

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1991) PUBLIC CO., LTD. (PLUP1)
ADDRESS : 1 MOO 2, THATOOM, SRIRAMAPHOT, PHRACHINBURI THAILAND 26140
CONTACT INFORMATION : TEL : 08 5035 1371 e-mail : kunnasat_p@doublea1991.com
SAMPLING SOURCE : MONITORING WELL #2
SAMPLE TYPE : GROUNDWATER
SAMPLING DATE : MAY 2, 2023
SAMPLING TIME : 14:50 HOUR
SAMPLING METHOD : SUBMERSIBLE PUMP
SAMPLING BY : MR KRISANAPONG NAMTHIP
ANALYZED BY : MISS KEWALEE SUKHAREE

RECEIVED DATE : MAY 3, 2023
ANALYTICAL DATE : MAY 3-14, 2023
REPORT NO. : 2023-LX06870
WORK NO. : 2023-000067
ANALYSIS NO. : T23AH765-0002

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			MONITORING WELL #2 T23AH765-0002	
COLOUR *	Platinum-Cobalt	VISUAL COMPARISON METHOD (SM PART 2102 B)	5	-
ELECTRICAL CONDUCTIVITY *	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM PART 2010 B)	1,807 (25°C)	-
AMMONIA-NITROGEN *	mg/L NH ₃ -N	PHENATE METHOD (SM PART 4550-NH ₃ -P)	2.22	-
CYANIDE *	mg/L CN	DISTILLATION, COLOURIMETRIC METHOD (SM PART 4550-CN C AND PART 4550-CN D)	ND	< 0.08
NITRATE-NITROGEN *	mg/L NO ₃ -N	CADMIUM REDUCTION METHOD (SM PART 4500-NO ₃ -E)	0.13	-
PHENOL *	mg/L	DISTILLATION, 4-AMINODIPYRIMINE METHOD (SM PART 5510 B AND PART 5510 C)	ND	-
TOTAL PHOSPHATE *	mg/L PO ₄ -P	PERMANGANATE OXIDATION AND ASCORBIC ACID METHOD (SM PART 4500-P B AND PART 4500-P C)	0.03	-
CHLORIDE *	mg/L Cl ⁻	MERCURIMETRIC METHOD (SM PART 4500-Cl B)	272	-
SULPHATE *	mg/L SO ₄ -S	TURBIDIMETRIC METHOD (SM PART 4500-SO ₄ -E)	679	-
ALKALINITY *	mg/L CaCO ₃	TITRATION METHOD (SM PART 2205 B)	246	-

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			MONITORING WELL #1 T23AH765-0002	
METALS				
MERCURY *	mg/L Hg	IN-HOUSE METHOD: USE TP-HCM-802 (COLD VAPOUR ATOMIC ABSORPTION SPECTROMETRIC METHOD) (SM PART 3112 B)	ND	0.001
SODIUM *	mg/L Na	NITRIC ACID-HYDROCHLORIC ACID DISSOLUTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (SM PART 3038 F AND PART 3100 G)	330	-
SAMPLE CONDITION				
WATERS COLOUR/TURBID			COLOURLESS/CLAR	
SEDIMENT			YELLOW	

* : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

* : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

* : VERIFIED BY ILM LABORATORY QUALITY SYSTEM BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23RD EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23RD EDITION, 2017.

REGULATORY STANDARD : NOTIFICATION OF THE NATIONAL ENVIRONMENTAL BOARD, NO.20, S.E.2543

ND : NON DETECTABLE (CYANIDE = 5 µg/L, PHENOLS = 0.085 mg/L, MERCURY = 0.001 mg/L)

(MR DRUCHONK PANICHLEUTUMPI)

LABORATORY SUPERVISOR

MAY 18, 2023

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1991) PUBLIC CO., LTD. (P&P-1)
ADDRESS : 1 MOO 2, THA TOOM, 88MVA-PHOTE, PRACHINBUR THAILAND 25140
CONTACT INFORMATION : TEL : 08 2635 1371 e-mail : kumsapet_p@doublea1991.com
SAMPLING SOURCE : MONITORING WELL #3
SAMPLE TYPE : GROUNDWATER
SAMPLING DATE : MAY 2, 2023
SAMPLING TIME : 14:35 HOUR
SAMPLING METHOD : SUBMERSIBLE PUMP
SAMPLING BY : MR KIRDSANAPONG NAMTHIP
ANALYZED BY : MISS KIRALEE SURKHAEE

RECEIVED DATE : MAY 3, 2023
ANALYTICAL DATE : MAY 3-14, 2023
REPORT NO. : 2023-U039071
WORK NO. : 2023-000007
ANALYSIS NO. : T23AH-083-0003

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			MONITORING WELL #3 T23AH083-0003	
COLOUR*	Platinum-Cobalt	VISUAL COMPARISON METHOD (SM PART 2120 B)	10	—
ELECTRICAL CONDUCTIVITY*	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT 25°C (SM PART 2510 B)	2.187 (20°C)	—
AMMONIA-NITROGEN*	mg/L NH ₃ -N	PHENATE METHOD (SM PART 4505-A, F)	0.08	—
CYANIDE*	µg/L CN	DISTILLATION COLOURIMETRIC METHOD (SM PART 4803-CN-C AND PART 4803-CN-E)	ND	0.200
NITRATE-NITROGEN*	mg/L NO ₃ -N	CADAMER REDUCTION METHOD (SM PART 4903-NO ₃ -E)	0.10	—
PHENOLS*	mg/L	DISTILLATION 4-AMINOANTHRACENE METHOD (SM PART 5003-B AND PART 5003-E)	ND	—
TOTAL PHOSPHATE*	mg/L PO ₄ ³⁻	POVSULPHATE DIGESTION AND ASOPHOSPHIC ACID METHOD (SM PART 4003-P-B AND PART 4003-P-E)	ND	—
CHLORIDE*	mg/L CL	ARGENTOMETRIC METHOD (SM PART 4500-CL-B)	300	—
SULPHATE*	mg/L SO ₄ ²⁻	TURBIDIMETRIC METHOD (SM PART 4500-SO ₄ ²⁻ -E)	ND	—
ALKALINITY*	mg/L CaCO ₃	TITRATION METHOD (SM PART 2000-B)	338	—

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			MONITORING WELL #3 T23AH083-0003	
METALS				
MERCURY *	mg/L Hg	IN-HOUSE METHOD: UPL-TP-HG-BIS (COLD VAPOR ATOMIC ABSORPTION SPECTROPHOTOMETRIC METHOD) (SM PART 3112-B)	ND	0.007
SODIUM *	mg/L Na	NITRIC ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (SM PART 3003-F AND PART 3003-B)	338	-
SAMPLE CONDITION				
WATER'S COLOUR/TURBID			YELLOW/CLEAR	
SEDIMENT			BROWN	

* ISO/ISO 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

† ISO/ISO 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

‡ VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23RD EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23RD EDITION, 2017.

REGULATORY STANDARD : NOTIFICATION OF THE NATIONAL ENVIRONMENTAL BOARD, NO.23, B.E.2543.

ND : NON-DETECTABLE (CYANIDE = 0.004 µg/L, PHENOLS = 0.004 µg/L, TOTAL PHOSPHATE = 0.00 µg/L, MERCURY = 0.0001 mg/L).

(MR BRUCHONK PANCHLEKTHUMPS)
 LABORATORY SUPERVISOR

MAY 16, 2023

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1991) PUBLIC CO., LTD. (PULPT)
ADDRESS : 1 MOO 2, THATDOM, SRIMAHAPHOTE, THACHINBURI THAILAND 25140
CONTACT INFORMATION : TEL : 08 6835 1371 e-mail : kunsapet_p@doubles1991.com
SAMPLING SOURCE : MONITORING WELL #4
SAMPLE TYPE : GROUNDWATER
SAMPLING DATE : MAY 2, 2023
SAMPLING TIME : 14.15 HOUR
SAMPLING METHOD : SUBMERSIBLE PUMP
SAMPLING BY : MR KRIDSANAPONG NAMTHIP
ANALYZED BY : MISS KEWALEE SUKHAREE

RECEIVED DATE : MAY 3, 2023
ANALYTICAL DATE : MAY 3-14, 2023
REPORT NO. : 2023-U006972
WORK NO. : 2023-000007
ANALYSIS NO. : T23AH703-0004

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	
			MONITORING WELL #4 T23AH703-0004	REGULATORY STANDARD
COLOUR ¹	Platinum-Cobalt	VISUAL COMPARISON METHOD (SM PART 212 B)	15	—
ELECTRICAL CONDUCTIVITY ²	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT 25°C (SM PART 212 B)	1,736 (25°C)	—
AMMONIA-NITROGEN ³	mg/L NH ₃ -N	PHENATE METHOD (SM PART 450B-PH ₃ P)	5.58	—
CYANIDE ⁴	µg/L CN	DISTILLATION-COLUMMETRIC METHOD (SM PART 450B-CN C AND PART 450B-CN E)	ND	5.00
NITRATE-NITROGEN ⁵	mg/L NO ₃ -N	CADMIUM REDUCTION METHOD (SM PART 450B-NO ₃ D)	5.07	—
PHENOLS ⁶	mg/L	DISTILLATION-4-AMINOANTHRACENE METHOD (SM PART 550B B AND PART 550B C)	ND	—
TOTAL PHOSPHATE ⁷	mg/L PO ₄ -P	PHOSPHATE DIGESTION AND ASCORBIC ACID METHOD (SM PART 450B-P B AND PART 450B-P E)	ND	—
CHLORIDE ⁸	mg/L Cl	ARGENTOMETRIC METHOD (SM PART 450B-Cl B)	305	—
SULPHATE ⁹	mg/L SO ₄ ²⁻	TURBIDIMETRIC METHOD (SM PART 450B-SO ₄ ²⁻ C)	519	—
ALKALINITY ¹⁰	mg/L CaCO ₃	TITRATION METHOD (SM PART 220 B)	343	—

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	
			MONITORING WELL #4 T23AH703-0004	REGULATORY STANDARD
METALS				
MERCURY ¹	µg/L Hg	SH-CLUSE METHOD: LME-TR-HG-002 (COLD VAPOR ATOMIC ABSORPTION SPECTROMETRIC METHOD) (SM PART 3112 B)	ND	5.0001
SODIUM ²	mg/L Na	METRIC ACID-HYDROCHLORIC ACID DIBESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (SM PART 3034 F AND PART 3112 B)	537	—
SAMPLE CONDITION				
WATER'S COLOR/TURBIDITY			YELLOW/CLEAR	
SEDIMENT			BROWN	

1: ISO/IEC 17025 ACCREDITED BY TAN INDUSTRIAL STANDARDS INSTITUTE (TISI)

2: ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF BUSINESS SERVICE (DSB)

3: VERIFIED BY OUR LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

SH-CLUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23RD EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23RD EDITION, 2017.

REGULATORY STANDARDS : NOTIFICATION OF THE NATIONAL ENVIRONMENTAL BOARD, NO.20, B.E.2543.

ND : NONDETECTABLE (CYANIDE < 5 µg/L, PHENOLS < 0.05 mg/L, TOTAL PHOSPHATE < 0.03 mg/L, MERCURY < 0.0001 mg/L).



(MR. SHUCHONK PANICHKERTUMPI)

LABORATORY SUPERVISOR

MAY 10, 2023

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1991) PUBLIC CO., LTD. (PLP)
ADDRESS : 1 MOO 2, THATOOM, SRINAKHAPHOT, PRACHINBUR THAILAND 25143.
CONTACT INFORMATION : TEL : 88 5835 1971 e-mail : kumapet_p@doublea1991.com
SAMPLING SOURCE : MONITORING WELL #1
SAMPLE TYPE : GROUNDWATER
SAMPLING DATE : JUNE 7, 2023
SAMPLING TIME : 14:00 HOUR
SAMPLING METHOD : SUBMERSIBLE PUMP
SAMPLING BY : MR KRIDSANAPONG NAMTHIP
ANALYZED BY : MISS KIWALIE SUKHAREE

RECEIVED DATE : JUNE 8, 2023
ANALYTICAL DATE : JUNE 8-16, 2023
REPORT NO. : 2023-J048812
WORK NO. : 2023-000067
ANALYSIS NO. : T23AK0254-0001

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			MONITORING WELL #1 T23AK0254-0001	
COLOUR ¹	Platinum-Cobalt	VISUAL COMPARISON METHOD (SM PART 212 B)	5	-
ELECTRICAL CONDUCTIVITY ²	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM PART 2810 B)	2,750 (25°C)	-
AMMONIA-NITROGEN ³	mg/L NH ₃ -N	PHENATE METHOD (SM PART 4500-NH ₃ F)	1.16	-
CYANIDE ⁴	µg/L CN	DISTILLATION COLOLUMETRIC METHOD (SM PART 4500-CN C AND PART 4500-CN E)	ND	0.300
NITRATE-NITROGEN ⁵	mg/L NO ₃ -N	CADMIUM REDUCTION METHOD (SM PART 4500-NO ₃ B)	ND	-
PHENOLS ⁶	mg/L	DISTILLATION 4-AMINODIMETHYLAMINE METHOD (SM PART 5510 B AND PART 5510 C)	ND	-
TOTAL PHOSPHATE ⁷	mg/L PO ₄ ³⁻	PERSULPHATE DIGESTION AND ASBOURNE ACID METHOD (SM PART 4500 P B AND PART 4500 P E)	0.82	-
CHLORIDE ⁸	mg/L Cl ⁻	ARGENTOMETRIC METHOD (SM PART 4500-Cl B)	289	-
SULPHATE ⁹	mg/L SO ₄ ²⁻	TURBIDIMETRIC METHOD (SM PART 4500-SO ₄ E)	838	-
ALKALINITY ¹⁰	mg/L CaCO ₃	TITRATION METHOD (SM PART 2320 B)	136	-

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			MONITORING WELL #1 T23AK025-0001	
DETAILS				
MERCURY ¹	mg/L Hg	IN-HOUSE METHOD: LURE-HG-MG2 (COLD VAPOUR ATOMIC ABSORPTION SPECTROMETRIC METHOD) (SM PART 3112 B)	< LOD	0.001
SODIUM ²	mg/L Na	NITRO ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (SM PART 3000 F AND PART 3100 B)	347	-
SAMPLE CONDITION				
WATER'S COLOUR/TURBIDITY			YELLOW/CLEAR	
SEDIMENT			BROWN	

1: ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

2: ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

3: VERIFIED BY CHN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED


IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23RD EDITION, 2017

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23RD EDITION, 2017

REGULATORY STANDARD : NOTIFICATION OF THE NATIONAL ENVIRONMENTAL BOARD, NO.28, B.E.2561

ND : NON DETECTABLE (CYANIDE = 0 µg/L, NITRATE-NITROGEN = 0.02 mg/L, PHENOLS = 0.005 mg/L)

< LOD : < LIMIT OF QUANTIFICATION (MERCURY = 0.001 AND < 0.005 mg/L)


(MR BHUCHONK PANICHLERTUM)
LABORATORY SUPERVISOR
JUNE 16, 2023

NO SIGNATURE GIVEN
BY THE GROUP (UNLAWFUL COPIED)

* PROHIBITED TO PARTIALLY COPY ANALYSIS REPORT PRIOR TO WRITTEN PERMISSION BY THE LABORATORY.
* THIS ANALYSIS REPORT APPROVES ONLY FOR SUBMITTED SAMPLES.

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1997) PUBLIC CO., LTD. (PULP1)
ADDRESS : 1 MOO 2, THATOOM, SRIRAMAPHOT, PRACHINBURI THAILAND 25140.
CONTACT INFORMATION : TEL : 08 5835 1371 e-mail : kunnapa_p@doublea1991.com
SAMPLING SOURCE : MONITORING WELL #2
SAMPLE TYPE : GROUNDWATER
SAMPLING DATE : JUNE 7, 2023
SAMPLING TIME : 13:40 HOUR
SAMPLING METHOD : SUBMERSIBLE PUMP
SAMPLING BY : MR. KRISANAPONG NAMTHIP
ANALYZED BY : MISS KIWALEE SUKHAREE

RECEIVED DATE : JUNE 8, 2023
ANALYTICAL DATE : JUNE 8-16, 2023
REPORT NO. : 2023-US48913
WORK NO. : 2023-000007
ANALYSIS NO. : T23AK859-0802

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			MONITORING WELL #2 T23AK859-0802	
COLOR ¹	Ptmcu-cuab	VISUAL COMPARISON METHOD (SM. PART 2120 B)	5	-
ELECTRICAL CONDUCTIVITY ¹	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT 25°C (SM. PART 2510 B)	2,625 (31°C)	-
AMMONIA NITROGEN ¹	mg/L NH ₃ -N	PHENATE METHOD (SM. PART 4008-M, P)	1.38	-
CYANIDE ¹	µg/L CN ⁻	DISTILLATION, COLOURMETRIC METHOD (SM. PART 4008-CN (C) AND PART 4500-CN (E))	ND	0.200
NITRATE-NITROGEN ¹	mg/L NO ₃ -N	CHROMIUM REDUCTION METHOD (SM. PART 4500-NO ₃ (C))	ND	-
PHENOLS ¹	mg/L	DISTILLATION, 4-AMINOANTHRACENE METHOD (SM. PART 5520 B AND PART 5520 (C))	ND	-
TOTAL PHOSPHATE ¹	mg/L PO ₄ -P	PHOSPHATE OXIDATION AND ASBORBIC ACID METHOD (SM. PART 4500-P (B) AND PART 4500-P (C))	0.03	-
CHLORIDE ¹	mg/L Cl ⁻	ARGENTOMETRIC METHOD (SM. PART 4500-CL (B))	278	-
SULPHATE ¹	mg/L SO ₄ ²⁻	TURBIDIMETRIC METHOD (SM. PART 4500-SO ₄ ²⁻ (E))	340	-
ALKALINITY ¹	mg/L CaCO ₃	TITRATION METHOD (SM. PART 2320 B)	281	-

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			MONITORING WELL #2 T23AK859-0802	
METALS				
MERCURY ¹	µg/L Hg	IN-HOUSE METHOD: USE TP-HEMOS (COLD VAPOUR ATOMIC ABSORPTION SPECTROMETRIC METHOD) (SM. PART 3112 B)	< LOD	< 0.001
SODIUM ¹	µg/L Na	NITRIC ACID-PERSULFONIC ACID DISSOLUTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (SM. PART 3000-P AND PART 3200 B)	312	-
SAMPLE CONDITION				
WATER'S COLOUR/TURBID (ppm/NTU)			YELLOW/CLAY BROWN	

* ISO 9001:2015 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

* ISO 17025:2017 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICES (DSS)

* VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23RD EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23RD EDITION, 2017.

REGULATORY STANDARD : NOTIFICATION OF THE NATIONAL ENVIRONMENTAL BOARD, NO.20, S. 6, 2543.

ND : NON-DETECTABLE (CYANIDE < 5 µg/L, NITRATE-NITROGEN < 0.03 mg/L, PHENOLS < 0.005 mg/L)

< LOD : < LIMIT OF QUANTITATION (MERCURY < 0.0051 AND < 0.005 mg/L)

(MR. SHUCHONK PANCHALERTJUMPI)
LABORATORY SUPERVISOR
JUNE 13, 2023

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1991) PUBLIC CO., LTD. (PULP1)
ADDRESS : 1 MOO 2, THATOOM, SRIRAMAPHOT, PRACHINSURI THAILAND 25145.
CONTACT INFORMATION : TEL : 06 8035 1371 e-mail : kunnagat_p@doublea1991.com
SAMPLING SOURCE : MONITORING WELL #3
SAMPLE TYPE : GROUNDWATER
SAMPLING DATE : JUNE 7, 2023
SAMPLING TIME : 13:20 HOUR
SAMPLING METHOD : SUBMERSIBLE PUMP
SAMPLING BY : MR KRISANAPONG NAMTHIP
ANALYZED BY : MISS KEWALEE SUKHAREE

RECEIVED DATE : JUNE 8, 2023
ANALYTICAL DATE : JUNE 8-16, 2023
REPORT NO. : 2023-U048914
WORK NO. : 2023-000007
ANALYSIS NO. : T25AK659-0003

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARDS
			MONITORING WELL #3 T25AK659-0003	
COLOUR ¹	Platinum-Cobalt	VISUAL COMPARISON METHOD (SM. PART 212 B)	ND	-
ELECTRICAL CONDUCTIVITY ¹	µmho/cm	ELECTRICAL CONDUCTIVITY METHOD AT 25°C (SM. PART 269 B)	2,780 (25°C)	-
AMMONIA-NITROGEN ¹	mg/L NH ₃ -N	PHENATE METHOD (SM. PART 430-4H, F)	5.80	-
CHLORIDE ¹	µg/L Cl ⁻	DISTILLATION COLOURIMETRIC METHOD (SM. PART 430-CH C AND PART 450-CH E)	ND	≤ 200
NITRATE-NITROGEN ¹	mg/L NO ₃ -N	CADMIUM REDUCTION METHOD (SM. PART 430-ND, E)	ND	-
RHENOIDS ¹	mg/L	DISTILLATION + AMINOANTHRACENE METHOD (SM. PART 303 B AND PART 303 C)	ND	-
TOTAL PHOSPHATE ¹	mg/L PO ₄ -P	PHOSPHATE DIGESTION AND ASCORBIC ACID METHOD (SM. PART 303-P B AND PART 450-P C)	0.00	-
CHLORIDE ¹	mg/L Cl ⁻	ARGENTOMETRIC METHOD (SM. PART 430-CH B)	505	-
SULPHATE ¹	mg/L SO ₄ -P	TURBIDIMETRIC METHOD (SM. PART 450- SO ₄ -P E)	640	-
ALKALINITY ¹	mg/L CaCO ₃	TITRATION METHOD (SM. PART 330 B)	318	-

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			MONITORING WELL #3 T25AK659-0003	
METALS				
MERCURY ¹	mg/L Hg	IN-HOUSE METHOD: UAC-TP-HEN-032 (COLD VAPOUR ATOMIC ABSORPTION SPECTROMETRIC METHOD) (SM. PART 3112 B)	< LOD	≤ 0.01
SODIUM ¹	mg/L Na	NITRIC ACID-HYDROCHLORIC ACID DISSOLUTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (SM. PART 3638 F AND PART 3130 B)	335	-
SAMPLE CONDITION				
WATER'S COLOUR/TURBID			YELLOW/CLEAR	
SEDIMENT			BROWN	

1 : ISO/IEC 17025 ACCREDITED BY THE INDUSTRIAL STANDARDS INSTITUTE (TISI)

2 : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

3 : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

REGULATORY STANDARD : NOTIFICATION OF THE NATIONAL ENVIRONMENTAL BOARD, NO.20, B.E.2543.

ND : NON-DETECTABLE (CYANIDE = 2 µg/L, NITRATE-NITROGEN = 0.02 mg/L, PHENOLS = 0.008 mg/L).

< LOD : < LIMIT OF QUANTITATION (MERCURY ≥ 0.001 AND = 0.005 mg/L).

(MR. SUCHONK PANCHLERTUMPI)

LABORATORY SUPERVISOR

JUNE 15, 2023

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1991) PUBLIC CO., LTD. (PULP1)
ADDRESS : 1 MOO 2, THATOOM, SRIRAKHAPHOT, PRACHINSURI THAILAND 20140.
CONTACT INFORMATION : TEL : 08-5535-1371 e-mail : junnapiet_p@doublea1991.com
SAMPLING SOURCE : MONITORING WELL #4
SAMPLE TYPE : GROUNDWATER
SAMPLING DATE : JUNE 9, 2023
SAMPLING TIME : 13:00 HOURS
SAMPLING METHOD : SUBVERSIBLE PUMP
SAMPLING BY : MR KRISANAPONG NANTHAP
ANALYZED BY : MISS KEWALEE SUKHARSEE

RECEIVED DATE : JUNE 9, 2023
ANALYTICAL DATE : JUNE 9-16, 2023
REPORT NO. : 2023-US48915
WORK NO. : 2023-000007
ANALYSIS NO. : T23AK039-0004

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			MONITORING WELL #4 T23AK039-0004	
COLOR ¹	Platinum-Cobalt	VISUAL COMPARISON METHOD (SM PART 2103 B)	15	-
ELECTRICAL CONDUCTIVITY ²	µmhos/cm	ELECTRODEAL CONDUCTIVITY METHOD AT SITE (SM PART 2510 B)	0.740 (30°C)	-
AMMONIA-NITROGEN ³	mg/L NH ₃ -N	PHENATE METHOD (SM PART 4500-NH ₃ F)	0.78	-
CYANIDE ⁴	µg/L CN	DISTILLATION, COLOURIMETRIC METHOD (SM PART 4500-CN C AND PART 4500-CN B)	ND	≤ 300
NITRATE-NITROGEN ⁵	mg/L NO ₃ -N	CADMIUM REDUCTION METHOD (SM PART 4500-NO ₃ E)	ND	-
PHENOLS ⁶	mg/L	DISTILLATION, 4-AMINOMANTHYRINE METHOD (SM PART 5530 B AND PART 5530 C)	ND	-
TOTAL PHOSPHATE ⁷	mg/L PO ₄ ³⁻	ASBOPHATE DIGESTION AND ASCORBIC ACID METHOD (SM PART 4500-P B AND PART 4500-P C)	0.39	-
CHLORIDE ⁸	mg/L Cl	ARGENTOMETRIC METHOD (SM PART 4500-CL B)	318	-
SULPHATE ⁹	mg/L SO ₄ ²⁻	TURBIDIMETRIC METHOD (SM PART 4500-SO ₄ ²⁻ E)	192	-
ALKALINITY ¹⁰	mg/L CaCO ₃	TITRATION METHOD (SM PART 2550 B)	228	-

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			MONITORING WELL #4 T23AK039-0004	
METALS				
MERCURY ¹	mg/L Hg	SHOULDER METHOD, LAMP FLUORESCENCE (COLD VAPOR ATOMIC ABSORPTION SPECTROPHOTOMETRIC METHOD) (SM PART 2112 B)	< LOD	≤ 0.001
SODIUM ²	mg/L Na	NITRIC ACID-HYDROLYSIS, ORG ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (SM PART 3000 F AND PART 3112 B)	ND	-
SAMPLE CONDITION				
WATER'S COLOUR/TURBID			YELLOW/CLAY	
SEDIMENT			BROWN	

1. ISO 9001:2015 ACCREDITED BY THE INDUSTRIAL STANDARDS AUTHORITY (ISA)

2. ISO 17025:2017 ACCREDITED BY DEPARTMENT OF BUSINESS SERVICE (DSB)

3. VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT WILL NOT ACCREDITED

SHOULDER : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23RD EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23RD EDITION, 2017.

REGULATORY STANDARD : MODIFICATION OF THE NATIONAL ENVIRONMENTAL BOARD, NO.20, S.E.2543.

ND : NON-DETECTABLE (CYANIDE < 1 µg/L, NITRATE-NITROGEN < 0.02 mg/L, PHENOLS < 0.05 mg/L).

< LOD : < LIMIT OF QUANTITATION (MERCURY < 0.001 AND < 0.005 mg/L).



