⁽²⁾ and place them on the rotating holding plate (PN 70405) ⁽²⁾. With an external thermometer measure the water starting temperature of each vessel and report into the table.

Run an heating program at 50% of Max nominal power for 1 minute.

With an external thermometer measure the water final temperature of each vessel and report into the table. Calculate and report the difference of temperature (ΔT) for each vessel.

	Position	T start	T final	ΔT
	1	28	50	22
	2	28	52	24
	3	28	52	24
	4	28	52	24
	5	28	52	24

$\Delta T = 2^\circ C$

Recommended acceptable result: Maximum $\Delta T < 7^\circ C$

⁽²⁾ Included in the Microwave cavity performance kit (PN 70630).

6. TEST OF FUNCTION

	OK	Not OK	N.A.
Main switch - check if the unit turns on/off	✓		
Cavity illumination – check if the led boards work properly	✓		
Turntable motor - check the regular rotation of carousel motor, adapter, 360° twist and position calibration.	✓		
Diffuser motor - check the regular rotation without abnormal friction	✓		
Exhaust motor – check if the fan is sucking air from the cavity	✓		
Magnetron cooling fan/s – check if the fan/s is cooling down the magnetron/s	✓		
Safety switches – check if the door safety switches are properly activated when the door is closed/opened	✓		
Cavity camera – check the correct functionality of camera on terminal display			✓
Door locking electropiston – check correct activation according to T1 temperature	✓		
Magnetic Stirrer - check that the stirrer is rotating properly at 100%, and max current			✓

7. TERMINAL

	OK	Not OK	N.A.	Readjusted
Display – check/adjust the brightness and correct functionality	✓			
Touch screen – check functionality and calibration	✓			
Interface cable – check condition and firm connection	✓			
Free memory – check size, in case erasing files	✓			
Actual Date and time – check correctness	✓			
Mouse (optional)			✓	
Keyboard (optional)			✓	

8. SENSORS TEST

Condition, calibration and functionality to be checked according to the related service manual

Type of sensor	Re-calibrated	OK	Not OK	N.A.
ATC-400 (thermocouple temperature sensor)		✓		
ATC-FO (fiber optic temperature sensor)				✓
IRTC (infrared temperature sensor)				✓
APC55 (pressure sensor)		✓		
AVC (vacuum sensor)				✓
QP (acid / solvent gas sensor) Type: QPA		✓		
CCS (cavity control system sensor):				✓

9. ACCESSORIES CHECK

The condition of each component has to be visually checked and tested according to the related User and Tips & Techniques manuals. Particular attention should be paid to marks of crack, deformation, discoloration, corrosion.

	Specify quantity:	OK	Not OK	N.A.
Rotor body	1 pcs	pcs		
Segment body	15 pcs	pcs		
Pressure screw	1 pcs	pcs		
Indicator ring	pcs	pcs		/
Covers	15 pcs	pcs		
Adapter plate	1 pcs	pcs		
Pressure release spring/valve	15 pcs	pcs		
Vessels	15 pcs	pcs		
Protection shield	15 pcs	pcs		
Thermowell / sealing screw (only for reference vessel)	1 pcs	pcs		
Pressure sensor tubing	1 pcs	pcs		
Torque wrench	1			

10. REPLACED SPARE PARTS

PN	DESCRIPTION	Q.ty

7.ACCESSORIES CHECK

The condition of each component has to be visually checked and tested according to the related User and Tips & Techniques manuals. Particular attention should be paid to marks of crack, deformation, discoloration, corrosion.

	Specify quantity:	OK	Not OK	N.A.
Rotor body		1 pcs	pcs	
Segment body		15 pcs	pcs	
Pressure screw		1 pcs	pcs	
Indicator ring		15 pcs	pcs	
Covers		15 pcs	pcs	
Adapter plate		15 pcs	pcs	
Pressure release spring/valve		- pcs	- pcs	-
Vessels		10 pcs	pcs	
Protection shield		- pcs	- pcs	-
Thermowell / sealing screw (only for reference vessel)		- pcs	1 pcs	-
Pressure sensor tubing		1 pcs	- pcs	-
Torque wrench				

8. Verified Temperature

Temperature	Temperature of Instrument	Temperature of TRUE RMS MULTIMETER
90 °C	90.0 °C	90.2 °C

REMARK :

.....

