

## ภาคผนวก จ-5

ใบรายงานผลการวิเคราะห์คุณภาพน้ำทิ้ง ในระยะดำเนินการ

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**Report No. : 2024-500001290-8/ 001-1 (Page 1 of 1)** Issued date : August 13, 2024

**CLIENT :** PTTEP SP LIMITED  
**CONTACT :** Khun Natthita Sribuhome  
**ADDRESS :** Energy Complex Building A, 19<sup>th</sup>-36<sup>th</sup> Floor,  
 555/1 Vibhavadi Rangsit Road, Chatuchak, Bangkok 10900  
 Tel. 085-642-7731 E-mail address : natthitas@pttep.com

## Analysis Report

**SAMPLE DESIGNATED AS :** Wastewater Quality Analysis  
**SAMPLING BY :** Chaowalit Srinan  
**LABORATORY NAME :** SGS (Thailand) Limited  
**SAMPLING LOCATION :** Sump collecting storm water prior to discharge out of GPP (SW62)  
 Sinphuhorm (SPH), Udonthani and Khonkaen

**SAMPLING DATE :** July 12, 2024  
**SAMPLING TIME :** 08:57 hr.

Parameter	Unit	Result	Standard		Analytical Method
			1/	2/	
Temperature	°C	28.9	≤40	≤40	APHA, 2550 B
pH	-	7.6	5.5-9.0	5.5-9.0	APHA, 4500-H <sup>+</sup> B
Conductivity	µs/cm	182	-	-	APHA, 2510 B
Total Suspended Solids (TSS)	mg/L	4.3	≤50	≤50	APHA, 2540 D
Total Dissolved Solids (TDS)	mg/L	98	≤3,000	≤3,000	APHA, 2540 C
Biochemical Oxygen Demand (BOD)	mg/l	<2	≤20	≤20	APHA, 5210 B
Chemical Oxygen Demand (COD)	mg/l	<40	≤120	≤120	APHA, 5220 C
Dissolved Oxygen (DO)	mg/l	8.8	-	-	APHA, 4500-O G
Oil & Grease	mg/l	<2	≤5	≤5	APHA, 5220 B
Chromium Hexavalent (Cr <sup>6+</sup> )	mg/l	<0.01	≤0.25	≤0.25	APHA, 3500-Cr B
Copper (Cu)	mg/l	<0.01	≤2.0	≤2.0	APHA, 3120 B
Cadmium (Cd)	mg/l	<0.002	≤0.03	≤0.03	APHA, 3120 B
Manganese (Mn)	mg/l	0.07	≤5.0	≤5.0	APHA, 3120 B
Mercury (Hg)	mg/l	<0.0005	≤0.005	≤0.005	APHA, 3112 B
Lead (Pb)	mg/l	<0.01	≤0.2	≤0.2	APHA, 3120 B
Zinc (Zn)	mg/l	<0.02	≤5.0	≤5.0	APHA, 3120 B
Total Coliform Bacteria	MPN/100 ml	23,000	-	-	APHA, 9221 B

**Remark:** - Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by APHA, AWWA&WEF 24<sup>th</sup> edition., 2023.

**Source:** <sup>1/</sup> Notification of Ministry of Natural Resources and Environment B.E. 2559, published in the Royal Government Gazette, Vol. 133 Special Part 129 D, dated June 6, B.E. 2559.  
<sup>2/</sup> Notification of Ministry of Industry B.E 2560 (2017), issued under Factory Act B.E. 2535 (1992), dated May 30, B.E.2560 (2017), published in the Royal Government Gazette Vol.134, Part Special 153D, dated June 7, B.E. 2560 (2017).



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IE 000269

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**Report No. : 2024-500001290-9/ 001-1 (Page 1 of 1)** Issued date : August 28, 2024

**CLIENT :** PTTEP SP LIMITED  
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 555/1 Vibhavadi Rangsit Road, Chatuchak, Bangkok 10900  
 Tel. 085-642-7731 E-mail address : natthitas@pttep.com

## Analysis Report

**SAMPLE DESIGNATED AS :** Wastewater Quality Analysis  
**SAMPLING BY :** Chalremwut Phunikom  
**LABORATORY NAME :** SGS (Thailand) Limited  
**SAMPLING LOCATION :** Sump collecting storm water prior to discharge out of GPP (SW62)  
 Sinphuhorm (SPH), Udonthani and Khonkaen

**SAMPLING DATE :** August 8, 2024  
**SAMPLING TIME :** 16:28 hr.

Parameter	Unit	Result	Standard		Analytical Method
			1/	2/	
Temperature	°C	34.7	≤40	≤40	APHA, 2550 B
pH	-	8.7	5.5-9.0	5.5-9.0	APHA, 4500-H <sup>+</sup> B
Conductivity	µs/cm	150	-	-	APHA, 2510 B
Total Suspended Solids (TSS)	mg/L	5.2	≤50	≤50	APHA, 2540 D
Total Dissolved Solids (TDS)	mg/L	89	≤3,000	≤3,000	APHA, 2540 C
Biochemical Oxygen Demand (BOD)	mg/l	9	≤20	≤20	APHA, 5210 B
Chemical Oxygen Demand (COD)	mg/l	43	≤120	≤120	APHA, 5220 C
Dissolved Oxygen (DO)	mg/l	9.9	-	-	APHA, 4500-O G
Oil & Grease	mg/l	<2	≤5	≤5	APHA, 5220 B
Chromium Hexavalent (Cr <sup>6+</sup> )	mg/l	<0.01	≤0.25	≤0.25	APHA, 3500-Cr B
Copper (Cu)	mg/l	<0.01	≤2.0	≤2.0	APHA, 3120 B
Cadmium (Cd)	mg/l	<0.002	≤0.03	≤0.03	APHA, 3120 B
Manganese (Mn)	mg/l	0.02	≤5.0	≤5.0	APHA, 3120 B
Mercury (Hg)	mg/l	<0.0005	≤0.005	≤0.005	APHA, 3112 B
Lead (Pb)	mg/l	<0.01	≤0.2	≤0.2	APHA, 3120 B
Zinc (Zn)	mg/l	<0.02	≤5.0	≤5.0	APHA, 3120 B
Total Coliform Bacteria	MPN/100 ml	13	-	-	APHA, 9221 B

**Remark:** - Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by APHA, AWWA&WEF 24<sup>th</sup> edition., 2023.

**Source:** <sup>1/</sup> Notification of Ministry of Natural Resources and Environment B.E. 2559, published in the Royal Government Gazette, Vol. 133 Special Part 129 D, dated June 6, B.E. 2559.  
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IE 000572

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**Report No. : 2024-500001290-9/ 001-2 (Page 1 of 1)** Issued date : August 28, 2024

**CLIENT :** PTTEP SP LIMITED  
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 Tel. 085-642-7731 E-mail address : natthitas@pttep.com

## Analysis Report

**SAMPLE DESIGNATED AS :** Wastewater Quality Analysis  
**SAMPLING BY :** Chalremwut Phunikom  
**LABORATORY NAME :** SGS (Thailand) Limited  
**SAMPLING LOCATION :** Off site from GPP at potential storm water discharge point (SW63)  
 Sinphuhorm (SPH), Udonthani and Khonkaen

**SAMPLING DATE :** August 8, 2024  
**SAMPLING TIME :** 16:18 hr.

Parameter	Unit	Result	Standard		Analytical Method
			1/	2/	
Temperature	°C	32.6	≤40	≤40	APHA, 2550 B
pH	-	8.5	5.5-9.0	5.5-9.0	APHA, 4500-H <sup>+</sup> B
Conductivity	µs/cm	154	-	-	APHA, 2510 B
Total Suspended Solids (TSS)	mg/L	<2.5	≤50	≤50	APHA, 2540 D
Total Dissolved Solids (TDS)	mg/L	97	≤3,000	≤3,000	APHA, 2540 C
Biochemical Oxygen Demand (BOD)	mg/l	<2	≤20	≤20	APHA, 5210 B
Chemical Oxygen Demand (COD)	mg/l	<40	≤120	≤120	APHA, 5220 C
Oil & Grease	mg/l	<2	≤5	≤5	APHA, 5220 B
Chromium Hexavalent (Cr <sup>6+</sup> )	mg/l	<0.01	≤0.25	≤0.25	APHA, 3500-Cr B
Copper (Cu)	mg/l	<0.01	≤2.0	≤2.0	APHA, 3120 B
Cadmium (Cd)	mg/l	<0.002	≤0.03	≤0.03	APHA, 3120 B
Manganese (Mn)	mg/l	0.03	≤5.0	≤5.0	APHA, 3120 B
Mercury (Hg)	mg/l	<0.0005	≤0.005	≤0.005	APHA, 3112 B
Lead (Pb)	mg/l	<0.01	≤0.2	≤0.2	APHA, 3120 B
Zinc (Zn)	mg/l	<0.02	≤5.0	≤5.0	APHA, 3120 B
Total Coliform Bacteria	MPN/100 ml	240	-	-	APHA, 9221 B

**Remark:** - Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by APHA, AWWA&WEF 24<sup>th</sup> edition., 2023.

**Source:** <sup>1/</sup> Notification of Ministry of Natural Resources and Environment B.E. 2559, published in the Royal Government Gazette, Vol. 133 Special Part 129 D, dated June 6, B.E. 2559.  
<sup>2/</sup> Notification of Ministry of Industry B.E 2560 (2017), issued under Factory Act B.E. 2535 (1992), dated May 30, B.E.2560 (2017), published in the Royal Government Gazette Vol.134 Part Special 153D, dated June 7, B.E. 2560 (2017).

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IE 000573

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**Report No. : 2024-500001290-11/001-1 (Page 1 of 1)** Issued date : October 8, 2024

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## Analysis Report

**SAMPLE DESIGNATED AS :** Wastewater Quality Analysis  
**SAMPLING BY :** Chaowalit Srinan  
**LABORATORY NAME :** SGS (Thailand) Limited  
**SAMPLING LOCATION :** Sump collecting storm water prior to discharge out of GPP (SW62)  
 Sinphuhorm (SPH), Udonthani and Khonkaen

**SAMPLING DATE :** September 11, 2024  
**SAMPLING TIME :** 15:30 hr.

Parameter	Unit	Result	Standard		Analytical Method
			1/	2/	
Temperature	°C	33.6	≤40	≤40	APHA, 2550 B
pH	-	8.6	5.5-9.0	5.5-9.0	APHA, 4500-H <sup>+</sup> B
Conductivity	µs/cm	167	-	-	APHA, 2510 B
Total Suspended Solids (TSS)	mg/L	<2.5	≤50	≤50	APHA, 2540 D
Total Dissolved Solids (TDS)	mg/L	88	≤3,000	≤3,000	APHA, 2540 C
Biochemical Oxygen Demand (BOD)	mg/l	<2	≤20	≤20	APHA, 5210 B
Chemical Oxygen Demand (COD)	mg/l	<40	≤120	≤120	APHA, 5220 C
Dissolved Oxygen (DO)	mg/l	8.4	-	-	APHA, 4500-O G
Oil & Grease	mg/l	<2	≤5	≤5	APHA, 5220 B
Chromium Hexavalent (Cr <sup>6+</sup> )	mg/l	<0.01	≤0.25	≤0.25	APHA, 3500-Cr B
Copper (Cu)	mg/l	<0.01	≤2.0	≤2.0	APHA, 3120 B
Cadmium (Cd)	mg/l	<0.002	≤0.03	≤0.03	APHA, 3120 B
Manganese (Mn)	mg/l	0.01	≤5.0	≤5.0	APHA, 3120 B
Mercury (Hg)	mg/l	<0.0005	≤0.005	≤0.005	APHA, 3112 B
Lead (Pb)	mg/l	<0.01	≤0.2	≤0.2	APHA, 3120 B
Zinc (Zn)	mg/l	0.05	≤5.0	≤5.0	APHA, 3120 B
Total Coliform Bacteria	MPN/100 ml	79	-	-	APHA, 9221 B

**Remark:** - Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by APHA, AWWA&WEF 24<sup>th</sup> edition., 2023.

**Source:** <sup>1/</sup> Notification of Ministry of Natural Resources and Environment B.E. 2559, published in the Royal Government Gazette, Vol. 133 Special Part 129 D, dated June 6, B.E. 2559.  
<sup>2/</sup> Notification of Ministry of Industry B.E 2560 (2017), issued under Factory Act B.E. 2535 (1992), dated May 30, B.E.2560 (2017), published in the Royal Government Gazette Vol.134, Part Spe 0 (2017).



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IE 004174

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**Report No. : 2024-500001290-11/001-2 (Page 1 of 1)** Issued date : October 8, 2024

**CLIENT :** PTTEP SP LIMITED  
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 Tel. 085-642-7731 E-mail address : natthitas@pttep.com

## Analysis Report

**SAMPLE DESIGNATED AS :** Wastewater Quality Analysis  
**SAMPLING BY :** Chaowalit Srinan  
**LABORATORY NAME :** SGS (Thailand) Limited  
**SAMPLING LOCATION :** Off site from GPP at potential storm water discharge point (SW63)  
 Sinphuhorm (SPH), Udonthani and Khonkaen

**SAMPLING DATE :** September 11, 2024  
**SAMPLING TIME :** 15:40 hr.

Parameter	Unit	Result	Standard		Analytical Method
			1/	2/	
Temperature	°C	32.1	≤40	≤40	APHA, 2550 B
pH	-	8.4	5.5-9.0	5.5-9.0	APHA, 4500-H <sup>+</sup> B
Conductivity	µs/cm	169	-	-	APHA, 2510 B
Total Suspended Solids (TSS)	mg/L	2.8	≤50	≤50	APHA, 2540 D
Total Dissolved Solids (TDS)	mg/L	90	≤3,000	≤3,000	APHA, 2540 C
Biochemical Oxygen Demand (BOD)	mg/l	6	≤20	≤20	APHA, 5210 B
Chemical Oxygen Demand (COD)	mg/l	<40	≤120	≤120	APHA, 5220 C
Oil & Grease	mg/l	<2	≤5	≤5	APHA, 5220 B
Chromium Hexavalent (Cr <sup>6+</sup> )	mg/l	<0.01	≤0.25	≤0.25	APHA, 3500-Cr B
Copper (Cu)	mg/l	<0.01	≤2.0	≤2.0	APHA, 3120 B
Cadmium (Cd)	mg/l	<0.002	≤0.03	≤0.03	APHA, 3120 B
Manganese (Mn)	mg/l	0.05	≤5.0	≤5.0	APHA, 3120 B
Mercury (Hg)	mg/l	<0.0005	≤0.005	≤0.005	APHA, 3112 B
Lead (Pb)	mg/l	<0.01	≤0.2	≤0.2	APHA, 3120 B
Zinc (Zn)	mg/l	0.03	≤5.0	≤5.0	APHA, 3120 B
Total Coliform Bacteria	MPN/100 ml	13	-	-	APHA, 9221 B

**Remark:** - Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by APHA, AWWA&WEF 24<sup>th</sup> edition., 2023.

**Source:** <sup>1/</sup> Notification of Ministry of Natural Resources and Environment B.E. 2559, published in the Royal Government Gazette, Vol. 133 Special Part 129 D, dated June 6, B.E. 2559.  
<sup>2/</sup> Notification of Ministry of Industry B.E 2560 (2017), issued under Factory Act B.E. 2535 (1992), dated May 30, B.E.2560 (2017), published in the Royal Government Gazette Vol.134, Part Special 153D. dated June 7. B.E. 2560 (2017).

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IE 004175

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**Report No. : 2024-500001290-13/004-1 (Page 1 of 1) Issued date : October 21, 2024**

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 555/1 Vibhavadi Rangsit Road, Chatuchak, Bangkok 10900  
 Tel. 085-642-7731 E-mail address : natthitas@pttep.com

## Analysis Report

**SAMPLE DESIGNATED AS :** Wastewater Quality Analysis **SAMPLING DATE :** October 1, 2024  
**SAMPLING BY :** Sompong Katkhuntod **SAMPLING TIME :** 09:00 hr.  
**LABORATORY NAME :** SGS (Thailand) Limited  
**SAMPLING LOCATION :** Sump collecting storm water prior to discharge out of GPP (SW62)  
 Sinphuorm (SPH), Udonthani and Khonkaen

Parameter	Unit	Result	Standard		Analytical Method
			1/	2/	
Temperature	°C	29.8	≤40	≤40	APHA, 2550 B
pH	-	7.1	5.5-9.0	5.5-9.0	APHA, 4500-H' B
Conductivity	µs/cm	220	-	-	APHA, 2510 B
Total Suspended Solids (TSS)	mg/L	2.9	≤50	≤50	APHA, 2540 D
Total Dissolved Solids (TDS)	mg/L	129	≤3,000	≤3,000	APHA, 2540 C
Biochemical Oxygen Demand (BOD)	mg/l	11	≤20	≤20	APHA, 5210 B
Chemical Oxygen Demand (COD)	mg/l	54	≤120	≤120	APHA, 5220 C
Dissolved Oxygen (DO)	mg/l	6.4	-	-	APHA, 4500-O G
Oil & Grease	mg/l	<2	≤5	≤5	APHA, 5220 B
Chromium Hexavalent (Cr <sup>6+</sup> )	mg/l	<0.01	≤0.25	≤0.25	APHA, 3500-Cr B
Copper (Cu)	mg/l	<0.01	≤2.0	≤2.0	APHA, 3120 B
Cadmium (Cd)	mg/l	<0.002	≤0.03	≤0.03	APHA, 3120 B
Manganese (Mn)	mg/l	0.10	≤5.0	≤5.0	APHA, 3120 B
Mercury (Hg)	mg/l	<0.0005	≤0.005	≤0.005	APHA, 3112 B
Lead (Pb)	mg/l	<0.01	≤0.2	≤0.2	APHA, 3120 B
Zinc (Zn)	mg/l	<0.02	≤5.0	≤5.0	APHA, 3120 B
Total Coliform Bacteria	MPN/100 ml	24,000	-	-	APHA, 9221 B

**Remark:** - Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by APHA, AWWA&WEF 24<sup>th</sup> edition., 2023.

**Source:** <sup>1/</sup> Notification of Ministry of Natural Resources and Environment B.E. 2559, published in the Royal Government Gazette, Vol. 133 Special Part 129 D, dated June 6, B.E. 2559.  
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IE 007160

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**Report No. : 2024-500001290-13/004-2 (Page 1 of 1) Issued date : October 21, 2024**

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 Tel. 085-642-7731 E-mail address : natthitas@pttep.com

## Analysis Report

**SAMPLE DESIGNATED AS :** Wastewater Quality Analysis  
**SAMPLING BY :** Sompong Katkhuntod  
**LABORATORY NAME :** SGS (Thailand) Limited  
**SAMPLING LOCATION :** Off site from GPP at potential storm water discharge point (SW63)  
 Sinphuhorm (SPH), Udonthani and Khonkaen

**SAMPLING DATE :** October 1, 2024  
**SAMPLING TIME :** 09:10 hr.

Parameter	Unit	Result	Standard		Analytical Method
			1/	2/	
Temperature	°C	30.1	≤40	≤40	APHA, 2550 B
pH	-	7.2	5.5-9.0	5.5-9.0	APHA, 4500-H <sup>+</sup> B
Conductivity	µs/cm	217	-	-	APHA, 2510 B
Total Suspended Solids (TSS)	mg/L	2.7	≤50	≤50	APHA, 2540 D
Total Dissolved Solids (TDS)	mg/L	130	≤3,000	≤3,000	APHA, 2540 C
Biochemical Oxygen Demand (BOD)	mg/l	4	≤20	≤20	APHA, 5210 B
Chemical Oxygen Demand (COD)	mg/l	<40	≤120	≤120	APHA, 5220 C
Oil & Grease	mg/l	<2	≤5	≤5	APHA, 5220 B
Chromium Hexavalent (Cr <sup>6+</sup> )	mg/l	<0.01	≤0.25	≤0.25	APHA, 3500-Cr B
Copper (Cu)	mg/l	<0.01	≤2.0	≤2.0	APHA, 3120 B
Cadmium (Cd)	mg/l	<0.002	≤0.03	≤0.03	APHA, 3120 B
Manganese (Mn)	mg/l	0.08	≤5.0	≤5.0	APHA, 3120 B
Mercury (Hg)	mg/l	<0.0005	≤0.005	≤0.005	APHA, 3112 B
Lead (Pb)	mg/l	<0.01	≤0.2	≤0.2	APHA, 3120 B
Zinc (Zn)	mg/l	<0.02	≤5.0	≤5.0	APHA, 3120 B
Total Coliform Bacteria	MPN/100 ml	4,900	-	-	APHA, 9221 B

**Remark:** - Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by APHA, AWWA&WEF 24<sup>th</sup> edition., 2023.

**Source:** <sup>1/</sup> Notification of Ministry of Natural Resources and Environment B.E. 2559, published in the Royal Government Gazette, Vol. 133 Special Part 129 D, dated June 6, B.E. 2559.  
<sup>2/</sup> Notification of Ministry of Industry B.E 2560 (2017), issued under Factory Act B.E. 2535 (1992), dated May 30, B.E.2560 (2017), published in the Royal Government Gazette Vol.134 Part Special 153D, dated June 7, B.E. 2560 (2017).