(MR. BUCHONK PANCHLERTUMP)

LABORATORY SUPERVISOR

JUNE 19, 2023



รายงานผลการทดสอบคุณภาพงาน

นางสาวสมพร	นางสาวสมพร
ชื่อลูกค้า	บริษัท อี.ซี.อี. จำกัด
ที่ตั้ง	เลขที่ 123 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10110
จำนวนเอกสาร	10000000
ระยะเวลาการดำเนินงาน	10000000
สถานที่ปฏิบัติงาน	เลขที่ 123 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10110
วิธีการเก็บตัวอย่าง	แบบสุ่ม
วันที่เก็บตัวอย่าง	10/10/2020

รายการผลการทดสอบ	หน่วย	วิธีการทดสอบ	ผลการทดสอบ	Standard
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	

หมายเหตุ: ผลการทดสอบการปนเปื้อนพบว่ามีค่าต่ำกว่าค่ามาตรฐานที่กำหนดไว้
 ผลการทดสอบการปนเปื้อนพบว่ามีค่าต่ำกว่าค่ามาตรฐานที่กำหนดไว้
 ผลการทดสอบการปนเปื้อนพบว่ามีค่าต่ำกว่าค่ามาตรฐานที่กำหนดไว้
 ผลการทดสอบการปนเปื้อนพบว่ามีค่าต่ำกว่าค่ามาตรฐานที่กำหนดไว้

นางสาวสมพร
 ผู้จัดการฝ่ายปฏิบัติการ

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รายงานผลการทดสอบคุณภาพงาน

นางสาวสมพร	นางสาวสมพร
ชื่อลูกค้า	บริษัท อี.ซี.อี. จำกัด
ที่ตั้ง	เลขที่ 123 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10110
จำนวนเอกสาร	10000000
ระยะเวลาการดำเนินงาน	10000000
สถานที่ปฏิบัติงาน	เลขที่ 123 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10110
วิธีการเก็บตัวอย่าง	แบบสุ่ม
วันที่เก็บตัวอย่าง	10/10/2020

รายการผลการทดสอบ	หน่วย	วิธีการทดสอบ	ผลการทดสอบ	Standard
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	
การทดสอบการปนเปื้อน	mg	การทดสอบการปนเปื้อน	100	

หมายเหตุ: ผลการทดสอบการปนเปื้อนพบว่ามีค่าต่ำกว่าค่ามาตรฐานที่กำหนดไว้
 ผลการทดสอบการปนเปื้อนพบว่ามีค่าต่ำกว่าค่ามาตรฐานที่กำหนดไว้
 ผลการทดสอบการปนเปื้อนพบว่ามีค่าต่ำกว่าค่ามาตรฐานที่กำหนดไว้
 ผลการทดสอบการปนเปื้อนพบว่ามีค่าต่ำกว่าค่ามาตรฐานที่กำหนดไว้

นางสาวสมพร
 ผู้จัดการฝ่ายปฏิบัติการ

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รายงานผลการทดสอบคุณภาพน้ำ

รายการเลขที่	2561-00-00
ชื่อลูกค้า	บริษัท อีทีบี จำกัด (มหาชน) - บริษัท อีทีบี จำกัด
ที่อยู่	เลขที่ 100 หมู่ 10 ตำบลบ้านใหม่ อำเภอเมือง จังหวัดนนทบุรี
ตัวแทนลูกค้า	02-010-1000
เลข บัญชีลูกค้า	01-01-00
สถานที่เก็บตัวอย่าง	หน้าประตูทางเข้า
วันที่เก็บตัวอย่าง	01/01/2561
ผู้เก็บตัวอย่าง	นางสาวอริยาพร

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	หมายเหตุ
ค่าความเป็นกรด-ด่าง (pH)	pH	ใช้กระดาษทดสอบสี	7.5	
ค่าความเค็ม (TDS)	mg/L	ใช้เครื่องวัด TDS	100	
ค่าความขุ่น (NTU)	NTU	ใช้เครื่องวัด NTU	0.5	
ค่าคลอรีน (mg/L)	mg/L	ใช้ชุดทดสอบคลอรีน	0.5	
ค่าเหล็ก (mg/L)	mg/L	ใช้ชุดทดสอบเหล็ก	0.5	

ผู้เก็บตัวอย่าง: นายอริยาพร

ผลการทดสอบ: ค่า pH อยู่ในช่วง 6.5-8.5 ค่า TDS อยู่ในช่วง 0-1000 mg/L ค่า NTU อยู่ในช่วง 0-10 NTU ค่าคลอรีน อยู่ในช่วง 0.2-1.0 mg/L ค่าเหล็ก อยู่ในช่วง 0.1-1.0 mg/L

ผู้เก็บตัวอย่าง: นายอริยาพร

นางสาวอริยาพร

นางสาวอริยาพร

นางสาวอริยาพร

ฉบับนี้ได้รับการแก้ไขปรับปรุงครั้งล่าสุด

วันที่ 01/01/2561

นางสาวอริยาพร



รายงานผลการทดสอบคุณภาพน้ำ

รายการเลขที่	2561-00-00
ชื่อลูกค้า	บริษัท อีทีบี จำกัด (มหาชน) - บริษัท อีทีบี จำกัด
ที่อยู่	เลขที่ 100 หมู่ 10 ตำบลบ้านใหม่ อำเภอเมือง จังหวัดนนทบุรี
ตัวแทนลูกค้า	02-010-1000
เลข บัญชีลูกค้า	01-01-00
สถานที่เก็บตัวอย่าง	หน้าประตูทางเข้า
วันที่เก็บตัวอย่าง	01/01/2561
ผู้เก็บตัวอย่าง	นางสาวอริยาพร

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	หมายเหตุ
ค่าความเป็นกรด-ด่าง (pH)	pH	ใช้กระดาษทดสอบสี	7.5	
ค่าความเค็ม (TDS)	mg/L	ใช้เครื่องวัด TDS	100	
ค่าความขุ่น (NTU)	NTU	ใช้เครื่องวัด NTU	0.5	
ค่าคลอรีน (mg/L)	mg/L	ใช้ชุดทดสอบคลอรีน	0.5	
ค่าเหล็ก (mg/L)	mg/L	ใช้ชุดทดสอบเหล็ก	0.5	
ค่าสังกะสี (mg/L)	mg/L	ใช้ชุดทดสอบสังกะสี	0.5	
ค่าทองแดง (mg/L)	mg/L	ใช้ชุดทดสอบทองแดง	0.5	
ค่าเงิน (mg/L)	mg/L	ใช้ชุดทดสอบเงิน	0.5	

ผู้เก็บตัวอย่าง: นายอริยาพร

ผลการทดสอบ: ค่า pH อยู่ในช่วง 6.5-8.5 ค่า TDS อยู่ในช่วง 0-1000 mg/L ค่า NTU อยู่ในช่วง 0-10 NTU ค่าคลอรีน อยู่ในช่วง 0.2-1.0 mg/L ค่าเหล็ก อยู่ในช่วง 0.1-1.0 mg/L ค่าสังกะสี อยู่ในช่วง 0.1-1.0 mg/L ค่าทองแดง อยู่ในช่วง 0.1-1.0 mg/L ค่าเงิน อยู่ในช่วง 0.1-1.0 mg/L

ผู้เก็บตัวอย่าง: นายอริยาพร

นางสาวอริยาพร

นางสาวอริยาพร

นางสาวอริยาพร

ฉบับนี้ได้รับการแก้ไขปรับปรุงครั้งล่าสุด

วันที่ 01/01/2561

นางสาวอริยาพร



รายงานผลการวิจัยการทดสอบมาตรฐาน

รายงานฉบับนี้	จัดทำขึ้นโดย
ชื่อผู้จัดทำ	บริษัท อินเตอร์เนชั่นแนล รีเสิร์ช เซ็นเตอร์ จำกัด
ที่ตั้ง	เลขที่ ๑๑๑ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
ผู้จัดทำ/ผู้ขาย	บริษัท อินเตอร์เนชั่นแนล รีเสิร์ช เซ็นเตอร์ จำกัด
เลขที่ใบเสร็จรับเงิน	000000
สถานที่ให้บริการ	เลขที่ ๑๑๑ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
วันที่ให้บริการ	๐๐/๐๐/๐๐

ประเภทสินค้า/บริการ	ขนาด	วิธีการทดสอบ	ผลการทดสอบ	Standard
สินค้า A	100g	ทดสอบด้วยเครื่องวัดแรงดัน	100g	100g
สินค้า B	200g	ทดสอบด้วยเครื่องวัดแรงดัน	200g	200g
สินค้า C	300g	ทดสอบด้วยเครื่องวัดแรงดัน	300g	300g
สินค้า D	400g	ทดสอบด้วยเครื่องวัดแรงดัน	400g	400g
สินค้า E	500g	ทดสอบด้วยเครื่องวัดแรงดัน	500g	500g

ผู้จัดทำ/ผู้ขาย: บริษัท อินเตอร์เนชั่นแนล รีเสิร์ช เซ็นเตอร์ จำกัด
 ที่อยู่: เลขที่ ๑๑๑ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
 โทรศัพท์: 000-0000000000
 โทรสาร: 000-0000000000
 อีเมล: info@irc.co.th

ผู้จัดทำ/ผู้ขาย
 บริษัท อินเตอร์เนชั่นแนล รีเสิร์ช เซ็นเตอร์ จำกัด
 เลขที่ ๑๑๑ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110



รายงานผลการวิจัยการทดสอบมาตรฐาน

รายงานฉบับนี้	จัดทำขึ้นโดย
ชื่อผู้จัดทำ	บริษัท อินเตอร์เนชั่นแนล รีเสิร์ช เซ็นเตอร์ จำกัด
ที่ตั้ง	เลขที่ ๑๑๑ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
ผู้จัดทำ/ผู้ขาย	บริษัท อินเตอร์เนชั่นแนล รีเสิร์ช เซ็นเตอร์ จำกัด
เลขที่ใบเสร็จรับเงิน	000000
สถานที่ให้บริการ	เลขที่ ๑๑๑ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
วันที่ให้บริการ	๐๐/๐๐/๐๐

ประเภทสินค้า/บริการ	ขนาด	วิธีการทดสอบ	ผลการทดสอบ	Standard
สินค้า A	100g	ทดสอบด้วยเครื่องวัดแรงดัน	100g	100g
สินค้า B	200g	ทดสอบด้วยเครื่องวัดแรงดัน	200g	200g
สินค้า C	300g	ทดสอบด้วยเครื่องวัดแรงดัน	300g	300g
สินค้า D	400g	ทดสอบด้วยเครื่องวัดแรงดัน	400g	400g
สินค้า E	500g	ทดสอบด้วยเครื่องวัดแรงดัน	500g	500g
สินค้า F	600g	ทดสอบด้วยเครื่องวัดแรงดัน	600g	600g
สินค้า G	700g	ทดสอบด้วยเครื่องวัดแรงดัน	700g	700g
สินค้า H	800g	ทดสอบด้วยเครื่องวัดแรงดัน	800g	800g
สินค้า I	900g	ทดสอบด้วยเครื่องวัดแรงดัน	900g	900g
สินค้า J	1000g	ทดสอบด้วยเครื่องวัดแรงดัน	1000g	1000g

ผู้จัดทำ/ผู้ขาย: บริษัท อินเตอร์เนชั่นแนล รีเสิร์ช เซ็นเตอร์ จำกัด
 ที่อยู่: เลขที่ ๑๑๑ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
 โทรศัพท์: 000-0000000000
 โทรสาร: 000-0000000000
 อีเมล: info@irc.co.th

ผู้จัดทำ/ผู้ขาย
 บริษัท อินเตอร์เนชั่นแนล รีเสิร์ช เซ็นเตอร์ จำกัด
 เลขที่ ๑๑๑ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110



รายงานผลการทดสอบคุณภาพน้ำ

หน่วยงานราชการที่ : กรมชลประทาน
 ชื่อสถานที่ : สถานีสูบน้ำดิบประปาเมืองเก่า จังหวัดขอนแก่น
 ปีที่ : 2562
 จังหวัด : ขอนแก่น
 อำเภอ : เมืองขอนแก่น
 ตำบล : บ้านฝาง
 หมู่บ้าน : บ้านฝาง
 วิธีการเก็บตัวอย่าง : 10 ลิตร/ตัวอย่าง

พารามิเตอร์ที่ทดสอบ	หน่วยวัด	วิธีทดสอบ	ผลการทดสอบ	ค่ามาตรฐาน
ค่าความเป็นกรด-ด่าง	pH	ค่าความเป็นกรด-ด่าง	7.5	6.5-8.5
ค่าความเค็ม	mg/L	ค่าความเค็ม	100	1000
ค่าความขุ่น	NTU	ค่าความขุ่น	1.0	1.0
ค่าคลอรีน	mg/L	ค่าคลอรีน	0.5	0.5
ค่าเหล็ก	mg/L	ค่าเหล็ก	0.5	0.5

ผู้ดำเนินการทดสอบ : บริษัท อินเตอร์เนชั่นแนล รีเสิร์ช เซ็นเตอร์ จำกัด
 หน่วยงาน : บริษัท อินเตอร์เนชั่นแนล รีเสิร์ช เซ็นเตอร์ จำกัด
 ที่อยู่ : บ้านฝาง ตำบลบ้านฝาง อำเภอเมือง จังหวัดขอนแก่น
 โทรศัพท์ : 043-855555

(Signature)
 (Signature)

(Signature)
 (Signature)



รายงานผลการทดสอบคุณภาพน้ำ

หน่วยงานราชการที่ : กรมชลประทาน
 ชื่อสถานที่ : สถานีสูบน้ำดิบประปาเมืองเก่า จังหวัดขอนแก่น
 ปีที่ : 2562
 จังหวัด : ขอนแก่น
 อำเภอ : เมืองขอนแก่น
 ตำบล : บ้านฝาง
 หมู่บ้าน : บ้านฝาง
 วิธีการเก็บตัวอย่าง : 10 ลิตร/ตัวอย่าง

พารามิเตอร์ที่ทดสอบ	หน่วยวัด	วิธีทดสอบ	ผลการทดสอบ	ค่ามาตรฐาน
pH	pH	ค่าความเป็นกรด-ด่าง	7.5	6.5-8.5
ค่าความเค็ม	mg/L	ค่าความเค็ม	100	1000
ค่าความขุ่น	NTU	ค่าความขุ่น	1.0	1.0
ค่าคลอรีน	mg/L	ค่าคลอรีน	0.5	0.5
ค่าเหล็ก	mg/L	ค่าเหล็ก	0.5	0.5
ค่าสังกะสี	mg/L	ค่าสังกะสี	0.5	0.5
ค่าทองแดง	mg/L	ค่าทองแดง	0.5	0.5
ค่าปรอท	mg/L	ค่าปรอท	0.5	0.5
ค่าไนโตรเจน	mg/L	ค่าไนโตรเจน	0.5	0.5
ค่าฟอสฟอรัส	mg/L	ค่าฟอสฟอรัส	0.5	0.5

ผู้ดำเนินการทดสอบ : บริษัท อินเตอร์เนชั่นแนล รีเสิร์ช เซ็นเตอร์ จำกัด
 หน่วยงาน : บริษัท อินเตอร์เนชั่นแนล รีเสิร์ช เซ็นเตอร์ จำกัด
 ที่อยู่ : บ้านฝาง ตำบลบ้านฝาง อำเภอเมือง จังหวัดขอนแก่น
 โทรศัพท์ : 043-855555

(Signature)
 (Signature)

(Signature)
 (Signature)



รายงานผลการติดตามและประเมินผลโครงการ

โครงการ/แผนงาน	โครงการพัฒนาระบบบริหารจัดการ
ชื่อโครงการ	โครงการพัฒนาระบบบริหารจัดการ
ปีงบประมาณ	2562
คำขวัญ/สlogan	สร้างคน สร้างงาน สร้างสังคม
หน่วยงาน/แผนก	แผนกบริหารทั่วไป
สถานที่/พื้นที่ดำเนินงาน	จังหวัดเชียงใหม่
สถานะ/พื้นที่ดำเนินงาน	พื้นที่ดำเนินงาน
ผู้ประสานงาน/ผู้ติดตาม	นางสาว...

หน่วยงาน/แผนก	พื้นที่	กิจกรรม/โครงการ	ผลการดำเนินงาน	หมายเหตุ
...

ผลการดำเนินงาน: ...
 ปัญหา/อุปสรรค: ...
 ข้อเสนอแนะ: ...

...
 ...
 ...



รายงานผลการติดตามและประเมินผลโครงการ

โครงการ/แผนงาน	โครงการพัฒนาระบบบริหารจัดการ
ชื่อโครงการ	โครงการพัฒนาระบบบริหารจัดการ
ปีงบประมาณ	2562
คำขวัญ/สlogan	สร้างคน สร้างงาน สร้างสังคม
หน่วยงาน/แผนก	แผนกบริหารทั่วไป
สถานที่/พื้นที่ดำเนินงาน	จังหวัดเชียงใหม่
สถานะ/พื้นที่ดำเนินงาน	พื้นที่ดำเนินงาน
ผู้ประสานงาน/ผู้ติดตาม	นางสาว...

หน่วยงาน/แผนก	พื้นที่	กิจกรรม/โครงการ	ผลการดำเนินงาน	หมายเหตุ
...

ผลการดำเนินงาน: ...
 ปัญหา/อุปสรรค: ...
 ข้อเสนอแนะ: ...

...
 ...
 ...



รายงานผลการทดสอบคุณภาพน้ำ

สถานที่ทดสอบ	กรุงเทพมหานคร			
ชื่อลูกค้า	บริษัท ไทย เคมิคอล จำกัด (มหาชน)			
ปีบัญชี	ปีงบประมาณ ๒๕๖๓ (๑ ตุลาคม ๒๕๖๒ ถึง ๓๐ กันยายน ๒๕๖๓)			
ผลิตภัณฑ์ทดสอบ	น้ำประปา	วันที่เก็บตัวอย่าง	๒๕/๐๙/๖๓	
สถานที่เก็บตัวอย่าง	กรุงเทพฯ	วันที่รับตัวอย่าง	๒๕/๐๙/๖๓	
สถานที่เก็บตัวอย่าง	บ้านบางกอกใหญ่	วันที่วิเคราะห์	๒๕/๐๙/๖๓	
ผู้ประสานงาน	นาย...	ชนิดตัวกรอง	ไส้กรอง	

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	ขีดจำกัด
ค่าความเป็นกรด-ด่าง (pH)	pH	วิธีมาตรฐาน (Standard Method)	7.5	6.5-8.5
ค่าความเค็ม (TDS)	mg/L	วิธีมาตรฐาน (Standard Method)	150	500
ค่าความขุ่น (NTU)	NTU	วิธีมาตรฐาน (Standard Method)	0.5	1.0
ค่าคลอรีนอิสระคงเหลือ (Free Chlorine)	mg/L	วิธีมาตรฐาน (Standard Method)	0.5	0.5-2.0

หมายเหตุ: ผลการทดสอบน้ำประปาตามมาตรฐานกรมอนามัย (ฉบับที่ ๒๕๖๓) และ มาตรฐาน WHO (ฉบับที่ ๒๕๖๓) พบว่า น้ำประปาที่ส่งมอบให้ลูกค้ามีความสะอาดและปลอดภัย สามารถบริโภคได้

หมายเหตุ: บริษัท ไทย เคมิคอล จำกัด (มหาชน) ขอสงวนสิทธิ์ในผลการทดสอบนี้ และขอสงวนสิทธิ์ในข้อมูลที่เกี่ยวข้องกับการดำเนินงานของบริษัท

ผู้ให้คำปรึกษา: นาย...

บริษัท ไทย เคมิคอล จำกัด (มหาชน)
เลขที่ ๑๐๐ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร ๑๐๑

นาย...
ผู้จัดการฝ่าย...

เอกสารนี้เป็นเอกสารของบริษัท ไทย เคมิคอล จำกัด (มหาชน) และสงวนลิขสิทธิ์ในเอกสารนี้



รายงานผลการทดสอบคุณภาพน้ำ

สถานที่ทดสอบ	กรุงเทพมหานคร			
ชื่อลูกค้า	บริษัท ไทย เคมิคอล จำกัด (มหาชน)			
ปีบัญชี	ปีงบประมาณ ๒๕๖๓ (๑ ตุลาคม ๒๕๖๒ ถึง ๓๐ กันยายน ๒๕๖๓)			
ผลิตภัณฑ์ทดสอบ	น้ำประปา	วันที่เก็บตัวอย่าง	๒๕/๐๙/๖๓	
สถานที่เก็บตัวอย่าง	กรุงเทพฯ	วันที่รับตัวอย่าง	๒๕/๐๙/๖๓	
สถานที่เก็บตัวอย่าง	บ้านบางกอกใหญ่	วันที่วิเคราะห์	๒๕/๐๙/๖๓	
ผู้ประสานงาน	นาย...	ชนิดตัวกรอง	ไส้กรอง	

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	ขีดจำกัด
ค่าความเป็นกรด-ด่าง (pH)	pH	วิธีมาตรฐาน (Standard Method)	7.5	6.5-8.5
ค่าความเค็ม (TDS)	mg/L	วิธีมาตรฐาน (Standard Method)	150	500
ค่าความขุ่น (NTU)	NTU	วิธีมาตรฐาน (Standard Method)	0.5	1.0
ค่าคลอรีนอิสระคงเหลือ (Free Chlorine)	mg/L	วิธีมาตรฐาน (Standard Method)	0.5	0.5-2.0
ค่าเหล็ก (Fe)	mg/L	วิธีมาตรฐาน (Standard Method)	0.1	0.3
ค่าแมงกานีส (Mn)	mg/L	วิธีมาตรฐาน (Standard Method)	0.05	0.1
ค่าไนโตรเจน (N)	mg/L	วิธีมาตรฐาน (Standard Method)	0.05	0.1
ค่าฟอสฟอรัส (P)	mg/L	วิธีมาตรฐาน (Standard Method)	0.01	0.05

หมายเหตุ: ผลการทดสอบน้ำประปาตามมาตรฐานกรมอนามัย (ฉบับที่ ๒๕๖๓) และ มาตรฐาน WHO (ฉบับที่ ๒๕๖๓) พบว่า น้ำประปาที่ส่งมอบให้ลูกค้ามีความสะอาดและปลอดภัย สามารถบริโภคได้

หมายเหตุ: บริษัท ไทย เคมิคอล จำกัด (มหาชน) ขอสงวนสิทธิ์ในผลการทดสอบนี้ และขอสงวนสิทธิ์ในข้อมูลที่เกี่ยวข้องกับการดำเนินงานของบริษัท

ผู้ให้คำปรึกษา: นาย...

บริษัท ไทย เคมิคอล จำกัด (มหาชน)
เลขที่ ๑๐๐ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร ๑๐๑

นาย...
ผู้จัดการฝ่าย...

เอกสารนี้เป็นเอกสารของบริษัท ไทย เคมิคอล จำกัด (มหาชน) และสงวนลิขสิทธิ์ในเอกสารนี้



รายงานผลการทดสอบคุณภาพน้ำ

รายงานเลขที่ : 0025-001-001
 ชื่อลูกค้า : บริษัท บ้านเมือง จำกัด (มหาชน)
 ที่ตั้ง : 110 หมู่ 2 ตำบลบ้านเมือง อำเภอเมือง จังหวัดขอนแก่น
 ตัวแทนลูกค้า : นายสมชาย ใจดี
 เวลาเก็บตัวอย่าง : 15/05/2564
 สถานที่เก็บตัวอย่าง : บ้านเมือง จำกัด
 วิธีการเก็บตัวอย่าง : ตาม

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	ค่ามาตรฐาน
อุณหภูมิ	°C	อุณหภูมิของน้ำโดยตรง	28.5	≤ 30
Dissolved Oxygen (DO)	mg/L	Dissolved Oxygen Meter	8.5	≥ 5
Total Dissolved Solids (TDS)	mg/L	Gravimetric Method	150	≤ 500
Hardness	mg/L	EDTA Titrimetric Method	120	≤ 300
pH	pH	pH Meter	7.5	6.5 - 8.5

ผลการวิเคราะห์ : น้ำดื่มคุณภาพดี ไม่มีสารปนเปื้อนอันตราย
 หมายเหตุ : เครื่องมือที่ใช้ในการทดสอบเป็นเครื่องมือที่ผ่านการสอบเทียบแล้ว
 ผู้เก็บตัวอย่าง : นายสมชาย ใจดี
 ผู้เก็บตัวอย่าง : นายสมชาย ใจดี



นายสมชาย ใจดี
 ผู้จัดการฝ่ายปฏิบัติการ
 โทร : 043-2345678

International Research Development Co., Ltd. 110 หมู่ 2 ตำบลบ้านเมือง อำเภอเมือง จังหวัดขอนแก่น 40130

วันที่ 15/05/2564
 110 หมู่ 2 ตำบลบ้านเมือง อำเภอเมือง จังหวัดขอนแก่น 40130
 โทร : 043-2345678



รายงานผลการทดสอบคุณภาพน้ำ

รายงานเลขที่ : 0025-001-002
 ชื่อลูกค้า : บริษัท บ้านเมือง จำกัด (มหาชน)
 ที่ตั้ง : 110 หมู่ 2 ตำบลบ้านเมือง อำเภอเมือง จังหวัดขอนแก่น
 ตัวแทนลูกค้า : นายสมชาย ใจดี
 เวลาเก็บตัวอย่าง : 15/05/2564
 สถานที่เก็บตัวอย่าง : บ้านเมือง จำกัด
 วิธีการเก็บตัวอย่าง : ตาม

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	ค่ามาตรฐาน
อุณหภูมิ	°C	อุณหภูมิของน้ำโดยตรง	28.5	≤ 30
Dissolved Oxygen (DO)	mg/L	Dissolved Oxygen Meter	8.5	≥ 5
Total Dissolved Solids (TDS)	mg/L	Gravimetric Method	150	≤ 500
Hardness	mg/L	EDTA Titrimetric Method	120	≤ 300
pH	pH	pH Meter	7.5	6.5 - 8.5
Calcium (Ca)	mg/L	EDTA Titrimetric Method	100	≤ 200
Magnesium (Mg)	mg/L	EDTA Titrimetric Method	20	≤ 100
Iron (Fe)	mg/L	Colorimetric Method	0.1	≤ 0.3
Copper (Cu)	mg/L	Colorimetric Method	0.01	≤ 0.05
Lead (Pb)	mg/L	Colorimetric Method	0.01	≤ 0.05
Mercury (Hg)	mg/L	Colorimetric Method	0.001	≤ 0.01
Chlorine (Cl)	mg/L	Colorimetric Method	0.01	≤ 0.05

ผลการวิเคราะห์ : น้ำดื่มคุณภาพดี ไม่มีสารปนเปื้อนอันตราย
 หมายเหตุ : เครื่องมือที่ใช้ในการทดสอบเป็นเครื่องมือที่ผ่านการสอบเทียบแล้ว
 ผู้เก็บตัวอย่าง : นายสมชาย ใจดี
 ผู้เก็บตัวอย่าง : นายสมชาย ใจดี



นายสมชาย ใจดี
 ผู้จัดการฝ่ายปฏิบัติการ
 โทร : 043-2345678

International Research Development Co., Ltd. 110 หมู่ 2 ตำบลบ้านเมือง อำเภอเมือง จังหวัดขอนแก่น 40130

วันที่ 15/05/2564
 110 หมู่ 2 ตำบลบ้านเมือง อำเภอเมือง จังหวัดขอนแก่น 40130
 โทร : 043-2345678

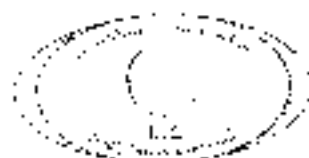


รายงานผลการทดสอบคุณภาพน้ำ

รายงานเลขที่ : 02-05-2023
 ชื่อลูกค้า : บริษัท สยามฟู้ด จำกัด (มหาชน)
 ที่อยู่ : อาคาร 10 ชั้น 10 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
 คณะกรรมการ : บริษัท สยามฟู้ด จำกัด
 สถานที่เก็บตัวอย่าง : บริษัท สยามฟู้ด จำกัด
 ช่วงเวลาที่เก็บตัวอย่าง : 14-15 มิ.ย. 2563
 วิธีการเก็บตัวอย่าง : Grab
 วันที่เก็บตัวอย่าง : 14-15 มิ.ย. 2563
 วันที่วิเคราะห์ : 17 มิ.ย. 2563
 วันที่ออกรายงาน : 20 มิ.ย. 2563
 ชนิดตัวอย่าง : น้ำดื่ม

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	Standard*
pH	-	Electrometric Method	6.5	-
Cadmium	mg/L	Digestion Inductively Coupled Plasma Method	< 0.002	≤ 0.003
Copper	mg/L	Digestion Inductively Coupled Plasma Method	0.010	≤ 1.0
Nickel	mg/L	Digestion Inductively Coupled Plasma Method	0.026	≤ 0.02
Lead	mg/L	Digestion Inductively Coupled Plasma Method	0.010	≤ 0.01
Zinc	mg/L	Digestion Inductively Coupled Plasma Method	0.025	≤ 5.0
Manganese	mg/L	Digestion Inductively Coupled Plasma Method	0.384	≤ 0.5
Arsenic	mg/L	Digestion Inductively Coupled Plasma Method	< 0.006	≤ 0.01
Hexavalent Chromium	mg/L	Redox/Coulometric Method	< 0.025	≤ 0.05