CUSTOMER SIGNATURE _____ DATE : _____

()

SERVICE SIGNATURE : DATE :

()

Instrument checklist

Customer name : Thongkham

Instrument model : Ethos Easy

Serial number : 17092707

INSTRUMENT TESTING PROCEDURE

- | | | | | |
|---------------------------|-------------------------------------|------|--------------------------|--------|
| 1. OPERATION INITIAL TEST | <input checked="" type="checkbox"/> | PASS | <input type="checkbox"/> | REMARK |
| 2. OPERATION POWER TEST | <input checked="" type="checkbox"/> | PASS | <input type="checkbox"/> | REMARK |

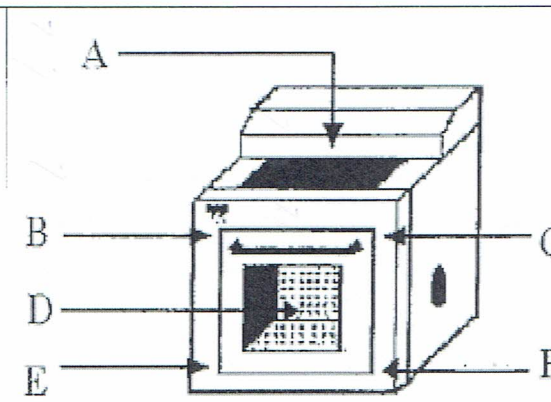
Fill a wide, shallow glass container with 1L of water and place it in the center rear of the microwave cavity. Create a microwave heating program to apply 1,800 watts of power for one minute. Vigorously stir the water and measure its temperature.

Create a microwave heating program to apply 1,800 watts of power for one minute.

maximum power	T1 (Start) :	T2 (Stop)
= (T2 – T1) x 70	27.7 °C	52.2 °C
≥ 1620 watts	Maximum power = 1801 W	

3. MICROWAVE RADIATION LEAKAGE TEST ☒ PASS ☐ REMARK

If the microwave field intensity is less than 1 mW/cm² at each of the test points, then the test is passed.

Field intensity measurements in m W/cm ² with 200ml of water at 100% of power	Position	Radiation leakage	Accept ≤ 1 mW/cm ²
	A	0.06	
	B	0.00	
	C	0.00	
	D	0.00	
	E	0.06	
	F	0.00	

4.TEST OF FUNCTION

	OK	Not OK	N.A.
Main switch - check if the unit turns on/off	✓		
Cavity illumination – check if the led boards work properly	✓		
Turntable motor - check the regular rotation of carousel motor, adapter, 360° twist and position calibration.	✓		
Diffuser motor - check the regular rotation without abnormal friction	✓		
Exhaust motor – check if the fan is sucking air from the cavity	✓		
Magnetron cooling fan/s – check if the fan/s is cooling down the magnetron/s	✓		
Safety switches – check if the door safety switches are properly activated when the door is closed/opened	✓		
Cavity camera – check the correct functionality of camera on terminal display			✓
Door locking electropiston – check correct activation according to T1 temperature	✓		
Magnetic Stirrer - check that the stirrer is rotating properly at 100%, and max current			✓

5.TERMINAL

	OK	Not OK	N.A.	Readjusted
Display – check/adjust the brightness and correct functionality	✓			
Touch screen – check functionality and calibration	✓			
Interface cable – check condition and firm connection	✓			
Free memory – check size, in case erasing files			✓	
Actual Date and time – check correctness			✓	
Mouse (optional)			✓	
Keyboard (optional)			✓	

6.SENSORS TEST

Condition, calibration and functionality to be checked according to the related service manual

Type of sensor	Re-calibrated	OK	Not OK	N.A.
ATC-400 (thermocouple temperature sensor)		✓		
ATC-FO (fiber optic temperature sensor)				✓
IRTC (infrared temperature sensor)				✓
APC55 (pressure sensor)		✓		
AVC (vacuum sensor)				✓
QP (acid / solvent gas sensor) Type: A		✓		
CCS (cavity control system sensor):				

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