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IE 007161

SGS (Thailand) Limited | 238 TRR Tower, 19<sup>th</sup>-21<sup>st</sup> Floor, Naradhiwas Rajanagarindra Road, Chong Nonsi, Yannawa, Bangkok 10120 t +66 (0)2 678 18 13 www.sgs.co.th

Member of the SGS Group



**Report No. : 2024-500001290-14/001-1 (Page 1 of 1) Issued date : November 29, 2024**

**CLIENT :** PTTEP SP LIMITED  
**CONTACT :** Khun Natthita Sribuhome  
**ADDRESS :** Energy Complex Building A, 19<sup>th</sup>-36<sup>th</sup> Floor,  
 555/1 Vibhavadi Rangsit Road, Chatuchak, Bangkok 10900  
 Tel. 085-642-7731 E-mail address : natthitas@pttep.com

## Analysis Report

**SAMPLE DESIGNATED AS :** Wastewater Quality Analysis **SAMPLING DATE :** November 15, 2024  
**SAMPLING BY :** Sompong Katkhuntod **SAMPLING TIME :** 08:26 hr.  
**LABORATORY NAME :** SGS (Thailand) Limited  
**SAMPLING LOCATION :** Sump collecting storm water prior to discharge out of GPP (SW62)  
 Sinphuhorm (SPH), Udonthani and Khonkaen

Parameter	Unit	Result	Standard		Analytical Method
			1/	2/	
Temperature	°C	28.9	≤40	≤40	APHA, 2550 B
pH	-	8.2	5.5-9.0	5.5-9.0	APHA, 4500-H <sup>+</sup> B
Conductivity	µs/cm	173	-	-	APHA, 2510 B
Total Suspended Solids (TSS)	mg/L	8.0	≤50	≤50	APHA, 2540 D
Total Dissolved Solids (TDS)	mg/L	102	≤3,000	≤3,000	APHA, 2540 C
Biochemical Oxygen Demand (BOD)	mg/l	<2	≤20	≤20	APHA, 5210 B
Chemical Oxygen Demand (COD)	mg/l	<40	≤120	≤120	APHA, 5220 C
Dissolved Oxygen (DO)	mg/l	8.5	-	-	APHA, 4500-O G
Oil & Grease	mg/l	<2	≤5	≤5	APHA, 5220 B
Chromium Hexavalent (Cr <sup>6+</sup> )	mg/l	<0.01	≤0.25	≤0.25	APHA, 3500-Cr B
Copper (Cu)	mg/l	<0.01	≤2.0	≤2.0	APHA, 3120 B
Cadmium (Cd)	mg/l	<0.002	≤0.03	≤0.03	APHA, 3120 B
Manganese (Mn)	mg/l	0.05	≤5.0	≤5.0	APHA, 3120 B
Mercury (Hg)	mg/l	<0.0005	≤0.005	≤0.005	APHA, 3112 B
Lead (Pb)	mg/l	<0.01	≤0.2	≤0.2	APHA, 3120 B
Zinc (Zn)	mg/l	<0.02	≤5.0	≤5.0	APHA, 3120 B
Total Coliform Bacteria	MPN/100 ml	33	-	-	APHA, 9221 B

**Remark:** - Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by APHA, AWWA&WEF 24<sup>th</sup> edition., 2023.

**Source:** <sup>1/</sup> Notification of Ministry of Natural Resources and Environment B.E. 2559, published in the Royal Government Gazette, Vol. 133 Special Part 129 D, dated June 6, B.E. 2559.  
<sup>2/</sup> Notification of Ministry of Industry B.E 2560 (2017), issued under Factory Act B.E. 2535 (1992), dated May 30, B.E.2560 (2017), published in the Royal Government Gazette Vol.134, Part 1, dated May 30, B.E. 2560 (2017).



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IE 007525

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Member of the SGS Group



**Report No. : 2024-500001290-15/001-1 (Page 1 of 1)** Issued date : January 3, 2025

**CLIENT :** PTTEP SP LIMITED  
**CONTACT :** Khun Natthita Sribuhome  
**ADDRESS :** Energy Complex Building A, 19<sup>th</sup>-36<sup>th</sup> Floor,  
 555/1 Vibhavadi Rangsit Road, Chatuchak, Bangkok 10900  
 Tel. 085-642-7731 E-mail address : natthitas@pttep.com

## Analysis Report

**SAMPLE DESIGNATED AS :** Wastewater Quality Analysis  
**SAMPLING BY :** Sompong Katkhuntod  
**LABORATORY NAME :** SGS (Thailand) Limited  
**SAMPLING LOCATION :** Sump collecting storm water prior to discharge out of GPP (SW62)  
 Sinphuhorm (SPH), Udonthani and Khonkaen

**SAMPLING DATE :** December 12, 2024  
**SAMPLING TIME :** 09:00 hr.

Parameter	Unit	Result	Standard		Analytical Method
			1/	2/	
Temperature	°C	27.2	≤40	≤40	APHA, 2550 B
pH	-	8.8	5.5-9.0	5.5-9.0	APHA, 4500-H <sup>+</sup> B
Conductivity	µs/cm	168	-	-	APHA, 2510 B
Total Suspended Solids (TSS)	mg/L	11	≤50	≤50	APHA, 2540 D
Total Dissolved Solids (TDS)	mg/L	135	≤3,000	≤3,000	APHA, 2540 C
Biochemical Oxygen Demand (BOD)	mg/l	<2	≤20	≤20	APHA, 5210 B
Chemical Oxygen Demand (COD)	mg/l	<40	≤120	≤120	APHA, 5220 C
Dissolved Oxygen (DO)	mg/l	7.7	-	-	APHA, 4500-O G
Oil & Grease	mg/l	<2	≤5	≤5	APHA, 5220 B
Chromium Hexavalent (Cr <sup>6+</sup> )	mg/l	<0.01	≤0.25	≤0.25	APHA, 3500-Cr B
Copper (Cu)	mg/l	<0.01	≤2.0	≤2.0	APHA, 3120 B
Cadmium (Cd)	mg/l	<0.002	≤0.03	≤0.03	APHA, 3120 B
Manganese (Mn)	mg/l	0.03	≤5.0	≤5.0	APHA, 3120 B
Mercury (Hg)	mg/l	<0.0005	≤0.005	≤0.005	APHA, 3112 B
Lead (Pb)	mg/l	<0.01	≤0.2	≤0.2	APHA, 3120 B
Zinc (Zn)	mg/l	<0.02	≤5.0	≤5.0	APHA, 3120 B
Total Coliform Bacteria	MPN/100 ml	21	-	-	APHA, 9221 B

**Remark:** - Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by APHA, AWWA&WEF 24<sup>th</sup> edition., 2023.

**Source:** <sup>1/</sup> Notification of Ministry of Natural Resources and Environment B.E. 2559, published in the Royal Government Gazette, Vol. 133 Special Part 129 D, dated June 6, B.E. 2559.  
<sup>2/</sup> Notification of Ministry of Industry B.E 2560 (2017), issued under Factory Act B.E. 2535 (1992), dated May 30, B.E.2560 (2017), published in the Royal Government Gazette Vol.134, Part Special 153D, dated June 7, B.E. 2560 (2017).



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IE 009326

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## ภาคผนวก ฉ

เอกสารสอบเทียบเครื่องมือตรวจวัด/วิเคราะห์

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บริษัท ไอเอสคอนซัลแตนท์ (ประเทศไทย) จำกัด  
103566 ถนนสีกันใหญ่ แขวงสีกันใหญ่ เขตคลองเตย กรุงเทพมหานคร 10260  
Tel. 0 2322 1852-54 ext.100

บริษัท ไอเอสคอนซัลแตนท์ (ประเทศไทย) CO., LTD.  
103566 ถนนสีกันใหญ่ แขวงสีกันใหญ่ เขตคลองเตย กรุงเทพมหานคร 10260  
Tel. 02 222 1852-54 ext.100

## รายงานผลการปรับเทียบระบบควบคุมอัตราการไหลอากาศบริสุทธิ์

MASS FLOW CONTROL ZERO AIR CALIBRATION REPORT

### Calibration Instrument

เครื่องมือตรวจวัด : เครื่องมือควบคุมการดอปเปียม  
Instrument :  
รุ่น : 4010  
Model :  
ชื่อ : SABIO  
Manufacturer :  
หมายเลขเครื่อง : 08500311  
Serial No. :  
ย่านการตรวจวัด : 0 - 10 LPM  
Measuring Range :  
ลูกค้า : SGS (THAILAND) LIMITED  
Customer :

วันที่เข้าปรับเทียบ : 12 พฤษภาคม 2567  
Date of Calibration :

### Result of Calibration

Flow Rate Volume (Multi Gas Calibrator Display)		Sensor Reading			
		Before		After	
Flow Set (LPM)	Monitor (LPM)	LPM	%Error	LPM	%Error
1.00	1.000	1.038	3.651	1.010	0.990
2.00	2.000	2.082	3.990	2.011	0.497
3.00	3.000	3.096	3.101	3.021	0.695
4.00	4.000	4.096	2.344	4.025	0.621
5.00	5.000	5.086	1.691	5.030	0.596
6.00	6.000	6.079	1.300	6.032	0.551
7.00	7.000	7.089	1.255	7.030	0.427
8.00	8.000	8.110	1.356	8.023	0.287
9.00	9.000	9.187	2.035	9.003	0.033
10.00	10.000	10.270	2.629	9.993	-0.009
AVERAGE DIFFERENCE (%)		2.3263		0.4587	
Interception		-0.0162		-0.0239	
Correlation		0.9999		1.0000	

Calibration Tolerance : % Difference be should  $\pm 1\%$  of Full Scal  
User Manual of Reference

### Reference Standard Instrument

เครื่องมือสอบเทียบ : DryCal (High)  
Instrument :  
รุ่น : DCL-MH  
Model :  
ชื่อ : BIOS  
Manufacturer :  
หมายเลขเครื่อง : 3222  
Serial No. :  
ย่านการตรวจวัด : 30 l/min  
Measuring Range :  
เครื่องมือสอบเทียบ : DryCal (Low)  
Instrument :  
รุ่น : Defender 520-L  
Model :  
ชื่อ : BIOS  
Manufacturer :  
หมายเลขเครื่อง : 122189  
Serial No. :  
ย่านการตรวจวัด : 500ml/min  
Measuring Range :

Result ☒ Accepted  
☐ Not Accepted

ผู้ดำเนินการ :  
Service By

ผู้ตรวจสอบ :  
Approved By

Doc. No. :-

Page 1 of 1



บริษัท ไอเอสคอนซัลแตนท์ (ประเทศไทย) จำกัด  
103566 ถนนสีกันใหญ่ แขวงสีกันใหญ่ เขตคลองเตย กรุงเทพมหานคร 10260  
Tel. 0 2322 1852-54 ext.100

บริษัท ไอเอสคอนซัลแตนท์ (THAILAND) CO., LTD.  
103566 ถนนสีกันใหญ่ แขวงสีกันใหญ่ เขตคลองเตย กรุงเทพมหานคร 10260  
Tel. 02 222 1852-54 ext.100

## รายงานผลการปรับเทียบระบบควบคุมอัตราการไหลอากาศบริสุทธิ์

MASS FLOW CONTROL STANDARD GAS CALIBRATION REPORT

### Calibration Instrument

เครื่องมือตรวจวัด : เครื่องมือควบคุมการดอปเปียม  
Instrument :  
รุ่น : 4010  
Model :  
ชื่อ : SABIO  
Manufacturer :  
หมายเลขเครื่อง : 08500311  
Serial No. :  
ย่านการตรวจวัด : 0 - 100 CCPM  
Measuring Range :  
ลูกค้า : SGS (THAILAND) LIMITED  
Customer :

วันที่เข้าปรับเทียบ : 12 พฤษภาคม 2567  
Date of Calibration :

### Result of Calibration

Flow Rate Volume (Multi Gas Calibrator Display)		Sensor Reading			
		Before		After	
Flow Set (CCPM)	Monitor (CCPM)	CCPM	%Error	CCPM	%Error
10.00	10.00	10.80	7.41	9.85	-1.52
20.00	20.00	21.59	7.36	19.97	-0.15
30.00	30.00	32.25	6.98	30.05	0.17
40.00	40.00	42.79	6.52	40.01	0.02
50.00	50.00	53.57	6.66	49.84	-0.32
60.00	60.00	63.97	6.21	59.82	-0.30
70.00	70.00	74.53	6.08	69.65	-0.50
80.00	80.00	85.00	5.88	79.60	-0.50
90.00	90.00	95.65	5.71	89.64	-0.40
100.00	100.00	107.46	6.94	100.10	0.10
AVERAGE DIFFERENCE (%)		6.5751		-0.3410	
Interception		-0.1778		0.0351	
Correlation		0.9999		1.0000	

Calibration Tolerance : % Difference be should  $\pm 1\%$  of Full Scal  
User Manual of Reference

### Reference Standard Instrument

เครื่องมือสอบเทียบ : DryCal (High)  
Instrument :  
รุ่น : DCL-MH  
Model :  
ชื่อ : BIOS  
Manufacturer :  
หมายเลขเครื่อง : 3222  
Serial No. :  
ย่านการตรวจวัด : 30 l/min  
Measuring Range :  
เครื่องมือสอบเทียบ : DryCal (Low)  
Instrument :  
รุ่น : Defender 520-L  
Model :  
ชื่อ : BIOS  
Manufacturer :  
หมายเลขเครื่อง : 122189  
Serial No. :  
ย่านการตรวจวัด : 500ml/min  
Measuring Range :

Result ☒ Accepted  
☐ Not Accepted

ผู้ดำเนินการ :  
Service By

ผู้ตรวจสอบ :  
Approved

Doc. No.

Page 1 of 1





บริษัท ไอแอลอีคอนซัลแทนท์ (ประเทศไทย) จำกัด  
105/506 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10250  
Tel. 0 2322 1922-54 fax 100

บริษัท ไอแอลอีคอนซัลแทนท์ (ประเทศไทย) จำกัด  
105/506 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10250  
Tel. 462 2222 1922-54 ext.100

105/506 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10250  
Tel. 462 2222 1922-54 ext.100

## รายงานผลการปรับเทียบระบบผลิตภัณฑ์ไอโซโทป

### OZONE GENERATOR CALIBRATION REPORT

#### Calibration Instrument

เครื่องมือตรวจวัด : เครื่องวัดความหนาแน่นของก๊าซ  
รุ่น : 4010  
Model : SABO  
Manufacturer : SAEBO  
Station : สถานีตรวจวัดคุณภาพอากาศในบรรยากาศทั่วไป

หมายเลขเครื่อง : 08500311  
Serial No : 0 - 100 C/PM  
Manufacturer : SGS (THAILAND) LIMITED  
ลูกค้า : Customer

วันที่รับเข้าเทียบ : 12 พฤษภาคม 2567  
Date of Calibration

#### Result of Calibration

Flow Rate Volume (Multi Gas Calibrator Display)		Sensor Reading	
Flow Set (PPB)	Monitor (PPB)	Before	After
0.0	0.0	0.0	1.0
100.0	100.0	96.0	98.0
200.0	200.0	190.0	196.0
300.0	300.0	285.0	301.0
400.0	400.0	372.0	399.0
500.0	500.0	457.0	500.0
600.0	600.0	544.0	600.0
700.0	700.0	626.0	701.0
800.0	800.0	704.0	802.0
AVERAGE DIFFERENCE (%)		-41.0000	-0.1250
Interception		-19.973898	2.315293
Correlation		0.999578	0.999994

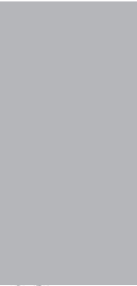
Calibration Tolerance : % Difference be should: +/- 3 PPB At 5 LPM  
User Manual of Reference

#### Reference Standard Instrument

เครื่องมือมาตรฐาน : Ozone Primary Standard  
รุ่น : Tanabate Engineering Inc.  
Manufacturer : Tanabate Engineering Inc.  
Serial No : 0 - 1500 PPB

รุ่น : SA2-734  
Model : 0140  
Manufacturer : 0140

Result : ☒ Accepted  
☐ Not Accepted



Doc. N



Airgas Specialty Gases  
Airgas USA LLC  
6341 Easton Road  
Plumsteadville, PA 18949  
Airgas.com

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA PROTOCOL STANDARD

Customer: BANGKOK INDUSTRIAL

Part Number: 160-402557716-1  
Cylinder Volume: 83.0 CF  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12022  
Gas Code: CO, NO, NOX, SO2, BALN

Expiration Date: Oct 21, 2025

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/031, 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. The results listed on this report are not to be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig, 14.07 megapascals.

#### ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	45.01 PPM	G1	+/- 1.3% NIST Traceable	10/13/2022, 10/21/2022
NITRIC OXIDE	45.00 PPM	45.01 PPM	G1	+/- 1.2% NIST Traceable	10/13/2022, 10/21/2022
SULFUR DIOXIDE	45.00 PPM	45.11 PPM	G1	+/- 0.9% NIST Traceable	10/13/2022, 10/21/2022
CARBON MONOXIDE	4500 PPM	4511 PPM	G1	+/- 0.8% NIST Traceable	10/14/2022
NITROGEN	Balance				

#### CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	210607-21	CC709065	48.41 PPM NITRIC OXIDE/NITROGEN	+/- 1.2%	Sep 21, 2025
PRM	12395	D887660	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 22, 2022
GMS	124206889110	CC322874	4.474 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 25, 2025
NTRM	160102-32	KAL004062	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
NTRM	08012355	KAL004734	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

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

#### ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 M1XD579	NDIR	Sep 22, 2022
Nicolet ISSO FTIR AUP2010245 NO	FTIR	Oct 20, 2022
Nicolet ISSO FTIR AUP2010245 NO2	FTIR	Oct 06, 2022
Nicolet ISSO FTIR AUP2010245 SO2	FTIR	Sep 29, 2022

#### Triad Data Available Upon Request

NOTES: PO# 5222004798  
Gross Weight: 17.2 Kg  
Net Weight: 2.7 Kg  
Cylinder: 80A





## CERTIFICATE OF CALIBRATION

Certificate No. : COF-038-67

### MEASUREMENT ITEM

MANUFACTURER : Top Load Orifice  
MODEL/TYPE : TISCH  
SERIAL NUMBER : TE-S028A  
ID NUMBER : 1547  
CONDITION AS-RECEIVED : -  
CUSTOMER : Used Item  
: SGS (Thailand) Limited  
100 Nanglinchee Road Chongnonsee Yamawa Bangkok  
10120 Thailand

### RECEIVED DATE

MEASUREMENT DATE : 16 Sep 2024

ISSUE DATE : 18 Sep 2024

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:  
Temperature :  $23.0 \pm 3.0$  °C  
Relative Humidity :  $55.0 \pm 15.0$  %RH  
Atmospheric Pressure :  $1010 \pm 10$  hPa

### CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.  
Measurement Condition : The average values during measurement are 23.9 °C and 50.3 %RH.

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

### TABULATION OF RESULTS:

The table on next page give the measured values.

### Calibration procedure:

The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/MC/W2-dp. The WI-CL-004 was used as a calibration guideline.

### Traceability:

This certificate provides a traceability of the measurement to recognized the national standards and to realization of the International system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0063-23.

### Uncertainty of Measurement:

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor  $k=2$ . Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

### MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The humid air was used as a medium in the system. The standard conditions are 25 °C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m <sup>3</sup> /min	Pressure [Pa] mmHg	Temperature [T <sub>a</sub> ] °C	Temperature [T <sub>m</sub> ] °C	Δp_meter mmHg	Δp_Orifice InH <sub>2</sub> O	γ	Standard Flow [Q <sub>s</sub> ] m <sup>3</sup> /min
1	0.702	753.965	23.87	22.44	42.635	0.965	0.980	0.663
2	1.000	753.994	23.84	22.48	29.995	2.144	1.461	0.961
3	1.118	754.063	23.83	22.54	24.771	2.747	1.654	1.082
4	1.168	754.102	24.01	22.68	22.895	3.030	1.737	1.132
5	1.406	754.157	24.00	22.77	13.050	4.612	2.143	1.381

Slope (m): 1.61747

Intercept (b): -0.09319

Correlation coefficient (r): 0.99984

Uncertainty (k=2): 0.015 m<sup>3</sup>/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m <sup>3</sup> /min	Pressure [Pa] mmHg	Temperature [T <sub>a</sub> ] °C	Temperature [T <sub>m</sub> ] °C	Δp_meter mmHg	Δp_Orifice InH <sub>2</sub> O	γ	Standard Flow [Q <sub>s</sub> ] m <sup>3</sup> /min
1	0.702	753.965	23.87	22.44	42.635	0.965	0.617	0.666
2	1.000	753.994	23.84	22.48	29.995	2.144	0.919	0.965
3	1.118	754.063	23.83	22.54	24.771	2.747	1.040	1.086
4	1.168	754.102	24.01	22.68	22.895	3.030	1.093	1.137
5	1.406	754.157	24.00	22.77	13.050	4.612	1.348	1.387

Slope (m): 1.01307

Intercept (b): -0.05859

Correlation coefficient (r): 0.99984

Uncertainty (k=2): 0.015 m<sup>3</sup>/min

\*\*\*End of Certificate of Calibration\*\*\*



Approved signa





บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

AQM 2206

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd.  
วันที่ : 16 กุมภาพันธ์ 2567  
รายชื่ออุปกรณ์ / เครื่องมือ : NO<sub>x</sub> Analyzer  
รุ่นของอุปกรณ์ / เครื่องมือ : T200

TEST VALUES			
API MODEL T200			
	BEFORE	AFTER	
1 RANGE	50 - 20,000 PPB	500.0	0.02
2 STABILITY	≤ 1 PPB	0.91	488
3 SAMPLE FLOW	500 ± 10% cc/min	464	82
4 OZONE FLOW	80 ± 10% cc/min	101	53.2
5 PMT	mV	163.4	20.6
6 NORM PMT	mV	23.7	54.6
7 A ZERO	-20 To 150 mV	145.8	622
8 HPVS	400 - 900 V	626	50.0
9 RX CELL TEMP	50 ± 1 °C	50.2	31.8
10 BOX TEMP	AMBIENT ± 5 °C	32.5	6.8
11 PMT TEMP	7 ± 2 °C	6.7	316.0
12 MOLY TEMP	315 ± 5 °C	316.0	4.4
13 RX CELL PRESSURE	<10 in - Hg-A	28.5	0.988
14 SAMPLE PRESSURE	25 - 35 in - Hg-A	28.5	0.958
15 NOX SLOPE	1.0 ± 0.3	1.024	-0.5
16 NOX OFFSET	-50 To 150	21.4	-1.3
17 NO SLOPE	1.0 ± 0.3	0.983	0.3
18 NO OFFSET	-50 To 150	-0.7	5.7
19 NO SAMPLE READING	PPB	9.6	6.0
20 NO2 SAMPLE READING	PPB	0.7	1510.0
21 NOX SAMPLE READING	PPB	10.3	2597.0
22 OPTIC TEST	2000 ± 1000 mV	1500.0	5.25 / 12.18 / 15.50 / 15.29
23 ELECTRICAL TEST	2000 ± 1000 mV	2597.0	-1.2 / 9.8
24 VOLTAGE TEST	+5V +12V +15V -15V	5.24 / 12.18 / 15.50 / 15.29	0.0 / 0.0
25 ZERO GAS NONOX	0.00/0.00 PPB	-1.2 / 9.8	399.4 / 401.2
26 SPAN GAS NONOX	400.00/400.00 PPB	421.4 / 418.5	

#### หมายเหตุ

- ทำการเปลี่ยน Power Supply 12vdc. ไปเป็นเครื่องจ่ายกระแสใช้งานไม่ได้
- ทำการเปลี่ยน Sintered Filter 3 ชิ้น, Spring 3 ชิ้น, O-ring 6 ชิ้น
- ทำการ Calibrate Multi-point



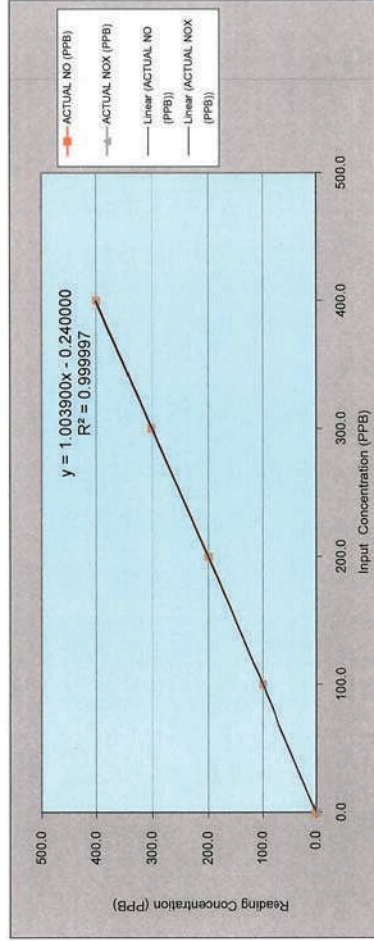
ต้องการข้อมูลเพิ่มเติม กรุณาติดต่อ : คุณณวัฒน์ มหาวงษ์ โทรศัพท์ : 0-2515-8987  
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระนอก เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8988 E-Mail : info@kinetics.co.th

#### MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd.	SERIAL NO. : 7535
EQUIPMENT NAME : NO <sub>x</sub> Analyzer	CYLINDER NO. : CT745169
MANUFACTURER : Teledyne - API	CERTIFIED DATE : Mar 10 ,2021
MODEL : T200	EXPIRED DATE : Mar 10 ,2029
STANDARD GAS CONCENTRATION (PPM) : 53.40	
CYLINDER PRESSURE (psig) : 1550	
CERTIFIED BY : AIRGAS SPECIALTY GASES	

#### CALIBRATION RESULTS

CALIBRATION RESULTS						
POINT NO	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	ACTUAL NO <sub>x</sub> (PPB)	% ERROR NO <sub>x</sub>
ZERO	0.0	0.0	0.0	0.0	0.0	0.0
1	100.0	99.7	-0.3	-0.3	99.8	-0.20
2	200.0	199.5	-0.5	-0.3	200.4	0.4
3	300.0	301.0	1.0	0.3	301.3	1.3
4	400.0	399.4	-0.6	-0.2	401.2	1.2
AVERAGE (%)						
				0.3		0.3



CALIBRATED BY : คุณณวัฒน์ มหาวงษ์

DATE : 16 /02 /2567

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : กรุณาติดต่อ คุณณวัฒน์ มหาวงษ์ โทรศัพท์ : 02-515-8987

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระนอก เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8988 E-Mail : info@kinetics.co.th



Customer service report

บริษัท เอส จี เอส (ประเทศไทย) จำกัด

Manufacturer  
Teledyne API

Equipment  
NOx Analyzer

Model  
T200

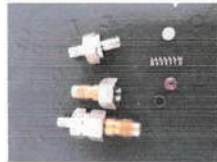
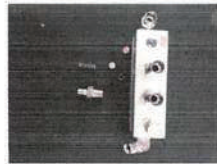
S/N  
7535

Quotation  
Q-82-2024-037-SV

● Checking Date ●  
16/02/2567

● Problem

- พบปัญหาไฟ 12vdc. เนื่องจากตัวเก่าใช้งานไม่ได้



● Correlation working / Remark

- ทำการเปลี่ยน Power Supply 12vdc.
- ทำการเปลี่ยน Sintered Filter 3 ชิ้น , Spring 3 ชิ้น O-ring 6 ชิ้น
- ทำการ Calibrate Multi-point

● Repair parts ●

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

Technician / Engineer

Mr. Sujit



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

AQM 2000

รายงานผลการซ่อมและเปรียบเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd.

รายชื่ออุปกรณ์ / เครื่องมือ : NOx Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T200

วันที่ : 16 กุมภาพันธ์ 2567

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 7534

TEST VALUES			
	API MODEL T200	BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500.0
2	STABILITY	≤ 1 PPB	0.03
3	SAMPLE FLOW	500 ± 10% cc/min	475
4	OZONE FLOW	80 ± 10% cc/min	83
5	PMT	mV	23.1
6	NORM PMT	mV	-0.8
7	A ZERO	-20 To 150 mV	23.7
8	HPVS	400 - 900 V	650
9	RX CELL TEMP	50 ± 1 °C	50.0
10	BOX TEMP	AMBIENT ± 5 °C	32.4
11	PMT TEMP	7 ± 2 °C	7.0
12	MOLY TEMP	315 ± 5 °C	314.6
13	RX CELL PRESSURE	<10 in - Hg-A	4.5
14	SAMPLE PRESSURE	25 - 35 in - Hg-A	28.7
15	NOX SLOPE	1.0 ± 0.3	0.944
16	NOX OFFSET	-50 To 150	19.5
17	NO SLOPE	1.0 ± 0.3	0.907
18	NO OFFSET	-50 To 150	-0.70
19	NO SAMPLE READING	PPB	-0.2
20	NO2 SAMPLE READING	PPB	1.0
21	NOX SAMPLE READING	PPB	0.8
22	OPTIC TEST	2000 ± 1000 mV	2827.0
23	ELECTRICAL TEST	2000 ± 1000 mV	2470.0
24	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.10 /11.89 /15.35 /-15.15
25	ZERO GAS NONOX	0.000.00 PPB	0.2 /- 2.4
26	SPAN GAS NONOX	400.00/400.00 PPB	397.6 /400.1

หมายเหตุ

- PMT Temp Warning ทำการเปลี่ยน TEC Cooler Driver BD.

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

- ทำการ Calibrate Multi-Point

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณณวัฒน์ มหาอาจ 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

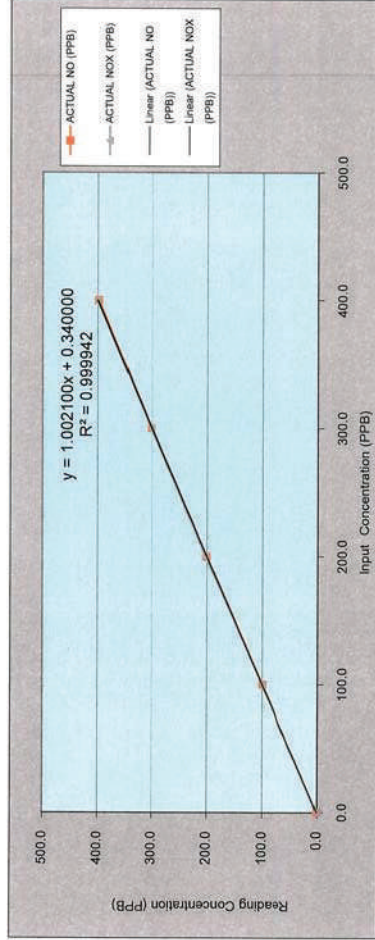


# MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd.			
EQUIPMENT NAME : NO <sub>x</sub> Analyzer			
MANUFACTURER : Teledyne - API		MODEL : T200	SERIAL NO : 7534
STANDARD GAS CONCENTRATION (PPM) :		53.4	CYLINDER NO : CC745169
CYLINDER PRESSURE (psig) :		1550	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 (PPB)	ACTUAL NO <sub>x</sub> (PPB)	ERROR NO <sub>x</sub> (PPB)
ZERO	0.0	0.0	0.0	0.0	0.0	0.0
1	100.0	99.4	-0.6	-0.6	99.6	-0.4
2	200.0	200.9	0.9	0.5	202.6	2.6
3	300.0	300.7	0.7	0.2	301.5	1.5
4	400.0	397.6	-2.4	-0.6	400.1	0.1
AVERAGE (%)		0.5		0.6		



CALIBRATED BY : คุณเนาวคน มหาวงษ์	DATE : 16 /02 /2567
ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : คุณเนาวคน มหาวงษ์ โทรศัพท์ : 02-515-8887	
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th	



## Customer service report

บริษัท เอส จี เอส (ประเทศไทย) จำกัด  
 Equipment  
 NOx Analyzer  
 Model  
 T200

Manufacturer  
 Teledyne API

S/N  
 7534  
 Quotation  
 Q-82-2024-038-SV

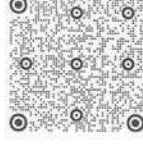
## ● Checking Date ●

16/02/2567

## ● Problem

- พบปัญหา PMT Temp Warming ค่าติดลบ -2.5

B2



contact us



## ● Correlation working / Remark

1. PMT Temp Warming ทำการเปลี่ยน TEC Cooler Driver BD
2. ทำการเปลี่ยน Sintered Filter 3 ชิ้น , Spring 3 ชิ้น O-ring 6 ชิ้น
3. ทำการ Calibrate Multi-point

## ● Repair parts ●

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

Technician / Engineer





บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

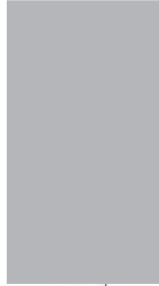
รายงานผลการสอบและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd.  
วันที่ : 15 กรกฎาคม 2567  
บริษัทผู้ผลิต : Teledyne API  
รุ่นของอุปกรณ์ / เครื่องมือ : T200  
หมายเลขอุปกรณ์ / เครื่องมือ : 2975

TEST VALUES			
API MODEL T200		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500.0
2	STABILITY	≤ 1 PPB	0.1
3	SAMPLE FLOW	500 ± 10% cc/min	506
4	OZONE FLOW	80 ± 10% cc/min	81
5	PMT	mV	314.0
6	NORM PMT	mV	231.0
7	A ZERO	-20 To 150 mV	28.0
8	HPVS	400 - 900 V	778
9	RX CELL TEMP	50 ± 1 °C	47.0
10	BOX TEMP	AMBIENT ± 5 °C	27.0
11	PMT TEMP	7 ± 2 °C	7.7
12	MOLY TEMP	315 ± 5 °C	315.0
13	RX CELL PRESSURE	<10 in - Hg-A	16.9
14	SAMPLE PRESSURE	25 - 35 in - Hg-A	29.4
15	NOX SLOPE	1.0 ± 0.3	1.222
16	NOX OFFSET	-50 To 150	-35.6
17	NO SLOPE	1.0 ± 0.3	1.196
18	NO OFFSET	-50 To 150	-35.6
19	NO SAMPLE READING	PPB	23.4
20	NO2 SAMPLE READING	PPB	12.3
21	NOX SAMPLE READING	PPB	35.7
22	OPTIC TEST	2000 ± 1000 mV	1033.6
23	ELECTRICAL TEST	2000 ± 1000 mV	1430.0
24	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.25 / 12.12 / 15.37 / -15.15
25	ZERO GAS NONOX	0.00/0.00 PPB	-0.3 / -0.2
26	SPAN GAS NONOX	400.00/400.00 PPB	431.2 / 439.35

หมายเหตุ

- Sample Flow Warning, RX Cell Warning
- ทำการเปลี่ยน SENSOR PRESS 0-15 PSI 2 ชิ้น
- ทำการเปลี่ยน Sintered Filter 3 ชิ้น, Spring 3 ชิ้น, O-ring 6 ชิ้น
- ทำการ Calibrate Multi-Point