ผู้ทดสอบตัวอย่าง : บริษัท สยามฟู้ด จำกัด (มหาชน) เลขที่ 10 ชั้น 10 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
 หมายเหตุ : ผลการทดสอบเป็นไปตามมาตรฐานการทดสอบน้ำดื่มของกรมอนามัย กระทรวงสาธารณสุข (ฉบับที่ 25) พ.ศ. 2563
 ผู้เก็บตัวอย่าง : บริษัท สยามฟู้ด จำกัด (มหาชน) เลขที่ 10 ชั้น 10 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110



บริษัท อินทิกรัล รีเสิร์ช เซ็นเตอร์ จำกัด
 เลขที่ 10 ชั้น 10 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110



รายงานผลการทดสอบคุณภาพน้ำ

รายงานเลขที่ : 02-05-2023
 ชื่อลูกค้า : บริษัท สยามฟู้ด จำกัด (มหาชน)
 ที่อยู่ : อาคาร 10 ชั้น 10 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
 คณะกรรมการ : บริษัท สยามฟู้ด จำกัด
 สถานที่เก็บตัวอย่าง : บริษัท สยามฟู้ด จำกัด
 ช่วงเวลาที่เก็บตัวอย่าง : 14-15 มิ.ย. 2563
 วิธีการเก็บตัวอย่าง : Grab
 วันที่เก็บตัวอย่าง : 14-15 มิ.ย. 2563
 วันที่วิเคราะห์ : 17 มิ.ย. 2563
 วันที่ออกรายงาน : 20 มิ.ย. 2563
 ชนิดตัวอย่าง : น้ำดื่ม

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	Standard*
pH	-	Electrometric Method	6.5	-
Cadmium	mg/L	Digestion Inductively Coupled Plasma Method	< 0.002	≤ 0.003
Copper	mg/L	Digestion Inductively Coupled Plasma Method	0.010	≤ 1.0
Nickel	mg/L	Digestion Inductively Coupled Plasma Method	0.026	≤ 0.02
Lead	mg/L	Digestion Inductively Coupled Plasma Method	0.010	≤ 0.01
Zinc	mg/L	Digestion Inductively Coupled Plasma Method	0.025	≤ 5.0
Manganese	mg/L	Digestion Inductively Coupled Plasma Method	0.384	≤ 0.5
Arsenic	mg/L	Digestion Inductively Coupled Plasma Method	< 0.006	≤ 0.01
Hexavalent Chromium	mg/L	Redox/Coulometric Method	< 0.025	≤ 0.05

ผู้ทดสอบตัวอย่าง : บริษัท สยามฟู้ด จำกัด (มหาชน) เลขที่ 10 ชั้น 10 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
 หมายเหตุ : ผลการทดสอบเป็นไปตามมาตรฐานการทดสอบน้ำดื่มของกรมอนามัย กระทรวงสาธารณสุข (ฉบับที่ 25) พ.ศ. 2563
 ผู้เก็บตัวอย่าง : บริษัท สยามฟู้ด จำกัด (มหาชน) เลขที่ 10 ชั้น 10 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110



บริษัท อินทิกรัล รีเสิร์ช เซ็นเตอร์ จำกัด
 เลขที่ 10 ชั้น 10 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110



งานวิจัยและการทดสอบคุณภาพน้ำ

[illegible]

พหุคูณที่มีอยู่ก่อนแล้ว	มูลค่า	ประเภทของหนี้	มูลค่าของหนี้	หมายเหตุ
พหุคูณที่มีอยู่ก่อนแล้ว	100	Interest-bearing debt	100	
พหุคูณที่มีอยู่ก่อนแล้ว	100	Non-interest-bearing debt	100	
พหุคูณที่มีอยู่ก่อนแล้ว	100	Interest-bearing debt	100	
พหุคูณที่มีอยู่ก่อนแล้ว	100	Non-interest-bearing debt	100	
พหุคูณที่มีอยู่ก่อนแล้ว	100	Interest-bearing debt	100	
พหุคูณที่มีอยู่ก่อนแล้ว	100	Non-interest-bearing debt	100	

[illegible][illegible]

รายงานผลการทดสอบชุดแบบฝึกหัด

[illegible]

พหุภาคีและองค์การระหว่างประเทศ	จำนวน	วัตถุประสงค์	ผลการดำเนินงาน	ข้อสังเกต
อาเซียน	10	ส่งเสริมความร่วมมือในภูมิภาค	2015	10
ASEAN+3	13	ส่งเสริมความร่วมมือในภูมิภาค	2015	10
ASEAN+6	16	ส่งเสริมความร่วมมือในภูมิภาค	2015	10
ASEAN+10	20	ส่งเสริมความร่วมมือในภูมิภาค	2015	10
ASEAN+13	23	ส่งเสริมความร่วมมือในภูมิภาค	2015	10
ASEAN+16	26	ส่งเสริมความร่วมมือในภูมิภาค	2015	10
ASEAN+19	29	ส่งเสริมความร่วมมือในภูมิภาค	2015	10
ASEAN+22	32	ส่งเสริมความร่วมมือในภูมิภาค	2015	10
ASEAN+25	35	ส่งเสริมความร่วมมือในภูมิภาค	2015	10
ASEAN+28	38	ส่งเสริมความร่วมมือในภูมิภาค	2015	10

[illegible]

127. $\frac{5}{3} - \frac{1}{2}$
 128. $\frac{1}{2} + \frac{1}{3}$
 129. $\frac{1}{2} - \frac{1}{3}$



รายงานผลการทดสอบคุณภาพน้ำ

รายงานเลขที่ : 2023/06/144
 ชื่อผู้ทำ : บริษัท สัมมิตร เอส (1991) จำกัด (มหาชน)
 ที่อยู่ : 1 หมู่ 2 ต.ท่าตูม อ.ศรีเทพพิจิตร จ.พิจิตร 35140
 วัตถุประสงค์ : ตรวจวัดค่าโลหะหนักในน้ำทิ้ง
 สถานที่เก็บตัวอย่าง : บ่อเก็บน้ำทิ้ง
 วันที่เก็บตัวอย่าง : 07/06/2023
 เวลาเก็บตัวอย่าง : 11.38 น.
 สถานที่เก็บตัวอย่าง : Monitoring Well 4
 วิธีการเก็บตัวอย่าง : Grab
 วันที่เก็บตัวอย่าง : 07/06/2023
 วันที่รับตัวอย่าง : 07/06/2023
 วันที่วิเคราะห์ : 7-14/06/2023
 ชนิดตัวอย่าง : น้ำทิ้ง

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	Standard*
pH	-	Electrometric Method	7.4	-
Cadmium	mg/L	Digestion, Inductively Coupled Plasma Method	< 0.002	≤ 0.003
Copper	mg/L	Digestion, Inductively Coupled Plasma Method	0.010	≤ 1.0
Nickel	mg/L	Digestion, Inductively Coupled Plasma Method	0.031	≤ 0.02
Lead	mg/L	Digestion, Inductively Coupled Plasma Method	0.010	≤ 0.01
Zinc	mg/L	Digestion, Inductively Coupled Plasma Method	0.004	≤ 5.0
Manganese	mg/L	Digestion, Inductively Coupled Plasma Method	0.344	≤ 0.5
Arsenic	mg/L	Digestion, Inductively Coupled Plasma Method	< 0.006	≤ 0.01
Hexavalent Chromium	mg/L	Redox, Colorimetric Method	< 0.025	≤ 0.06

หมายเหตุ : ผลการทดสอบค่าโลหะหนักในน้ำทิ้ง พบว่าค่าโลหะหนักในน้ำทิ้งไม่เกินค่ามาตรฐานที่กำหนดไว้
 วิธีการเก็บตัวอย่าง : Grab
 วิธีการวิเคราะห์ : Inductively Coupled Plasma Method (ICP-MS)
 สถานที่เก็บตัวอย่าง : บ่อเก็บน้ำทิ้ง
 วันที่เก็บตัวอย่าง : 07/06/2023
 เวลาเก็บตัวอย่าง : 11.38 น.
 สถานที่เก็บตัวอย่าง : Monitoring Well 4
 วิธีการเก็บตัวอย่าง : Grab
 วันที่เก็บตัวอย่าง : 07/06/2023
 วันที่รับตัวอย่าง : 07/06/2023
 วันที่วิเคราะห์ : 7-14/06/2023
 ชนิดตัวอย่าง : น้ำทิ้ง



รายงานผลการทดสอบคุณภาพน้ำ

รายงานเลขที่ : 2023/06/144
 ชื่อผู้ทำ : บริษัท สัมมิตร เอส (1991) จำกัด (มหาชน)
 ที่อยู่ : 1 หมู่ 2 ต.ท่าตูม อ.ศรีเทพพิจิตร จ.พิจิตร 35140
 วัตถุประสงค์ : ตรวจวัดค่าโลหะหนักในน้ำทิ้ง
 สถานที่เก็บตัวอย่าง : บ่อเก็บน้ำทิ้ง
 วันที่เก็บตัวอย่าง : 07/06/2023
 เวลาเก็บตัวอย่าง : 11.38 น.
 สถานที่เก็บตัวอย่าง : Monitoring Well 4
 วิธีการเก็บตัวอย่าง : Grab
 วันที่เก็บตัวอย่าง : 07/06/2023
 วันที่รับตัวอย่าง : 07/06/2023
 วันที่วิเคราะห์ : 7-14/06/2023
 ชนิดตัวอย่าง : น้ำทิ้ง

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	Standard*
pH	-	Electrometric Method	7.4	-
Cadmium	mg/L	Digestion, Inductively Coupled Plasma Method	< 0.002	≤ 0.003
Copper	mg/L	Digestion, Inductively Coupled Plasma Method	0.010	≤ 1.0
Nickel	mg/L	Digestion, Inductively Coupled Plasma Method	0.031	≤ 0.02
Lead	mg/L	Digestion, Inductively Coupled Plasma Method	0.010	≤ 0.01
Zinc	mg/L	Digestion, Inductively Coupled Plasma Method	0.004	≤ 5.0
Manganese	mg/L	Digestion, Inductively Coupled Plasma Method	0.344	≤ 0.5
Arsenic	mg/L	Digestion, Inductively Coupled Plasma Method	< 0.006	≤ 0.01
Hexavalent Chromium	mg/L	Redox, Colorimetric Method	< 0.025	≤ 0.06

หมายเหตุ : ผลการทดสอบค่าโลหะหนักในน้ำทิ้ง พบว่าค่าโลหะหนักในน้ำทิ้งไม่เกินค่ามาตรฐานที่กำหนดไว้
 วิธีการเก็บตัวอย่าง : Grab
 วิธีการวิเคราะห์ : Inductively Coupled Plasma Method (ICP-MS)
 สถานที่เก็บตัวอย่าง : บ่อเก็บน้ำทิ้ง
 วันที่เก็บตัวอย่าง : 07/06/2023
 เวลาเก็บตัวอย่าง : 11.38 น.
 สถานที่เก็บตัวอย่าง : Monitoring Well 4
 วิธีการเก็บตัวอย่าง : Grab
 วันที่เก็บตัวอย่าง : 07/06/2023
 วันที่รับตัวอย่าง : 07/06/2023
 วันที่วิเคราะห์ : 7-14/06/2023
 ชนิดตัวอย่าง : น้ำทิ้ง

ผู้ทำ : บริษัท สัมมิตร เอส (1991) จำกัด (มหาชน)
 ผู้รับ : บริษัท สัมมิตร เอส (1991) จำกัด (มหาชน)
 วันที่ : 07/06/2023
 สถานที่ : บ่อเก็บน้ำทิ้ง
 เวลา : 11.38 น.
 สถานที่ : Monitoring Well 4
 วิธีการ : Grab
 วันที่ : 07/06/2023
 วันที่รับ : 07/06/2023
 วันที่วิเคราะห์ : 7-14/06/2023
 ชนิด : น้ำทิ้ง

กากของเสีย

ตรวจวัดโดยบริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1991) PUBLIC CO., LTD. (PULP1)
ADDRESS : 1 MOO 2, THATOOM, SRIMAHAPHOTE, PRACHINBURI THAILAND 25140.
CONTACT INFORMATION : TEL : 08 5835 1371 e-mail : kunnapat_p@doublea1991.com
SAMPLING SOURCE : DOUBLE A (1991) PUBLIC CO., LTD. (PULP1)
SAMPLE TYPE : SLUDGE
SAMPLING DATE : APRIL 18, 2023
SAMPLING TIME : 10:50 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : MR YUTTHANAWIN MUENCHOB
ANALYZED BY : MISS CHOMTHANAN APHIPATPAPHA

RECEIVED DATE : APRIL 18, 2023
ANALYTICAL DATE : APRIL 18 - MAY 2, 2023
REPORT NO. : 2023-U034185
WORK NO. : 2023-000007
ANALYSIS NO. : T23AG811-0003

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT SLUDGE ETP#1 T23AG811-0003	REGULATORY STANDARD
SOLUBLE THRESHOLD LIMIT CONCENTRATION (STLC)				
ARSENIC	mg/L As	WASTE EXTRACTION TEST AND HYDRIDE GENERATION AAS METHOD	0.0060	≤ 5.0
BARIUM	mg/L Ba	WASTE EXTRACTION TEST, NITRIC ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD	0.810	≤ 100
CADMIUM	mg/L Cd	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	ND	≤ 1.0
LEAD	mg/L Pb	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	0.091	≤ 5.0
MERCURY	mg/L Hg	WASTE EXTRACTION TEST AND COLD VAPOUR AAS METHOD	0.0027	≤ 0.2
SELENIUM	mg/L Se	WASTE EXTRACTION TEST AND HYDRIDE GENERATION AAS METHOD	ND	≤ 1.0
SILVER	mg/L Ag	WASTE EXTRACTION TEST, NITRIC ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD	ND	≤ 5
CHROMIUM	mg/L Cr	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	0.038	≤ 5
SAMPLE CONDITION			GREY SLUDGE	

REGULATORY STANDARD : DISPOSAL OF SOLID WASTE OR UNUSABLE MATERIAL, NOTIFICATION OF THE MINISTRY OF INDUSTRY (B.E.2548),
APPENDIX 2, ITEM 5.2.

ND : NON-DETECTABLE (CADMIUM < 0.006 mg/L, SELENIUM < 0.0005 mg/L, SILVER < 0.005 mg/L).

(MR BHUCHONK PANICHLERTUMPI)

LABORATORY SUPERVISOR

MAY 11, 2023

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1991) PUBLIC CO., LTD. (PULP1)
ADDRESS : 1 MOO 2, THATOOM, SRIMAHAPHOTE, PRACHINBURI THAILAND 25140.
CONTACT INFORMATION : TEL : 08 5835 1371 e-mail : kunnapat_p@doublea1991.com
SAMPLING SOURCE : DOUBLE A (1991) PUBLIC CO., LTD. (PULP1)
SAMPLE TYPE : SLUDGE
SAMPLING DATE : APRIL 18, 2023
SAMPLING TIME : 10:50 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : MR YUTTHANAWIN MUENCHOB
ANALYZED BY : MISS JINTASUPA PLIANSRI

RECEIVED DATE : APRIL 18, 2023
ANALYTICAL DATE : APRIL 18 - MAY 11, 2023
REPORT NO. : 2023-U034186
WORK NO. : 2023-000007
ANALYSIS NO. : T23AG811-0004

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT SLUDGE ETP#1 T23AG811-0004	REGULATORY STANDARD
TOTAL THRESHOLD LIMIT CONCENTRATION (TTLC)				
ARSENIC (As) ^a	mg/kg (wet weight)	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (US EPA 1996.3050B AND 1992.7061A)	0.103	≤ 500
BARIUM (Ba) ^c	mg/kg (wet weight)	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (US EPA 1996.3050B AND 2018.8010D)	21.0	≤ 10,000
CADMIUM (Cd) ^c	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (US EPA 1996.3050B AND 2007.7000B)	ND	≤ 100
LEAD (Pb) ^c	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (US EPA 1996.3050B AND 2007.7000B)	ND	≤ 1,000
MERCURY (Hg) ^c	mg/kg (wet weight)	ACID DIGESTION AND COLD VAPOUR AAS METHOD (US EPA 2007.7471B)	ND	≤ 20
SELENIUM (Se) ^c	mg/kg (wet weight)	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (US EPA 1996.3050B AND 1994.7742)	ND	≤ 100
SILVER (Ag) ^c	mg/kg (wet weight)	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (US EPA 1996.3050B AND 2018.6010D)	ND	≤ 500
CHROMIUM (Cr) ^c	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (US EPA 1996.3050B AND 2007.7000B)	1.53	≤ 2,500
SAMPLE CONDITION			GREY SLUDGE	

^a : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

^b : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

^c : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

REGULATORY STANDARD : DISPOSAL OF SOLID WASTE OR UNUSABLE MATERIAL, NOTIFICATION OF THE MINISTRY OF INDUSTRY (B.E.2548),
APPENDIX 2, ITEM 5.1.

ND : NON-DETECTABLE (CADMIUM < 0.300 mg/kg, LEAD < 1.55 mg/kg, MERCURY < 0.100 mg/kg, SELENIUM < 0.100 mg/kg,
SILVER < 0.250 mg/kg).

(MR BHUCHONK PANICHLERTUMPI)

LABORATORY SUPERVISOR

MAY 11, 2023

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1991) PUBLIC CO., LTD. (PULP1)
ADDRESS : 1 MOO 2, THATOON, SRIRAMAPHOT, PRACHINBURI THAILAND 25140.
CONTACT INFORMATION : TEL : 08 5835 1371 e-mail : kunnarat_p@doublea1991.com
SAMPLING SOURCE : SLUDGE ETHER (TLC)
SAMPLE TYPE : SLUDGE
SAMPLING DATE : APRIL 18, 2023
SAMPLING TIME : 10:50 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : MR YUTTHANAWIN MUENCHOB
ANALYZED BY : SC

RECEIVED DATE : APRIL 18, 2023
ANALYTICAL DATE : APRIL 18 - MAY 15, 2023
REPORT NO. : 2023-0037138
WORK NO. : 2023-000007
ANALYSIS NO. : T23A0811-0001

COMPONENT	DETECTION LIMIT (mg/kg)	AMOUNT ^a (mg/kg)	TEF ^b (I-TEF)	TEQ (I-TEF) ^c (mg/kg - I-TEQ)
PCDDs				
2,3,7,8-TeCDD	0.0000002500	0.000000669	1	0.000000669
1,2,3,7,8-PeCDD	0.0000002500	0.000000362	0.5	0.000000181
1,2,3,4,7,8-HxCDD	0.0000002500	0.000000315	0.1	0.0000000315
1,2,3,6,7,8-HxCDD	0.0000002500	0.000000318	0.1	0.0000000318
1,2,3,7,8,9-HxCDD	0.0000002500	0.000000378	0.1	0.0000000378
1,2,3,4,6,7,8-HpCDD	0.0000002500	0.000000382	0.01	0.00000000382
OCDD	0.0000002500	0.000000684	0.001	0.00000000684
PCDFs				
2,3,7,8-TeCDF	0.0000002500	0.000000778	0.1	0.0000000778
1,2,3,7,8-PeCDF	0.0000002500	0.000000357	0.05	0.00000001785
2,3,4,7,8-PeCDF	0.0000002500	0.000000472	0.5	0.000000236
1,2,3,4,7,8-HxCDF	0.0000002500	0.000000361	0.1	0.0000000361
1,2,3,6,7,8-HxCDF	0.0000002500	0.000000343	0.1	0.0000000343
2,3,4,6,7,8-HxCDF	0.0000002500	0.000000426	0.1	0.0000000426
1,2,3,7,8,9-HxCDF	0.0000002500	0.000000461	0.1	0.0000000461
1,2,3,4,6,7,8-HpCDF	0.0000002500	0.000000371	0.01	0.00000000371
1,2,3,4,7,8,9-HpCDF	0.0000002500	0.000000390	0.01	0.00000000390
OCDF	0.0000002500	0.000000874	0.001	0.00000000874
Total^d				0.000000553

COMPONENT	AMOUNT (mg/kg) ^e
TeCDDs	0.000000669
PeCDDs	0.000000362
HxCDDs	0.000000315
HpCDDs	0.000000382
OCDD	0.000000684
Total PCDDs	0.000000689
TeCDFs	0.000000778
PeCDFs	0.000000357
HxCDFs	0.000000426
HpCDFs	0.000000461
OCDF	0.000000874
Total PCDFs	0.000000935
Total	0.000000935

^a AMOUNT OF COMPONENT PER SAMPLE.
^b TEF (TOXIC EQUIVALENCY FACTOR), TEF (TOXIC EQUIVALENCY) USE IS ACCORDING TO NATO/CMS, 1988 (I-TEF).
^c I-TEQ, TEQ FOR EACH COMPONENT OBTAINED BY MULTIPLYING THE CONCENTRATION WITH ITS CORRESPONDING TEF.
^d DETECTION LIMIT OF TOTAL PCDDs AND PCDFs CALCULATED BY COMBINE ALL DETECTION LIMIT OF TOXIC PCDDs AND PCDFs.
^e SC - THE TEST WAS SUBCONTRACTED TO THE ANOTHER LABORATORY.

Pyapat S.

(MRS PYAPAT SUTTANANUTWONG)
LABORATORY SUPERVISOR
MAY 18, 2023

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1991) PUBLIC CO., LTD. (PULP1)
ADDRESS : 1 MOO 2, THATOON, SRIRAMAPHOT, PRACHINBURI THAILAND 25140.
CONTACT INFORMATION : TEL : 08 5835 1371 e-mail : kunnarat_p@doublea1991.com
SAMPLING SOURCE : SLUDGE ETHER (STLD)
SAMPLE TYPE : SLUDGE
SAMPLING DATE : APRIL 18, 2023
SAMPLING TIME : 10:50 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : MR YUTTHANAWIN MUENCHOB
ANALYZED BY : SC

RECEIVED DATE : APRIL 18, 2023
ANALYTICAL DATE : APRIL 18 - MAY 15, 2023
REPORT NO. : 2023-0037138
WORK NO. : 2023-000007
ANALYSIS NO. : T23A0811-0002

COMPONENT	DETECTION LIMIT (mg/L)	AMOUNT ^a (mg/L)	TEF ^b (I-TEF)	TEQ (I-TEF) ^c (mg/L - I-TEQ)
PCDDs				
2,3,7,8-TeCDD	0.00000002500	0.00000003268	1	0.00000003268
1,2,3,7,8-PeCDD	0.00000002500	0.0000000168	0.5	0.0000000084
1,2,3,4,7,8-HxCDD	0.00000002500	0.0000000143	0.1	0.00000000143
1,2,3,6,7,8-HxCDD	0.00000002500	0.0000000144	0.1	0.00000000144
1,2,3,7,8,9-HxCDD	0.00000002500	0.0000000136	0.1	0.00000000136
1,2,3,4,6,7,8-HpCDD	0.00000002500	0.0000000137	0.01	0.00000000137
OCDD	0.00000002500	0.0000000202	0.001	0.000000000202
PCDFs				
2,3,7,8-TeCDF	0.00000002500	0.0000000398	0.1	0.00000000398
1,2,3,7,8-PeCDF	0.00000002500	0.0000000175	0.05	0.000000000875
2,3,4,7,8-PeCDF	0.00000002500	< 0.00000002500	0.5	< 0.00000000125
1,2,3,4,7,8-HxCDF	0.00000002500	0.0000000156	0.1	0.00000000156
1,2,3,6,7,8-HxCDF	0.00000002500	0.0000000146	0.1	0.00000000146
2,3,4,6,7,8-HxCDF	0.00000002500	0.0000000189	0.1	0.00000000189
1,2,3,7,8,9-HxCDF	0.00000002500	< 0.00000002500	0.1	< 0.00000000125
1,2,3,4,6,7,8-HpCDF	0.00000002500	0.0000000159	0.01	0.00000000159
1,2,3,4,7,8,9-HpCDF	0.00000002500	0.0000000160	0.01	0.00000000160
OCDF	0.00000002500	0.0000000331	0.001	0.000000000331
Total^d				0.0000000232

COMPONENT	AMOUNT (mg/L) ^e
TeCDDs	0.00000003268
PeCDDs	0.0000000168
HxCDDs	0.0000000143
HpCDDs	0.0000000136
OCDD	0.0000000202
Total PCDDs	0.0000000116
TeCDFs	0.0000000398
PeCDFs	0.0000000175
HxCDFs	0.0000000189
HpCDFs	0.0000000159
OCDF	0.0000000331
Total PCDFs	0.000000178
Total	0.000000227

^a AMOUNT OF COMPONENT PER SAMPLE 1 L.
^b TEF (TOXIC EQUIVALENCY FACTOR), TEF (TOXIC EQUIVALENCY) USE IS ACCORDING TO NATO/CMS, 1988 (I-TEF).
^c I-TEQ, TEQ FOR EACH COMPONENT OBTAINED BY MULTIPLYING THE CONCENTRATION WITH ITS CORRESPONDING TEF.
^d DETECTION LIMIT OF TOTAL PCDDs AND PCDFs CALCULATED BY COMBINE ALL DETECTION LIMIT OF TOXIC PCDDs AND PCDFs.
^e SC - THE TEST WAS SUBCONTRACTED TO THE ANOTHER LABORATORY.

Pyapat S.

(MRS PYAPAT SUTTANANUTWONG)
LABORATORY SUPERVISOR
MAY 18, 2023

ทรัพยากรนิเวศในน้ำ

ตรวจวัดโดยบริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (HMC) PUBLIC CO., LTD (PULP.)
ADDRESS : 1 MOO 2 THA TUM SE HANA PHOT PHACHEN BURE 25148
CONTACT INFORMATION : TEL : 08 5835 1371 e-mail : kumapat.p@doublea-hat991.com
SAMPLING SOURCE : -
SAMPLE TYPE : SURFACE WATER
SAMPLING DATE : MARCH 1, 2023
SAMPLING TIME : -
SAMPLING METHOD : PLANKTON NET
SAMPLING BY : MR KISSAWONG NAWTHIP
ANALYZED BY : MISS NAKPORN PURATKO

RECEIVED DATE : MARCH 2, 2023
ANALYTICAL DATE : MARCH 2-14, 2023
REPORT NO. : 2023-UD18561
WORK NO. : 2023-00087
ANALYSIS NO. : T23AD620-0002, T23AD620-0005

PHYTOPLANKTON (Natural Unit/mL)	COUNTING UNIT	RESULT	
		SAMPLE NO. 1 11:55 HOUR * T23AD620-0002	SAMPLE NO. 2 13:40 HOUR * T23AD620-0005
Division Cyanophyta			
Class Cyanophyceae			
Family Chlorococcaceae			
Microcystis aeruginosa ¹⁾	COLONY	75	0
Family Oscillatoraceae			
Oscillatoria spp. ²⁾	FLAMENT	20	10
Division Chlorophyta			
Class Chlorophyceae			
Family Chloridomnaceae			
Pleodorina musum ³⁾	COLONY	449	0
Family Cocconeaceae			
Chlorella spp. ⁴⁾	COLONY	76	0
Family Hydrocoleaceae			
Hydrocolea spp. ⁵⁾	COLONY	64	4
Family Coelastraceae			
Coelastrum spp. ⁶⁾	COLONY	8	0
Family Corythaceae			
Tetradon spp. ⁷⁾	CELL	72	3
Family Scenedesmeceae			
Scenedesmus spp. ⁸⁾	COLONY	91	2
Family Desmidiaceae			
Desmidsium spp. ⁹⁾	COLONY	95	22
Family Desmidiaceae			
Chlorella spp. ¹⁰⁾	CELL	19	4
Staurastrum spp. ¹¹⁾	CELL	39	0
Class Euglenophyceae			
Family Euglenaceae			
Euglena spp. ¹²⁾	CELL	71	0
Phacus spp. ¹³⁾	CELL	19	0
Staurastrum spp. ¹⁴⁾	CELL	100	8
Trachelomonas spp. ¹⁵⁾	CELL	10	0

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PHYTOPLANKTON (Natural Unit/mL)	COUNTING UNIT	RESULT	
		SAMPLE NO. 1 11:55 HOUR * T23AD620-0002	SAMPLE NO. 2 13:40 HOUR * T23AD620-0005
Trachelomonas ¹⁾	CELL	35	3
Division Chlorophyta			
Class Bacillariophyceae			
Family Thalassiosiraaceae			
Thalassiosira spp. ²⁾	CELL	9	2
Family Achnanthesaceae			
Achnanthes granulata ³⁾	FLAMENT	594	4
Family Fragilariaceae			
Synedra spp. ⁴⁾	CELL	118	38
S. utra ⁵⁾	CELL	65	3
Family Cyclotellaaceae			
Cyclotella spp. ⁶⁾	CELL	202	1
Family Naviculaaceae			
Synedra spp. ⁷⁾	CELL	21	2
Navicula spp. ⁸⁾	CELL	87	24
Family Bacillariaceae			
Alveolaria spp. ⁹⁾	CELL	31	2
Family Surirellaceae			
Surirella spp. ¹⁰⁾	CELL	253	5
Class Chrysophyceae			
Family Rhinodermaceae			
Rhinodermis spp. ¹¹⁾	CELL	27	0
Class Chlorophyceae			
Family Characeaceae			
Chara spp. ¹²⁾	CELL	23	0

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PHYTOPLANKTON (Natural Unfiltered)	COUNTING UNIT	RESULT	
		SAMPLE NO. 1 11:55 HOUR * T23AD620-0002	SAMPLE NO. 2 13:40 HOUR * T23AD620-0005
Family Peridiniaceae <i>Peridinium</i> spp. ¹	CELL	290	17
TOTAL ABUNDANCE (Natural Unfiltered)		3,215	189
AMOUNT OF SPECIES		28	70
SAMPLE VOLUME (mL)		90	90
SAMPLE CONDITION WATER'S COLOUR/TURBID SEDIMENT		COLOURLESS/CLEAR BROWN	COLOURLESS/CLEAR YELLOW

* : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

¹ : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

REMARKS : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF 23RD EDITION, 2017 PART 9300-F.

SAMPLE NO. 1 : *Peridinium* (natural unfiltered)
SAMPLE NO. 2 : *Peridinium* (natural unfiltered)



(PISS CHAWEEVAN BOONLA)
LABORATORY SUPERVISOR

MARCH 21, 2023

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2023-0018562

ISO 17025 CERTIFIED
BY THAI GROUP (THAILAND) CO., LTD.

ANALYSIS REPORT

CUSTOMER NAME	: DOUBLE A (1980) PUBLIC CO., LTD (PAP. 1)	RECEIVED DATE	: MARCH 2, 2023
ADDRESS	: 1 MOO 2 THA TUM SI MAHA PHOT RACHEN BLUE 25145	ANALYTICAL DATE	: MARCH 2-13, 2023
CONTACT INFORMATION	: TEL : 08 5835 1371 e-mail : kumpat_p@doublea1991.com	REPORT NO.	: 2023-0018562
SAMPLING SOURCE	: -	WORK NO.	: 2023-000007
SAMPLE TYPE	: SURFACE WATER	ANALYSIS NO.	: T23AD620-0002, T23AD620-0005
SAMPLING DATE	: MARCH 1, 2023		
SAMPLING TIME	: *		
SAMPLING METHOD	: PLANKTON NET		
SAMPLING BY	: MR KOSASAMPONG NAWITHIP		
ANALYZED BY	: MISS NARAPORN PURATARO		

ZOOPLANKTON (UNIT/m ³)	COUNTING UNIT	RESULT	
		SAMPLE NO. 1 11:55 HOUR * T23AD620-0002	SAMPLE NO. 2 13:40 HOUR * T23AD620-0005
Phylum Protocista			
Class Sarcodina			
Family Amoeboidea			
<i>Amoeba</i> sp.	CELL	127,407	11,008
Family Diffluginae			
<i>Difflugia</i> sp.	CELL	8,960	4,408
<i>Centropyge</i> sp.	CELL	3,507	0
Phylum Metazoa			
Class Mollusca			
Family Bivalvia			
<i>Bivalvia</i> sp.	INDIVIDUAL	35,002	8,200
<i>Rissoella</i> sp.	INDIVIDUAL	0	2,195
Family Lacinidae			
<i>Lacinia</i> sp.	INDIVIDUAL	0	1,109
Family Tridacnidae			
<i>Tridacna</i> sp.	INDIVIDUAL	0,003	0
Family Sphenocoridae			
<i>Sphenocorida</i> sp.	INDIVIDUAL	0	4,408
Class Diglossina			
Family Phlebotomina			
<i>Phlebotomus</i> sp.	INDIVIDUAL	0	3,940
Phylum Arthropoda			
Class Crustacea			
Copepod Copepod	INDIVIDUAL	0	2,195
Nauplius of Copepod	INDIVIDUAL	11,907	10,000
Ostracod	INDIVIDUAL	3,507	1,690

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United Analyst and Engineering Consultant Co., Ltd.
 350 Udonrak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
 Tel: 0 2763 2838 Fax: 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

ZOOPLANKTON (UNIT/ML)	COUNTING UNIT	RESULT	
		SAMPLE NO. 1 11:55 HOUR * T23AD620-0002	SAMPLE NO. 2 13:40 HOUR * T23AD620-0005
Phylum/Mollusca			
Class Bivalvia			
Bivalvia Larva	INDIVIDUAL	20307	9
TOTAL ABUNDANCE (UNIT/SAW)		20307	9
AMOUNT OF SPECIES		5	1
SAMPLE CONDITION			
WATER'S COLOUR/TURBID SEDIMENT		COLOURLESS/CLEAR BROWN	COLOURLESS/CLEAR YELLOW

REMARKS : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, 1918A, WEP 22nd EDITION, 2017 PART 10000 P.

SAMPLE NO. 1 : 11:55 HOUR (11:55:00 AM)

SAMPLE NO. 2 : 13:40 HOUR (13:40:00 PM)

(MISS CHAWEEVAN BOONLA)
LABORATORY SUPERVISOR

MARCH 20, 2023



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 Tel: 0 2763 2838 Fax: 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1991) PUBLIC CO., LTD (DUP L)
 ADDRESS : 1 MOO 2 THA TUM SI MAHA PHOT RACHIN BURG 25340
 CONTACT INFORMATION : TEL : 08 9835 1371 e-mail : kamapet_p@doublea1991.com
 SAMPLING SOURCE : -
 SAMPLE TYPE : SURFACE WATER
 SAMPLING DATE : MARCH 1, 2023
 SAMPLING TIME : -
 SAMPLING METHOD : PLANKTON NET
 ANALYZED BY : MISS SARWORN PURATKAD
 RECEIVED DATE : MARCH 2, 2023
 ANALYTICAL DATE : MARCH 2-13, 2023
 REPORT NO. : 2023-U018592
 WORK NO. : 2023-009007
 ANALYSIS NO. : T23AD620-0002, T23AD620-0005

ZOOPLANKTON (UNIT/ML)	COUNTING UNIT	RESULT	
		SAMPLE NO. 1 11:55 HOUR * T23AD620-0002	SAMPLE NO. 2 13:40 HOUR * T23AD620-0005
Phylum Protista			
Class Sarcodina			
Family Amoeboidea			
Amoeba sp.	CELL	107,407	11,206
Family Diffugiidae			
Diffugia sp.	CELL	9,660	4,499
Centropyge sp.	CELL	1,907	0
Phylum Rotifera			
Class Monogononta			
Family Brachionidae			
Brachionus sp.	INDIVIDUAL	25,840	8,290
Amphileta sp.	INDIVIDUAL	0	2,965
Family Lecanidae			
Lecane sp.	INDIVIDUAL	0	1,100
Family Trichocercae			
Trichocerca sp.	INDIVIDUAL	9,263	0
Family Synchaetidae			
Polysyllus sp.	INDIVIDUAL	0	4,400
Class Digenetida			
Family Philodendridae			
Philodendron sp.	INDIVIDUAL	0	3,845
Phylum Arthropoda			
Class Crustacea			
Copepod Copepod	INDIVIDUAL	0	2,195
Nauplius of Copepod	INDIVIDUAL	11,007	9,045
Ostracod	INDIVIDUAL	3,907	1,650



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Tel. 02763 2828 Fax 02763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

ZOOPLANKTON (UNIT/L)	COUNTING UNIT	RESULT	
		SAMPLE NO. 1 13:55 HOUR * T23AD620-0002	SAMPLE NO. 2 13:40 HOUR * T23AD620-0005
Phylum Mollusca Class Bivalvia Bivalvia Larva	INDIVIDUAL	20,307	0
TOTAL ABUNDANCE (UNIT/L)		20,307	0 (0%)
AMOUNT OF SPECIES		1	0
SAMPLE CONDITION WATER'S COLOUR/TURBID SEDIMENT		COLOURLESS/CLAR BROWN	COLOURLESS/CLAR YELLOW

REMARK: STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF 23RD EDITION, 20TH PART 1200 F.

SAMPLE NO. 1 Seachon (seachon.com)
SAMPLE NO. 2 Seachon (seachon.com)



United Analyst and Engineering Consultant Co., Ltd.
350 Udomsak 41, Sukhumvit Road, Bangchak, Phra Khanong, Bangkok 10260
Tel. 02763 2828 Fax 02763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

ANALYSIS REPORT

CUSTOMER NAME : DOUBLE A (1993) PUBLIC CO., LTD (PULP I)
ADDRESS : 1 MOO 2 THA TUM SE MAHA WET PLACHEN BURI 25148
CONTACT INFORMATION : TEL. : 08 5835 1371 e-mail : kumapai_pjdoublea1993.com
SAMPLING SOURCE : -
SAMPLING TYPE : SEDIMENT
SAMPLING DATE : MARCH 1, 2023
SAMPLING TIME : -
SAMPLING METHOD : PETERSEN GRAB
SAMPLING BY : MR KRODSANAPONG MATTHEP
ANALYZED BY : MISS PATTACHAREE NONGCHUNNAM
RECEIVED DATE : MARCH 2, 2023
ANALYTICAL DATE : MARCH 2-13, 2023
REPORT NO. : 2023-U018562
WORK NO. : 2023-00007
ANALYSIS NO. : T23AD620-0003, T23AD620-0005

BENTHOS (INDIVIDUAL/m ²)	RESULT	
	SAMPLE NO. 1 12:50 HOUR * T23AD620-0003	SAMPLE NO. 2 13:50 HOUR * T23AD620-0005
Phylum Annelida Class Oligochaeta Family Tubificidae	35	0
Phylum Arthropoda Class Insecta Family Chironomidae Chironomus sp.	35	7
TOTAL DENSITY (INDIVIDUAL/m ²)	70	7
AMOUNT OF SPECIES	2	1
SAMPLE CONDITION	GRAVEL	HEAVY CLAY

SAMPLE NO. 1 Seachon (seachon.com)
SAMPLE NO. 2 Seachon (seachon.com)

(MISS CHAWEEVAN BOOMLA)
LABORATORY SUPERVISOR

MARCH 20, 2023

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2023-U018562

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LABORATORY SUPERVISOR

MARCH 20, 2023

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คุณภาพอากาศในพื้นที่ทำงาน

ตรวจวัดโดยบริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด



Analysis Report

Job No. : QT.WP004/2023

Issued Date : 25 March 2023

REPORT No. WD007/2023
CUSTOMER NAME บริษัท ดีบีเอส เอ (1991) จำกัด (มหาชน) (โรงเยื่อ 1)
CONTACT NAME คุณกัญจน์กมล บัญญาประเสริฐ (085-835-1371)
SAMPLING PARAMETER Total Dust and Respirable Dust
SAMPLING DATE 15 March 2023
ANALYTICAL DATE 21 March 2023
SAMPLING INSTRUMENT Personal Air Sampling Model SKC 224-PCXR8 and PVC Filter

Item	Location	Measured Time	Result (mg/m ³)	
			Total Dust	Respirable Dust
1	Wood Handling at Chipper	9.38 am - 10.38 am	0.34	0.10
2	Wood Handling at Debarking Drum	9.42 am - 10.42 am	0.26	0.01
3	RC & LK	9.51 am - 10.51 am	0.17	0.01
4	ระบบฝังกลบแบบ Secured Landfill AA	2.45 pm - 3.45 pm	0.19	0.03
Standard*			15	5

Reference : *Notification of Ministry of Interior on Safety in Working Environment, B.E. 2520 (Chemical Substances)

Tested by : 
Mr. Kaiwit Sangkaew
Environmental Scientist

Approved by : 
Ms. Thittaya Nanmuen
Laboratory Manager

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Page 1 of 1



Analysis Report

Job No. : AAH2304323-00


Issued Date : 10 July 2023

REPORT No. WD048/2023
CUSTOMER NAME บริษัท ดีบีเอส เอ (1991) จำกัด (มหาชน) (โรงเยื่อ 1)
CONTACT NAME คุณกัญญ์ณภัส ปิณฑุภาประเสริฐ (085-835-1371)
SAMPLING PARAMETER Total Dust and Respirable Dust
SAMPLING DATE 23 June 2023
ANALYTICAL DATE 3 July 2023
SAMPLING INSTRUMENT Personal Air Sampling Model SKC 224-PCXR8 and PVC Filter

Item	Location	Measured Time	Result (mg/m ³)	
			Total Dust	Respirable Dust
1	Wood Handling at Chipper	9.30 am - 10.30 am	0.25	0.05
2	Wood Handling at Debarking Drum	9.40 am - 10.40 am	0.05	0.01
3	RC & LK	10.30 am - 11.30 am	0.30	0.01
Standard*			15	5

Reference : *Notification of Ministry of Interior on Safety in Working Environment, B.E. 2520 (Chemical Substances)

Tested by : 
Mr. Kalvit Sangkaew
Environmental Scientist

Approved by : 
Ms. Thittaya Nannmuen
Laboratory Manager

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Page 1 of 1

ระดับเสียงในพื้นที่ทำงาน

ตรวจวัดโดยบริษัท อินทิเกรทเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด



Analysis Report

Job No. : QT.WP004/2023
Issued Date : 25 March 2023

REPORT No. WS005/2023
CUSTOMER NAME บริษัท สยามนิรภัย (1991) จำกัด (มหาชน) (โทรเลข 1)
CONTACT NAME คุณวิภาดาพร/คุณวิภาดาพร (085-835-1371)
MEASURED PARAMETER Equivalent Sound Level 8 hours (Leq 8 hrs)
MEASURED DATE 15 March 2023
MEASURED TIME 9:40 am - 5:40 pm
MEASURED INSTRUMENT Sound Level Meter Model Acc Type 6236 No.12 Serial No.192015

Location	Period	Sound Level: (dB(A))	
		Leq	Lmax
Chippel Line 1	1 st hour	94.8	98.5
	2 nd hour	94.0	97.5
	3 rd hour	92.8	97.0
	4 th hour	91.0	95.5
	5 th hour	86.9	89.3
	6 th hour	91.9	97.5
	7 th hour	95.3	96.4
	8 th hour	95.1	97.0
	Leq 8 hrs	92	
	Standard ^U	85	

Reference : ^U Announcement of Department of Labour Protection and Welfare, B.E.2561 (Time Weighted Average-TWA)

Tested by :
Mr. Kalvit Sangsuan
Environmental Scientist

Approved by :
Ms. Thittaya Narmuan
Laboratory Manager

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Page 2 of 6

122 Moo. 2 Thatoon, Srirachaphote, Prachinburi, 25140 TEL: 085-835-4510 FAX: 02-659-1430



Analysis Report

Job No. : QT.WP004/2023
Issued Date : 25 March 2023

REPORT No. WS005/2023
CUSTOMER NAME บริษัท สยามนิรภัย (1991) จำกัด (มหาชน) (โทรเลข 1)
CONTACT NAME คุณวิภาดาพร/คุณวิภาดาพร (085-835-1371)
MEASURED PARAMETER Equivalent Sound Level 8 hours (Leq 8 hrs)
MEASURED DATE 15 March 2023
MEASURED TIME 9:45 am - 5:45 pm
MEASURED INSTRUMENT Sound Level Meter Model Acc Type 6236 No.11 Serial No.192016

Location	Period	Sound Level: (dB(A))	
		Leq	Lmax
Debarking Drum Line 1	1 st hour	81.5	94.9
	2 nd hour	80.6	91.7
	3 rd hour	78.2	86.6
	4 th hour	76.6	90.6
	5 th hour	69.0	77.9
	6 th hour	78.0	88.9
	7 th hour	80.7	87.4
	8 th hour	79.6	91.9
	Leq 8 hrs	79	
	Standard ^U	85	

Reference : ^U Announcement of Department of Labour Protection and Welfare, B.E.2561 (Time Weighted Average-TWA)

Tested by :
Mr. Kalvit Sangsuan
Environmental Scientist

Approved by :
Ms. Thittaya Narmuan
Laboratory Manager

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122 Moo. 2 Thatoon, Srirachaphote, Prachinburi, 25140 TEL: 085-835-4510 FAX: 02-659-1430



Analysis Report

Job No. : QT.WP004/2023

Issued Date : 28 March 2023

REPORT No. : S2_002/2023
 CUSTOMER NAME : บริษัท สีนอร์ม เอ (1991) จำกัด (มหาชน) (โรนลี่ 1)
 CONTACT NAME : คุณวิญญูวัฒน์ บัญญาพรหมศิริ (085-835-1571)
 MEASURED PARAMETER : Equivalent Sound Level, 12 hours (Leq 12 hrs)
 MEASURED DATE : 15 March 2023
 MEASURED TIME : 9:45 am - 9:45 pm
 MEASURED INSTRUMENT : Sound Level Meter Model Aco Type 6236 No.11 Serial No.192014

Location	Period	Sound Level [dB(A)]	
		Leq	Lmax
Debarking Drum Line 1	1 st hour	81.5	94.9
	2 nd hour	80.6	91.7
	3 rd hour	78.2	86.6
	4 th hour	76.6	86.6
	5 th hour	89.0	77.9
	6 th hour	78.0	88.9
	7 th hour	80.7	87.4
	8 th hour	79.6	91.9
	9 th hour	80.3	88.0
	10 th hour	78.7	91.0
	11 th hour	81.4	84.8
	12 th hour	78.6	89.4
	Leq 12 hrs	79	
	Standard ¹⁾	83	

Reference : ¹⁾ Announcement of Department of Labour Protection and Welfare, B.E.2561 (Time Weighted Average-TWA)

Tested by : วิญญู
 Mr. Kaimit Sangkaew
 Environmental Scientist

Approved by : วิญญู
 Mr. Thittaya Nannuan
 Laboratory Manager

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122 Moo. 2 Thatoom, Srirachaphote, Prachinburi, 25140 .TEL: 037-208-800 Ext.3838 FAX: 02-659-1430



Analysis Report

Job No. : QT.WP004/2023

Issued Date : 28 March 2023

REPORT No. : S2_002/2023
 CUSTOMER NAME : บริษัท สีนอร์ม เอ (1991) จำกัด (มหาชน) (โรนลี่ 1)
 CONTACT NAME : คุณวิญญูวัฒน์ บัญญาพรหมศิริ (085-835-1571)
 MEASURED PARAMETER : Equivalent Sound Level, 12 hours (Leq 12 hrs)
 MEASURED DATE : 15 March 2023
 MEASURED TIME : 9:40 am - 9:40 pm
 MEASURED INSTRUMENT : Sound Level Meter Model Aco Type 6236 No.12 Serial No.192015

Location	Period	Sound Level [dB(A)]	
		Leq	Lmax
Chipper Line 1	1 st hour	94.8	98.5
	2 nd hour	94.0	97.3
	3 rd hour	92.8	97.0
	4 th hour	91.0	95.3
	5 th hour	86.0	99.3
	6 th hour	91.9	97.3
	7 th hour	93.3	96.4
	8 th hour	93.1	97.0
	9 th hour	93.9	97.1
	10 th hour	92.0	96.9
	11 th hour	93.0	96.9
	12 th hour	92.4	97.2
	Leq 12 hrs	92	
	Standard ¹⁾	85	

Reference : ¹⁾ Announcement of Department of Labour Protection and Welfare, B.E.2561 (Time Weighted Average-TWA)

Tested by : วิญญู
 Mr. Kaimit Sangkaew
 Environmental Scientist

Approved by : วิญญู
 Mr. Thittaya Nannuan
 Laboratory Manager

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122 Moo. 2 Thatoom, Srirachaphote, Prachinburi, 25140 .TEL: 037-208-800 Ext.3838 FAX: 02-659-1430



Analysis Report

Job No. : AAH2304323-00


Issued Date : 10 July 2023

REPORT No. WS013/2023
 CUSTOMER NAME บริษัท สัมพันธ์ เม (1991) จำกัด (มหาชน) (โรงเรียน 1)
 CONTACT NAME ศูนย์วิจัยสิ่งแวดล้อม (085-835-1371)
 MEASURED PARAMETER Equivalent Sound Level 8 hours (Leq 8 hrs)
 MEASURED DATE 23 June 2023
 MEASURED TIME 9:45 am - 5:45 pm
 MEASURED INSTRUMENT Sound Level Meter Model Aco Type 6236 No.14 Serial No.212014

Location	Period	Sound Level [dB(A)]	
		Leq	Lmax
Debarking Drum Line 1	1 st hour	78.0	85.8
	2 nd hour	81.5	89.1
	3 rd hour	78.9	91.1
	4 th hour	75.0	97.3
	5 th hour	70.4	90.5
	6 th hour	68.6	81.3
	7 th hour	78.2	93.6
	8 th hour	69.2	86.8
	Leq 8 hrs	77	
	Standard ¹⁾	85	

Reference : ¹⁾ Announcement of Department of Labour Protection and Welfare, B.E.2561 (Time Weighted Average-TWA)

Tested by : 
 Mr. Kailit Sangkroew
 Environmental Scientist

Approved by : 
 Ms. Thittaya Nannuen
 Laboratory Manager

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122 Moo. 2 Thatoom, Srimahaphote, Prachinburi, 25140 .TEL: 085-835-4510 FAX: 02-659-1430



Analysis Report

Job No. : AAH2304323-00


Issued Date : 10 July 2023

REPORT No. WS015/2023
 CUSTOMER NAME บริษัท สัมพันธ์ เม (1991) จำกัด (มหาชน) (โรงเรียน 1)
 CONTACT NAME ศูนย์วิจัยสิ่งแวดล้อม (085-835-1371)
 MEASURED PARAMETER Equivalent Sound Level 8 hours (Leq 8 hrs)
 MEASURED DATE 23 June 2023
 MEASURED TIME 9:30 am - 6:30 pm
 MEASURED INSTRUMENT Sound Level Meter Model Aco Type 6236 No.16 Serial No.212016

Location	Period	Sound Level [dB(A)]	
		Leq	Lmax
Chipper Line 1	1 st hour	85.2	89.0
	2 nd hour	83.3	86.7
	3 rd hour	85.1	91.1
	4 th hour	84.8	88.8
	5 th hour	85.3	95.6
	6 th hour	85.5	94.5
	7 th hour	83.7	88.7
	8 th hour	81.0	87.5
	Leq 8 hrs	84	
	Standard ¹⁾	85	

Reference : ¹⁾ Announcement of Department of Labour Protection and Welfare, B.E.2561 (Time Weighted Average-TWA)

Tested by : 
 Mr. Kailit Sangkroew
 Environmental Scientist

Approved by : 
 Ms. Thittaya Nannuen
 Laboratory Manager

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122 Moo. 2 Thatoom, Srimahaphote, Prachinburi, 25140 .TEL: 085-835-4510 FAX: 02-659-1430



Analysis Report

Job No. : AAH2304323-00

Issued Date : 10 July 2023

REPORT No. 52_008/2023
 CUSTOMER NAME บริษัท สีน/เวิลด์ เอ (1991) จำกัด (มหาชน) (โบสถ์ 1)
 CONTACT NAME คุณวิญญูวัฒน์ ธีระกุลประเสริฐ (085-835-1371)
 MEASURED PARAMETER Equivalent Sound Level 12 hours (Leq 12 hrs)
 MEASURED DATE 23 June 2023
 MEASURED TIME 9:45 am - 9:45 pm
 MEASURED INSTRUMENT Sound Level Meter Model Aco Type 6236 No.14 Serial No.212014

Location	Period	Sound Level [dB(A)]	
		Leq	Lmax
Debarling Drum Line 1	1 st hour	78.0	86.8
	2 nd hour	81.5	89.1
	3 rd hour	78.9	91.1
	4 th hour	76.0	97.3
	5 th hour	70.4	90.5
	6 th hour	68.6	81.3
	7 th hour	78.2	93.6
	8 th hour	69.2	86.8
	9 th hour	76.8	85.9
	10 th hour	81.4	83.6
	11 th hour	80.7	83.6
	12 th hour	79.6	84.4
	Leq 12 hrs	78	
	Standard ¹⁾	83	

Reference : ¹⁾ Announcement of Department of Labour Protection and Welfare, B.E.2561 (Time Weighted Average-TWA)

Tested by :
 Mr. Kewit Sangkaew
 Environmental Scientist

Approved by :
 Ms. Thittaya Nannmuon
 Laboratory Manager

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122 Moo. 2 Thatoom, Srirachaphote/Prachinburi, 25140 .TEL: 037-208-800 Ext.3838 FAX: 02-659-1430



Analysis Report

Job No. : AAH2304323-00

Issued Date : 10 July 2023

REPORT No. 52_008/2023
 CUSTOMER NAME บริษัท สีน/เวิลด์ เอ (1991) จำกัด (มหาชน) (โบสถ์ 1)
 CONTACT NAME คุณวิญญูวัฒน์ ธีระกุลประเสริฐ (085-835-1371)
 MEASURED PARAMETER Equivalent Sound Level 12 hours (Leq 12 hrs)
 MEASURED DATE 23 June 2023
 MEASURED TIME 9:30 am - 9:30 pm
 MEASURED INSTRUMENT Sound Level Meter Model Aco Type 6236 No.16 Serial No.212016

Location	Period	Sound Level [dB(A)]	
		Leq	Lmax
Chipper Line 1	1 st hour	85.2	89.0
	2 nd hour	83.3	86.7
	3 rd hour	85.1	91.1
	4 th hour	84.8	88.8
	5 th hour	85.3	95.6
	6 th hour	85.3	94.5
	7 th hour	83.7	85.7
	8 th hour	81.0	87.5
	9 th hour	83.5	87.9
	10 th hour	84.7	88.0
	11 th hour	84.5	88.0
	12 th hour	84.2	88.0
	Leq 12 hrs	84	
	Standard ¹⁾	83	

Reference : ¹⁾ Announcement of Department of Labour Protection and Welfare, B.E.2561 (Time Weighted Average-TWA)

Tested by :
 Mr. Kewit Sangkaew
 Environmental Scientist

Approved by :
 Ms. Thittaya Nannmuon
 Laboratory Manager

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122 Moo. 2 Thatoom, Srirachaphote/Prachinburi, 25140 .TEL: 037-208-800 Ext.3838 FAX: 02-659-1430

ระดับความร้อนในพื้นที่ทำงาน

ตรวจวัดโดยบริษัท อินทิเกรทเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด



Analysis Report

Job No. : QT.WP004/2023

Issued Date : 28 March 2023

REPORT No. WH003/2023
CUSTOMER NAME บริษัท ดีบีเอส เอ (1991) จำกัด (มหาชน) (โรงเยื่อ 1)
CONTACT NAME คุณกัญจน์ภัสร์ ปัญญาประเสริฐ (085-835-1371)
MEASURED PARAMETER Wet Bulb Globe Temperature
MEASURED DATE 13, 15 March 2023
MEASURED TIME 10.00 am - 12.00 pm
MEASURED INSTRUMENT Heat Stress Monitor Model Delta Ohm ; HD 32.2

Item	Location	Type of Work	Temperature (°C)				
			WB	GT	DB	WBGT	Standard ^{1/}
1	Digester Pulp 1	งานเบา	24.5	36.1	35.5	28	34
2	Lime Klin Pulp 1	งานเบา	24.3	36.0	35.5	27	34
3	Recovery Boiler at Burner Floor at NPP5	งานเบา	24.7	33.8	33.0	27	34

Reference : ^{1/}Ministerial Regulation on Standard of Safety Administration and Management, Occupational Health and Environmental Condition concerning Heat, Light and Noise, B.E. 2559 (Section 1 : Heat)

Tested by :

Mr. Kaiwit Sangkaew
Environmental Scientist

Approved by :