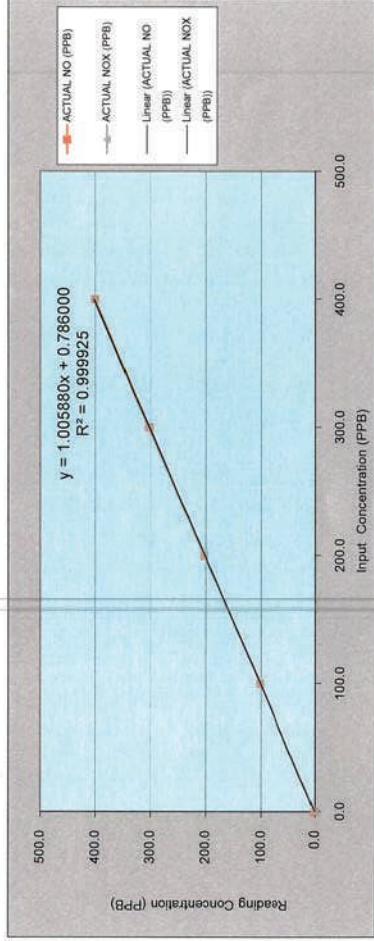
ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณนพดล นพอาจ โทรศัพท์ : 0-2515-8987  
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทรมาน เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd.	SERIAL NO : 2975
EQUIPMENT NAME : NO <sub>x</sub> Analyzer	CYLINDER NO : CC745169
MANUFACTURER : Teledyne - API	CERTIFIED DATE : Mar 10, 2021
MODEL : T200	EXPIRED DATE : Mar 10, 2023
STANDARD GAS CONCENTRATION (PPM) : 53.40	
CYLINDER PRESSURE (psig) : 1550	
CERTIFIED BY : AIRGAS SPECIALTY GASES	

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS					
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	ACTUAL NO <sub>x</sub> (PPB)	% ERROR NO <sub>x</sub>
ZERO	0.0	0.0	0.0	-	0.0	0.0
1	100.0	101.0	1.0	1.0	101.2	1.2
2	200.0	202.8	-0.7	1.4	202.9	2.9
3	300.0	302.4	2.4	0.8	304.3	4.3
4	400.0	400.3	0.3	0.1	401.4	1.4
AVERAGE (%)				0.8		1.1



CALIBRATED BY : คุณนพดล นพอาจ

DATE : 15 /07 2567

ต้องการข้อมูลเพิ่มเติมติดต่อ : คุณนพดล นพอาจ โทรศัพท์ : 02-515-8987

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





Customer service report

บริษัท เคส จี เอส (ประเทศไทย) จำกัด  
Equipment  
NOx Analyzer

Manufacturer  
Teledyne API

S/N  
2975

Model  
T200

Quotation  
Q-B2-2024-140-SV Rev.03

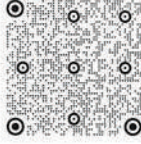
● Checking Date ●

15/07/2567

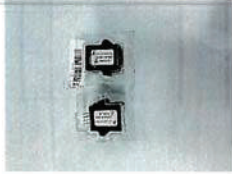
● Problem

- Sample Flow Warning , RX Cell Warning

B2



contact us



● Correlation working / Remark

- ทำการเปลี่ยน SENSOR PRESS 0-15 PSI 2 ชิ้น
- ทำการเปลี่ยน Sintered Filter 3 ชิ้น , Spring 3 ชิ้น O-ring 6 ชิ้น
- ทำการ Calibrate Multi-point

● Repair parts ●

SENSOR PRESS 0-15 PSI 2 ชิ้น , Sintered Filter 3 ชิ้น , Spring 3 ชิ้น O-ring 6 ชิ้น

Technician / Engineer

Mr. Thanakorn



Calibration Report

General Information				
Equipment:	CO Analyzer	Report No:		AQMC013/2024
Brand / Model:	API-300	Calibrated Date:		01/08/2024
Principle:	Gas Filter Correlation / NDIR	Calibrated by:		Sompong K.
Serial No:	446 (#CO-01) / 400 (#CO-02)			

Certified Gas Cylinder			
Manufacturer:	AIRGAS	Certified Concentrations	
		Component	Concentration
Gas Grade:	EPA Potocal		
Cylinder No:	LL164665	CO	4511 ppm
Certified Date:	21/10/2022		
Expired Date:	21/10/2025		

Calibration Result						
Equipment Setting			Standard Gas		Reading	
Serial No.	Parameter	Meas. Range	Unit	Zero	Span	Dif
446	CO	50	ppm	0.0	40.0	0.0
400	CO	50	ppm	0.0	40.0	0.0

Authority Signature

(Phloenchai Saengsaioo)

www.enquips.com



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd.

รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T300

วันที่ : 15 กรกฎาคม 2567

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 2550

TEST VALUES			
API MODEL T300		BEFORE	AFTER
1	RANGE 1 - 1000 PPM	50.0	50.0
2	STABILITY ≤1 PPM	0.01	0.01
3	CO MEASURE 2500 - 4800 mV	3050.4	3764
4	CO REFERENCE 2000 - 4800 mV	2542.1	3156
5	PRESEURE 25 - 35 in - Hg-A	29.5	29.5
6	SAMPLE FLOW 800 ± 10% cc/min	782	792
7	SAMPLE TEMP 48 ± 4 °C	44.6	44.4
8	BENCH TEMP 48 ± 2 °C	48	48
9	WHEEL TEMP 68 ± 2 °C	68	68
10	BOX TEMP 39.4	39.4	32.9
11	CO SLOPE 1.0 ± 0.3	0.953	0.942
12	CO OFFSET 0.0 ± 0.3	-0.008	-0.009
13	CO READING (AMBIENT) PPM	1.12	0.58
14	VOLTAGE TEST +5 V +12 V +15 V -15 V	5.25 / 12.17 / 16.68 / 15.19	5.25 / 12.17 / 16.68 / 15.19
15	ZERO GAS 0.00 PPM	0.84	0.00
16	SPAN GAS 40.0 PPM	43.09	40.01

หมายเหตุ

- ทำการเปลี่ยน Sintered Filter 1 ชิ้น, Spring 1 ชิ้น, O-ring 2 ชิ้น

- ทำการ Calibrate Multi-Point

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณณัฏฐกมล มหาวงษ์ โทรที่ : 0-2515-8987

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระนอก เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8988 E-Mail : info@kinetics.co.th

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd.

EQUIPMENT NAME : CO Analyzer

MANUFACTURER : Teledyne - API

MODEL : T300 SERIAL NO : 2550

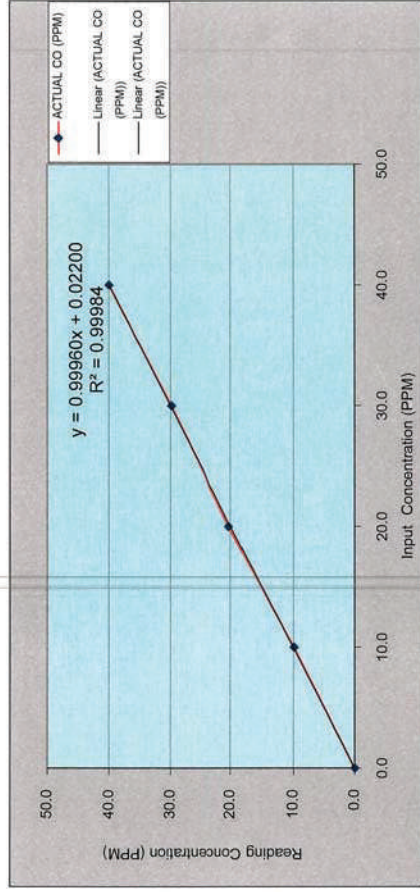
STANDARD GAS CONCENTRATION (PPM) : 4512 CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1550 CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.00	0.00	-
1	10.00	9.89	-0.11	-1.10
2	20.00	20.34	0.34	1.70
3	30.00	29.83	-0.17	-0.57
4	40.00	40.01	0.01	0.02
AVERAGE (%)				0.84



CALIBRATED BY : คุณณัฏฐกมล มหาวงษ์

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิคเพิ่มเติม : คุณณัฏฐกมล มหาวงษ์ โทรศัพท์ : 02-515-8987

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระนอก เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8988 E-Mail : info@kinetics.co.th

DATE : 15 /07 2567





Customer service report

บริษัท เคส ซี เอส (ประเทศไทย) จำกัด

Manufacturer  
Teledyne API

Equipment  
CO Analyzer

Model  
T300

S/N  
2550

Quotation  
Q-B2-2024-148-SV

• Checking Date •

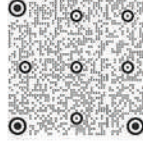
15/07/2567

• Problem

- Preventive Maintenance



B2



contact us



• Correlation working / Remark

- 1. ทำการเปลี่ยน Sintered Filter 1 ชิ้น , Spring 1 ชิ้น O-ring 2 ชิ้น
- 2. ทำการ Calibrate Multi-point

• Repair parts •

Sintered Filter 1 ชิ้น , Spring 1 ชิ้น , O-ring 2 ชิ้น

Technician / Engineer

THAI METEOROLOGICAL DEPARTMENT  
4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469  
Calibration Certificate



Issued by : Calibration & Test Section : Meteorological Instruments Bureau  
Date of Issue : 23 July, 2024  
Certification No. 271/24  
Page : 1 of 6

Object : Precision Weather Station  
Manufacturer : Davis Instruments  
Type : Vantage Pro 2 Model No. : 6152C  
Mfg Code : Display AM140127092 Transmitter A10119A022  
Customer : SGS (Thailand) Limited,  
100 Nanglinchee Road, Chongnonsi,  
Yannawa, Bangkok 10120.  
Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.0 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aloft Plotting Board  
: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO 1425  
N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec  
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)  
Serial Number 110730029 (sensor 120629586)  
JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec  
STANDARD : Dry No.8390/94 Wet No. 8389/94

STANDARD : 9188 : testo, testo 645 Serial No. 02848057  
Calibrated : sala Type PTB220 No. 02200015

Mr. Watchaporn Suwan  
Mechanical Engineer





## The Result of Calibration

23 July, 2024  
Certification No. 271/24  
Page : 3 of 6

Standard Barometer		Tested Barometer		Correction
Pressure		Pressure		
756.02		756.8		-0.78
755.93		756.7		-0.77
755.81		756.6		-0.79
755.71		756.5		-0.79
755.46		756.3		-0.84
754.88		755.7		-0.82
754.59		755.4		-0.81
754.34		755.1		-0.76
754.10		755.0		-0.90
754.04		754.9		-0.86
754.00		754.8		-0.80
754.10		754.9		-0.80
754.31		755.1		-0.79
754.55		755.3		-0.75
754.82		755.6		-0.78
755.78		756.6		-0.82
756.39		757.4		-1.01
756.04		757.0		-0.96
		756.4		-0.81
		755.5		-0.83
Average				

Mr. Watanaporn Suwata  
Mechanical Engineer



## The Result of Calibration

23 July, 2024  
Certification No. 271/24  
Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H <sub>2</sub> O	Vacuum inches H <sub>2</sub> O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.00	-	-	-	6.7	0.30
9.02	-	-	-	8.9	0.12
11.01	-	-	-	10.7	0.31
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.8	0.21
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.3	0.72

Wind Aloft Plotting Board.	
US DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Mr. Watanaporn Suwata  
Mechanical Engineer





The Result of Calibration

23 July, 2024  
Certification No. 271/24  
Page : 4 of 6

Standard Temp. °C	Temperature Sensor	
	Reading °C	Correction °C
45.8	45.8	0.0
30.2	30.3	-0.1
15.5	15.6	-0.1

Mechanical Engineer



The Result of Calibration

23 July, 2024  
Certification No. 271/24  
Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor	
	Reading % R.H.	Correction % R.H.
92.3	91	1.30
65.2	66	-0.80
46.4	48	-1.60



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THAI METEOROLOGICAL DEPARTMENT  
4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469  
Calibration Certificate



Issued by : Calibration & Test Section : Meteorological Instruments Bureau  
Date of Issue : 7 February, 2024  
Certification No. 074/24  
Page : 1 of 6

Object : Precision Weather Station  
Manufacturer : Davis Instruments  
Mode No. : 6152C Model No. : 6152C  
Mfg Code : Display BD190415090 Transmitter BD190415090  
Customer : SGS (Thailand) Limited.  
100 Nanglinchee Road, Chongnonsi,  
Yannawa, Bangkok 10120.  
Calibration Condition : Temperature 25.1 °C Barometric Pressure 1011.9 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aloft Plotting Board  
: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO 1425  
N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec  
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)  
Serial Number 110730029 (sensor 120629586)  
JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec  
STANDARD THERMOMETER : Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94

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Mechanical Engineer



Date of Issue 23 July, 2024  
Certification No. 271/24  
Page: 6 of 6  
ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ซีรีส์ Davis Instruments แบบ TIPPING  
BUCKET Product No. 6152C Mfg. Code. A10119A022 ทำการสอบเทียบกับแก้ววัดฝนแบบ  
แก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082  
และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.01 in./TIP)



วิศวกรชำนาญการ





## The Result of Calibration

7 February, 2024  
Certification No. 074/24  
Page : 3 of 6

Standard Barometer Pressure	Tested Barometer Pressure	Correction
758.19	759.5	-1.31
758.01	759.3	-1.29
758.84	760.2	-1.36
759.19	760.4	-1.21
759.29	760.6	-1.31
759.25	760.7	-1.45
759.65	760.8	-1.15
759.77	760.9	-1.13
760.20	761.4	-1.20
760.68	762.0	-1.32
761.90	763.1	-1.20
762.08	763.3	-1.22
761.96	763.1	-1.14
761.83	763.0	-1.17
758.69	760.0	-1.31
758.91	760.1	-1.19
759.11	760.3	-1.19
759.67	760.9	-1.23
759.98	761.2	-1.22
760.18	761.4	-1.22

Average

Cal



## The Result of Calibration

7 February, 2024  
Certification No. 074/24  
Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425		TESTED ANEMOMETER	
	Pressure inches H <sub>2</sub> O	Vacuum inches H <sub>2</sub> O	Velocity m/sec	Correction m/sec
1.00	-	-	0.9	0.10
3.02	-	-	3.0	0.02
5.00	-	-	4.9	0.10
7.00	-	-	7.0	0.00
9.02	-	-	9.0	0.02
11.01	-	-	11.0	0.01
13.01	-	-	13.0	0.01
15.01	-	-	15.1	-0.09
17.02	-	-	17.0	0.02
20.02	-	-	20.1	-0.08

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180



Document Engineer



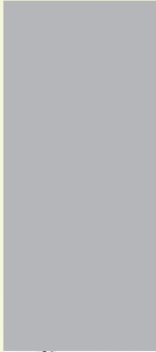
The Result of Calibration

7 February, 2024

Certification No. 074/24

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.3	45.2	0.1
30.2	30.2	0.0
15.8	15.9	-0.1



The Result of Calibration

7 February, 2024

Certification No. 074/24

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
45.1	45	0.10
65.5	67	-1.50
95.2	98	-2.80







Date of Issue 7 February, 2024

Certification No. 074/24

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING BUCKET Product No. 6152C Mfg. Code. BD190415090 ทำการสอบเทียบกับแก้ววัดฝนแบบ แก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.01 in./TIP)



(นายวัชรพล ทรพวิวัฒน์)

วิศวกรชำนาญการ

ENR 17115

THAI METEOROLOGICAL DEPARTMENT  
4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469  
Calibration Certificate



Issued by : Calibration & Test Section : Meteorological Instruments Bureau  
Date of Issue 31 May, 2024  
Certification No. 221/24  
Page : 1 of 6

Object : Precision Weather Station  
Manufacturer : Davis Instruments  
Type : Vantage Pro 2 Model No. : 6152C  
Mfg Code : Display AZ170619045 Transmitter BD190415075  
Customer : SGS (Thailand) Limited.  
100 Nanglinchee Road, Chongnonsi,  
Yannawa, Bangkok 10120.  
Calibration Condition : Temperature 25.1 °C Barometric Pressure 1008.1 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aloft Plotting Board  
: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO 1425  
N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec  
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)  
Serial Number 110730029 (sensor 120629586)  
JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec  
STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8399/94  
: Thermoschneider No. 9188 : testo, testo 645 Serial No. 02848057

STANDARD  
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Mechan





## The Result of Calibration

Certification No. 221/24

31 May, 2024

Page : 3 of 6

Standard Barometer Pressure	Tested Barometer Pressure	Correction
753.68	754.6	-0.92
753.80	754.8	-1.00
753.92	754.9	-0.98
754.06	755.0	-0.94
754.69	755.6	-0.91
754.76	755.7	-0.94
755.17	756.1	-0.93
755.33	756.3	-0.97
755.46	756.4	-0.95
755.50	756.3	-0.80
754.28	755.2	-0.92
754.78	755.7	-0.92
753.98	755.0	-1.02
754.35	755.4	-1.05
754.69	755.7	-1.01
755.37	756.4	-1.03
755.70	756.7	-1.00
755.75	756.8	-1.05
755.90	756.9	-1.00
756.08	757.1	-1.02

Average



## The Result of Calibration

Certification No. 221/24

31 May, 2024

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425		TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Correction m/sec
1.00	-	-	0.9	0.10
3.02	-	-	3.0	0.02
5.00	-	-	4.9	0.10
7.00	-	-	7.0	0.00
9.02	-	-	8.9	0.12
11.01	-	-	11.0	0.01
13.01	-	-	13.0	0.01
15.01	-	-	15.0	0.01
17.02	-	-	17.0	0.02
20.02	-	-	19.3	0.02

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Cali







The Result of Calibration

31 May, 2024  
Certification No. 221/24  
Page : 4 of 6

Standard Temp. °C	Temperature Sensor	
	Reading °C	Correction °C
45.2	45.3	-0.1
30.5	30.5	0.0
15.6	15.7	-0.1



The Result of Calibration

31 May, 2024  
Certification No. 221/24  
Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor	
	Reading % R.H.	Correction % R.H.
86.32	89	-2.68
67.54	69	-1.46
46.23	47	-0.77





Date of Issue 31 May, 2024

Certification No. 221/24

Page: 6 of 6

## ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING  
BUCKET Product No. 6152C Mfg. Code: BD190415075 ทำการสอบเทียบกับแก้ววัดฝนแบบ  
แก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082  
และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.01 in./TIP)



(นายวัชรพล ทวีพัฒน์)

วิศวกรชำนาญการ



Meter Console Verification

Dry Gas Meter ID. : ENSS 071 Date of Calibration : 23/9/2024  
Instrument Brand : Apex / Model 572 Calibrated By : MW

Wet gas meter Information

Wet gas Brand : Shinagawa Wet gas S/N : 544122  
Wet gas Model : W-NK-2.5A Expire Date : 30/8/2025

Orifice Setting ΔH@ (mm H <sub>2</sub> O)	Wet gas		Metering System		Time ( min )	Yi	ΔH@
	V <sub>w</sub> ( L )	T <sub>w</sub> ( °C )	V <sub>d</sub> ( L )	T <sub>m</sub> ( °C )			
13	143.78	24.6	140.0	20.5	12.40	1.0116	48.336
13	143.26	24.2	140.0	21.0	12.45	1.0112	49.098
26	141.10	24.4	140.0	22.0	8.21	0.9972	43.395
26	141.82	24.5	140.0	22.5	8.22	1.0038	43.069
40	281.56	24.4	280.0	23.0	14.07	0.9970	47.825
40	281.28	24.5	280.0	23.0	14.06	0.9958	47.823
50	280.04	24.4	280.0	23.0	12.41	0.9908	48.813
50	279.82	24.3	280.0	23.0	12.41	0.9902	48.874
70	278.24	24.3	280.0	23.0	10.34	0.9827	48.125
70	278.72	24.3	280.0	23.0	10.35	0.9844	48.111
90	276.14	24.2	280.0	23.5	9.21	0.9754	49.165
90	276.06	24.2	280.0	24.0	9.20	0.9769	48.919
Average							47.629