Ms. Thittaya Nanmuen
Laboratory Manager

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Analysis Report

Job No. : AAH2304323-00


Issued Date : 10 July 2023

REPORT No. WH008/2023
 CUSTOMER NAME บริษัท ดีบีเอส เอ (1991) จำกัด (มหาชน) (โรงเยื่อ 1)
 CONTACT NAME คุณกัญญ์จักษ์ ปิณฑาประเสริฐ (085-835-1371)
 MEASURED PARAMETER Wet Bulb Globe Temperature
 MEASURED DATE 20, 23 June 2023
 MEASURED TIME 9.45 am - 11.45 am
 MEASURED INSTRUMENT Heat Stress Monitor Model Delta Ohm ; HD 32.2

Item	Location	Type of Work	Temperature (°C)				
			WB	GT	DB	WBGT	Standard ^U
1	Digester Pulp 1	งานเบา	28.0	36.5	36.0	31	34
2	Lime Klin Pulp 1	งานเบา	27.8	35.2	34.0	30	34
3	Recovery Boiler at Burner Floor at NPP5	งานเบา	30.7	37.3	36.6	33	34

Reference : ^U Ministerial Regulation on Standard of Safety Administration and Management, Occupational Health and Environmental Condition concerning Heat, Light and Noise, B.E. 2559 (Section 1 : Heat)

Tested by : 
 Mr. Kaiwit Sangkaew
 Environmental Scientist

Approved by : 
 Ms. Thittaya Nanmuen
 Laboratory Manager

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สารเคมีในพื้นที่ทำงาน

ตรวจวัดโดยบริษัท อินทิเกรทเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด



Analysis Report

Job No. : QT.WP004/2023

Issued Date : 11 April 2023

REPORT No. WC009/2023
 CUSTOMER NAME บริษัท สืบเน็ค เอ (1991) จำกัด (มหาชน) (ไชนีส 1)
 CONTACT NAME คุณวิญญูวัฒน์ บัญญาประเสริฐ (085-835-1371)
 SAMPLING PARAMETER Chemical Fume
 SAMPLING DATE 15 March 2023
 ANALYTICAL DATE 21 March - 10 April 2023
 SAMPLING INSTRUMENT Personal Air Sampling Model SKC 224-PCXR8 and Filter, Sorbent Tube, Sampling Bag

Item	Location	Parameter ¹⁾	Unit	Result	Standard ²⁾	LOD	Analytical Method
1	Chemical Plant	NaOH	mg/m ³	0.02	2	0.001	OSHA ID 121
		ClO ₂	mg/m ³	0.02	0.3	0.001	OSHA ID 101
		SO ₂	ppm	0.005	5	0.001	UV Fluorescence
2	ClO ₂ Plant	NaOH	mg/m ³	0.02	2	0.001	OSHA ID 121
		ClO ₂	mg/m ³	0.03	0.3	0.001	OSHA ID 101
		SO ₂	ppm	0.005	5	0.001	UV Fluorescence
3	Fiberline	H ₂ S ³⁾	ppm	0.135	20	0.001	UV Fluorescence
		CH ₃ SH ⁴⁾	ppm	0.05	10	0.01	NIOSH 2542
		CH ₃ SC ₂ H ₅	ppm	0.21	10 ⁵⁾	0.01	OSHA IRIS D650

Reference : ¹⁾ Announcement of Department of Labour Protection and Welfare, B.E. 2569 (Chemical Threshold Limit)

²⁾ American Conference of Governmental Industrial Hygienists 2003 (ACGIH)

³⁾ Tested by Breen Association Co., Ltd. Registration No. >286

⁴⁾ Tested by Integrated Research Center Co., Ltd. Registration No. >599

Sampling by: 
 Mr. Kalvit Sangkroew
 Environmental Scientist

Approved by: 
 Ms. Thittaya Nannuen
 Laboratory Manager

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Analysis Report

Job No. : QT.WP006/2023

Issued Date : 11 April 2023

REPORT No. WC009/2023
 CUSTOMER NAME บริษัท สืบเน็ค เอ (1991) จำกัด (มหาชน) (ไชนีส 1)
 CONTACT NAME คุณวิญญูวัฒน์ บัญญาประเสริฐ (085-835-1371)
 SAMPLING PARAMETER Chemical Fume
 SAMPLING DATE 15 March 2023
 ANALYTICAL DATE 16 March - 4 April 2023
 SAMPLING INSTRUMENT Personal Air Sampling Model SKC 224-PCXR8 and Filter, Sorbent Tube, Sampling Bag

Item	Location	Parameter ¹⁾	Unit	Result	Standard ²⁾	LOD	Analytical Method
1	Pulp Mill at Evaporation Plant	H ₂ S ³⁾	ppm	0.096	20	0.001	UV Fluorescence
		CH ₃ SH	ppm	0.02	10	0.025	NIOSH 2542
		CH ₃ SC ₂ H ₅	ppm	0.06	10 ⁴⁾	0.01	OSHA IRIS D650
2	Recovery Boiler at Burner Floor	H ₂ S ³⁾	ppm	0.041	20	0.001	UV Fluorescence
		CH ₃ SH	ppm	0.04	10	0.025	NIOSH 2542
		CH ₃ SC ₂ H ₅	ppm	0.05	10 ⁴⁾	0.01	OSHA IRIS D650


Reference : ¹⁾ Announcement of Department of Labour Protection and Welfare, B.E. 2569 (Chemical Threshold Limit)

²⁾ American Conference of Governmental Industrial Hygienists 2003 (ACGIH)

³⁾ Tested by Breen Association Co., Ltd. Registration No. >286

⁴⁾ Tested by Integrated Research Center Co., Ltd. Registration No. >599

Sampling by: 
 Mr. Kalvit Sangkroew
 Environmental Scientist

Approved by: 
 Ms. Thittaya Nannuen
 Laboratory Manager

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Analysis Report

Job No. : AAH2304323-00

Issued Date : 18 July 2023

REPORT No. WC059/2023
 CUSTOMER NAME บริษัท สังกะเล็ ๒ (1991) จำกัด (มหาชน) (ไทยเชื้อเพลิง 1)
 CONTACT NAME คุณวิญญูวัฒน์ วิญญูวัฒน์ (085-835-1371)
 SAMPLING PARAMETER Chemical Fume
 SAMPLING DATE 23 June 2023
 ANALYTICAL DATE 27 June - 18 July 2023
 SAMPLING INSTRUMENT Personal Air Sampling Model SKC 224-PCXFB and Sorbent Tube/MCE Filter/Solution/Impinger

Item	Location	Parameter ^U	Unit	Result	Standard ^V	LOD	Analytical Method
1	Chemical Plant	NaOH	mg/m ³	0.09	2	0.001	OSHA ID 121
		CO ₂	mg/m ³	0.28	0.3	0.001	OSHA ID 101
		SO ₂ ^W	ppm	0.010	5	0.001	UV Fluorescence
2	CO ₂ Plant	NaOH	mg/m ³	0.02	2	0.001	OSHA ID 121
		CO ₂	mg/m ³	0.23	0.3	0.001	OSHA ID 101
		SO ₂ ^W	ppm	0.010	5	0.001	UV Fluorescence
3	Fiberline	H ₂ S ^A	ppm	0.026	30	0.001	UV Fluorescence
		CH ₃ SH	ppm	0.01	10	0.01	NIOSH 2542
		CH ₃ SC ₂ H ₅	ppm	0.20	10 ^W	0.01	OSHA IMS D650

Reference : ^U Announcement of Department of Labour Protection and Welfare, B.E. 2560 (Chemical Threshold Limit)

^W American Conference of Governmental Industrial Hygienists 2013 (ACGIH)

^W Tested by Emex Association Co., Ltd. Registration No. 1-294

^W Tested by Integrated Research Center Co., Ltd. Registration No. 1-186

Sampling by : 
 Mr. Kaiwit Sangkaew
 Environmental Scientist

Approved by : 
 Ms. Thittaya Nannuen
 Laboratory Manager

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Analysis Report

Job No. : AAH2304323-00

Issued Date : 15 July 2023

REPORT No. WC059/2023
 CUSTOMER NAME บริษัท สังกะเล็ ๒ (1991) จำกัด (มหาชน) (ไทยเชื้อเพลิง 1)
 CONTACT NAME คุณวิญญูวัฒน์ วิญญูวัฒน์ (085-835-1371)
 SAMPLING PARAMETER Chemical Fume
 SAMPLING DATE 20 June 2023
 ANALYTICAL DATE 26 June - 11 July 2023
 SAMPLING INSTRUMENT Personal Air Sampling Model SKC 224-PCXFB and Filter, Sorbent Tube, Sampling Bag

Item	Location	Parameter ^U	Unit	Result	Standard ^V	LOD	Analytical Method
1	Pulp Mill at Evaporation Plant	H ₂ S ^W	ppm	0.087	20	0.001	UV Fluorescence
		CH ₃ SH	ppm	0.05	10	0.025	NIOSH 2542
		CH ₃ SC ₂ H ₅	ppm	0.70	10 ^W	0.01	OSHA IMS D650
2	Recovery Boiler at Burner Floor	H ₂ S ^W	ppm	0.175	20	0.001	UV Fluorescence
		CH ₃ SH	ppm	0.03	10	0.025	NIOSH 2542
		CH ₃ SC ₂ H ₅	ppm	0.08	10 ^W	0.01	OSHA IMS D650

Reference : ^U Announcement of Department of Labour Protection and Welfare, B.E. 2560 (Chemical Threshold Limit)

^W American Conference of Governmental Industrial Hygienists 2013 (ACGIH)

^W Tested by Emex Association Co., Ltd. Registration No. 1-244

^W Tested by Integrated Research Center Co., Ltd. Registration No. 1-198

Sampling by : 
 Mr. Kaiwit Sangkaew
 Environmental Scientist

Approved by : 
 Ms. Thittaya Nannuen
 Laboratory Manager

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• REPORTED ANALYSIS REFERS TO SUBMITTED SAMPLE ONLY

Page 3 of 3

122 Moo. 2 Thatoom, Srirachaphote, Prachinburi, 25140 .TEL: 085-835-4510 FAX: 02-459-1430

ภาคผนวก จ
ใบรับรองการสอบเทียบเครื่องมือ

บริษัท อินทิเกรทเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 144/0166

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.
Address : 122 Moo 2 T.Thatoom, A.Srimahaphote, Prachinburi 25140
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter
Manufacturer : ACO
Model : 6236
Serial No. : 192014
Microphone : 7052NR No.73303
Preamplifier : -

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 13 Jan. 2023

Date of Calibration : 13 Feb. 2023

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Request No. 21-66/0219

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9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 13 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

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1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value(dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
114.00	113.9	114.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 114.1 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
19.7	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	13.1	0.10	N/A
C-Weight	18.0	0.10	N/A
Flat	21.9	0.10	N/A

Date of Calibration : 13 Feb. 2023

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Request No. 21-66/0219

MTC No. EEL BP. 144/0166

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
125	0.1	0.1	0.0	1.5	0.45	0.6
1 000	-0.6	-0.6	-0.5	1.0	0.45	0.6
8 000	-2.3	-2.5	-2.1	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
63	0.1	0.0	-0.1	2.0	0.20	0.6
125	0.0	0.0	-0.1	1.5	0.20	0.6
250	0.0	0.0	0.0	1.5	0.20	0.6
500	0.0	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.1	0.0	-0.1	2.0	0.20	0.6
4 000	-0.4	-0.4	-0.1	3.0	0.20	0.6
8 000	-0.6	-0.6	-0.2	5.0	0.20	0.7

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5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.1	0.1	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 13 Feb, 2023

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7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
120	120.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	113.9	-0.1	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	88.9	-0.1	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	63.9	-0.1	1.1	0.30	0.3
59	58.9	-0.1	1.1	0.30	0.3
54	53.9	-0.1	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	38.9	-0.1	1.1	0.30	0.3

Date of Calibration : 13 Feb. 2023

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7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
34	34.0	0.0	1.1	0.30	0.3
33	33.0	0.0	1.1	0.30	0.3
32	32.1	0.1	1.1	0.30	0.3
31	31.1	0.1	1.1	0.30	0.3
30	30.2	0.2	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
40-130	94.0	94.0	0.0	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	94.0	0.0	1.1	0.30	0.3
20-100	94.0	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 13 Feb. 2023

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8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	45	45.0	0.0	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	25.3	0.3	1.1	0.30	0.3
20-100	25	25.3	0.3	1.1	0.30	0.3
20-90	25	25.2	0.2	1.1	0.30	0.3
20-80	25	25.0	0.0	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	116.0	0.0	±1.0	0.20	0.3
	2	98.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	89.2	-0.8	+1.5; -5.0	0.20	0.3
Slow	200	109.5	-0.1	±1.0	0.20	0.3
	2	89.8	-0.2	+1.0; -5.0	0.20	0.3
SEL	200	109.9	-0.1	±1.0	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 13 Feb. 2023

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Request No. 21-66/0219

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10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.8	0.4	3.0	0.20	0.35
Positive half cycle	124.4	124.2	-0.2	2.0	0.20	0.35
Negative half cycle	124.4	124.2	-0.2	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
133.0	133.0	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by :


(Mr. Wittawat Supanich)

Approved by :


(Mr. Prawate Khuyapa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 13 Feb. 2023

Date of Issue : 13 Feb. 2023

Ref : 2011266011300149010

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

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CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.
Address : 122 Moo 2 T.Thatoom, A.Srimahaphote, Prachinburi 25140
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter
Manufacturer : ACO
Model : 6236
Serial No. : 192015
Microphone : 7052NR No.73304
Preamplifier : -

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 13 Jan. 2023

Date of Calibration : 13 Feb. 2023

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9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 ; Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 13 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 145/0166

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	Before adjust	After adjust				
114.00	112.0	114.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 115.8 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
19.8	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-Weight	15.6	0.10	N/A
C-Weight	21.2	0.10	N/A
Flat	25.6	0.10	N/A

Date of Calibration : 13 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 145/0166

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
125	0.1	-0.1	-0.2	1.5	0.45	0.6
1 000	0.0	0.0	0.1	1.0	0.45	0.6
8 000	-2.5	-2.1	-1.7	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
63	0.1	0.0	-0.1	2.0	0.20	0.6
125	0.1	0.0	0.0	1.5	0.20	0.6
250	0.0	0.0	0.0	1.5	0.20	0.6
500	0.0	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	0.0	0.0	-0.1	2.0	0.20	0.6
4 000	-0.4	-0.3	-0.1	3.0	0.20	0.6
8 000	-0.6	-0.6	-0.2	5.0	0.20	0.7

Date of Calibration : 13 Feb. 2023

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5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.1	0.1	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 13 Feb. 2023

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Request No. 21-66/0219

MTC No. EEL. BP. 145/0166

7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
120	120.0	0.0	1.1	0.30	0.3
119	119.1	0.1	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.1	0.1	1.1	0.30	0.3
74	74.2	0.2	1.1	0.30	0.3
69	69.1	0.1	1.1	0.30	0.3
64	64.0	0.0	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3
54	54.0	0.0	1.1	0.30	0.3
49	49.1	0.1	1.1	0.30	0.3
44	44.1	0.1	1.1	0.30	0.3
39	39.1	0.1	1.1	0.30	0.3

Date of Calibration : 13 Feb. 2023

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Request No. 21-66/0219

MTC No. EEL. BP. 145/0166

7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
34	34.2	0.2	1.1	0.30	0.3
33	33.2	0.2	1.1	0.30	0.3
32	32.3	0.3	1.1	0.30	0.3
31	31.3	0.3	1.1	0.30	0.3
30	30.4	0.4	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
40-130	94.0	94.0	0.0	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	94.0	0.0	1.1	0.30	0.3
20-100	94.0	93.9	-0.1	1.1	0.30	0.3

Date of Calibration : 13 Feb. 2023

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MTC No. EEL. BP. 145/0166

8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
40-130	45	45.0	0.0	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	25.3	0.3	1.1	0.30	0.3
20-100	25	25.3	0.3	1.1	0.30	0.3
20-90	25	25.3	0.3	1.1	0.30	0.3
20-80	25	25.1	0.1	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	200	115.8	-0.2	± 1.0	0.20	0.3
	2	98.0	-1.0	+1.0; -2.5	0.20	0.3
	0.25	89.2	-0.8	+1.5; -5.0	0.20	0.3
Slow	200	109.3	-0.3	± 1.0	0.20	0.3
	2	89.7	-0.3	+1.0; -5.0	0.20	0.3
SEL	200	109.8	-0.2	± 1.0	0.20	0.3
	2	89.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 13 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 145/0166

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.8	0.4	3.0	0.20	0.35
Positive half cycle	124.4	124.3	-0.1	2.0	0.20	0.35
Negative half cycle	124.4	124.3	-0.1	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
133.0	133.0	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by :


(Mr. Wittawat Supanich)

Approved by :


(Mr. Prawate Kluaypa)
Director
TISTR

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 13 Feb. 2023

Date of Issue : 13 Feb. 2023

Ref : 2011266011300149011

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 152/0166

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.
Address : 122 Moo 2 T.Thatoom A.Srimahaphote Prachinburi 25140.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Integrating Sound Level Meter
Manufacturer : ACO
Model : 6236
Serial No. : 192016
Microphone : Type 7052NR No.73305
Preamplifier : -

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 13 Jan. 2023

Date of Calibration : 7-8 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 152/0166

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 7-8 Feb. 2023

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Request No. 21-66/0219

MTC No. EEL. BP. 152/0166

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.96	109.6	113.9	-0.1	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 115.7 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
19.8	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	14.7	0.10	N/A
C-Weight	20.6	0.10	N/A
Flat	24.6	0.10	N/A

Date of Calibration : 7-8 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 152/0166

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response			Acceptance limit class 2 (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	0.3	0.2	0.0	±1.5	0.45	0.6
1 000	-0.5	-0.5	-0.3	±1.0	0.45	0.6
8 000	-1.7	-1.7	-2.0	±5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response			Acceptance limit class 2 (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	0.1	0.0	0.0	±2.0	0.20	0.6
125	0.0	0.0	0.0	±1.5	0.20	0.6
250	0.0	0.0	0.0	±1.5	0.20	0.6
500	0.0	0.0	0.0	±1.5	0.20	0.6
1 000	0.0	0.0	0.0	±1.0	0.20	0.6
2 000	-0.1	-0.1	0.0	±2.0	0.20	0.6
4 000	-0.4	-0.4	-0.1	±3.0	0.20	0.6
8 000	-0.7	-0.7	-0.2	±5.0	0.20	0.7

Date of Calibration : 7-8 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 152/0166

5. Long-term stability

Time	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.1	0.1	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 7-8 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 152/0166

7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
122	122.2	0.2	1.1	0.30	0.3
121	121.2	0.2	1.1	0.30	0.3
120	120.1	0.1	1.1	0.30	0.3
119	119.1	0.1	1.1	0.30	0.3
114	114.1	0.1	1.1	0.30	0.3
109	109.1	0.1	1.1	0.30	0.3
104	103.9	-0.1	1.1	0.30	0.3
99	99.1	0.1	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	83.9	-0.1	1.1	0.30	0.3
79	79.2	0.2	1.1	0.30	0.3
74	74.2	0.2	1.1	0.30	0.3
69	69.2	0.2	1.1	0.30	0.3
64	64.1	0.1	1.1	0.30	0.3
59	59.1	0.1	1.1	0.30	0.3
54	54.1	0.1	1.1	0.30	0.3
49	49.1	0.1	1.1	0.30	0.3
44	44.2	0.2	1.1	0.30	0.3
39	39.1	0.1	1.1	0.30	0.3
34	34.3	0.3	1.1	0.30	0.3

Date of Calibration : 7-8 Feb. 2023

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Request No. 21-66/0219

MTC No. EEL. BP. 152/0166

7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
33	33.3	0.3	1.1	0.30	0.3
32	32.3	0.3	1.1	0.30	0.3
31	31.4	0.4	1.1	0.30	0.3
30	30.5	0.5	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
40-130	94.0	94.0	0.0	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	94.0	0.0	1.1	0.30	0.3
20-100	94.0	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 7-8 Feb. 2023

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8. Level linearity including the level range control

At reference level at 5 dB greater than the signal level that first clause an indication of under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
40-130	45	45.1	0.1	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	25.5	0.5	1.1	0.30	0.3
20-100	25	25.6	0.6	1.1	0.30	0.3
20-90	25	25.4	0.4	1.1	0.30	0.3
20-80	25	25.2	0.2	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	200	116.0	0.0	± 1.0	0.20	0.3
	2	98.8	-0.2	+1.0; -2.5	0.20	0.3
	0.25	89.6	-0.4	+1.5; -5.0	0.20	0.3
Slow	200	109.4	-0.2	± 1.0	0.20	0.3
	2	89.7	-0.3	+1.0; -5.0	0.20	0.3
SEL	200	109.9	-0.1	± 1.0	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 7-8 Feb. 2023

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Signature

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 152/0166

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.8	0.4	3.0	0.20	0.35
Positive half cycle	124.4	124.2	-0.2	2.0	0.20	0.35
Negative half cycle	124.4	124.2	-0.2	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
131.1	131.1	0.0	2.0	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	119.0	0.0	0.3	0.10	0.1
End	119.0				

Calibrated by :

Pannasit Ph.

(Mr. Pannasit Phasingri)

Approved by :

Prawate Kluaypa
(Mr. Prawate Kluaypa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 7-8 Feb. 2023

Date of Issue : 13 Feb. 2023

Ref : 2011266011300149018

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL BP. 140/0166

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.
Address : 122 Moo 2 T.Thatoom, A.Srimahaphote, Prachinburi 25140
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre,
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Ambient Environment

Description	: Sound Level Meter	Temperature	: $(23 \pm 3) ^\circ\text{C}$
Manufacturer	: ACO	Relative Humidity	: $(50 \pm 15) \%$
Model	: 6236	Ambient Pressure	: $(101.325 \pm 1.5) \text{ kPa}$
Serial No.	: 212014		
Microphone	: 7052NR No.76235		
Preamplifier	: -		

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 13 Jan. 2023

Date of Calibration : 10 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 140/0166

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 10 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 140/0166

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value(dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
114.00	114.1	114.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 114.0 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
19.9	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	13.4	0.10	N/A
C-Weight	19.0	0.10	N/A
Flat	23.9	0.10	N/A

Date of Calibration : 10 Feb. 2023

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Request No. 21-66/0219

MTC No. EEL. BP. 140/0166

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
125	0.1	-0.1	-0.1	1.5	0.45	0.6
1 000	-0.5	-0.5	-0.5	1.0	0.45	0.6
8 000	0.6	0.6	1.2	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
63	0.3	0.0	0.0	2.0	0.20	0.6
125	0.1	0.0	0.0	1.5	0.20	0.6
250	0.1	0.0	0.0	1.5	0.20	0.6
500	0.1	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.1	0.0	0.0	2.0	0.20	0.6
4 000	-0.4	-0.3	-0.1	3.0	0.20	0.6
8 000	-0.6	-0.6	-0.2	5.0	0.20	0.7

Date of Calibration : 10 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL, BP, 140/0166

5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 10 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 140/0166

7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
120	120.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	83.9	-0.1	1.1	0.30	0.3
79	79.1	0.1	1.1	0.30	0.3
74	74.1	0.1	1.1	0.30	0.3
69	69.1	0.1	1.1	0.30	0.3
64	64.0	0.0	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3
54	54.0	0.0	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	39.0	0.0	1.1	0.30	0.3

Date of Calibration : 10 Feb, 2023

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Request No. 21-66/0219

MTC No. EEL, BP. 140/0166

7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
34	34.1	0.1	1.1	0.30	0.3
33	33.1	0.1	1.1	0.30	0.3
32	32.2	0.2	1.1	0.30	0.3
31	31.2	0.2	1.1	0.30	0.3
30	30.3	0.3	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
40-130	94.0	94.0	0.0	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	94.0	0.0	1.1	0.30	0.3
20-100	94.0	93.9	-0.1	1.1	0.30	0.3

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MTC No. EEL. BP. 140/0166

8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	45	45.0	0.0	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	25.4	0.4	1.1	0.30	0.3
20-100	25	25.3	0.3	1.1	0.30	0.3
20-90	25	25.3	0.3	1.1	0.30	0.3
20-80	25	25.1	0.1	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	115.9	-0.1	±1.0	0.20	0.3
	2	98.3	-0.7	+1.0; -2.5	0.20	0.3
	0.25	89.5	-0.5	+1.5; -5.0	0.20	0.3
Slow	200	109.4	-0.2	±1.0	0.20	0.3
	2	89.8	-0.2	+1.0; -5.0	0.20	0.3
SEL	200	109.9	-0.1	±1.0	0.20	0.3
	2	89.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

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Request No. 21-66/0219

MTC No. EEL. BP. 140/0166

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Complete cycle	125.4	125.8	0.4	3.0	0.20	0.35
Positive half cycle	124.4	124.3	-0.1	2.0	0.20	0.35
Negative half cycle	124.4	124.3	-0.1	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Positive one-half cycle	Negative one-half cycle				
133.0	133.0	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by :


(Mr. Wittawat Supanich)

Approved by :


(Mr. Prapote Klungpa)
Director
TISTR

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 10 Feb. 2023

Date of Issue : 10 Feb. 2023

Ref : 2011266011300149006

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL BP. 138/0166

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.
Address : 122 Moo 2 T.Thatoom, A.Srimahaphote, Prachinburi 25140
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter
Manufacturer : ACO
Model : 6236
Serial No. : 212015
Microphone : 7052NR No.76236
Preamplifier : -

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 13 Jan. 2023

Date of Calibration : 9 Feb. 2023

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9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 9 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 138/0166

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value(dB)	Acceptance limit class 2(\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	Before adjust	After adjust				
114.02	114.4	114.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 113.8 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
19.8	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-Weight	13.2	0.10	N/A
C-Weight	18.6	0.10	N/A
Flat	23.7	0.10	N/A

Date of Calibration : 9 Feb. 2023

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3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (+dB)	Uncertainty (+dB)	Maximum-permitted uncertainty of measurement (+dB)
	A-weight	C-weight	Flat			
125	0.4	0.3	0.3	1.5	0.45	0.6
1 000	-0.8	-0.8	-0.8	1.0	0.45	0.6
8 000	-1.2	-1.2	-0.8	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (+dB)	Uncertainty (+dB)	Maximum-permitted uncertainty of measurement (+dB)
	A-weight	C-weight	Flat			
63	0.1	0.0	0.0	2.0	0.20	0.6
125	0.0	0.0	0.0	1.5	0.20	0.6
250	0.0	0.0	0.0	1.5	0.20	0.6
500	0.0	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.1	0.0	0.0	2.0	0.20	0.6
4 000	-0.4	-0.4	0.0	3.0	0.20	0.6
8 000	-0.6	-0.7	-0.2	5.0	0.20	0.7

Date of Calibration : 9 Feb. 2023

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Request No. 21-66/0219

MTC No. EEL. BP. 138/0166

5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

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7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
120	120.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	83.9	-0.1	1.1	0.30	0.3
79	79.1	0.1	1.1	0.30	0.3
74	74.2	0.2	1.1	0.30	0.3
69	69.1	0.1	1.1	0.30	0.3
64	64.0	0.0	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3
54	54.0	0.0	1.1	0.30	0.3
49	49.1	0.1	1.1	0.30	0.3
44	44.1	0.1	1.1	0.30	0.3
39	39.0	0.0	1.1	0.30	0.3

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7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
34	34.1	0.1	1.1	0.30	0.3
33	33.1	0.1	1.1	0.30	0.3
32	32.1	0.1	1.1	0.30	0.3
31	31.2	0.2	1.1	0.30	0.3
30	30.3	0.3	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
40-130	94.0	93.9	-0.1	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	93.9	-0.1	1.1	0.30	0.3
20-100	94.0	93.9	-0.1	1.1	0.30	0.3

Date of Calibration : 9 Feb. 2023

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Request No. 21-66/0219

MTC No. EEL. BP. 138/0166

8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	45	45.0	0.0	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	25.4	0.4	1.1	0.30	0.3
20-100	25	25.3	0.3	1.1	0.30	0.3
20-90	25	25.1	0.1	1.1	0.30	0.3
20-80	25	25.0	0.0	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	115.9	-0.1	±1.0	0.20	0.3
	2	98.6	-0.4	+1.0; -2.5	0.20	0.3
	0.25	89.2	-0.8	+1.5; -5.0	0.20	0.3
Slow	200	109.5	-0.1	±1.0	0.20	0.3
	2	89.8	-0.2	+1.0; -5.0	0.20	0.3
SEL	200	109.8	-0.2	±1.0	0.20	0.3
	2	89.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