Remark : Yi ≤ ± 0.02 from average  
Yi = 1.00 ± 0.05  
ΔH@ ≤ ± 5.08 mm.H<sub>2</sub>O from average  
ΔH@ = 46.7 ± 6.4 mm.H<sub>2</sub>O

Check

Position

Date

Approved By

Position :

Date :

Temperature Display Verification

Dry Gas Meter ID. : ENSS 071 Date of Calibration : 23/9/2024  
Instrument Brand : Apex / Model 572 Calibrated By : CS

Temperature Simulator Information

Simulator Brand : Handy Cal Simulator S/N : T1L1015  
Simulator Model : CA11E Expire Date : 11/7/2025

Standard Value	Instrument Display			
	Stack	Probe	Filter	Aux
300	301	301	301	300
200	200	200	201	201
150	150	150	151	150
100	100	101	101	101
50	50	51	51	50
0	0	0	0	0
Difference	0.1%	1.0	1.0	1.0

Remark : Stack ≤ ± 1.5 % Absolute  
Probe ≤ ± 3.0 °C  
Filter ≤ ± 3.0 °C

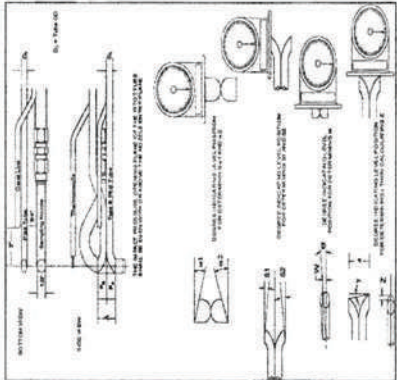
Aux ≤ ± 3.0 °C  
Exit ≤ ± 3.0 °C



Certificate of Calibration

S-Type Geometric Pitot Tube Calibration

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



Pitot tube/Probe No. No.39/A8465

Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes or Y	PASS
Ports Damaged?	N	No or n	PASS
$\alpha 1$	1.6	$-10^{\circ} < \alpha 1 < +10^{\circ}$	PASS
$\alpha 2$	-1.7	$-10^{\circ} < \alpha 1 < +10^{\circ}$	PASS
$\beta 1$	-0.8	$-5^{\circ} < \alpha 1 < +5^{\circ}$	PASS
$\beta 2$	1	$-5^{\circ} < \alpha 1 < +5^{\circ}$	PASS
$\gamma$	-0.4	N/A	-
$\theta$	1.6	N/A	-
$D_1$	0.375	0.188" to 0.375"	PASS
A	0.919685	$2.1D_1 \leq A \leq 3.0D_1$	PASS
A/2D <sub>1</sub>	1.226247	$1.05 \leq A/D_1 \leq 1.5$	PASS
Z = A tan $\gamma$	-0.00642	$Z \leq 0.125"$	PASS
W = A tan $\theta$	0.025689	$W \leq 0.031"$	PASS

I certify that pitot tube/probe No.39/A8465 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App A, EPA Method 2

Standard Device  
Device Name Digital Inclinometer  
Manufacturer BASELINE  
Model 12-1057  
ID No. QC-1824

Certified by Naval C.  
Date 8-Dec-24

Expiration data  
ENSS No. 18-Dec-24  
ENSS 22159





Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.

Address : 100 Nanglinchee Road, Chongnonsi, Yamawa Bangkok 10120

Certificate No : 24-ACT-015

Request No : Req-2024-0221

Unit Under Calibration Details

Measurement item : Acoustic Calibrator

Manufacturer : CIRRUS

Model : CR-515

Serial Number : 80411

ID : ENSL 17149

Calibration Environment and Details

Temperature : ( 23 ±2 °C )

Humidity : ( 50 ± 20 %RH )

Barometric Pressure : ( 1013 ±10.0 hPa )

Received Date : 30 January 2024

Calibration Date : 13 February 2024

Location of Calibration : LAB 1 Acoustic

Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Class : 1

Range : 94 dB / 1000 Hz

Instrument Status : Used

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	31 May 2024
THD Multimeter	2015	1047765	NIMT	16 January 2025

Traceability

: This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

Note

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

Calibrated

App

Certificate No : 24-ACT-015

Request No : Req-2024-0221

Calibration Results : Without Adjustment

Sound pressure level	Calibration Range (dB)	Without Adjustment (dB)		Uncertainty ( ± dB)	Acceptance limit Class 1 ( ± dB)
		Measured	Deviated value		
94 dB / 1000 Hz		94.03	0.03	0.13	0.25

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment	Uncertainty ( ± %)	Acceptance limit Class 1 ( ± %)
	Measured (Hz)	Deviated value			
94 dB / 1000 Hz	1000.00	0.00	-	0.01	0.70

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment		Adjustment	Uncertainty ( ± %)	Acceptance limit Class 1 ( ± %)
	Measured (%)	Deviated value			
94 dB / 1000 Hz	0.11	-	-	0.40	2.5

Note :

Function	Maximum-permitted
Sound pressure level	0.15 dB
Frequency	0.20%
Total distortion+noise	0.50%

- Acceptance limit was IEC60942:2017 Class 1
- The calibration results exclude the calibrator pressure correction
- The calibration results exclude the microphone volume correction

End of Calibration

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-53 / Microphone UC-59 / Preamplifier NH-25  
Serial No.: 00541049 / 25579 / 34002  
ID No.: -

Condition As Found : GOOD  
Customer : SGS ( THAILAND ) LIMITED,  
100 NANGLINCHEE ROAD, CHONGNONSEE,  
YANNAWA, BANGKOK 10120 THAILAND.

Location : -  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 28 JUNE 2024  
Calibration Date : 01-03 JULY 2024  
Date of Issue : 05 JULY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :

Cert. No. : ACL24199  
Pages : 1 of 9

Cert. No. : ACL24199  
Job No. : VC67AC0115  
Pages : 2 of 9

Calibration Procedure : CP-AC-02

### Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

### Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.  
3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).



**Summary of Measurement Result :**

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

**Result of calibration :****1. Absolute sensitivity**

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	0.0	±0.3

**2. Self-generated noise****2.1 Normal test**

Measured Value (dB)
15.1

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	11.9
C - weight	15.9
Flat	21.5

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.1	0.1	0.1
1000	0.0	0.0	0.0
8000	-0.6	-0.6	-0.5
			Acceptance Limits
			± 1.0
			± 0.7
			+ 1.5, - 2.5

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
63	0.0	0.0	0.1
125	0.0	0.1	0.0
250	0.0	0.0	0.0
500	0.0	0.1	0.0
1000	0.0	0.0	0.0
2000	0.0	0.1	0.0
4000	0.0	0.0	0.0
8000	0.0	-0.1	-0.1
16000	0.0	-0.9	-0.9

## 5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

## 6. Long - term stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits
A - weight	94.0	94.0		

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	27.9	-0.1	±0.8
27.0	26.9	-0.1	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.9	-0.1	±0.8



Cert. No. : ACL24199

Job No. : VC67AC0115

Pages : 7 of 9

## 8. Level linearity including the level range control

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	29.6	29.6	0.0	±0.8

## 9. Tone burst response

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.1	0.1	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.1	0.1	±0.5

Cert. No. : ACL24199

Job No. : VC67AC0115

Pages : 8 of 9

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, Lepeak ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	130.0	130.0	0.0	±2.0
One	133.4	133.4	0.0	±2.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	130.0	130.0	0.0	±1.0
Positive half cycle	132.4	132.2	-0.2	±1.0
Negative half cycle	132.4	132.2	-0.2	±1.0

## 11. Overload indication

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle	0.0	±1.5
90.6	90.6		

## 12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.1

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

End of Calibration Certificate

*T. Peteh.*

## Calibration Certificate

Equipment : SOUND LEVEL METER

Manufacturer : RION

Model : NL-53 / Microphone UC-59 / Preamplifier NH-25

Serial No.: 00541084 / 25618 / 34037

ID No.:

Condition As Found : GOOD

Customer :

SGS ( THAILAND ) LIMITED,  
100 NANGLINCHEE ROAD, CHONGNONSEE,  
YANNAWA, BANGKOK 10120 THAILAND.

Location :

( 23.0 ± 3 )

°C

Ambient Temperature :

( 101.3 ± 3 )

kPa

Pressure :

( 50.0 ± 20 )

%

Relative Humidity :

19 JULY 2024

Received Date :

23-24 JULY 2024

Calibration Date :

25 JULY 2024

Date of Issue :

Calibrated by :

Nathakorn Pisupaisan

Approved by :

This certificate is issued in accordance with the requirements of ISO 17025:2017, other than in full, except with the prior written approval of the head of Calibration Laboratory.

be reproduced.



Cert. No. : ACL24232  
Job No. : VC67AC0118  
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Cert. No. : ACL24232  
Job No. : VC67AC0118  
Pages : 3 of 8

**Summary of Measurement Result :**

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL24232  
Job No. : VC67AC0118  
Page : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.94)	94.0	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value ( dB )
15.1

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Weighting ( dB )
A - weight	12.4
C - weight	16.3
Flat	21.9

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.2	0.3	0.3
1000	0.4	0.4	0.4
8000	0.0	0.1	0.1
Acceptance Limits			
± 1.0			
± 0.7			
+ 1.5, - 2.5			

Cert. No. : ACL24232  
Job No. : VC67AC0118  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±1.0
125	0.1	0.1	0.1	±1.0
250	0.1	0.1	0.1	±1.0
500	0.1	0.0	0.0	±1.0
1000	0.0	-0.7	-0.7	±1.0
2000	0.0	0.1	0.0	±1.0
4000	0.0	0.1	0.1	±1.0
8000	0.0	0.0	0.0	+ 1.5, - 2.5
16000	0.0	0.0	0.0	+ 2.5, -16.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

## 5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

## 6. Long - term stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated	Acceptance
A - weight	94.0	94.1		



Cert. No. : ACL24232

Job No. : VC67AC0118

Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	48.9	-0.1	±0.8
44.0	44.0	0.0	±0.8
39.0	38.9	-0.1	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	28.9	-0.1	±0.8
28.0	28.0	0.0	±0.8
27.0	26.9	-0.1	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.9	-0.1	±0.8

Cert. No. : ACL24232

Job No. : VC67AC0118

Pages : 7 of 8

## 8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±0.8

## 9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
Slow	200	800	134.0	134.0	0.0	±0.5
	2	8	108.0	108.0	0.0	1.0 ; -3.0
SEL	200	800	127.6	127.6	0.0	±0.5
	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.0	0.0	±0.5

10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, Lpeak ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	130.0	130.0	0.0	±2.0
One	133.4	133.3	-0.1	±2.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±1.0
Positive half cycle	135.4	135.1	-0.3	±1.0
Negative half cycle	135.4	135.1	-0.3	±1.0

11. Overload indication

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle	0.0	±1.5
89.5	89.5		

12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	136.9	0.1	±0.1

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

End of Calibration Certificate

ENSL 24207

Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-53 / Microphone UC-59 / Preamplifier NH-25  
Serial No.: 00541085 / 25619 / 34038  
ID No.:

Condition As Found : GOOD

Customer : SGS ( THAILAND ) LIMITED,  
100 NANGLINCHEE ROAD, CHONGNONSEE,  
YANNAWA, BANGKOK 10120 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 19 JULY 2024  
Calibration Date : 23-24 JULY 2024  
Date of Issue : 25 JULY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced  
other than in full, except with the prior written approval of the head of Calibration Laboratory.



Cert. No. : ACL24233

Job No. : VC67AC0118

Pages : 2 of 8

Calibration Procedure : CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Cert. No. : ACL24233

Job No. : VC67AC0118

Pages : 3 of 8

**Summary of Measurement Result :**

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

**Result of calibration :****1. Absolute sensitivity**

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.94)	94.0	0.0	±0.3

**2. Self-generated noise**  
2.1 Normal test

Measured Value ( dB )
15.1

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Weighting ( dB )
A - weight	11.8
C - weight	15.0
Flat	20.6

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.3	0.3	0.3
1000	0.3	0.3	0.3
8000	-0.4	-0.4	-0.3
			Acceptance Limits
			± 1.0
			± 0.7
			+ 1.5, - 2.5

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
63	0.0	0.0	0.0
125	0.0	0.0	0.1
250	0.0	0.0	0.0
500	0.0	0.0	0.0
1000	0.0	-0.8	-0.8
2000	0.0	0.0	0.0
4000	0.0	0.0	0.0
8000	-0.1	0.0	0.0
16000	-0.1	-0.1	-0.1
			Acceptance Limits
			±1.0
			±1.0
			±1.0
			±1.0
			±1.0
			+ 1.5, - 2.5
			+ 2.5, -16.0

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

**6. Long - term stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.1



Cert. No. : ACL24233

Job No. : VC67AC0118

Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.1	0.1	±0.8
136.0	136.1	0.1	±0.8
135.0	135.1	0.1	±0.8
134.0	134.1	0.1	±0.8
133.0	133.1	0.1	±0.8
132.0	132.0	0.0	±0.8
131.0	131.1	0.1	±0.8
129.0	129.1	0.1	±0.8
124.0	124.0	0.0	±0.8
119.0	119.1	0.1	±0.8
114.0	114.1	0.1	±0.8
109.0	109.1	0.1	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	26.9	-0.1	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.9	-0.1	±0.8

Cert. No. : ACL24233

Job No. : VC67AC0118

Pages : 7 of 8

## 8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±0.8

## 9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
Slow	200	800	134.0	134.1	0.1	±0.5
	2	8	108.0	108.0	0.0	1.0 ; -3.0
SEL	200	800	127.6	127.6	0.0	±0.5
	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.1	0.1	±0.5

Cert. No. : ACL24233  
Job No. : VC67AC0118  
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, Lepeak ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	130.0	130.0	0.0	±2.0
One	133.4	133.4	0.0	±2.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

11. Overload indication

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle	0.0	±1.5
89.5	89.5		

12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.1

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$   
or any value following calculation providing a level of confidence of approx

End of Calibration Certificate





## Certificate of Calibration

**Equipment:** Balance  
**Model:** CPA225D  
**Serial No. (or ID.):** 28812504 (B2014002)  
**Manufacturer:** Sartorius  
**Condition:** In condition

**Certificate No.:** C01233893  
**Issued Date:** 15 November 2023  
**Job No.:** WO-00009644  
**Page:** 1 of 3

**Customer:** SGS (THAILAND) CO., LTD.  
1/209, 1/211 Moo 1, Tambol Banchang,  
Amphur Banchang, Rayong 21130 Thailand

**Environment Condition:** Temperature 21 °C ± 0.8 °C  
Humidity 73 %RH ± 1.7 %RH

**Calibration Place:** SGS (THAILAND) CO., LTD. ( Balance Lab )  
1/209, 1/211 Moo 1, Tambol Banchang,  
Amphur Banchang, Rayong 21130 Thailand

**Calibration By:** Mr. Thanathorn Phunook  
**Calibration Date:** 15 November 2023

**The Method used:** In-house method, CAL-WI-47, based on UKAS Lab 14  
**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02230102

### Person in charge

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

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

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CAL-FM-C01-14: 12 Sep 2022



Certificate No.: C01233893

Page: 2 of 3

### Calibration Results: Without Adjustment

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

Nominal Test Value	Reference Points (g)			
	A	B	C	D
-		0.0000	-66.0001	-99.0001
				0.0001

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.00001 (g)

Nominal test value (g)	Standard Deviation
5	0.000005
50	0.000005

Error of indication from nominal or conventional mass value., Readability 0.00001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.01	0.010000	0.01000	0.00000	0.000011	2.03
0.05	0.050006	0.05000	-0.00001	0.000012	2.02
0.1	0.100002	0.10000	0.00000	0.000013	2.01
0.5	0.499999	0.49999	-0.00001	0.000016	2.01
1	1.000002	1.00000	0.00000	0.000018	2.00
5	4.999983	4.99998	0.00000	0.000027	2.00
10	10.000002	10.00000	0.00000	0.000034	2.00
20	20.000005	20.00000	-0.00001	0.000048	2.00
50	49.999940	49.99995	0.00001	0.000080	2.00
70	69.999945	69.99994	-0.00001	0.00013	2.00
90	89.999923	89.99992	0.00000	0.00016	2.00

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CAL-FM-C01-14: 12 Sep 2022



Certificate No.: C01233893

Page: 3 of 3

Without Adjustment (Cont.)