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10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.8	0.4	3.0	0.20	0.35
Positive half cycle	124.4	124.3	-0.1	2.0	0.20	0.35
Negative half cycle	124.4	124.3	-0.1	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
133.0	133.0	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by :


(Mr. Wittawat Supanich)

Approved by :


(Mr. Prawat Kluaypa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 9 Feb. 2023

Date of Issue : 10 Feb. 2023

Ref : 2011266011300149004

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 139/0166

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.
Address : 122 Moo 2 T.Thatoom, A.Srimahaphote, Prachinburi 25140
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre,
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter
Manufacturer : ACO
Model : 6236
Serial No. : 212016
Microphone : 7052NR No.76237
Preamplifier : -

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 13 Jan. 2023

Date of Calibration : 10 Feb. 2023

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9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 10 Feb. 2023

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1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	Before adjust	After adjust				
114.00	114.5	114.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 113.6 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
20.1	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-Weight	13.9	0.10	N/A
C-Weight	18.7	0.10	N/A
Flat	23.6	0.10	N/A

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3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
125	0.1	0.0	-0.1	1.5	0.45	0.6
1 000	-0.9	-0.9	-0.7	1.0	0.45	0.6
8 000	0.4	0.4	0.7	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
63	0.1	0.0	0.0	2.0	0.20	0.6
125	0.1	0.0	0.0	1.5	0.20	0.6
250	0.0	0.0	0.0	1.5	0.20	0.6
500	0.0	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.1	-0.1	0.0	2.0	0.20	0.6
4 000	-0.4	-0.4	-0.1	3.0	0.20	0.6
8 000	-0.6	-0.6	-0.2	5.0	0.20	0.7

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Date of Calibration : 10 Feb. 2023

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5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (+dB)	Uncertainty (+dB)	Maximum-permitted uncertainty of measurement (+dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (+dB)	Uncertainty (+dB)	Maximum-permitted uncertainty of measurement (+dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.1	0.1	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (+dB)	Uncertainty (+dB)	Maximum-permitted uncertainty of measurement (+dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

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7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
120	120.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	113.9	-0.1	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	103.9	-0.1	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	88.9	-0.1	1.1	0.30	0.3
84	83.9	-0.1	1.1	0.30	0.3
79	79.1	0.1	1.1	0.30	0.3
74	74.1	0.1	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	63.9	-0.1	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3
54	53.9	-0.1	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	39.0	0.0	1.1	0.30	0.3

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7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
34	34.0	0.0	1.1	0.30	0.3
33	33.0	0.0	1.1	0.30	0.3
32	32.1	0.1	1.1	0.30	0.3
31	31.1	0.1	1.1	0.30	0.3
30	30.2	0.2	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
40-130	94.0	93.9	-0.1	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	93.9	-0.1	1.1	0.30	0.3
20-100	94.0	93.9	-0.1	1.1	0.30	0.3

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8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(+dB)	Uncertainty (+dB)	Maximum-permitted uncertainty of measurement (+dB)
40-130	45	45.0	0.0	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	25.1	0.1	1.1	0.30	0.3
20-100	25	25.2	0.2	1.1	0.30	0.3
20-90	25	25.2	0.2	1.1	0.30	0.3
20-80	25	25.1	0.1	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(dB)	Uncertainty (+dB)	Maximum-permitted uncertainty of measurement (+dB)
Fast	200	115.8	-0.2	± 1.0	0.20	0.3
	2	98.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	89.8	-0.2	+1.5; -5.0	0.20	0.3
Slow	200	109.5	-0.1	± 1.0	0.20	0.3
	2	89.8	-0.2	+1.0; -5.0	0.20	0.3
SEL	200	110.0	0.0	± 1.0	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 139/0166

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.8	0.4	3.0	0.20	0.35
Positive half cycle	124.4	124.2	-0.2	2.0	0.20	0.35
Negative half cycle	124.4	124.2	-0.2	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
133.0	133.0	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by :


(Mr. Wittawat Supanich)

Approved by :


(Mr. Prawate Kluaypa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 10 Feb. 2023

Date of Issue : 10 Feb. 2023

Ref : 2011266011300149005

End of Certificate

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FM.BL.MTC.002 Rev.4

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 15/0266

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.
Address : 122 Moo 2 T.Thatoom A.Srimahaphote, Prachinburi 25140.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter
Manufacturer : Delta OHM
Model : HD 2010UC
Serial No. : 11040842479
Microphone : Type UC-52 No.114674
Preamplifier : Delta Type HD2010PNE2 No.11001018

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 1 Feb. 2023

Date of Calibration : 20-21 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 15/0266

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 20-21 Feb. 2023

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1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	Before adjust	After adjust				
113.96	114.2	114.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 114.2 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
23.1	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-Weight	19.1	0.10	N/A
C-Weight	27.3	0.10	N/A
Flat	31.1	0.10	N/A

Date of Calibration : 20-21 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 15/0266

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
125	0.3	0.2	0.2	1.5	0.45	0.6
1 000	-0.4	-0.4	-0.4	1.0	0.45	0.6
8 000	-4.5	-3.9	-4.5	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
63	-0.1	-0.2	-0.4	2.0	0.20	0.6
125	0.0	-0.1	-0.1	1.5	0.20	0.6
250	0.0	-0.1	-0.1	1.5	0.20	0.6
500	0.0	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	0.0	0.0	0.1	2.0	0.20	0.6
4 000	0.0	0.1	0.1	3.0	0.20	0.6
8 000	0.0	0.1	0.1	5.0	0.20	0.7

Date of Calibration : 20-21 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL, BP. 15/0266

5. Long-term stability

Time	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	114.0	0.0	0.3	0.10	0.1
End	114.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-weight	114.0	0.0	0.2	0.20	0.2
C-weight	114.0	0.0	0.2	0.20	0.2
Flat	114.0	0.0	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	114.0	0.0	0.1	0.20	0.2
Slow	114.0	0.0	0.1	0.20	0.2
Leq	114.0	0.0	0.1	0.20	0.2

Date of Calibration : 20-21 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 15/0266

7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
120	120.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	64.0	0.0	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3
54	54.0	0.0	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	39.1	0.1	1.1	0.30	0.3

Date of Calibration : 20-21 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 15/0266

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
60-140	114.0	114.0	0.0	1.1	0.30	0.3
50-130	114.0	114.0	0.0	1.1	0.30	0.3
40-120	114.0	114.0	0.0	1.1	0.30	0.3

Date of Calibration : 20-21 Feb. 2023

7/9

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 15/0266

8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
60-140	65	65.2	0.2	1.1	0.30	0.3
50-130	55	55.0	0.0	1.1	0.30	0.3
40-120	45	45.0	0.0	1.1	0.30	0.3
30-110	35	35.1	0.1	1.1	0.30	0.3
20-100	25	25.9	0.9	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	200	115.9	-0.1	± 1.0	0.20	0.3
	2	98.8	-0.2	+1.0; -2.5	0.20	0.3
	0.25	89.6	-0.4	+1.5; -5.0	0.20	0.3
Slow	200	109.4	-0.2	± 1.0	0.20	0.3
	2	89.8	-0.2	+1.0; -5.0	0.20	0.3
SEL	200	109.9	-0.1	± 1.0	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 20-21 Feb, 2023

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FM.BLMTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 15/0266

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Complete cycle	135.4	135.3	-0.1	3.0	0.20	0.35
Positive half cycle	134.4	134.0	-0.4	2.0	0.20	0.35
Negative half cycle	134.4	134.0	-0.4	2.0	0.20	0.35

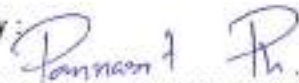
11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Positive one-half cycle	Negative one-half cycle				
141.0	141.0	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	139.0	0.0	0.3	0.10	0.1
End	139.0				

Calibrated by :



(Mr. Pannasit Phasingsri)

Approved by :


(Mr. Prawate Khuaypa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 20-21 Feb. 2023

Date of Issue : 28 Feb. 2023

Ref : 2011266020100453001

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 16/0266

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.

Address : 122 Moo 2 T.Thatoom A.Srimahaphote, Prachinburi 25140.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter

Manufacturer : Delta OHM

Model : HD 2010UC

Serial No. : 11040842480

Microphone : Type UC-52 No.121411

Preamplifier : Delta Type HD2010PNE2 No.11001019

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 1 Feb. 2023

Date of Calibration : 20-21 Feb. 2023

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FM.BLMTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 16/0266

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 20-21 Feb. 2023

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FM.BLMTC.002 Rev.A

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL BP. 16/0266

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	Before adjust	After adjust				
113.96	114.2	114.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 114.2 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
22.6	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-Weight	18.1	0.10	N/A
C-Weight	24.3	0.10	N/A
Flat	27.0	0.10	N/A

Date of Calibration : 20-21 Feb. 2023

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FM.BLMTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 16/0266

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
125	0.3	0.1	0.1	1.5	0.45	0.6
1 000	-0.6	-0.7	-0.7	1.0	0.45	0.6
8 000	-3.9	-4.0	-4.1	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
63	0.0	-0.1	-0.3	2.0	0.20	0.6
125	0.0	0.0	-0.1	1.5	0.20	0.6
250	0.0	0.0	0.0	1.5	0.20	0.6
500	0.0	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	0.0	0.1	0.0	2.0	0.20	0.6
4 000	0.0	0.1	0.0	3.0	0.20	0.6
8 000	0.1	0.1	0.0	5.0	0.20	0.7

Date of Calibration : 20-21 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 16/0266

5. Long-term stability

Time	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	114.0	0.0	0.3	0.10	0.1
End	114.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-weight	114.0	0.0	0.2	0.20	0.2
C-weight	114.0	0.0	0.2	0.20	0.2
Flat	114.0	0.0	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	114.0	0.0	0.1	0.20	0.2
Slow	114.0	0.0	0.1	0.20	0.2
Leq	114.0	0.0	0.1	0.20	0.2

Date of Calibration : 20-21 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL BP. 16/0266

7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
120	120.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	64.0	0.0	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3
54	54.0	0.0	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	39.0	0.0	1.1	0.30	0.3

Date of Calibration : 20-21 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 16/0266

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (+dB)	Uncertainty (+dB)	Maximum-permitted uncertainty of measurement (+dB)
60-140	114.0	114.0	0.0	1.1	0.30	0.3
50-130	114.0	114.0	0.0	1.1	0.30	0.3
30-120	114.0	114.0	0.0	1.1	0.30	0.3

Date of Calibration : 20-21 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL. BP. 16/0266

8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
60-140	65	64.9	-0.1	1.1	0.30	0.3
50-130	55	54.9	-0.1	1.1	0.30	0.3
30-120	45	45.0	0.0	1.1	0.30	0.3
20-110	35	34.9	-0.1	1.1	0.30	0.3
20-100	25	25.8	0.8	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	200	115.8	-0.2	± 1.0	0.20	0.3
	2	98.8	-0.2	+1.0; -2.5	0.20	0.3
	0.25	89.6	-0.4	+1.5; -5.0	0.20	0.3
Slow	200	109.4	-0.2	± 1.0	0.20	0.3
	2	89.8	-0.2	+1.0; -5.0	0.20	0.3
SEL	200	109.9	-0.1	± 1.0	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 20-21 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0268

MTC No. EEL BP. 16/0266

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Complete cycle	135.4	135.3	-0.1	3.0	0.20	0.35
Positive half cycle	134.4	134.0	-0.4	2.0	0.20	0.35
Negative half cycle	134.4	134.0	-0.4	2.0	0.20	0.35

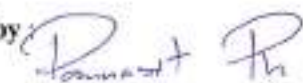
11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Positive one-half cycle	Negative one-half cycle				
141.0	141.0	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	139.0	0.0	0.3	0.10	0.1
End	139.0				

Calibrated by



(Mr. Pannasit Phasingsri)

Approved by :



(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 20-21 Feb. 2023

Date of Issue : 28 Feb. 2023

Ref : 2011266020100453002

End of Certificate

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FM.BLMTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 141/0166

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.
Address : 122 Moo 2 T.Thatoom, A.Srimahaphote, Prachinburi 25140
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter
Manufacturer : Rion
Model : NL-42
Serial No. : 00433730
Microphone : UC-52 No.144953
Preamplifier : NH-24 No.33780

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 13 Jan. 2023

Date of Calibration : 7 Feb. 2023

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FM.BLMTC.002 Rev.4

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 141/0166

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 7 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 141/0166

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value(dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.97	114.1	114.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 113.9 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
17.0	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	12.4	0.10	N/A
C-Weight	17.7	0.10	N/A
Flat	23.1	0.10	N/A

Date of Calibration : 7 Feb. 2023

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PM.BL.MTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 141/0166

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
125	-0.1	0.0	0.0	1.5	0.45	0.6
1 000	0.1	0.1	0.1	1.0	0.45	0.6
8 000	-2.5	-2.5	-2.6	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
63	0.0	0.1	0.1	2.0	0.20	0.6
125	0.0	0.1	0.1	1.5	0.20	0.6
250	0.0	0.1	0.1	1.5	0.20	0.6
500	0.0	0.1	0.1	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.1	-0.1	-0.1	2.0	0.20	0.6
4 000	-0.3	-0.3	-0.2	3.0	0.20	0.6
8 000	0.0	0.0	0.0	5.0	0.20	0.7

Date of Calibration : 7 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 141/0166

5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 7 Feb. 2023

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Request No. 21-66/0219

MTC No. EEL BP. 141/0166

7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
128	128.1	0.1	1.1	0.30	0.3
127	127.1	0.1	1.1	0.30	0.3
126	126.1	0.1	1.1	0.30	0.3
125	125.0	0.0	1.1	0.30	0.3
124	124.0	0.0	1.1	0.30	0.3
119	119.1	0.1	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.1	0.1	1.1	0.30	0.3
74	74.1	0.1	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	64.0	0.0	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3
54	53.9	-0.1	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3

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MTC No. EEL. BP. 141/0166

7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
44	43.9	-0.1	1.1	0.30	0.3
39	39.0	0.0	1.1	0.30	0.3
34	34.0	0.0	1.1	0.30	0.3
29	28.9	-0.1	1.1	0.30	0.3
24	23.9	-0.1	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
80-130	94.0	94.0	0.0	1.1	0.30	0.3
70-120	94.0	94.0	0.0	1.1	0.30	0.3
60-110	94.0	94.0	0.0	1.1	0.30	0.3
50-100	94.0	94.0	0.0	1.1	0.30	0.3

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8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
80-130	85	85.0	0.0	1.1	0.30	0.3
70-120	75	75.0	0.0	1.1	0.30	0.3
60-110	65	65.0	0.0	1.1	0.30	0.3
50-100	55	54.9	-0.1	1.1	0.30	0.3
40-90	45	44.9	-0.1	1.1	0.30	0.3
30-80	35	35.0	0.0	1.1	0.30	0.3
20-70	25	24.9	-0.1	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	116.1	0.1	±1.0	0.20	0.3
	2	99.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	90.0	0.0	+1.5; -5.0	0.20	0.3
Slow	200	109.6	0.0	±1.0	0.20	0.3
	2	90.0	0.0	+1.0; -5.0	0.20	0.3
SEL	200	110.0	0.0	±1.0	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	81.0	0.0	+1.5; -5.0	0.20	0.3

Date of Calibration : 7 Feb. 2023

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10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.3	-0.1	3.0	0.20	0.35
Positive half cycle	124.4	124.1	-0.3	2.0	0.20	0.35
Negative half cycle	124.4	124.1	-0.3	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
136.6	136.6	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by :


(Mr. Wittawat Supanich)

Approved by :


(Mr. Prawate Klaiyapa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 7 Feb. 2023

Date of Issue : 9 Feb. 2023

Ref : 2011266011300149007

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL BP. 143/0166

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.
Address : 122 Moo 2 T.Thatoom, A.Srinahaphote, Prachinburi 25140
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter
Manufacturer : Rion
Model : NL-42
Serial No. : 00646442
Microphone : UC-52 No.153069
Preamplifier : NH-24 No.46656

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 13 Jan. 2023

Date of Calibration : 9 Feb. 2023

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9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 9 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 143/0166

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value(dB)	Acceptance limit class 2(\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	Before adjust	After adjust				
113.97	118.0	114.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 114.3 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
16.7	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-Weight	13.6	0.10	N/A
C-Weight	18.8	0.10	N/A
Flat	24.1	0.10	N/A

Date of Calibration : 9 Feb. 2023

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Request No. 21-66/0219

MTC No. EEL BP. 143/0166

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
125	0.0	0.1	0.1	1.5	0.45	0.6
1 000	0.0	0.0	0.0	1.0	0.45	0.6
8 000	-1.7	-1.7	-1.8	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
	A-weight	C-weight	Flat			
63	0.0	0.1	0.1	2.0	0.20	0.6
125	0.0	0.1	0.1	1.5	0.20	0.6
250	0.0	0.1	0.1	1.5	0.20	0.6
500	0.0	0.1	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.2	-0.1	-0.1	2.0	0.20	0.6
4 000	-0.3	-0.3	-0.3	3.0	0.20	0.6
8 000	0.0	0.0	0.0	5.0	0.20	0.7

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Request No. 21-66/0219

MTC No. EEL. BP. 143/0166

5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 9 Feb. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL BP. 143/0166

7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
128	127.9	-0.1	1.1	0.30	0.3
127	127.0	0.0	1.1	0.30	0.3
126	125.9	-0.1	1.1	0.30	0.3
125	124.9	-0.1	1.1	0.30	0.3
124	123.9	-0.1	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	63.9	-0.1	1.1	0.30	0.3
59	58.9	-0.1	1.1	0.30	0.3
54	53.9	-0.1	1.1	0.30	0.3
49	48.9	-0.1	1.1	0.30	0.3

Date of Calibration : 9 Feb. 2023

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FM&L/MTC.002 Rev.4

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Request No. 21-66/0219

MTC No. EEL. BP. 143/0166

7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
44	43.9	-0.1	1.1	0.30	0.3
39	38.9	-0.1	1.1	0.30	0.3
34	33.9	-0.1	1.1	0.30	0.3
29	28.9	-0.1	1.1	0.30	0.3
24	23.9	-0.1	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
80-130	94.0	94.0	0.0	1.1	0.30	0.3
70-120	94.0	94.0	0.0	1.1	0.30	0.3
60-110	94.0	94.0	0.0	1.1	0.30	0.3
50-100	94.0	94.0	0.0	1.1	0.30	0.3

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Request No. 21-66/0219

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8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
80-130	85	85.0	0.0	1.1	0.30	0.3
70-120	75	75.0	0.0	1.1	0.30	0.3
60-110	65	65.0	0.0	1.1	0.30	0.3
50-100	55	54.9	-0.1	1.1	0.30	0.3
40-90	45	44.9	-0.1	1.1	0.30	0.3
30-80	35	35.0	0.0	1.1	0.30	0.3
20-70	25	25.0	0.0	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	116.0	0.0	±1.0	0.20	0.3
	2	99.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	89.9	-0.1	+1.5; -5.0	0.20	0.3
Slow	200	109.5	-0.1	±1.0	0.20	0.3
	2	89.9	-0.1	+1.0; -5.0	0.20	0.3
SEL	200	110.0	0.0	±1.0	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

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Request No. 21-66/0219

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10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.3	-0.1	3.0	0.20	0.35
Positive half cycle	124.4	124.1	-0.3	2.0	0.20	0.35
Negative half cycle	124.4	124.1	-0.3	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
136.5	136.5	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by :


(Mr. Wittawat Supanich)

Approved by :


(Mr. Prawate Kluaypa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 9 Feb. 2023

Date of Issue : 9 Feb. 2023

Ref : 2011266011300149009

End of Certificate

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Request No. 21-66/0219

MTC No. EEL. BP. 142/0166

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.
Address : 122 Moo 2 T.Thatoon, A.Srinahaphote, Prachinburi 25140
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre,
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Ambient Environment

Description	: Sound Level Meter	Temperature	: $(23 \pm 3) ^\circ\text{C}$
Manufacturer	: Rion	Relative Humidity	: $(50 \pm 15) \%$
Model	: NL-42	Ambient Pressure	: $(101.325 \pm 1.5) \text{ kPa}$
Serial No.	: 01022362		
Microphone	: UC-52 No.142301		
Preamplifier	: NH-24 No.22410		

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 13 Jan. 2023

Date of Calibration : 9 Feb. 2023

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MTC No. EEL. BP. 142/0166

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 9 Feb. 2023

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1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value(dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.97	114.1	114.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 114.0 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
16.5	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	13.2	0.10	N/A
C-Weight	18.6	0.10	N/A
Flat	24.0	0.10	N/A

Date of Calibration : 9 Feb. 2023

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Request No. 21-66/0219

MTC No. EEL, BP, 142/0166

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	0.0	0.0	-0.1	1.5	0.45	0.6
1 000	-0.1	0.0	0.0	1.0	0.45	0.6
8 000	-3.7	-3.8	-3.8	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	0.0	0.0	0.0	2.0	0.20	0.6
125	0.0	0.1	0.1	1.5	0.20	0.6
250	0.0	0.1	0.1	1.5	0.20	0.6
500	0.0	0.1	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.1	-0.1	-0.1	2.0	0.20	0.6
4 000	-0.4	-0.3	-0.3	3.0	0.20	0.6
8 000	0.0	-0.1	-0.1	5.0	0.20	0.7

Date of Calibration : 9 Feb. 2023

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5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

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7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
128	128.1	0.1	1.1	0.30	0.3
127	127.1	0.1	1.1	0.30	0.3
126	126.1	0.1	1.1	0.30	0.3
125	125.1	0.1	1.1	0.30	0.3
124	124.0	0.0	1.1	0.30	0.3
119	119.1	0.1	1.1	0.30	0.3
114	114.1	0.1	1.1	0.30	0.3
109	109.1	0.1	1.1	0.30	0.3
104	104.1	0.1	1.1	0.30	0.3
99	99.1	0.1	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
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79	79.1	0.1	1.1	0.30	0.3
74	74.1	0.1	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	64.0	0.0	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3
54	54.0	0.0	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3

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MTC No. EEL BP. 142/0166

7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
44	44.0	0.0	1.1	0.30	0.3
39	39.0	0.0	1.1	0.30	0.3
34	34.0	0.0	1.1	0.30	0.3
29	29.0	0.0	1.1	0.30	0.3
24	24.0	0.0	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
80-130	94.0	94.0	0.0	1.1	0.30	0.3
70-120	94.0	94.0	0.0	1.1	0.30	0.3
60-110	94.0	94.0	0.0	1.1	0.30	0.3
50-100	94.0	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 9 Feb. 2023

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Amphoe Muang, Changwat Samutprakan 10280, Thailand
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E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 142/0166

8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
80-130	85	85.0	0.0	1.1	0.30	0.3
70-120	75	75.0	0.0	1.1	0.30	0.3
60-110	65	65.0	0.0	1.1	0.30	0.3
50-100	55	55.0	0.0	1.1	0.30	0.3
40-90	45	45.0	0.0	1.1	0.30	0.3
30-80	35	35.0	0.0	1.1	0.30	0.3
20-70	25	25.0	0.0	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	116.0	0.0	±1.0	0.20	0.3
	2	98.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	89.9	-0.1	+1.5; -5.0	0.20	0.3
Slow	200	109.5	-0.1	±1.0	0.20	0.3
	2	90.0	0.0	+1.0; -5.0	0.20	0.3
SEL	200	110.0	0.0	±1.0	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 9 Feb. 2023

8 / 9

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 142/0166

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Complete cycle	125.4	125.3	-0.1	3.0	0.20	0.35
Positive half cycle	124.4	124.2	-0.2	2.0	0.20	0.35
Negative half cycle	124.4	124.2	-0.2	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Positive one-half cycle	Negative one-half cycle				
136.6	136.6	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by :


(Mr. Wittawat Supanich)

Approved by :


(Mr. Prawate Klueypa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 9 Feb. 2023

Date of Issue : 9 Feb. 2023

Ref : 2011266011300149008

End of Certificate

9 / 9

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FM.BLMTC.002 Rev.4

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E-mail : sumalee@tistr.or.th

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer:	BANGKOK INDUSTRIAL GAS CO LTD	Customer PO Number: 5222002512
Part Number:	E02NI99E15AC255	Reference Number: 160-402443704-1
Cylinder Number:	EB0152519	Cylinder Volume: 144.0 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure: 2015 PSIG
PGVP Number:	A12022	Valve Outlet: 330
Gas Code:	H2S,BALN	Certification Date: May 31, 2022

Expiration Date: May 31, 2025

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

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

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
HYDROGEN SULFIDE	50.00 PPM	49.58 PPM	G1	+/- 2.0% NIST Traceable	05/23/2022, 05/31/2022
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMS	122401193440103	CC215634	49.62 PPM HYDROGEN SULFIDE/NITROGEN	+/-0.7%	Jul 15, 2023
RGM	12338	CC162437	49.14 PPM HYDROGEN SULFIDE/NITROGEN	+/-0.7%	Jan 25, 2021

The SRM, PRM or RGM noted 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
AAI-QMA408-AA210275	NDUV	May 04, 2022

Triad Data Available Upon Request

PERMANENT NOTES: PRODUCED IN ACCORDANCE WITH ISO17025 REQUIREMENTS

K=2 95% UNCERTAINTY

NOTES: PRODUCED IN ACCORDANCE WITH ISO17025 REQUIREMENTS

K=2 95% UNCERTAINTY

PO# 5222002512

NET WEIGHT 4.74 Kgs

GROSS WEIGHT 28.5 Kgs



Riley AM - 2
Approved for Release



CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI99E80A0020	Reference Number:	82-401285019-1
Cylinder Number:	LL193324	Cylinder Volume:	83.4 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2215 PSIG
PGVP Number:	B52018	Valve Outlet:	660
Gas Code:	NO,NOX,SO2,BALN	Certification Date:	Sep 05, 2018

Expiration Date: Sep 05, 2026

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

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

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	50.00 PPM	50.71 PPM	G1	+/- 1.4% NIST Traceable	08/27/2018, 09/05/2018
NITRIC OXIDE	50.00 PPM	50.67 PPM	G1	+/- 1.4% NIST Traceable	08/27/2018, 09/05/2018
SULFUR DIOXIDE	50.00 PPM	50.54 PPM	G1	+/- 1.0% NIST Traceable	08/27/2018, 09/05/2018
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	16080625	CC442585	50.42 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Jun 27, 2020
PRM	12368	5604119	29.85 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Jun 02, 2017
GMIS	7042010104	CC503941	5.101 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Jun 01, 2020
NTRM	14010327	KAL004376	49.08 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Apr 17, 2024

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

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 APW1100391 NO	FTIR	Aug 09, 2018
Nicolet 6700 APW1100391 NO2	FTIR	Aug 31, 2018
Nicolet 6700 APW1100391 SO2	FTIR	Aug 30, 2018

Triad Data Available Upon Request

NOTES: PO# 5218003935

Net weight: 2736 grams

Gross weight: 17393 grams

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2008 and relate only to items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 3082.05

Approved for Release



Certificate of Calibration

Certificate Number : MB1-1843-2022
Equipment : Electronic Balance
Manufacturer : Sartorius
Model : BSA224S-CW
Serial Number : 31591470
ID Number : N/A
Max Capacity : 220 (g)
Resolution : 0.0001 (g)

Page 1 of 2 Pages

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS M3003 requirements. This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI). This Certificate may not be reproduced other than in full except with the prior written approval of Calibration Center, Intro TSC Co., Ltd.

Customer Reference : L087
Customer : INTEGRATED RESEARCH CENTER CO.,LTD.
CSRS No.: CSRS19851022
122 Moo 2, T. Thatoom,
Date of Receipt : 28-Oct-22
A. Srimahaphote, Prachinburi 25140
Date of Calibration : 31-Oct-22
Location : WATER LAP IP-1

Condition of this result of calibration

1. Reference Standard instruments :

Instruments	Model	Serial No.	Certificate No.	Due Date
Weight set (1 mg to 200 g)	Class E2	K-1871/20	10468/3149/20	22-Nov-22

2. This Certification is traceable to the International System of Unit maintained at : -

- National Institute of Metrology (Thailand)

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

Method : Measurement In-house Method Calibration Procedure No. CP-CL-43 base on UKAS Publication Ref : Lab 14 : 2019

Environmental Conditions :

Temperature : (30 ± 10) °C

Humidity : (50 ± 20) %

Air Pressure : (1010 ± 10) mbar

Calibrated By : Mr. Lek Intasen

Approved Signatory :

Date of Issued : 3-Nov-22

Ms. Nathee Keamchaiyaphoom

FM-CL-11-05



Certificate Number : MB1-1843-2022

Page 2 of 2 Pages

Calibration Result (Weight) : Without Adjustment

1. Repeatability of Reading

Nominal Value (g)	Standard Deviation (g)	Maximum diff. Between successive (g)
200	0.00000	0.0000

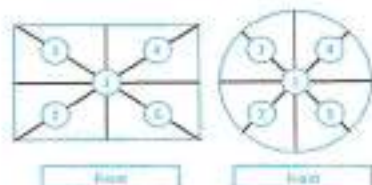
2. Error of indication from nominal value

Nominal Value (g)	Balance Reading (g)	Correction Value (g)	Uncertainty (±) (g)	factor k	Balance Reading Before Adjust (g)
Unload	0.0000	0.0000	0.000084	2.00	-
20	20.0000	0.0000	0.00010	2.00	-
40	40.0000	0.0000	0.00013	2.00	-
60	60.0000	0.0000	0.00021	2.00	-
80	80.0000	0.0000	0.00021	2.00	-
100	100.0000	0.0000	0.00022	2.00	-
120	120.0000	0.0000	0.00040	2.00	-
140	140.0000	0.0000	0.00040	2.00	-
160	160.0000	0.0000	0.00040	2.00	-
180	180.0000	0.0000	0.00040	2.00	-
200	200.0000	0.0000	0.00040	2.00	-

3. Eccentric or off-center loading

Nominal Value (g)	Reference Position				
	Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)
100	100.0000	100.0000	100.0000	100.0000	100.0000

Eccentric Error = 0.0000 (g)



End of report

Nath



INTRO TSC Company Limited

Calibration Center Measuring and Testing Instrument

46/155 Nualchan Rd., Nualchan, Bungkum, Bangkok 10230, Thailand
Tel : +66-2363-4417-21 Fax : +66-2363-4427 E-mail : info@intro.co.th



Certificate of Calibration

Certificate Number : MB1-1844-2022

Page 1 of 2 Pages

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : ME36S

Serial Number : 27206085

ID Number : N/A

Max Capacity : 31000 (mg)

Resolution : 0.001 (mg)

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS M3003 requirements. This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI). This Certificate may not be reproduced other than in full except with the prior written approval of Calibration Center, Intro TSC Co., Ltd.

Customer Reference : L087

Customer : INTEGRATED RESEARCH CENTER CO.,LTD.

CSRS No.: CSRS19851022

122 Moo 2, T. Thatoom,

Date of Receipt : 28-Oct-22

A. Srimahaphote, Prachinburi 25140

Date of Calibration : 31-Oct-22

Location : WATER LAB IP-1

Condition of this result of calibration

1. Reference Standard instruments :

Instruments	Model	Serial No.	Certificate No.	Due Date
Weight set (1 mg to 200 g)	Class E2	K-1871/20	10468/3149/20	22-Nov-22

2. This Certification is traceable to the International System of Unit maintained at : -

- National Institute of Metrology (Thailand)

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

Method : Measurement In-house Method Calibration Procedure No. CP-CL-43 base on UKAS Publication Ref : Lab 14 : 2019

Environmental Conditions :

Temperature : (30 ± 10) °C

Humidity : (50 ± 20) %

Air Pressure : (1010 ± 10) mbar

Calibrated By : Mr. Lek Intasen

Approved Signatory :

Date of Issued : 3-Nov-22

Ms. Nathee Kearmchaiyaphoom

FM-CL-11-05



INTRO TSC Company Limited

Calibration Center Measuring and Testing Instrument

46/155 Nualchan Rd., Nualchan, Bungkum, Bangkok 10230, Thailand

Tel : +66-2363-4417-21 Fax : +66-2363-4427 E-mail : info@intro.co.th

Certificate Number : MB1-1844-2022

Page 2 of 2 Pages

Calibration Result (Weight) : Without Adjustment

1. Repeatability of Reading

Nominal Value (mg)	Standard Deviation (mg)	Maximum diff. Between successive (mg)
30000	0.0008	0.002

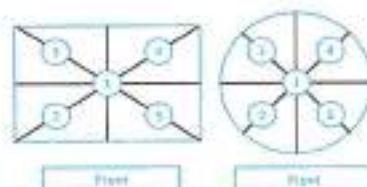
2. Error of indication from nominal value

Nominal Value (mg)	Balance Reading (mg)	Correction Value (mg)	Uncertainty (±) (mg)	factor <i>k</i>	Balance Reading Before Adjust (mg)
Unload	0.000	0.000	0.00084	2.00	-
3000	3000.003	-0.003	0.028	2.00	-
6000	6000.007	-0.007	0.040	2.00	-
9000	9000.016	-0.016	0.043	2.00	-
12000	11999.984	0.016	0.10	2.00	-
15000	14999.976	0.024	0.10	2.00	-
18000	17999.967	0.033	0.10	2.00	-
21000	20999.953	0.047	0.13	2.00	-
24000	23999.943	0.057	0.13	2.00	-
27000	26999.938	0.062	0.13	2.00	-
30000	29999.922	0.078	0.13	2.00	-

3. Eccentric or off-center loading

Nominal Value (mg)	Reference Position				
	Position 1 (mg)	Position 2 (mg)	Position 3 (mg)	Position 4 (mg)	Position 5 (mg)
10000	9999.997	9999.998	9999.988	9999.983	9999.988

Eccentric Error = 0.014 (mg)



End of report

Math

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-66/0173

MTC.No.23-66/0173

Number of page(s) 2

CALIBRATION CERTIFICATE

Nomenclature : DRYCAL FLOWMETER

Manufacturer : Bios International Corporation, USA

Serial No.: 120879

Model : Defender 510 M

Scale range : 50 ml/min to 5000 ml/min

Subdivision : (0.00001, 0.0001, 0.001) l/min

Submitted by : INTEGRATED RESEARCH CENTER COMPANY LIMITED.

122 T.Thatoom A.Srimahaphote,

Prachinburi 25140, Thailand.

Received date : 13 January 2023

Condition of measured item : Normal

Calibration date : 19 January 2023

Standard :

Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 643/65	1-Jun-24	TISTR
Molbox/Pressure Transducer/UpStream	MP-0013-21	25-Jan-23	NIMT
Primary Flow Calibrator S/N 117982	MW-0011-21	8-Apr-23	NIMT
Primary Flow Calibrator S/N 119521	MW-0012-21	31-Mar-23	NIMT

Calibrated by : 

(Mr.Terasak Panna)

Approved by : 

(Ms.Kirana Luanghirun)

Director

Mechanical Engineering Standards Laboratory

Ref. 2013266011300154001

Issued Date 19 January 2023

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Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-66/0173

2/2

MTC.No.23-66/0173

Calibration point : (0.05, 0.5, 1, 1.5, 2) l/min

Ambient condition : Temperature (23 ± 3) °C , Relative humidity (55 ± 15) %

Atmospheric pressure (1010 ± 13) hPa

Calibration method : The flowmeter (UUC) was calibrated by comparison method with standard flowmeter according to CP-370.01.

The reported value is the value that converted to value at reference condition within pressure and temperature of the actual gas entering the UUC

Measurement data :

UUC Value (l/min)	Standard Value (l/min)	Temperature (°C)	Pressure (hPa)	Deviation (%)	Uncertainty (%)
0.05655	0.055399	24.624	1006.36	+2.08	1.00
0.51386	0.50293	24.659	1006.60	+2.17	0.99
1.0232	1.0974	24.616	1006.84	-6.76	0.86
1.5371	1.5037	24.608	1007.10	+2.22	0.86
2.0531	2.0096	24.591	1007.36	+2.17	0.86

The reported expanded uncertainties are based on standard uncertainties multiplied by a coverage factor $k=2$, which provides a level of confidence of approximately 95%.

The end of calibration certificate.

78

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Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

Request No. 22-66 / 0256

MTC No. PSL-H 0112 / 66

Certificate of Calibration

Customer : Integrated Research Center Company Limited
122, T.Thatoom, A.Srimahaphote, Prachinburi, 25140

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : HD32.2

Serial Number : 10027484

Manufacturer : Delta OHM

Date of Request : 24 January 2023

Date of Calibration : 6 February 2023

The certifies the above equipment was calibrated in accordance with the recognised International Standard ISO/IEC 17025:2017 and the operation according to procedure no. WI.CP.18.

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

Calibrated by :



(Ms. Panit Thummasri)

Approved by :



(Mr. Kamchai Singhapiwat)

Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012266012400292002

Issued Date : 13 February 2023

Page 1 of 4

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FM.BL.MTC.002 Rev.4

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Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

Request No. 22-66 / 0256

MTC No. PSL-H 0112 / 66

Description of Unit Under Calibration :

Customer : Integrated Research Center Company Limited
Address : 122, T.Thatoom, A.Srimahaphote, Prachinburi, 25140
Item : Thermo-Hygrometer (Thermal Environment Monitor)
Serial Number : 10027484
Calibration Required : Temperature at (20, 30, 40) °C
Ambient Condition : Ambient temperature (23 ± 3) °C
Relative humidity (55 ± 20) %
Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 0786/65.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WI.CP.18.

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9141-5110, S/N : 1205101

Adjustments : NONE

Head Office

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E-mail : sumalee@tistr.or.th

Request No. 22-66 / 0256

MTC No. PSL-H 0112 / 66

Results of Calibration :- (/) Without Adjustment () After Adjustment

Table : Temperature Measurement @ Wet Bulb (Tn)

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
20.1	20.1	0.0	0.50
30.0	29.8	0.2	0.50
39.9	39.7	0.2	0.50

Table : Temperature Measurement @ Dry Bulb (T)

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
20.1	20.2	-0.1	0.50
30.0	29.7	0.3	0.50
39.9	39.5	0.4	0.50

Head Office

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E-mail : sumalee@tistr.or.th

Request No. 22-66 / 0256

MTC No. PSL-H 0112 / 66

Results of Calibration :-

Table : Temperature Measurement @ Globe Bulb (Tg)

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
20.1	20.5	-0.4	0.50
30.0	30.0	0.0	0.50
39.9	39.8	0.1	0.50

- Note :**
1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
 2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

Head Office

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Request No. 22-66 / 0256

MTC No. PSL-H 0111 / 66

Certificate of Calibration

Customer : Integrated Research Center Company Limited
122, T.Thatoom, A.Srimahaphote, Prachinburi, 25140

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : HD32.2

Serial Number : 10027485

Manufacturer : Delta OHM


Date of Request : 24 January 2023

Date of Calibration : 6 February 2023

The certifies the above equipment was calibrated in accordance with the recognised International Standard ISO/IEC 17025:2017 and the operation according to procedure no. WI.CP.18.

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

Calibrated by :



(Ms. Panit Thummasri)

Approved by :



(Mr. Kamchai Singhapiwat)
Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012266012400292001

Issued Date : 13 February 2023

Page 1 of 4

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Request No. 22-66 / 0256

MTC No. PSL-H 0111 / 66

Description of Unit Under Calibration :

Customer : Integrated Research Center Company Limited
Address : 122, T.Thatoom, A.Srimahaphote, Prachinburi, 25140
Item : Thermo-Hygrometer (Thermal Environment Monitor)
Serial Number : 10027485
Calibration Required : Temperature at (20, 30, 40) °C
Ambient Condition : Ambient temperature (23 ± 3) °C
Relative humidity (55 ± 20) %
Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 0786/65.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WLCP.18.

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9141-5110, S/N : 1205101

Adjustments : NONE

Request No. 22-66 / 0256

MTC No. PSL-H 0111 / 66

Results of Calibration :- (/) Without Adjustment () After Adjustment

Table : Temperature Measurement @ Wet Bulb (T_w)

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
20.1	20.1	0.0	0.50
30.0	29.7	0.3	0.50
39.9	39.6	0.3	0.50

Table : Temperature Measurement @ Dry Bulb (T)

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
20.1	20.1	0.0	0.50
30.0	29.5	0.5	0.50
39.9	39.4	0.5	0.50

Request No. 22-66 / 0256

MTC No. PSL-H 0111 / 66

Results of Calibration :-

Table : Temperature Measurement @ Globe Bulb (Tg)

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
20.1	20.3	-0.2	0.50
30.0	29.8	0.2	0.50
39.9	39.6	0.3	0.50

- Note :**
1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
 2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

Request No. 22-66 / 0256

MTC No. PSL-H 0113 / 66

Certificate of Calibration

Customer : Integrated Research Center Company Limited
122, T.Thatoon, A.Srimahaphote, Prachinburi, 25140

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : HD32.2

Serial Number : 10027486

Manufacturer : Delta OHM

Date of Request : 24 January 2023

Date of Calibration : 6 February 2023

The certifies the above equipment was calibrated in accordance with the recognised International Standard ISO/IEC 17025:2017 and the operation according to procedure no. WI.CP.18.

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

Calibrated by :



(Ms. Panit Thummasri)

Approved by :



(Mr. Kamchai Singhapiwat)

Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012266012400292003

Issued Date : 13 February 2023

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Request No. 22-66 / 0256

MTC No. PSL-H 0113 / 66

Description of Unit Under Calibration :

Customer : Integrated Research Center Company Limited
Address : 122, T.Thatoom, A.Srimahaphote, Prachinburi, 25140
Item : Thermo-Hygrometer (Thermal Environment Monitor)
Serial Number : 10027486
Calibration Required : Temperature at (20, 30, 40) °C
Ambient Condition : Ambient temperature $(23 \pm 3) ^\circ\text{C}$
Relative humidity $(55 \pm 20) \%$
Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 0786/65.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WLCP.18.

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9141-5110, S/N : 1205101

Adjustments : NONE

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Request No. 22-66 / 0256

MTC No. PSL-H 0113 / 66

Results of Calibration :- (/) Without Adjustment () After Adjustment

Table : Temperature Measurement @ Wet Bulb (T_w)

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
20.1	20.0	0.1	0.50
30.0	29.8	0.2	0.50
39.9	39.7	0.2	0.50

Table : Temperature Measurement @ Dry Bulb (T)

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
20.1	20.1	0.0	0.50
30.0	29.9	0.1	0.50
39.9	39.8	0.1	0.50

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Request No. 22-66 / 0256

MTC No. PSL-H 0113 / 66

Results of Calibration :-

Table : Temperature Measurement @ Globe Bulb (Tg)

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
20.1	20.2	-0.1	0.50
30.0	29.8	0.2	0.50
39.9	39.6	0.3	0.50

Note :

1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

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Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Flow measurement laboratory
Calibration services department.



CERTIFICATE OF CALIBRATION

Certificate No. : CL-008-66

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : TISCH
MODEL/TYPE : TE-5028A
SERIAL NUMBER : 2926
ID NUMBER : -
CONDITION AS-RECEIVED : Used item
CUSTOMER : Integrated Research Center Company Limited.
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140,
Thailand.

RECEIVED DATE : 20 Mar 2023
MEASUREMENT DATE : 24 Apr 2023
ISSUE DATE : 24 Apr 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 24.4 °C and 51.3%RH.

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/IMC/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 VSL (National Metrology Institute of Netherlands) via Certificate number: G2211901

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'

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

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^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	γ	Standard Flow [Q_s] m^3/min
1	0.705	758.329	24.44	23.77	50.462	1.122	1.059	0.659
2	1.001	758.356	24.29	23.90	36.610	2.376	1.542	0.954
3	1.117	758.415	24.01	23.47	31.484	3.004	1.734	1.074
4	1.166	758.484	23.86	23.34	29.640	3.290	1.815	1.124
5	1.418	758.544	23.98	23.51	18.777	5.030	2.245	1.387

Slope (m): 1.62707
 Intercept (b): -0.01273
 Correlation coefficient (r): 0.99981
 Uncertainty ($k=2$): 0.015 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	γ	Standard Flow [Q_s] m^3/min
1	0.705	758.329	24.44	23.77	50.462	1.122	0.664	0.659
2	1.001	758.356	24.29	23.90	36.610	2.376	0.965	0.954
3	1.117	758.415	24.01	23.47	31.484	3.004	1.085	1.073
4	1.166	758.484	23.86	23.34	29.640	3.290	1.135	1.122
5	1.418	758.544	23.98	23.51	18.777	5.030	1.404	1.385

Slope (m): 1.01912
 Intercept (b): -0.00799
 Correlation coefficient (r): 0.99981
 Uncertainty ($k=2$): 0.015 m^3/min

End of Certificate of Calibration



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 135/0166

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.

Address : 122 Moo 2 T.Thatoom A.Srimahaphote Prachinburi 25140.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 100012

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Keithley 2015-P S/N 4106495.
 7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 13 Jan. 2023

Date of Calibration : 18 Jan. 2023

1/2 ✓

The results relate only to the items tested/calibrated or value assigned.

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 135/0166

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

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0°C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.92	-0.08	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	± 1.5	$\pm 1.0\%$

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	2.15	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Klaiyapa)

Director
TISTR

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 18 Jan. 2023

Date of Issue : 19 Jan. 2023

Ref : 2011266011300149001

End of Certificate

2 / 2

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 137/0166

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited

Address : 122 Moo 2 T.Thatoom A.Srimahaphote Prachinburi 25140.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre,
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : Delta Ohm

Model : HD9102

Serial No. : 10038483

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N 4106495.
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 13 Jan. 2023

Date of Calibration : 18 Jan. 2023

1/3
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FM.BLMTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL BP. 137/0166

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

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0°C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Brüel&Kjaer 4180	93.99	-0.01	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Brüel&Kjaer 4180	988.7	-11.3	± 1.5	$\pm 2.0\%$

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Brüel&Kjaer 4180	1.02	± 0.60	$\pm 4.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Date of Calibration : 18 Jan. 2023

2 / 3 ✓

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 137/0166

Nominal Output of Unit Under Test = 114 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0 °C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	113.96	-0.04	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	988.7	-11.3	± 1.5	$\pm 2.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	0.32	± 0.60	$\pm 4.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Klunypa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 18 Jan. 2023

Date of Issue : 19 Jan. 2023

Ref : 2011266011300149003

End of Certificate

3 / 3

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL. BP. 136/0166

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.
Address : 122 Moo 2 T.Thatoom A.Srimahaphote Prachinburi 25140.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator
Manufacturer : Rion
Model : NC-74
Serial No. : 35046798

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N 4106495.
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 13 Jan. 2023

Date of Calibration : 18 Jan. 2023

1/2 ✓

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0219

MTC No. EEL, BP. 136/0166

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

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.98	-0.02	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1001.5	1.5	± 1.5	$\pm 1.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.00	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was included at level of 0.16 dB from manual.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)
Director
TISTR

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 18 Jan. 2023

Date of Issue : 19 Jan. 2023

Ref : 2011266011300149002

End of Certificate

2 / 2

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บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

List of Instruments Certification for Water Wastewater and Sludge Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipments.									
1	Inductively Coupled Plasma-Optical Emission Spectrometer (ICP-OES)	Heavy Metals : Na, SAR, Hg, Fe, Mg, As, Ba, Cd, Pb, Ag, Cr, Se	Agilent Technologies	System ID:G8015A G8015AA / MY18030001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	30 Nov 22	29 Nov 23	-
2	Atomic Absorption Spectrometer (AAS)		Agilent Technologies	System ID:G8015A G8015AA / MY18030001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	30 Nov 22	29 Nov 23	-
3	UV-VIS Spectrophotometer	Phenol, Sulphate, Color (ADMI) Nitrate -Nitrogen , Ammonia-Nitrogen Fluoride Cyanide Total Phosphate Turbidity	Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	SP23-021	20 May 23	18 May 24	-
4	UV-VIS Spectrophotometer		Hitachi	U-1900 / 2021-064	DQE Services Co.,Ltd.	SP23-007	6 Jan 23	5 Jan 24	-
5	UV-VIS Spectrophotometer		Hitachi	U-2900 / 21E22-009	DQE Services Co.,Ltd.	SP23-008	6 Jan 23	5 Jan 24	-
6	pH Meter		Mettler-Toledo	Seven Easy S20 / 1230525212	National Food Institute, Ministry of Industry, Thailand	2302181-001-01	24 Mar 23	22 Mar 24	-
7	Conductivity Meter	Conductivity	SI Analytics	Lab955 / 16300356	DKSH Technology Limited	C24230059	16 Mar 23	14 Mar 24	-
8	Analytical Balance (Repeatability 0.01 mg)	Total Solids	Mettler-Toledo	XSR205DU / C009071872	Technology Promotion Association (Thailand-Japan)	23MM112	26 Apr 23	24 Apr 24	-
9	Hot Air Oven	Total Solids	Memmert	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	23TM373	11 Apr 23	9 Apr 24	-
10	Digester Unit	Nitrate -Nitrogen , Ammonia-Nitrogen	FOSS TECATOR	2520auto / 91794469	National Food Institute, Ministry of Industry, Thailand	2302413-001-01	30 Mar 23	28 Mar 24	-
11	Distillation Unit (Kjeldahl Method)	Total Kjeldahl Nitrogen (TKN) Ammonia	FOSS TECATOR	KT8100 / 91889052	FOSS South East Asia	6623	25 Jul 22	24 Jul 23	-
12	Incubator	Fecal Coliform Bacteria, E.Coli, Total Coliform Bacteria	Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	23TM728	27 Apr 23	25 Apr 24	-
13	Incubator	Fecal Coliform Bacteria, E.Coli, Total Coliform Bacteria	Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	23TM378	12 Apr 23	10 Apr 24	-
14	Water Bath	Fecal Coliform Bacteria, E.Coli, Total Coliform Bacteria	Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	23TM193	15 Feb 23	14 Feb 24	-

List of Instruments Certification for Water Wastewater and Sludge Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipments.									
15	Water Bath	Fecal Coliform Bacteria, E.Coli, Total Coliform Bacteria	Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	23TM194	15 Feb 23	14 Feb 24	-
16	Analytical Balance	Fecal Coliform Bacteria, E.Coli, Total Coliform Bacteria	OHAUS	PX623 / C236754745	DKSH (Thailand) Ltd.	C01223732	9 Dec 22	8 Dec 23	-
17	Auto Clave	Fecal Coliform Bacteria, E.Coli, Total Coliform Bacteria	ALP	CL-40L / 810010	SPC Calibration Center	C11230106	9 Jun 23	7 Jun 24	-
18	Auto Clave	Fecal Coliform Bacteria, E.Coli, Total Coliform Bacteria	Memmert	CL-40L / 808763	Technology Promotion Association (Thailand-Japan)	23TM763	27 Apr 23	25 Apr 24	-

Due Date of Calibration* : กำหนดตามแผนการสอบเทียบประจำปี อย่างน้อยปีละ 1 ครั้ง

Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended services for your analytical systems to ensure 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.

For more information about Agilent Technologies services please visit our web site using the following URL: <http://www.agilent.com/service/analytical-instrument-services>

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- For customers using ICP applications, the instrument should be returned to its standard sample introduction system.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts not included in the Parts List 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 additional or special procedures and/or parts for the instrument service, then these must be ordered separately and charged as a repair, which may incur additional

Service Engineer's Responsibilities

- Thoroughly complete/pretest pages that relate to the system being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checklists in the checklist using a "X" or tick mark "✓" in the checklist.
- Complete the Applicable check boxes to indicate services not delivered, as needed.
- Complete the PM service in the order of the items listed.
- Complete the Service Review section together with the customer.

Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

System Information

Instrument system name and ID	ICP 5110 5100
Instrument system site and location	ภาค 1 จังหวัด เชียงใหม่
List system component product numbers List the serial numbers of each component	
1. 5100-001	1. 5100-001
2. 5100-002	2. 5100-002
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

ICP-OES Configuration table	Circle the type or initial in the type if other
Injection Type	Indirect (Gas Neb) other
Sample Chamber	Cyclonic Single Pass (Cyclonic Double Pass) other
View	Radial (Dual View) other
Injection Diameter	3.0mm (3.0mm) 1.0mm (3.0mm) other
Injection Material	Quartz (Ceramic) other

Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

General Preparation

- Discuss any specific questions or issues with the customer prior to starting.
- Review the instrument logbook.
- Perform general external inspection of system for cleanliness.
- Check for proper installation of safety-related parts, assemblies, sensors, etc.
- Check for required firmware/software updates and verify with customers if they would like it installed.
- For ICP application systems, if standard sample introduction system was not installed, ask the customer to install it.
- Run Instrument Performance test and record results in Instrument Performance Test Results Table - Pre PM.

Inspect and clean the system

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

GB481A Cooling water system

- Section NOT Applicable
- Drain cooling fluid and remove any particles from the drain reservoir.
- Remove, clean and reinstall water inlet mesh filter.
- Re-fill with Polyborine cooling fluid.
- Clean the cooling system Air filter and the condenser by compressed air or vacuum cleaner.

Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

SPS 8 Auto Sampler

- Section NOT Applicable
- Power cycle the autosampler and verify successful installation.
- Inspect X and Z axis belts for wear. Replace if necessary.
- Clean X and Z axis slide tracks.
- Using customer's tools and the Agilent software move the sample probe to the 4 instrument corners and close port, ensure that the probe is approximately centered in the vial.

SPS 4 Auto Sampler

- Section NOT Applicable
- Clean the spill tray, each reaction well, and frames and channels with a damp soft cloth and diluted mild detergent.
- Clean the auto sampler cover panels, if cover kit is installed, with isopropanol wipe down.
- Check the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- Check the X-axis, Theta-axis and Z-axis PPC cables for cracks, incorrect positioning, damaged edges or damaged connectors.
- Pump Tubing Replacement: Replace peristaltic pump tubing. Replace all tubing that goes from the flow station to the pump and from the pump to the waste/flush bottles.

AYS 4, 6, 7

- Section NOT Applicable
- Replace valve cover seal.
- Check fittings for signs of leaks.
- Check tubing, including autosampler tubing for leaks or excessive wear.
- Check high flow pump for signs of leaks.

Instrument Adjustment

- Check position of Zc probe, adjust if required.
- Check Argon Ratio, adjust to specified value if required.
- Perform Detector Calibration.
- Perform Instrument Calibration.
- Run Instrument Performance Test and record results in Instrument Performance Test Results Table - Post PM.
- For options using ICP Expert version 7.3 and above run the following Instrument Test and record the result in the Instrument Test Results Table
 - Subsystem Communications Test.
 - Air Flow

Agilent 5110 and 5100 ICP-OES
Preventive Maintenance Checklist

- ☒ Water Flow
- ☒ Gas Flow
- ☒ RF Generator
- ☒ Camera Test
- ☒ Optical Test
- ☒ Nucleon Test

Instrument Performance Test Results Table

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

	Pre-PM Sensitivity Check		Post-PM Sensitivity Check	
	Radial	Axial ¹	Radial	Axial ¹
2x 233.071 mm SBH	4130.6	8264.6	4195.0	8390.6
Max 207.633 mm SBH	1010.7	2020.1	1030.7	2060.2
M 208.181 mm SBH	1.5	3.0	3.2	7.6
K 790.431 mm SBH	5.1	10.2	6.4	12.7

* Axial result is not applicable for G801AAA, G801LAA Radial View Instruments.