Repeatability: Determination of the standard deviation of weighing balance, Readability

0.0001 (g)

Nominal test value (g)	Standard Deviation
110	0.00000
200	0.00004

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

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
105	104.99992	105.0000	0.0001	0.00019	2.00
110	109.99994	110.0000	0.0001	0.00019	2.00
120	119.99992	120.0000	0.0001	0.00020	2.00
130	129.99992	130.0000	0.0001	0.00023	2.00
140	139.99992	140.0000	0.0001	0.00024	2.00
150	149.99988	150.0000	0.0001	0.00023	2.00
160	159.99988	160.0000	0.0001	0.00027	2.00
170	169.99989	170.0000	0.0001	0.00027	2.00
180	179.99989	180.0000	0.0001	0.00030	2.00
190	189.99986	190.0000	0.0001	0.00031	2.00
200	199.99984	200.0000	0.0002	0.00029	2.00

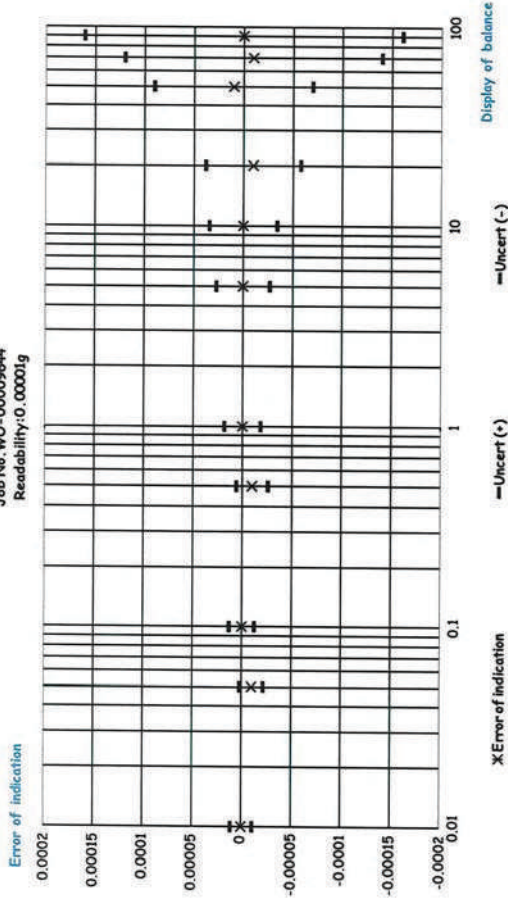
The End of Certificate

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

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CAL-FM-C01-14: 12 Sep 2022

Without Adjustment  
Job No. WO-00009644  
Readability: 0.00001g



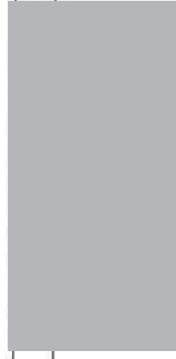


## ใบตรวจสอบสภาพเครื่องชั่ง

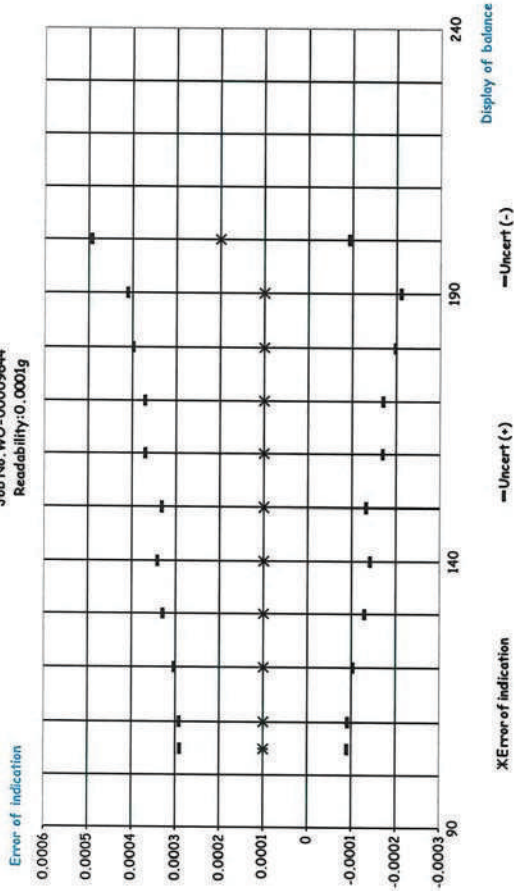
ชไตเครื่องมือ: Balance      รุ่น: CPA225D      เลขที่ใบงาน: WO-00009644  
 หมายเหตุ: 28812504

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
15 Nov 2023			15 Nov 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระจกัลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input type="checkbox"/>	<input checked="" type="checkbox"/>	เสื่อมสภาพ
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตอบสนองของไมกด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองงานชั่ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและแกน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติมอื่น ๆ :



Without Adjustment  
 Job No. WO-00009644  
 Readability: 0.0001g





## Certificate of Calibration

Equipment: CONDUCTIVITY METER Certificate No.: C24240053  
Model: HQ14d Issued Date: 7 March 2024  
Serial No. (or ID.): 141200015083 Job No.: WO-00018779  
Manufacturer: HACH Page: 1 of 2  
Electrode Serial No. 150122587009 Model: CDC401 Brand: HACH  
Condition: In Condition

Customer: SGS (THAILAND) CO., LTD.  
1/209, 1/211 Moo 1, Tambol Banchang,  
Amphur Banchang, Rayong 21130 Thailand

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

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

Calibration By: Mr. Pongpisut Suebchantha  
Calibration Date: 7 March 2024  
The Method used: In house method, CAL-WI-49, base on ASTM D 1125-14 and D 5391-14  
Traceability: This certificate is traceable to the SI Units maintained by CRM of NIST(SRM)  
through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 960753, 890591,  
890593

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

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CAL-FM-C24-09: 12 Sep 2022



Certificate No.: C24240053

Page: 2 of 2

### Calibration Results:

#### Before Adjustment

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty ( ± )
Conductivity Solution	Reading			
25.000 µS/cm	32.6 µS/cm	-7.600 µS/cm	2.00	0.21 µS/cm
1413.0 µS/cm	1589 µS/cm	-156.0 µS/cm	2.00	9.0 µS/cm
111.3 mS/cm	123.2 mS/cm	-11.9 mS/cm	2.00	0.67 mS/cm

#### After Adjustment ; at 1413 µS/cm

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty ( ± )
Conductivity Solution	Reading			
25.000 µS/cm	24.8 µS/cm	0.200 µS/cm	2.00	0.21 µS/cm
1413.0 µS/cm	1413 µS/cm	0.0 µS/cm	2.00	9.0 µS/cm
111.3 mS/cm	111.6 mS/cm	-0.3 mS/cm	2.00	0.67 mS/cm

The End of Certificate

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CAL-FM-C24-09: 12 Sep 2022





ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

ชนิดเครื่อง: CONDUCTIVITY METER รุ่น: HQ14d เลขที่ใบงาน: WO-00018779 หมายเลขเครื่อง: 141200015083

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
ปกติ	ไม่ปกติ		07 Mar 2024	ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)		<input checked="" type="checkbox"/>	
		Spectrophotometer			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) $\geq 2.5$ VDC		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV $< 3,000$ hour)		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible $< 5,000$ hour)		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)		<input checked="" type="checkbox"/>	
		pH Meter and Conductivity Meter			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)		<input checked="" type="checkbox"/>	
		Turbidimeter			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	16. ค่าความทึบที่ต่ำสุด (No Sample)		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง ( $\geq 2.5$ ไม่นเกิน 3.0)		<input checked="" type="checkbox"/>	
		Automatic titrator			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	18. ลำพา Piston Burettes		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายนำและอุปกรณ์ประกอบ		<input checked="" type="checkbox"/>	

คำแนะนำ : Electrode ควบคุมอุณหภูมิได้ 25.0 °C โดย Control Waterbath ที่ 25.0 ±0.1°C

บริษัท ดีเคเอส เอช จำกัด  
DKSH Technology Limited  
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Mr. Pongpisut Suebchantha  
Service Engineer

Delivering Growth - in Asia and Beyond.

CAL-FM-R31-03: 20 Jul 2022



Agilent CrossLab Start Up Services  
Agilent 7890 Gas Chromatograph  
Preventive Maintenance Checklist

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

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the preventive maintenance activities.



## Introduction

### Customer Information

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

### Important Customer Web Links

- For more information about **Agilent Technologies services**, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful **Agilent Resource Center** web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>.
- Need technical support, FAQs, supplies? – visit our **Support Home page** <http://www.agilent.com/search/support>.
- **Videos** about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>.
- **7890B Manuals** are also available on Agilent.com:
  - **Safety** [https://www.agilent.com/cs/library/usermanuals/public/7890B\\_Safety.pdf](https://www.agilent.com/cs/library/usermanuals/public/7890B_Safety.pdf)
  - **Installation and First Startup** [https://www.agilent.com/cs/library/usermanuals/Public/7890B\\_Installation.pdf](https://www.agilent.com/cs/library/usermanuals/Public/7890B_Installation.pdf)
  - **Operation Manual** [https://www.agilent.com/cs/library/usermanuals/Public/7890B\\_Operation.pdf](https://www.agilent.com/cs/library/usermanuals/Public/7890B_Operation.pdf)
  - **Maintaining Your GC** [https://www.agilent.com/cs/library/usermanuals/public/G3430-90052%207890B\\_Maintaining%20Guide.pdf](https://www.agilent.com/cs/library/usermanuals/public/G3430-90052%207890B_Maintaining%20Guide.pdf)

## Service Engineer's Responsibilities

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

## Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service.
- Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the instrument control software.



System Information

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

Instrument System Name and ID	CN17493064
Instrument System Site and Location	Laboratory

List System Component Product Numbers		List the Serial Numbers of each Component
1.	G3440B	CN17493064
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components, settings as defined by current Service Notes.
- ☐ Check for required firmware updates and verify with customers if they would like them installed.
- ☐ Before starting the following procedures, record the Detector Signal Output(s) in the results table. If the GC is turned OFF or in a service mode, comparing the detector outputs before and after the service is not possible.

Preventive Maintenance Procedure

Clean and inspect GC

- ☒ Unplug power cord from the power source.
- ☒ Open GC covers and vacuum/remove any dust/debris. Pay particular attention to cooling fans.
- ☒ Inspect internal connectors for proper contact and placement.
- ☒ Reconnect Power to the GC. Power the GC on and verify the power on self-test passed.
- ☒ Verify oven motor spins freely and turns on with the oven door closed; off when the door is opened.
- ☒ Verify operation of all other fans - the inlet and EPC cooling fans.
- ☒ Verify oven intake/outlet flap assembly is operating smoothly while heating and cooling the oven

Inlet and detector consumable replacement

- ☒ For the inlets installed, perform inlet maintenance as defined in the 7890 manual – "Maintaining Your GC" - for the inlet(s) installed.
- ☒ Replace the split vent trap cartridge filter on units with these inlets: Split/Splitless Capillary (SSL), Multi-Mode Inlet (MMI), Programmed Temperature Vaporizer (PTV), Volatiles Interface (VI).
- ☒ If the inlet system is used in Split Mode with viscous samples, inspect and clean the split vent tube on the inlet and flush or replace the tubing between the inlet and the split vent trap.
- ☒ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the ignitor shows any buildup of sample or corrosion, replace the ignitor. Examine the FID collector and castle assemblies for contamination – clean as necessary.

Zero Sensors and Leak test

- ☒ Zero all pressure sensors per the procedure in the 7890 "Advanced User Guide".
- ☒ Perform inlet pressure decay test(s) as defined in the 7890 "Troubleshooting Manual".  
If the PM is done in preparation for an Operational Qualification, then the pressure decay test defined within that protocol can be used for the PM.
- ☒ Record if test passed or failed in the results table.



ALS Maintenance

- ☐ Section NOT applicable
  - ☒ Check all cabling and configuration settings between GC, tray, and injectors.
  - ☒ Vacuum or remove any dust, especially around fans.
  - ☒ Check operation of all fans.
  - ☒ Check syringe for smooth plunger operation.
  - ☒ Check for smooth operation of the needle support – clean if necessary
- Restore Instrument
- ☒ Restore the normal operating conditions or customer method using the Data System.
  - ☒ Purge the system with carrier flow for 15 minutes
  - ☒ Bake out the system, then restore the normal operating conditions
  - ☒ After equilibration, check and record the post PM detector signal output values.  
Results should be similar or lower than the detector outputs recorded prior to PM.
  - ☐ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

Note: If the PM Service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.



Signature Page

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review with the customer this service, parts replaced, and test results obtained.
- ☐ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.
- ☐ Supply the customer with a copy of the Smart Alerts flyer.
- ☐ Describe Smart Alerts to the customer.
- ☐ Install Smart Alerts if requested.

7890 GC Test Results Table

Detector Signal Outputs	Before PM Service	After PM Service
Front detector output		
Back detector output		
AUX detector output		
Pressure decay test	Expected test result	Actual test result
Front inlet pressure decay test	Pass	Pass
Back inlet pressure decay test	Pass	Pass





7890 Parts List Table

The following kits are recommended for capillary and purged packed inlets. If this is a general PM and the customer has a preferred set of consumables, you may use the customer's consumables.

Part description	Part number	Product or model# where used	Quantity consumed
SSL Capillary Inlet PM kit, Splitless	5188-6497	7890A/B	1
SSL Capillary Inlet PM kit, split	5188-6496	7890A/B	1
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	7890A/B	
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	7890A/B	
SSL Capillary Ultra Inert Inlet Low Pressure Drop Split Liner - with Glass Wool	5190-2295	7890A/B	
PP Inlet PM kit	5188-6498	7890A/B	
Split vent trap PM kit, single cartridge (for MMI, PTV & VI)	5188-6495	7890A/B	
MMI Cleaning Kit	G3510-60820	7890A/B	
PTV Septumless Head Rebuild Kit	5182-9747	7890A/B	
PTV Septumless Head Teflon Guide	5182-9748	7890A/B	
Ignitor (glow plug) assembly with O-ring	19231-60680	7890A/B	
FID Collector Rebuild/Cleaning Kit	G1531-67000	7890A/B	
Standard .011-inch FID Jet for capillary FID base	G1531-80560	7890A/B	
High Temperature .018-inch FID Jet for capillary FID base	G1531-80620	7890A/B	
Standard .018-inch FID Jet for packed column with packed FID base	18710-20119	7890A/B	
Standard .011-inch FID Jet for capillary column with packed/adaptable FID base	19244-80560	7890A/B	
High Temperature .018-inch FID Jet for capillary column with packed/adaptable FID base	19244-80620	7890A/B	
NPD Jet, universal fit, .011-inch ID	G1534-80580	7890A/B	
NPD Jet, universal fit, .011-inch ID Extended tip	G1534-80590	7890A/B	
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	7890A/B	
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	7890A/B	
**FID Collector Replacement Kit, if needed	G1531-67001	7890A/B	

Service Engineer Comments

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

Service Completion

Service request number 6007017122 Date service completed 27 June 2024  
Agilent signature Eaknarin P. Customer signature  
Total number of pages in this document 8

# Qualification Report

PM Check list, CM\_OQ and PQ  
Aquion : Anion (ID#1054)

For  
SGS (THAILAND) Limited  
(2<sup>nd</sup> Contract)



## Certificate of Calibration

Aquion : Anion (ID#1054)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co., Ltd.

Aquion	S/N : 220380025
AS-DV	S/N : 2203880170

for

SGS (THAILAND) Limited



Operator : May 15, 2024

Operator

Application is submitted



PM

Preventive Maintenance  
Check List



Checklist ICS Preventive Maintenance

Dionex Ion Chromatography  
Preventive Maintenance Report

Customer Organization	Name/ Department
SGS (THAILAND) Limited	N.A.
Engineer	Date
Mr. Soranat Thongnop	15 / May / 2024

Instrument Detail

Instrument Model	Application
AQUION RFIC	Anion
Instrument components	Serial Number
AQUION RFIC	220380025
AS-DV	2203880170

Consumable Detail

Columns	Guard Columns	Suppressors	Concentrators	Etc.
AS18	AG18	ADRS 600	N.A.	CR-ATC 500
Remark:				

Perform By Archemica



Customer

Date



## General ICS Maintenance Checklist

No.	Description	Checked	Cleaned	Replaced	N.A.
<b>Power on &amp; Connection</b>					
1	Instrument power on	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
2	Instrument connection	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
<b>Injection Valve Rebuild</b>					
3	Rebuilt injection valve 6 port	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	- Rotor seal	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	- Stator face	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>(Optional) Auxiliary Valve Rebuild</b>					
6	Rebuilt auxiliary valve N.A. port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	- Rotor seal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	- Stator face	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Check Valve Cartridge</b>					
9	Inlet check valve assembly	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Outlet check valve assembly	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Verified correct flow orientation	<input type="checkbox"/>	-	-	<input checked="" type="checkbox"/>
<b>Pump Piston Rinse Seal, Piston Seal and Piston</b>					
12	Piston rinse seal in <i>primary</i> pump head	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Piston seal in <i>primary</i> pump head	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Piston in <i>primary</i> pump head	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Piston rinse seal in <i>secondary</i> pump head	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Piston seal in <i>secondary</i> pump head	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Piston in <i>secondary</i> pump head	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Waste Valve and Priming Valve</b>					
18	Waste valve	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Priming valve	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Cell Detector</b>					
20	Check conductivity cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Check electrochemical cell	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
22	- Working electrode	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
23	- Reference electrode	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
24	- Gasket	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
25	- Cell body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Other</b>					
26	Sample Loop Size 100 µL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	End-line filter	<input checked="" type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>
28	Leak sensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29	Lubricate pump mechanic	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	<input type="checkbox"/>
30	Reconnected liquid lines to the valve	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
31	Reconnected liquid lines to pump heads	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
32	Primed pump	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
33	Checked pump for leaks	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
34	Checked gas for leaks	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>



## AS-DV Autosampler Preventive Maintenance Checklist

Model	Serial number	Firmware Version
<input checked="" type="checkbox"/> AS-DV	2203880170	1.6.0

No.	Description	Checked	Cleaned	Replaced	N.A.
<b>Power on &amp; Connection</b>					
1.	AS-DV power on	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
2.	AS-DV connection	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
<b>Sampling Tip</b>					
3.	Sampling needle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	Sampling tubing (Transfer line)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Reconnect sampling needle & tubing	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
<b>Other</b>					
6.	Check carousel movement	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
7.	Check needle movement	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
8.	Lubricate needle drive	<input checked="" type="checkbox"/>	Lubricated	-	<input type="checkbox"/>
9.	AS-DV cover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>(Optional) High Pressure Valve</b>					
10.	High pressure valve N.A Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11.	- Rotor seal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12.	- Stator face	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13.	- Reconnected liquid line to the valve	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Others / comments

# CM OQ

## Chromeleon Operation Qualification



### General Information

Instrument Controller: DESKTOP-U6OSBC5  
Client: DESKTOP-U6OSBC5  
Operator: Mr.Soranat Thongnop  
Computer Name: DESKTOP-U6OSBC5  
Version Number: 7.3.1 Build 6535  
Overall Test Result: **Passed**

### Comparison Format:

All Parameters:	Significant Digits:	10
-----------------	---------------------	----

Reviewer's Signature // Date







Chromeleon Operational Qualification, Part 1  
Verification of Selected Results

Detection Algorithm: Calibration Type: Evaluation Type: Standard Method: Calibration Mode:	Cobra		
	Ln, WithOffset		
	Area		
	External		
	Total		
Report Variable	Peak Name	Status	
Offset (c0)	Acetanilide	ok	
	Acetophenone	ok	
	Propiophenone	ok	
Slope (c1)	Acetanilide	ok	
	Acetophenone	ok	
	Propiophenone	ok	
Correlation Coeff.	Acetanilide	ok	
	Acetophenone	ok	
	Propiophenone	ok	
Variance	Acetanilide	ok	
	Acetophenone	ok	
	Propiophenone	ok	
Std. Deviation	Acetanilide	ok	
	Acetophenone	ok	
	Propiophenone	ok	
Rel. Std. Dev.	Acetanilide	ok	
	Acetophenone	ok	
	Propiophenone	ok	
Variance Coeff.	Acetanilide	ok	
	Acetophenone	ok	
	Propiophenone	ok	



Chromeleon Operational Qualification, Part 1  
Verification of Selected Results

Report Variable	Peak Name	Status
Calibration Point X	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Calibration Point Y	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Amount [ng]	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Resolution (EP)	Acetanilide	ok
	Acetophenone	ok
Resolution (USP)	Acetanilide	ok
	Acetophenone	ok
Peak Asymmetry (EPI/USP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Peak Asymmetry (AIA)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok



## Chromeleon Operational Qualification, Part 1

### Verification of Selected Results

Report Variable	Peak Name	Status
Theoretical Plates (EP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Theoretical Plates (USP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Theoretical Plates (JP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

Test Result: Passed



## Chromeleon Operational Qualification, Part 2

### Most Frequently Used Parameters: Comparison with Expected Results

Detection Algorithm: Cobra  
Calibration Type: Lin, WithOffset  
Evaluation Type: Area  
Standard Method: External  
Calibration Mode: Total

Variable Category	Report Variable	Peak Name	Status
Injection	No.		ok
	Name		ok
	Type		ok
	Position		ok
	Status		ok
	Volume		ok
	Dilution Factor		ok
	Weight		ok
	IntStd		ok
	InstrumentMethod		ok
	ProcessingMethod		ok
	Channel		ok
	No. of Peaks		ok
Chromatogram	Chromatogram Start Time		ok
	Signal Min.		ok
	Signal Max.		ok
	Unit		ok
Peak Results	Noise		ok
	No.	Acetanilide	ok
	No.	Acetophenone	ok
	No.	Propiophenone	ok
	Peak Name	Acetanilide	ok
	Peak Name	Acetophenone	ok
	Peak Name	Propiophenone	ok
	Ret Time	Acetanilide	ok
	Ret Time	Acetophenone	ok
	Ret Time	Propiophenone	ok



## Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Abs.Ret.Dev.	Acetanilide	ok
	Ret.Dev.(abs)	Acetophenone	ok
	Ret.Dev.(abs)	Propiophenone	ok
	Rel.Ret.Dev.	Acetanilide	ok
	Ret.Dev.(rel)	Acetophenone	ok
	Ret.Dev.(rel)	Propiophenone	ok
	Area	Acetanilide	ok
	Area	Acetophenone	ok
	Area	Propiophenone	ok
	Rel.Area	Acetanilide	ok
	Rel.Area (Total)	Acetophenone	ok
	Rel.Area (Total)	Propiophenone	ok
	Height	Acetanilide	ok
	Height	Acetophenone	ok
	Height	Propiophenone	ok
	Rel.Height (Total)	Acetanilide	ok
	Rel.Height (Total)	Acetophenone	ok
	Rel.Height (Total)	Propiophenone	ok
	Amount	Acetanilide	ok
	Amount	Acetophenone	ok
	Amount	Propiophenone	ok
	Concentration	Acetanilide	ok
	Concentration	Acetophenone	ok
	Concentration	Propiophenone	ok
	Rel.Amount	Acetanilide	ok
	Rel.Amount	Acetophenone	ok
	Rel.Amount	Propiophenone	ok
	Peak Width (0%)	Acetanilide	ok
	Peak Width (0%)	Acetophenone	ok
	Peak Width (0%)	Propiophenone	ok
	Peak Width (5%)	Acetanilide	ok
	Peak Width (5%)	Acetophenone	ok
	Peak Width (5%)	Propiophenone	ok
	Peak Width (10%)	Acetanilide	ok
	Peak Width (10%)	Acetophenone	ok
	Peak Width (10%)	Propiophenone	ok



## Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Peak Width (50%)	Acetanilide	ok
	Peak Width (50%)	Acetophenone	ok
	Peak Width (50%)	Propiophenone	ok
	Left Width (0%)	Acetanilide	ok
	Left Width (0%)	Acetophenone	ok
	Left Width (0%)	Propiophenone	ok
	Right Width (0%)	Acetanilide	ok
	Right Width (0%)	Acetophenone	ok
	Right Width (0%)	Propiophenone	ok
	Peak Start	Acetanilide	ok
	Peak Start	Acetophenone	ok
	Peak Start	Propiophenone	ok
	Peak Stop	Acetanilide	ok
	Peak Stop	Acetophenone	ok
	Peak Stop	Propiophenone	ok
	Peak Start Value	Acetanilide	ok
	Peak Start Value	Acetophenone	ok
	Peak Start Value	Propiophenone	ok
	Peak Stop Value	Acetanilide	ok
	Peak Stop Value	Acetophenone	ok
	Peak Stop Value	Propiophenone	ok
	BL-Value Peak Start	Acetanilide	ok
	BL-Value Peak Start	Acetophenone	ok
	BL-Value Peak Start	Propiophenone	ok
	BL-Value Peak Stop	Acetanilide	ok
	BL-Value Peak Stop	Acetophenone	ok
	BL-Value Peak Stop	Propiophenone	ok
	Type	Acetanilide	ok
	Type	Acetophenone	ok
	Type	Propiophenone	ok
	Resolution (EP)	Acetanilide	ok
	Resolution (EP)	Acetophenone	ok
	Resolution (USP)	Acetanilide	ok
	Resolution (USP)	Acetophenone	ok
	Asymmetry (EP)	Acetanilide	ok
	Asymmetry (EP)	Acetophenone	ok
	Asymmetry (EP)	Propiophenone	ok





## Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Asymmetry(AIA)	Acetanilide	ok
	Asymmetry(AIA)	Acetophenone	ok
	Asymmetry(AIA)	Propiophenone	ok
	Theor. Plates(EP)	Acetanilide	ok
	Theor. Plates(EP)	Acetophenone	ok
	Theor. Plates(EP)	Propiophenone	ok
	Theor. Plates(USP)	Acetanilide	ok
	Theor. Plates(USP)	Acetophenone	ok
	Theor. Plates(USP)	Propiophenone	ok
	Theor.Plates (JP)	Acetanilide	ok
	Theor. Plates(JP)	Acetophenone	ok
	Theor. Plates(JP)	Propiophenone	ok
Peak Calibration	Cal.Mode	Acetanilide	ok
	Cal.Mode	Acetophenone	ok
	Cal.Mode	Propiophenone	ok
	Cal.Type	Acetanilide	ok
	Cal.Type	Acetophenone	ok
	Cal.Type	Propiophenone	ok
	Weights	Acetanilide	ok
	Weights	Acetophenone	ok
	Weights	Propiophenone	ok
	Calibr. Coefficient C0	Acetanilide	ok
	Calibr. Coefficient C0	Acetophenone	ok
	Calibr. Coefficient C0	Propiophenone	ok
	Calibr. Coefficient C1	Acetanilide	ok
	Calibr. Coefficient C1	Acetophenone	ok
	Calibr. Coefficient C1	Propiophenone	ok
	RF-Value	Acetanilide	ok
	RF-Value	Acetophenone	ok
	RF-Value	Propiophenone	ok
	No. of Points	Acetanilide	ok
	No. of Points	Acetophenone	ok



## Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Calibration	No. of Points	Propiophenone	ok
	No. of Points(disabled)	Acetanilide	ok
	No. of Points(disabled)	Acetophenone	ok
	No. of Points(disabled)	Propiophenone	ok
	Variance	Acetanilide	ok
	Variance	Acetophenone	ok
	Variance	Propiophenone	ok
	Var.Coeff	Acetanilide	ok
	Var.Coeff	Acetophenone	ok
	Var.Coeff	Propiophenone	ok
	Std.Dev.	Acetanilide	ok
	Std.Dev.	Acetophenone	ok
	Std.Dev.	Propiophenone	ok
	Rel.Std.Dev.	Acetanilide	ok
	Rel.Std.Dev.	Acetophenone	ok
	Rel.Std.Dev.	Propiophenone	ok
	Corr.Coeff.	Acetanilide	ok
	Corr.Coeff.	Acetophenone	ok
	Corr.Coeff.	Propiophenone	ok
	R-Square	Acetanilide	ok
	R-Square	Acetophenone	ok
	R-Square	Propiophenone	ok
	Adj. R-Square	Acetanilide	ok
	Adj. R-Square	Acetophenone	ok
	Adj. R-Square	Propiophenone	ok
	X	Acetanilide	ok
	X	Acetophenone	ok
	X	Propiophenone	ok
	Y	Acetanilide	ok
	Y	Acetophenone	ok
	Y	Propiophenone	ok
	W	Acetanilide	ok
	W	Acetophenone	ok
	W	Propiophenone	ok
	F(X)	Acetanilide	ok
	F(X)	Acetophenone	ok
	F(X)	Propiophenone	ok



Chromeleon Operational Qualification, Part 2  
Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Calibration	Residual for Cal.Point X	Acetanilide	ok
	Residual for Cal.Point X	Acetophenone	ok
	Residual for Cal.Point X	Propiophenone	ok
	Calibration Point Status	Acetanilide	ok
	Calibration Point Status	Acetophenone	ok
	Calibration Point Status	Propiophenone	ok
	Amount	Acetanilide	ok
	Amount	Acetophenone	ok
	Amount	Propiophenone	ok
	Cal.Type	Acetanilide	ok
Component	Peak Type	Acetanilide	ok
	Left Limit	Acetophenone	ok
	Right Limit	Acetanilide	ok
	Group	Acetanilide	ok
	Factor	Acetophenone	ok
	Amount	Acetanilide	ok
	Conc.Unit	Acetophenone	ok



Chromeleon Operational Qualification, Part 2  
Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Purity	PPI	Acetanilide	ok
	PPI	Acetophenone	ok
	PPI	Propiophenone	ok
	RSD PPI	Acetanilide	ok
	RSD PPI	Acetophenone	ok
	RSD PPI	Propiophenone	ok
	Match	Acetanilide	ok
	Match	Acetophenone	ok
	Match	Propiophenone	ok
	RSD Match	Acetanilide	ok
	RSD Match	Acetophenone	ok
	RSD Match	Propiophenone	ok
	Rel.Max at	Acetanilide	ok
	Rel.Max at	Acetophenone	ok
	Rel.Max at	Propiophenone	ok

Test Result: Passed



Chromeleon Operational Qualification, Part 3  
System Suitability Test: Comparison with Expected Results

Variable Category	Report Variable	Status
System Suitability Test Case	Number	ok
	Name	ok
	Inj. Condition	ok
	Eval. Formula	ok
	Operator	ok
	Statistics	ok
	Rounding	ok
	MinimumNumberOfInjections	ok
	MaximumNumberOfInjections	ok
	Channel	ok
	Peak	ok
	Ref. Value Formula 1	ok
	Ref. Value Formula 2	ok
	N.A.	ok
	Inj. Eval. Result	ok
System Suitability Test Case Result	Eval. Result	ok
	Peak Result	ok
	Injection Condition Result	ok
	Ref. Value 1	ok
	Ref. Value 2	ok
	Result	ok
	Message	ok
	Average	ok
	Count	ok
	Maximum	ok
	Minimum	ok
	Range	ok
	Rel. Range	ok
	Rel. Std. Dev.	ok
	Std. Dev.	ok
	Sum	ok

Test Result: Passed

PQ

Performance Qualification



OQ REVIEW AND COMPLETION



These Operational Qualification Results should be reviewed by the Customer. If the qualification is accepted, both the Customer and the Service Representative should sign the Operational Qualification Results, below.

OPERATIONAL QUALIFICATION RESULTS

Based upon the actual results obtained, this Operational Qualification PASSED the acceptance criteria described in the Operational Qualification in the Installation Checklist procedure.

Service Representative

A Field Service Representative signature below confirms the completion of all aspects of the Operational Qualification and have concluded that the system has been successfully verified to be operating as required.

Customer

A Customer signature below confirms the completion of all aspects of the Operational Qualification have been completed and that the system has been successfully verified to be operating as required.

Field Service F

Customer Signature:

Date:

TEST EQUIPMENT AND STANDARDS



Test Equipment

Equipment	Manufacturer	Model	Serial Number	Cal/Ver Date	Good Until
Multimeter	FLUKE	289	32320105	4-Dec-2024	N/A
Thermometer Sensor	FLUKE	289	32320105	2-Dec-2024	N/A
Test Box	Thermo scientific	Test Box II	20030631	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Standards/Chemicals

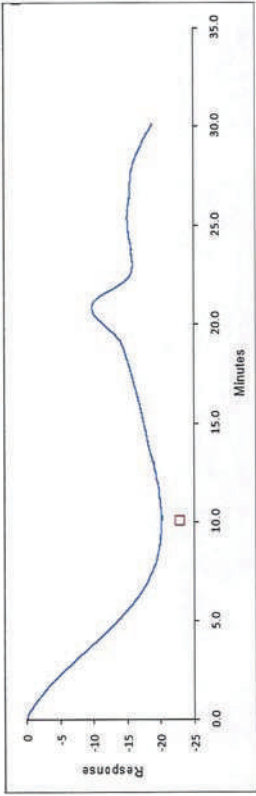
Description	Manufacturer	Concentration	Part Number	Lot Number	Expiration Date
Nitrate	Thermo scientific	5 ppm	060254	231226	Dec-2024
Nitrate	Thermo scientific	10 ppm	060254	231226	Dec-2024
Nitrate	Thermo scientific	25 ppm	060254	231226	Dec-2024
Nitrate	Thermo scientific	50 ppm	060254	231226	Dec-2024
Nitrate	Thermo scientific	100 ppm	060254	231226	Dec-2024
Nitrate	Thermo scientific	1000 ppm	060254	231226	Dec-2024
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Field Service F

Customer Signature:

Date:

NOISE AND DRIFT (CD)



Information

System Name	AQUION
Detector SN	220260110
Data Path	chrom://desktop-mpo8678/ChromleonLocal/SGS/2rd Contract 15-May-24/IC OQ_seq/808.smp/ECD_1.channel/ECD_1.chm

Noise and Drift

Test	Measured (nS)	OQ Limit (nS)	Result	Conversion Factor
Noise	1.8 nS	≤ 2.0 nS	PASS	1000
Drift	11.2 nS/hr	≤ 20.0 nS/hr	PASS	1000

OVERALL TEST

Field S	Customer Signature:
	Date:

REPEATABILITY (CD)

Information

System Name	AQUION
Detector SN	220260110
Data Path	ChromleonLocal//Archemical/Contract/2023/2rd Contract 15-May-24/IC_OQ

Peak Results

Sample Name	Injection Volume (µL)	Retention Time (min)	Area
Repeatability 01	25	0.1883	2.92
Repeatability 02	25	0.1883	2.94
Repeatability 03	25	0.19	2.927
Repeatability 04	25	0.1883	2.947
Repeatability 05	25	0.19	2.934
Repeatability 06	25	0.19	2.937

Repeatability

Test	Measured (% RSD)	OQ Limit (% RSD)	Result
Retention Time	0.5	≤ 5.0	PASS
Area	0.3	≤ 1.0	PASS

OVERALL TEST

F	Customer Signature:
	Date:

CARRYOVER (CD)

Information

System Name	AQUION	
Detector SN	220260110	
Data Path	ChromeleonLocal://Archemical/Contract/2023/2rd Contract 15-May-24/IC OQ	

Peak Results

Sample Name	Injection Volume (µL)	Retention Time (min)	Area
Reference Blank	25	0.1883	0.019
High Standard	25	0.1933	49.529
Carryover	25	0.1867	0.021

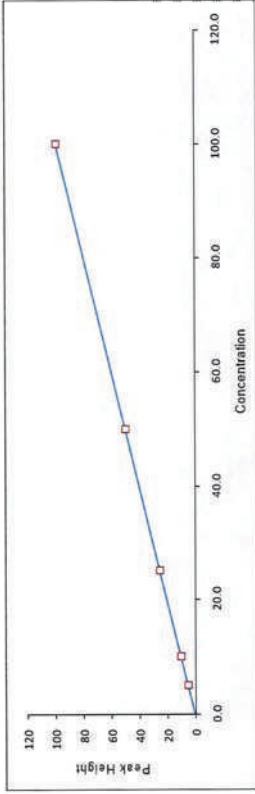
Results

Test	Observed (%)	OQ Limit (%)	Result
AREA	0.00	≤ 0.10	PASS

OVERALL TEST RESULT:

Field Service Rep	<div></div>		Customer Signature:
Date: 15/Nov/2024			Date:

DETECTOR LINEARITY (CD)



Information

System Name	AQUION
Detector SN	220260110
Data Path	ChromeleonLocal://Archemical/Contract/2023/2rd Contract 15-May-24/IC OQ

Peak Results

Sample Name	Concentration	Peak Height	Calculated
Detector Linearity 01	5	5.765	4.94
Detector Linearity 02	10	10.708	9.97
Detector Linearity 03	25	25.747	25.25
Detector Linearity 04	50	49.912	49.80
Detector Linearity 05	100	99.37	100.05

Linearity

Test	Observed	OQ Limit	Result
r <sup>2</sup>	1.000	≥ 0.999	PASS

OVERALL TEST RESULT:

Field	<div></div>		Customer Signature:
Date:			Date:



ELUENT GENERATOR TEST

EG Current Test

Set Point (mM)	Expected (mA)	Reading (mA)	Deviation (mA)	OQ Limit (mA)	Result
1.00	1.6082	1.6075	0.00	± 0.01	PASS
5.00	8.041	8.037	0.00	± 0.05	PASS
10.00	16.082	16.076	0.01	± 0.10	PASS
50.00	80.41	80.38	0.03	± 0.50	PASS
100.00	160.82	160.75	0.07	± 1.00	PASS

OVERALL TEST RE

Field Service	Customer Signature:	
	Date: 15/Nov/2024	Date:

TEMPERATURE ACCURACY

Column Compartment

Set Point (°C)	Reading (°C)	Deviation (°C)	OQ Limit (°C)	Result
30.0	29.9	0.1	± 2.0	PASS

OVERALL

File	Customer Signature:	
	Date: 15/Nov/2024	Date:

# Certificate

## Certificate of Standards and Instruments for Qualification

### Certificate of Analysis

Better Separations Through  
Better Chemistry



#### Dionex Nitrate OQ/PQ IC Standards Kit

(Set of 6)

Product Number 060254

Certificate of Analysis

Lot Number 231226

Expiration of Certification  
December 2024

The Dionex Nitrate Standard was developed to aid the analysis of anions by Ion Chromatography (IC). The single-ion standard was prepared by the dissolution of high-purity salt in  $\geq 18.2$  megohm deionized water, which was tested by IC for ionic contaminants. The bottle label states the nominal concentration value of the ionic component for informational purposes only. The actual ion concentration value was determined by Ion Chromatography. The IC system was standardized using the National Institute of Standards & Technology (NIST), Standard Reference Material, SRM 3185 (Nitrate Standard Solution). Actual concentration values determined for the single-ion is listed below.

#### Dionex Nitrate Standard

Vial #	Concentration (mg/L)
1	5.08 $\pm$ 0.03
2	10.03 $\pm$ 0.14
3	25.16 $\pm$ 0.65
4	50.43 $\pm$ 0.09
5	99.7 $\pm$ 3
6	1014 $\pm$ 17

The concentration value is based a proven reliable method of analysis. The estimated uncertainties are two standard deviations of the concentration value. The concentration value is warranted to be stable for one year from the date of manufacture.

The preparation and analyses of the Dionex Nitrate Standard was performed with extreme care by Thermo Scientific Corporation Consumables Manufacturing Department in Sunnyvale California.

Document No. 078698-01

20-Dec-2011

[thermoscientific.com/dionex](http://thermoscientific.com/dionex)

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thermo  
scientific





# SYSTRONICS CO.,LTD.

19/11-12, Sukhumvit Rd., Nernphra, Muang Rayong, Rayong 21150, Thailand  
Tel:+66(38) 694 145-8, Fax:+66(38) 694 149



## CALIBRATION CERTIFICATE

**Customer Name:** Archimex Lab Co., Ltd.  
**Customer Address:** 39 Soi Sukhumvit 63 (Ekamai)  
Sukhumvit Rd., North Klongkon,  
Watana, Bangkok 10110  
**Instrument Description:** TRUE RMS MULTIMETER  
**Manufacturer:** FLUKE  
**Model No.** : 289  
**Serial Number:** : 32320105  
**Calibration Procedure:**  
Calibration were conducted using in-house calibration procedure according to direct measurement with reference standard.  
**Procedure No.** CP-EL-01, 02, 03, 04, 05, 06, 07, 10,  
**Comment:**  
**Tag No. :-**  
**Service :-**  
**Condition As Received :-** Used

**Reference Standards Instrument:**

Instrument Name	Model	Serial No.	Cert. No.	Due Date.
Multi-Function Calibrator	Fluke 5522A	2177901	EE-0033-23	03 Apr 2024
-	-	-	-	-
-	-	-	-	-

### Traceability Information.

- Traceable to the International System of Units (SI) through the National Institute of Metrology (Thailand), NIMT.

### Environmental Conditions.

Temperature : (23 +/- 3) °C Relative Humidity : (50 +/- 15) %

### Calibration Information.

- The result of calibration was found accurate as show on date and place of calibration only.  
- The reported uncertainty of measurement is based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing confidence level of approximately 95%.

**Calibrated by :** Mr.Suputhana Prapasai

**Approved by :**  
  
Mr. Phisanu Wiangchial  
( ) Mr. Tanawat Siripakdee

This certificate may not be reproduced, except in full unless permission for the publication of an approved abstract is obtained in writing from the calibration organization issuing this report.



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## CALIBRATION CERTIFICATE

**Certificate No.** EL231989  
**Page.** 2 of 5

**Range** **Standard Value** **UUC\*Reading** **Error** **(±) Uncertainty**

### Function : DC Voltage Measurement (Without Adjustment)

50 mV	0.0000 mV	0.000 mV	0.0016 mV
50 mV	5.0000 mV	4.989 mV	0.0016 mV
50 mV	45.0000 mV	44.988 mV	0.0021 mV
500 mV	-45.0000 mV	-45.012 mV	0.0021 mV
500 mV	50.0000 mV	49.99 mV	0.0061 mV
500 mV	-450.0000 mV	-449.95 mV	0.0080 mV
500 mV	-450.0000 mV	-449.9501 mV	0.0080 mV
5 V	0.500000 V	0.500000 V	0.000059 V
5 V	4.50000 V	4.4998 V	0.000082 V
5 V	-4.50000 V	-4.4996 V	0.000082 V
50 V	5.00000 V	5.000 V	0.00059 V
50 V	45.0000 V	44.999 V	0.00095 V
50 V	-45.0000 V	-44.997 V	0.00095 V
500 V	50.0000 V	50.00 V	0.00059 V
500 V	450.000 V	449.99 V	0.00095 V
500 V	-450.000 V	-449.98 V	0.00095 V
1000 V	100.0000 V	100.0 V	0.0058 V
1000 V	900.000 V	900.0 V	0.060 V
1000 V	-900.000 V	-900.0 V	0.060 V

### Function : DC Voltage Measurement LoZ (Without Adjustment)

1000 V	0.0000000 V	0.0 V	0.058 V
1000 V	100.0000 V	100.0 V	0.058 V
1000 V	900.000 V	900.5 V	0.5 V
1000 V	-900.000 V	-900.5 V	-0.5 V

### Function : AC Voltage Measurement (Without Adjustment)

50 mV	5.000 mV	50 Hz	4.993 mV	0.0053 mV
50 mV	45.000 mV	50 Hz	44.989 mV	0.013 mV
500 mV	50.000 mV	50 Hz	50.00 mV	0.014 mV
500 mV	450.00 mV	50 Hz	449.96 mV	0.11 mV
5 V	0.50000 V	50 Hz	0.4998 V	0.00012 V
5 V	4.5000 V	50 Hz	4.5024 V	0.0011 V
50 V	5.0000 V	50 Hz	5.000 V	0.0012 V
50 V	45.000 V	50 Hz	45.026 V	0.0085 V
500 V	50.000 V	50 Hz	50.00 V	0.011 V
500 V	450.00 V	50 Hz	450.29 V	0.12 V
1000 V	100.000 V	50 Hz	100.0 V	0.060 V
1000 V	900.00 V	50 Hz	900.6 V	0.22 V

**Remark :** (\*) UUC : Unit Under Calibration





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## CALIBRATION CERTIFICATE

Certificate No. EL231989  
Page. 3 of 5

Range	Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : AC Voltage Measurement LoZ (Without Adjustment)				
1000 V	100.000 V	100.4 V	0.4 V	0.060 V
100 V	100.000 V	904.1 V	4.1 V	0.23 V
Function : DC Current Measurement (Without Adjustment)				
500 uA	0.000 uA	0.00 uA	0.00 uA	0.017 uA
500 uA	50.000 uA	50.00 uA	0.00 uA	0.023 uA
5000 uA	450.00 uA	450.02 uA	0.02 uA	0.078 uA
5000 uA	500.00 uA	500.0 uA	0.0 uA	0.097 uA
5000 uA	4500.0 uA	4499.7 uA	-0.3 uA	0.57 uA
50 mA	5.0000 mA	5.002 mA	0.002 mA	0.00082 mA
50 mA	45.0000 mA	44.991 mA	-0.009 mA	0.0058 mA
400 mA	40.0000 mA	39.99 mA	-0.01 mA	0.0077 mA
400 mA	360.00 mA	359.85 mA	-0.15 mA	0.090 mA
5 A	0.50000 A	0.5001 A	0.0001 A	0.00013 A
5 A	4.5000 A	4.4991 A	-0.0009 A	0.00022 A
10 A	1.00000 A	1.000 A	0.000 A	0.00061 A
10 A	9.0000 A	8.998 A	-0.002 A	0.00040 A
Function : AC Current Measurement (Without Adjustment)				
500 uA	50.00 uA	49.86 uA	-0.14 uA	0.13 uA
500 uA	450.00 uA	449.75 uA	-0.25 uA	0.48 uA
5000 uA	500.00 uA	499.8 uA	-0.2 uA	0.51 uA
5000 uA	4500.0 uA	4499.7 uA	-0.3 uA	3.1 uA
50 mA	5.0000 mA	4.989 mA	-0.011 mA	0.0032 mA
50 mA	45.0000 mA	44.958 mA	-0.042 mA	0.031 mA
400 mA	40.0000 mA	39.97 mA	-0.03 mA	0.029 mA
400 mA	360.00 mA	359.85 mA	-0.15 mA	0.22 mA
5 A	0.50000 A	0.4985 A	-0.0015 A	0.00028 A
5 A	4.5000 A	4.4957 A	-0.0043 A	0.0038 A
10 A	1.00000 A	0.993 A	-0.007 A	0.0008 A
10 A	9.0000 A	8.995 A	-0.005 A	0.0059 A

Remark : (\*) UUC : Unit Under Calibration



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## CALIBRATION CERTIFICATE

Certificate No. EL231989  
Page. 4 of 5

Range	Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : Resistance Measurement (Without Adjustment)				
500 Ω	0.0000 Ω	0.00 Ω	0.00 Ω	0.0075 Ω
500 Ω	50.0000 Ω	49.99 Ω	-0.01 Ω	0.0084 Ω
500 Ω	450.000 Ω	449.96 Ω	-0.04 Ω	0.017 Ω
5 kΩ	0.500000 kΩ	0.4999 kΩ	-0.0001 kΩ	0.00060 kΩ
5 kΩ	4.50000 kΩ	4.4992 kΩ	-0.0008 kΩ	0.00060 kΩ
50 kΩ	5.00000 kΩ	5.000 kΩ	0.000 kΩ	0.00060 kΩ
50 kΩ	45.0000 kΩ	44.997 kΩ	-0.003 kΩ	0.0017 kΩ
500 kΩ	450.000 kΩ	449.98 kΩ	-0.02 kΩ	0.0060 kΩ
500 kΩ	450.0000 kΩ	449.78 kΩ	-0.22 kΩ	0.018 kΩ
5 MΩ	0.500000 MΩ	0.4997 MΩ	-0.0003 MΩ	0.00070 MΩ
5 MΩ	4.50000 MΩ	4.4975 MΩ	-0.0025 MΩ	0.00056 MΩ
30 MΩ	3.000000 MΩ	2.998 MΩ	-0.002 MΩ	0.00061 MΩ
30 MΩ	27.00000 MΩ	26.963 MΩ	-0.037 MΩ	0.00075 MΩ
50 MΩ	5.00000 MΩ	5.00 MΩ	0.00 MΩ	0.00059 MΩ
50 MΩ	45.0000 MΩ	44.92 MΩ	-0.08 MΩ	0.021 MΩ
100 MΩ	10.00000 MΩ	10.0 MΩ	0.0 MΩ	0.058 MΩ
100 MΩ	90.00000 MΩ	89.7 MΩ	-0.3 MΩ	0.069 MΩ
500 MΩ	250.0000 MΩ	248.3 MΩ	-1.7 MΩ	0.68 MΩ
500 MΩ	450.000 MΩ	444.9 MΩ	-5.1 MΩ	5.9 MΩ
Function : Resistance Measurement LoZ (Without Adjustment)				
50 Ω	0.0000 Ω	0.000 Ω	0.000 Ω	0.0050 Ω
50 Ω	5.0000 Ω	5.002 Ω	0.002 Ω	0.0050 Ω
50 Ω	25.0000 Ω	25.021 Ω	0.021 Ω	0.0060 Ω
50 Ω	45.0000 Ω	45.017 Ω	0.017 Ω	0.0060 Ω
Function : Capacitance Measurement (Without Adjustment)				
1 nF	0.0000 nF	0.000 nF	0.000 nF	0.0078 nF
1 nF	0.5000 nF	0.496 nF	-0.004 nF	0.0098 nF
1 nF	0.9000 nF	0.898 nF	-0.002 nF	0.012 nF
10 nF	1.0000 nF	1.00 nF	0.00 nF	0.013 nF
10 nF	9.0000 nF	9.00 nF	0.00 nF	0.029 nF
100 nF	10.0000 nF	10.0 nF	0.0 nF	0.064 nF
100 nF	90.00 nF	90.0 nF	0.0 nF	0.29 nF
1 uF	0.100000 uF	0.100 uF	0.000 uF	0.00064 uF
1 uF	0.90000 uF	0.900 uF	0.000 uF	0.00029 uF
10 uF	1.00000 uF	1.00 uF	0.00 uF	0.0064 uF
10 uF	9.0000 uF	9.00 uF	0.00 uF	0.028 uF
100 uF	10.0000 uF	10.0 uF	0.0 uF	0.064 uF
100 uF	90.0000 uF	90.0 uF	0.0 uF	0.42 uF
1000 uF	100.000 uF	100 uF	0 uF	0.72 uF
1000 uF	900.00 uF	899 uF	-1 uF	4.2 uF
10 mF	1.00000 mF	1.00 mF	0.00 mF	0.0077 mF
10 mF	9.0000 mF	9.0 mF	0.0 mF	
100 mF	10.0000 mF	10 mF		
100 mF	90.000 mF	89 mF		

Remark : (\*) UUC : Unit Under Calibration





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## CALIBRATION CERTIFICATE

Certificate No. EL231989  
Page 5 of 5

Range	Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : Frequency Measurement (Without Adjustment)				
100 Hz	10.00 Hz @ 1 V	10.000 Hz	0.000 Hz	0.00059 Hz
100 Hz	90.00 Hz @ 1 V	90.000 Hz	0.000 Hz	0.00066 Hz
1000 Hz	100.00 Hz @ 1 V	100.00 Hz	0.00 Hz	0.0058 Hz
1000 Hz	900.0 Hz @ 1 V	900.00 Hz	0.00 Hz	0.0061 Hz
10 kHz	1.0000 kHz @ 1 V	1.0000 kHz	0.0000 kHz	0.000058 kHz
10 kHz	9.000 kHz @ 1 V	9.0000 kHz	0.0000 kHz	0.000061 kHz
100 kHz	10.000 kHz @ 1 V	10.000 kHz	0.000 kHz	0.00058 kHz
100 kHz	90.000 kHz @ 1 V	90.000 kHz	0.000 kHz	0.00061 kHz
1000 kHz	100.00 kHz @ 1 V	100.00 kHz	0.00 kHz	0.0058 kHz
1000 kHz	500.0 kHz @ 1 V	500.00 kHz	0.00 kHz	0.0059 kHz

Range	Standard Value	Required UUC*Reading	UUC*Reading	Error	(±) Uncertainty
Function : Thermocouple Measurement K Type (Without Adjustment)					
-200 to 1350 °C	-5.550 mV	-180.0 °C	-179.6 °C	0.4 °C	0.37 °C
-200 to 1350 °C	0.000 mV	0.0 °C	0.2 °C	0.2 °C	0.24 °C
-200 to 1350 °C	4.096 mV	100.0 °C	100.2 °C	0.2 °C	0.22 °C
-200 to 1350 °C	24.905 mV	600.0 °C	600.2 °C		0.22 °C
-200 to 1350 °C	37.326 mV	900.0 °C	900.3 °C		0.22 °C
-200 to 1350 °C	48.838 mV	1200.0 °C	1200.1 °C		0.23 °C

Remark : (\*) UUC : Unit Under Calibration

END OF CALIBRATION

Thermo SCIENTIFIC

## IC QUALIFICATION TEST BOX II

This certificate validates that the product values referenced below exceed all Thermo Scientific functional specifications and release requirements.

Instrument Serial Number: 20030631  
Instrument Part Number: 22000-60001

## TEST BOX LOADS AND FUNCTIONS

[x] AES	100Ω	+/- 5%	CR-TC 3-pin ANA INT	1.3KΩ	+/- 5%
[x] EGC CAP KOH	100Ω	+/- 5%	CR-TC 3-pin CAP INT	13.05KΩ	+/- 1%
[x] EGC CAP MSA	100Ω	+/- 5%	CR-TC 4-pin ANA INT	1.3KΩ	+/- 5%
[x] EGC ANA KOH	100Ω	+/- 5%	CR-TC 4-pin CAP INT	13.05KΩ	+/- 1%
[x] EGC ANA MSA	100Ω	+/- 5%	EGC - Memory Test		
[x] ERS (CO)			ERS - Memory Test		
[x] ERC			CR-TC - Memory Test		

Date: 27 Mar 2020

P/N 22000-97001 C



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## CALIBRATION CERTIFICATE

Certificate No. TL230238  
Job No. 23110141  
Page. 1 of 2

Customer Name : Archimica Lab. Co., Ltd.  
Customer Address : 39 Soi Sukhumvit 63 (Ekmal),  
Sukhumvit Rd., North Klongton, Wattana,  
Bangkok 10110.

Received Date : 30 Nov 2023  
Calibrated Date : 01 to 02 Dec 2023  
Issued Date : 02 Dec 2023

Instrument Description : Digital Thermometer with sensor  
Manufacturer : FLUKE  
Model No. : 289  
Serial Number : 32320105

Tag No. :  
Service :  
Condition As Received : Used Item

**Calibration Procedure.**  
Calibration were conducted using in-house calibration procedure according to comprehensive measurement with Platinum Resistance Thermometer (PRT) into temperature source.

**Procedure No.**  
CP-TL-01  
**Comment.**

**Reference Standards Instrument.**

Instrument Name	Model	Serial No.	Cert No.	Due Date
Platinum Resistance Thermometer	5615	958332	TT-0066-23	21 Jun 2024
Thermometer Readout	1529	829730	22E4124	26 Dec 2023

**Traceability Information.**  
The temperature scale used was based on ITS-90.  
This certification is traceable to the International System of Units (SI).

**Environmental Conditions**  
Temperature : (23 ± 3) °C  
Relative Humidity :

**Calibration Information.**  
The result of calibration was found accurate as show on date and place of calibration only.  
The reported uncertainty of measurement is based on standard uncertainty multiplied by a coverage factor providing confidence level of approximately 95%.

Calibrated by : Nuttapon Srisuwan  
Approved by :  
Approved Signatory  
( ) Mr. Phitsanu Wangchai  
( ) Mr. Tanawat Siripakdee

This certificate may not be reproduced, except in full unless permission for the publication of an approved abstract is obtained in writing from the calibration organization issuing this report.



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## CALIBRATION CERTIFICATE

Certificate No. TL230238  
Page. 2 of 2

**Result of Calibration :**

( Without Adjustment )

Sensor of UUC\* : Thermocouple Wire Type : K Serial No. : ID/Tag No. : 32320105  
Dimension : Length : 930 mm Diameter : 1.5 mm

Immersion Depth	Standard Reading	UUC* Reading	Correction Value	Uncertainty of Measurement (z)	Coverage Factor
mm	°C	°C			K =
150	0.0055	0.7			2.00
150	-49.5967	49.2			2.00
150	100.0040	98.6			2.00

UUC\* : Unit Under Calibration

END OF CERTIFICATE



## Certificate of Completion

This certifies that

**Soranat Thongnop**

Has successfully completed

### OJT RPG Mentoring: Ion Chromatography System Qualification Service Training

Valid for 3 years from:

Oct/4/2022

Issued electronically and  
approved by:

TFS - Learning Management  
System, Training, Mentoring,  
and Certification Group  
[tmc.training@thermofisher.com](mailto:tmc.training@thermofisher.com)

● The world leader in serving science

Important note: The certificate is only valid during employment with the Thermo Fisher Scientific including its subsidiaries and certified contractors.

## Certificate of Completion

This certifies that

**Soranat Thongnop**

Has successfully completed

### IC Installation, Maintenance and Troubleshooting Service Training

Valid Certificate no expire date:

Sep/28/2022

Issued electronically and  
approved by:

TFS - Learning Management  
System, Training Mentoring,  
and Certification Group  
[tmc.training@thermofisher.com](mailto:tmc.training@thermofisher.com)

● The world leader in serving science

Important note: The certificate is only valid during employment with the Thermo Fisher Scientific including its subsidiaries and certified contractors.



## CALIBRATION CERTIFICATE

Date of Issue Jun 24, 2024 Cert No. 24/2304  
Site Calibration Order No. 24060319

Customer SGS (Thailand) Limited.  
1/209, 1/211 Moo 1, T. Ban Chang, A. Ban Chang Rayong 21130 Thailand.

Place of Calibration	Sample Area			
Description	BOD Incubator			
Model	ICP450			
Serial No.	F721.0023			
ID.No.	I2022007			
Date of Receipt	Jun 20, 2024			
Date of Calibration	Jun 20, 2024			
Environment	Temperature	(Min)	25.3 °C (Max)	27.1 °C
	Relative Humidity	(Min)	52.6 %RH (Max)	59.6 %RH

### Calibration Method

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

### Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY49010059, Certificate No. QR24-0874, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292. Due Date Apr 24, 2025.

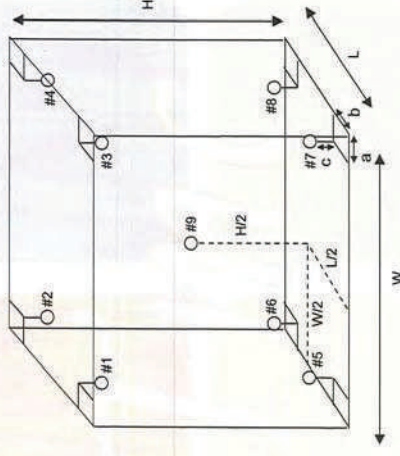
This certificate is traceable to SI unit.



## CALIBRATION CERTIFICATE

Date of Issue Jun 24, 2024 Cert No. 24/2304  
Site Calibration Order No. 24060319

Results (without adjustment)



Position of reference thermometers were placed

### Note.

- 1). Dimension (W x L x H) is 104 x 60 x 72 cm
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state reference sensor should preferably be located at the geometric center of the chamber.