Instrument Test Results Table

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

Instrument Test	Result
Adaptive Communication Test	79/82
Air Flow	100%
Water Flow	100%
Gas Flow	100%
EF Generator	100%
Control Test	100%
Optics Test	100%
Reliability test	100%

Agilent 5110 and 5100 ICP-OES
Preventive Maintenance Checklist

NP-OKS Status Results Table

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

Measurement	GasBy Mode	Ratio To
Stack Voltage	75.4 VAC	VAC
Stack Current	3.724 A	Q148 A
Instrument Temperature	88.6 °C	88.7 °C
RF Air Flow (nominal speed)	15.0	Hz
Plasma Exhaust Temperature	No measurement	95.7 °C
Water Flow Switcher	No measurement	1.64 L/min
Water Flow Indicator	1.00 L/min	1.00 L/min
Water Inlet Temperature	98.0 °C	98.0 °C
Polymerization Temperature	35.9 °C	35.0 °C
CCO Temperature	-30.8 °C	-30.8 °C
Thermal Stabilizer	55.0 °C	55.0 °C
Argon Supply Pressure	670.94 kPa	679.73 kPa
Fluor Gas Supply Pressure 1	674.30 kPa	645.40 kPa
Oxygen Gas Supply Pressure 1	674.30 kPa	645.40 kPa
Refueling Flow	No measurement	0.70 L/min
Refueling Back Pressure	No measurement	144.63 kPa
Fluorine Gas Flow	No measurement	1.58 L/min
Argon Gas Flow	No measurement	1.10 L/min
RF Power	No measurement	1800 W
RF Supply Current	No measurement	8.663 A
RF Supply Voltage	No measurement	164.60 V

^a I III capture installed.Agilent 8110 and 8100 ICP-OES
Preventative Maintenance Checklist

ICP-OES Parts List Table

Part Description	Part Number	Product / Model it works with	Quantity / Comments
Acid Pre-Filter Window	03010-00014	03010A, 03011A, 03012AA, 03012A	1
Initial Pre-Filter Window	03010-00015	All	1
Pre-Filter Coating Pack	03002-00010	03041A	
Final Gas Filter	03010-00030	All	1
Air Inlet Filter	03000-00002	All	1
High Capacity Air Filter	03010-00030	Optional	
Router used for 6-7 port valve for AVD9T	03004-00002	03004A, 03040S	
Router used for 4 port valve for AVD4	03003-00002	03003A	
Blow solenoid for first station 2.5mm of 1/8"	03010-00033	03014	
Blow solenoid for first station 2.5mm of 1/8"	03010-00034	03014	
PVC union tubing, 1/8" of a foot 10, 20"	03010-00022	03014	

Additional Parts may be required from engine/motor stock:

1 axle drive belt	041007100	03010
2 vee drive belt	041007000	03010
Peristaltic pump tubing, PVE Schwabel, 5' included	071004000	03014

Restore system

The HP application, ask the customer to reinstall their legacy introduction system.

Leave syringes in an airtight container and purge.

Guidance: If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final treatment set up and check-out.

Service Review

- ☐ Affix the IM sticker to the system or instrument logbook based on the customer's request.

Agilent 5110 and 5100 ICP-OES
Preventive Maintenance Checklist

- 2. Review the service and any test results with the customer.
- 3. If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box below or if necessary, in the customer's IQ records.

Service Engineer Comments (optional)

If there are any specific goods you wish to name as part of perpetuating the installation or other items of interest for the monument, please write in this box.

Other Important Customer Web Links

How to get information on your product:

- ☐ Literature Library - <http://www.audible.com.au/membersdata/lit-own-lit-own-systems-11103m-audible.html>
- ☒ Need to know more? - <http://www.audible.com.au/help/ask-a-question>
- ☒ Need technical support, FAQ? - <http://www.audible.com.au/customer-support/faq-faq-2>
- ☒ Need suggestions? - <http://www.audible.com.au/forums>

Service Completion

Service request number 022005287 Date service completed 21 Nov 2019

Agent signature Vincent T. Customer signature [Signature]

Desiccant part number: D8014-00075

Report Summary	
Instrument Model	Agilent 6100/118 VDA ICP-OES
Instrument ID	09811A03805A
Instrument Serial Number	MT1803001
Software Version	V 3.1.507
Firmware Version	3442
Tested By	Test Reflex PM
Test Completed On	11/09/2023 9:35:32 AM
Result Summary	
Subsystem Communications Test	Skipped
Air Flow Test	Skipped
Water Flow Test	Skipped
Gas Flow Test	Skipped
RF Generator Test	Skipped
Camera Test	Skipped
Crack Test	Skipped
Autosave Value System Test	Skipped
Resolution Test	Pass
Sensitivity Test	Pass
Preprocess Test	Pass

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เอกสารไม่ควบคุม

Resolution Test		Pass
Element Wavelength	Specification	Value
N (174.213 nm)	≤ 9.40	6.83
As (188.880 nm)	≤ 8.20	6.80
Co (187.827 nm)	≤ 11.80	9.35
Mn (207.810 nm)	≤ 8.20	6.47
Cr (206.152 nm)	≤ 13.40	3.04
Zn (213.887 nm)	≤ 8.70	9.60
Pb (220.383 nm)	≤ 9.90	7.13
Co (228.416 nm)	≤ 17.20	11.11
Se (235.424 nm)	≤ 9.40	7.21
Mo (237.813 nm)	≤ 13.38	9.60
Br (236.868 nm)	≤ 25.30	14.35
Cr (267.715 nm)	≤ 11.00	8.14
Co (324.754 nm)	≤ 20.00	16.86
Ca (326.765 nm)	≤ 14.20	11.24
Sc (338.071 nm)	≤ 33.58	24.47
Na (458.403 nm)	≤ 44.00	43.88
Si (467.703 nm)	≤ 34.00	17.32
Na (488.408 nm)	≤ 38.00	28.48
Se (494.171 nm)	≤ 42.90	25.47
Ar (505.283 nm)	≤ 74.90	64.82
K (766.491 nm)	≤ 80.01	64.94

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เอกสารไม่ควบคุม

Sensitivity Test		Pass
Element		
Element Wavelength	Specification	Method Ratio Standard Blank
As (188.880 nm)	≤ 60.0	0.009 147.3 1166.5 55.5
Se (187.827 nm)	≤ 41.0	0.020 111.1 1195.3 81.7
Zn (213.887 nm)	≤ 1421.0	0.035 4180.4 51859.5 158.5
Pb (220.383 nm)	≤ 46.0	0.059 182.5 2889.6 185.7
Mn (207.810 nm)	≤ 3518.0	0.004 11064.7 244165.0 987.8
Ar (505.152 nm)	≤ 3.4	0.00 7.0 46047.0 8170.5
Se (494.171 nm)	≤ 34.0	0.01 107.4 987710.3 11407.5
K (766.491 nm)	≤ 1.8	0.01 6.1 102826.6 19528.4
Acid		
Element Wavelength	Specification	Method Ratio Standard Blank
As (188.880 nm)	≤ 385.0	0.009 234.9 3096.4 152.9
Se (187.827 nm)	≤ 160.0	0.006 218.1 3865.1 271.8
Zn (213.887 nm)	≤ 234.0	0.004 1300.0 15850.4 144.8
Cr (213.887 nm)	≤ 1145.0	0.004 3504.0 183257.0 476.4
Co (214.438 nm)	≤ 4207.0	0.009 7718.9 143248.2 342.8
Pb (220.383 nm)	≤ 520.0	0.009 878.3 14695.2 668.4
Mn (207.810 nm)	≤ 18625.0	0.004 21942.1 1411307.3 1958.9
Cr (267.715 nm)	≤ 1040.0	0.009 4402.1 181113.6 1832.2
Co (324.754 nm)	≤ 15.0	0.00 46.2 811667.5 7662.8
Ca (326.765 nm)	≤ 0.0	0.00 14.9 218447.4 11782.6
Ar (384.152 nm)	≤ 90.0	0.00 190.8 10801527.5 52618.8
Se (485.408 nm)	≤ 34.0	0.00 38.8 1812153.4 88880.1

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เอกสารไม่ควบคุม

Preprocess Test		Pass
Element		
Element Wavelength	Specification	Measured Value % RSD
As (188.880 nm)	≤ 2.80	0.81
Se (187.827 nm)	≤ 2.80	0.71
Zn (213.887 nm)	≤ 1.50	0.42
Pb (220.383 nm)	≤ 2.80	0.78
Mn (207.810 nm)	≤ 1.80	0.90
Ar (505.152 nm)	≤ 1.80	0.45
Se (485.408 nm)	≤ 1.50	0.89
K (766.491 nm)	≤ 1.50	0.42
Acid		
Element Wavelength	Specification	Measured Value % RSD
As (188.880 nm)	≤ 1.80	0.57
Se (187.827 nm)	≤ 1.80	0.78
Zn (213.887 nm)	≤ 1.80	0.81
Cr (213.887 nm)	≤ 1.50	0.91
Co (214.438 nm)	≤ 1.80	0.86
Pb (220.383 nm)	≤ 1.50	0.52
Mn (207.810 nm)	≤ 1.00	0.54
Cr (267.715 nm)	≤ 1.80	0.89
Co (324.754 nm)	≤ 1.80	0.89
Ar (384.152 nm)	≤ 1.80	0.51
Se (485.408 nm)	≤ 1.50	0.98
K (766.491 nm)	≤ 1.50	1.23

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เอกสารไม่ควบคุม

Report Summary	
Instrument Model	Agilent 3100/5110 VDM ICP-OES
Instrument ID	080114VG0015A
Instrument Serial Number	MY18030001
Software Version	7.3.1.9007
Firmware Version	3440
Tested By	RM Functional test
Test Completed On	11/09/2022 11:43:38 AM
Result Summary	
Subsystem Communications Test	Pass
Air Flow Test	Pass
Water Flow Test	Pass
Gas Flow Test	Pass
RF Generator Test	Pass
Camera Test	Pass
Optics Test	Skipped
Advanced Valve System Test	Skipped
Resolution Test	Skipped
Sensitivity Test	Skipped
Pressure Test	Skipped
Teletype Communications Test	Pass
Air Flow Test	Pass
30% Air Flow relative speed: 14.08	70% Air Flow relative speed: 19.00
Water Flow Test	Pass
RF Water Flow Limit: 1.44	Camera Water Flow: 1.08
	Water inlet Temperature: 18.51

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เอกสารไม่ควบคุม

Gas Flow Test			Pass		
Reductor Target Flow	Actual Flow	Back Pressure	Auxiliary Target Flow	Actual Flow	Back Pressure
0.75	0.70	603.57	2.00	1.90	108.09
Makeup Target Flow	Actual Flow	Back Pressure	Purge Target Flow	Actual Flow	Back Pressure
2.00	2.00	112.98	18.08	17.91	23.48
RF Generator Test			Pass		
RF Power Supply Test	Passed				
RF Power Supply (V)	147.007				
RF Oscillator Test	Passed				
RF Oscillator Frequency (MHz)	2.500				
Work Coil Current (A)	45.089				
RF Power Supply Current (A)	1.997				
Camera Test			Pass		
	Integration Time (ms)	Standard Deviation	Offset		
Electronic Offset Test	1300	0.306	Passed		
Dark Current Test	0800	0.876	Passed		
Array Test	9	0.024	Passed		
Linearity Test		0.116	Passed		

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เอกสารไม่ควบคุม

Report Summary		
Instrument Model	Agilent 3100/5110 VDM ICP-OES	
Instrument ID	080114VG0015A	
Instrument Serial Number	MY18030001	
Software Version	7.3.1.9007	
Firmware Version	3440	
Tested By	RM Performance test	
Test Completed On	11/09/2022 12:35:42 PM	
Result Summary		
Subsystem Communications Test	Skipped	
Air Flow Test	Skipped	
Water Flow Test	Skipped	
Gas Flow Test	Skipped	
RF Generator Test	Skipped	
Camera Test	Skipped	
Optics Test	Pass	
Advanced Valve System Test	Skipped	
Resolution Test	Pass	
Sensitivity Test	Pass	
Pressure Test	Pass	
Optics Test	Pass	
Intensity	Radial 8074608	Axial 5573476
Wavelength	237.212	237.212

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Resolution Test			Pass		
Element Wavelength	Specification	Result			
B (114.213 nm)	± 0.40	0.79			
As (156.980 nm)	± 0.20	0.09			
C (163.627 nm)	± 11.50	0.29			
Be (202.552 nm)	± 0.20	0.30			
Cr (206.186 nm)	± 10.40	0.08			
Di (212.857 nm)	± 0.16	0.77			
Fe (230.363 nm)	± 0.50	7.10			
Co (228.615 nm)	± 17.20	11.87			
Na (230.424 nm)	± 0.40	7.38			
Mn (257.816 nm)	± 10.30	9.48			
Mn (260.566 nm)	± 30.58	14.25			
Cr (267.718 nm)	± 11.80	7.94			
Cu (324.754 nm)	± 25.08	10.99			
Cu (327.399 nm)	± 16.29	11.33			
Si (336.371 nm)	± 30.00	24.44			
Be (455.403 nm)	± 04.35	22.08			
Si (460.733 nm)	± 36.80	17.31			
Be (497.408 nm)	± 38.80	26.58			
Be (505.171 nm)	± 42.00	24.95			
Ar (505.283 nm)	± 74.00	28.39			
K (766.481 nm)	± 80.00	25.83			

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Sensitivity Test		Pass				
Element	Wavelength	Specification	Method	Ratio	Standard	Blank
As	(188.880 nm)	± 48.0	SP21	147.8	1146.2	54.8
Se	(195.826 nm)	± 41.0	SP21	111.6	1023.8	101.0
Zn	(213.857 nm)	± 142.0	SP21	4375.0	62662.0	142.7
Pb	(220.353 nm)	± 46.8	SP21	188.8	2144.4	195.5
Mn	(279.818 nm)	± 3618.0	SP21	12601.7	282554.3	486.9
Al	(306.152 nm)	± 1.4	SP1	9.6	52085.8	4873.6
Ba	(455.408 nm)	± 34.0	SP1	154.5	2287261.6	14595.1
K	(766.481 nm)	± 1.8	SP1	5.4	106731.8	14358.9
Asa						
Element	Wavelength	Specification	Method	Ratio	Standard	Blank
As	(188.880 nm)	± 208.3	SP21	342.4	3173.1	154.8
Se	(195.826 nm)	± 184.0	SP21	236.1	4124.5	289.3
Zn	(213.857 nm)	± 234.2	SP21	1126.8	13752.0	148.9
Pb	(220.353 nm)	± 1742.0	SP21	8480.8	177185.3	442.6
Cd	(214.439 nm)	± 4227.0	SP21	7051.6	125984.3	321.8
Pb	(220.353 nm)	± 323.0	SP21	536.3	12899.3	533.6
Mn	(279.818 nm)	± 10925.0	SP21	38945.2	1281846.5	1758.6
Cu	(280.716 nm)	± 1046.0	SP21	4598.0	187235.0	1424.4
Cu	(324.754 nm)	± 76.0	SP1	82.1	273850.7	7031.1
Al	(306.152 nm)	± 6.0	SP1	96.8	268357.7	10112.4
Ba	(455.408 nm)	± 60.8	SP1	235.2	10173441.8	49811.7
K	(766.481 nm)	± 24.0	SP1	56.7	1874136.2	46255.7

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Precision Test		Pass	
Fail			
Element Wavelength	Specification	Measured Value % RSD	
As (188.880 nm)	± 2.08	0.00	
Se (195.826 nm)	± 2.08	0.04	
Zn (213.857 nm)	± 1.58	0.28	
Pb (220.353 nm)	± 2.09	0.28	
Mn (279.818 nm)	± 1.88	0.28	
Al (306.152 nm)	± 1.88	0.20	
Ba (455.408 nm)	± 1.50	0.89	
K (766.481 nm)	± 1.50	0.23	
Asa			
Element Wavelength	Specification	Measured Value % RSD	
As (188.880 nm)	± 1.58	8.71	
Se (195.826 nm)	± 1.88	6.42	
Zn (213.857 nm)	± 1.88	0.46	
Cd (214.439 nm)	± 1.88	0.37	
Pb (220.353 nm)	± 1.50	0.45	
Mn (279.818 nm)	± 1.58	3.74	
Cu (280.716 nm)	± 1.58	8.28	
Cu (324.754 nm)	± 1.50	6.51	
Al (306.152 nm)	± 1.88	0.45	
Ba (455.408 nm)	± 1.88	0.81	
K (766.481 nm)	± 1.88	0.84	

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Agilent 55 240 280 Series Atomic Absorption Spectroscopy Systems

Preventive Maintenance Checklist

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

Performed 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 installation.

Note: While not current production AA instrument and/or accessory models are not covered specifically in this document it can be used as a good reference.

For more information about Agilent Technologies services please visit our web site using the following URL: <http://www.agilent.com/service>.

Introduction

Customer Information

1. Customers should provide all necessary operating supplies upon request of the engineer.
2. A customer representative should be available to the engineer while performing the preventive maintenance procedures.
3. Any parts not included in the Parts List section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
4. 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.

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Instrument Preventive Maintenance Checklist

Important Customer Web Links

- For more information about Agilent Technologies services, please visit our website using the following URL: <http://www.agilent.com/service>
- To access Agilent University, visit <http://www.agilent.com/chem/university> to learn about training options, which include online, classroom and on-site 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 facts of consumables for new instruments, and other valuable information. Check out the Resource Page here: <http://www.agilent.com/chem/aa/55/240/280>
- Need technical support, FAQs, supplies? - visit our Support Home Page at <http://www.agilent.com/support>
- Join a network, share insights, build connections. Join the Agilent community at <http://community.agilent.com/welcome>

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Confirm the ability of the instrument to deliver continued safe operation as established via the Agilent AA safe operation flow chart. (Refer directly to the AA 55/240/280 Preventive Maintenance Scope of Work to make this decision.)
- 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 "3" 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 signatures.

This information is subject to change without notice.

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Instrument Maintenance

System Information

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

Instrument System Name and ID	012 113A / 012 113A / 012 113A
Instrument System Site and Location	Wong 101 / 012 113A / 012 113A

List System Component Product Numbers	List the Serial Numbers of each Component
1. 012 113A	012 113A
2. 012 113A	012 113A
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

- ☐ Agilent AA auto operation flow chart inspection to determine if the PM can be performed.

NOTE: If by following the flow chart the instrument is deemed to be unsafe for continued use you MUST NOT continue PM work, inform the customer immediately of the Agilent recommendation that use of the instrument be discontinued.

- ☐ Discuss any specific issues with the customer before starting.
- ☐ For HP application systems, if standard sample introduction system was not installed, ask the customer to install it now.
- ☐ Review the instrument logbook for recorded problems and comments.
- ☐ Save instrument config of 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.
- ☐ Use SVD to perform a Full Wavelength Scan for Cu, Ag, Pb, Bi, Cd, Ni, Cr, Fe, Mn, Zn, Co, Ni, Cu, Ag, Pb, Bi, Cd, Ni, Cr, Fe, Mn, Zn, Co.
- ☐ Perform a Basic Cu-As-Bi test - "As found test, 1".
- ☐ Print the Details page or screen capture of the test results and attach to the end of this checklist.

Preparation, Safe operation and Initial performance checks

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Preventive Maintenance Procedures

FLAME SYSTEM section

- ☐ Section not applicable

Electronic components

- ☐ Review and confirm instrument configuration data in SVD.
- ☐ Confirm power supply voltages using the SVD Power Supply diagnosis.
- ☐ For Dual Beam instruments - Confirm RBC frequency using the SVD RBC frequency diagnosis.

Mechanical components

- ☐ Check the burner adjuster controls for complete and free movement. If the burner adjuster needs lubrication, use Molykote 331 or mineral based molybdenum disulfide grease.
- ☐ Run SVD tests to exercise all motor drives over the full range of their travel:
 - Monochromator drive
 - DR drive
 - Lamp selector
 - AAH - etc

Optics components

- ☐ Check that external optical surfaces are clean - Clean or replace as required.
- ☐ Use SVD and perform Mono Wavelength Correction.
- ☐ Use SVD and perform slit Calibration.
- ☐ Use SVD and perform Gating Squaresize Diagnosis.
- ☐ Use SVD and perform Zero Order Offset/Mono Correction.
- ☐ Use SVD and perform Wavelength Reproducibility.
- ☐ Physically inspect selected I-C lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.
- ☐ Check that the signal energy of the G2 and I-C lamps track properly. Advise customer if their G2 lamp is showing emission degradation due to age.

Sample Introduction and Atomization

- ☐ Inspect the burner interlock plate to ensure that the interlock pin is secure and correct for the burner type.
- ☐ Clean the burner slot with a clean white cloth.
- ☐ Check the uniformity of the slot width.
- ☐ Clean the burner if required.
- ☐ Change the burner O-ring.
- ☐ Clean the nebulizer, spray chamber and liquid trap.
- ☐ Change all O-rings and seals in the nebulizer, nebulizer block and spray chamber.
- ☐ Check that the pressure relief bung releases readily.
- ☐ Change O-rings on the fast-act nebulizer delivery factor.
- ☐ Leave the liquid trap EMPTY and verify the flame will not ignite in this state.
- ☐ Add liquid trap and check that overfill drains freely into the drain waste tube.
- ☐ Check the drain waste tube for good drainage. It should not have tight bends, kinks or traps and the lower end must be above the liquid level in the waste vessel.
- ☐ Check and clean the system electrode.

Gas handling components and safety interlocks

- ☐ Pressure test for leaks.
- ☐ Leak test gasbox internal components and connections.
- ☐ Check safety interlock status and operation using the SVD interlock monitoring diagnosis.

Analytical performance for Flame systems

- ☐ Ignite a flame.
- ☐ Check that you can adjust the nebulizer output rate from 4 to 6 L/min per minute.
- ☐ Optimize the instrument ready to perform a Basic Cu-As-Bi test - "As found test, 1".
- ☐ Create a manual method to perform a Basic Cu-As-Bi test - "As found test, 1".
- ☐ Run a PM completed sensitivity test for a 1 ppm copper sample and record the results in the AA PM Performance test results and measurements table.

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FURNACE SYSTEM section

Section not applicable

Electronics components

- Review and confirm instrument configuration data in DVC
- Confirm power supply voltages using the **DVC Power Supply diagnostic**

Mechanical components

- Run DVC tests to exercise all motor drives over the full range of their travel
 - Motor/rotator drive
 - Sit drive
 - Lamp selector

Optics components

- Check that external optical surfaces are clean – Clean or replace as required
- Use DVC and perform **Mono Wavelength Correction**
- Use DVC and perform **Slit Calibration**
- Use DVC and perform **Slit-to-Slit Squaresize Diagnostic**
- Use DVC and perform **Zero Order Offset/Mono Correction**
- Use DVC and perform **Wavelength Repeatability**
- Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gen for each lamp. Advise customer if lamps are showing emission degradation due to age

Gas handling, water system and workhead component checks

- Inspect the GTA workhead gas hoses and connections for leaks
- Pressure test for gas leaks
- If the cooler system is accessible (stand alone) check for correct operation and coolant/water level – this includes any temperature and pressure settings plus filter cleaning (air flow and water)
- Inspect the GTA workhead water hoses and connections for leaks
- Check all graphic components and replace if necessary

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- Tube
- Electrodes
- Shroud

- Check and clean the end window on the workhead
- Check safety interlock operation

Analytical performance for Furnace systems

- Operate the instrument ready to perform G1 sensitivity test
- Run the sensitivity test for a 25 ppb copper sample and record the results in the results table

PSD autosampler accessory for Furnace systems

Section NOT Applicable

- Check condition of the PSD capillary – replace if necessary
- Check condition and operation of PSD syringe – ensure it does not have air leaks and bubbles
- Change PSD cross bottle cving
- Check and clean the cross vial
- Check the drain tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel
- Ensure that the waste vessel is suitable for use with the furnace system

Sample introduction pump system (SIPS) accessory

Section NOT Applicable

- Re-tighten screws securing the tube, pressure arms and pump nozzles
- Adjust each roller so that it rotates freely
- Wipe clean the pump rotor rollers and pump bands with a dry clean cloth
- Ensure that the pressure arms and the surfaces near the pump are free from dirt and spills
- Remove the pump module rear cover and check for the incursion of liquids and any signs of corrosion
- Re-check the tube that fastens the motor mounting plate to the chassis
- Check clips securing the clients holder and replace if necessary
- Disconnect, clean T-piece, and reassemble the tubing using the following check

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- Remove the T-piece by disconnecting the pump tubes, the pump bands and all other tubing
- Place the T-piece in an ultrasonic bath containing strong detergent, 1-10% Decon 30 or similar, for approximately 5-15 minutes
- Wash the T-piece under a tap with a strong flow of water
- Rinse with distilled water through all of the slots in the reverse direction to normal sample flow
- Reassemble

Sample preparation system (SPS 4) accessory

Section NOT Applicable

The Agilent SPS 4 autosampler is designed to need minimal maintenance

The following maintenance requirements are suggested to maintain the performance of the autosampler

- Cleaning the split tray, rack, bucket rest, and frames and chassis accessories with a damp soft cloth and diluted mild detergent
- Cleaning the autosampler cover panels with domestic window cleaner
- Checking the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, noise changes or degradation from fumes
- Check the X-axis, Y-axis and Z-axis FPC cables for cracks, correct positioning, damaged edge or damaged connectors

NOTE: The autosampler requires no extra lubrication throughout its lifetime.
For further details refer to the SPS 4 service manual G3413-90025

Sample preparation system (SPS 30) accessory

Section NOT Applicable

- Check the X-axis and Z-axis timing belts – Replace if there is any wear, cracks, splits or color deterioration and belt tension
- Check belt tension – adjust if required
- Check the lubrication point for sledge X-axis shaft. If pad is dry or customer has observed any vibration or erratic movements of the sledge carriage, add 1 mL of Dow Corning 200 S Fluid, 300 CS into the well
- Check the autosampler ability to find tube positions – Calibrate if required
- Clean the exterior surfaces of the accessory with soft lint free cloth. The cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents

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Vapor generation accessory VQA (hydride generator)

Section NOT Applicable

- Inspect VQA gas supply lines
- Inspect/replace VQA pump tubing
- Check low gas pressure interlock setting – adjust if required
- Check precision on-line gas flow setting – adjust if required
- Check gas regulator pressure to 40 psi (2.75 MPa) – adjust if required
- Clean the exterior surfaces of the accessory with soft lint free cloth. The cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents

UltraAA lamp accessory (external)

Section NOT Applicable

- Check the condition of the power cable
- Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents

Restore System

- If you have altered the customer's instrumentation during the course of PM, restore to the original status to allow the customer to conduct their normal activities (e.g., reboot the customer's method)

Guidance

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

Document: 51-00, Issue: November 2021

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Signature Page

Service Review

- ☒ Attach available reports/synopsis of all tests to this document/website.
- ☒ Record all the Preventive Maintenance service activity in the customer's records/feedback.
- ☒ Update/insert instrument maintenance comments as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's ID records.

Test Results

Test Description	Expected Test Result	Actual Test Result
Harmonics THD (dist test)		
For copper at 300 ft/m, 4 mm, 0.5 mm-cable width	< 10 %	4.0 %
Harmonics performance test with 30-ppt copper sample		
At 1000 Hz, rising profile observed	At a value < 0.5	0.19 %
At 1000 Hz, rising profile observed, 15 mm-cable	At 0.02 < 1.5	0.4 %
Distortion factor (dist test)		
For copper at 300 ft/m, 4 mm, 0.5 mm-cable width	< 10 %	—
Distortion factor performance test with 30-ppt copper sample (300 ft/m)		
Frequency: 1000 Hz	< 0.25	—
At a value	< 0.15	—
Distortion factor analytical performance 20 ppt copper sample (300 ft/m)		
Frequency: 1000 Hz	< 0.25	—
At a value	< 0.15	—
At 1000 Hz	< 0.2	—

Reviews: G. J. G. Meijer / Journal of Macroeconomics 26 (2004) 93–117

© 2004 Blackwell Publishing Ltd *Journal of Internal Medicine* 255: 111–117

เอกสารไม่ควบคุม

AA consumable and parts list table

[illegible]

^a For engineers who only service AA instruments 5193-8279 can be used as a cheaper alternative for 6610030100.

Items classified as PM supplied in the above table are included in the standard PM. Those classified as consumable should be provided by the customer or changed to the customer if supplied by the Agilent service engineer.

Theorem 10.10. (Hadamard's inequality) If f is a function on $[a, b]$ such that $|f'(x)| \leq M$ for all x in $[a, b]$, then
$$|f(b) - f(a)| \leq M(b - a).$$

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Service Engineer Courses (optional)

© 2000 Blackwell Science Ltd, *Journal of Internal Medicine* 247: 399–405

Service Completion

Service water number 62044111 Date service completed Feb. 01, 2012
Agent signature Michael J. Customer signature Steve Hansen
Total number of pages in this document 11

Received 17(XX) 2000; accepted 16(XXXX) 2001

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เอกสารไม่ควบคุม

SVD Results Report



Report ID: **Diagnosis Start Time: 2017/03/21 9:07:52 AM** **Diagnosis End Time: 2017/03/21 9:10:18 AM**
 Customer: **UNITED STATES AND ENGINEERING** **CONTACT NAME: Andrew Lussengbauer**
 Address: **Contact Details: 01-637-6363**

Instrument Configuration

Configuration:

```

Serial Number: MY1360061
Instrument Model: YANIS-A14524028C
Flame Instrument: True
Furnace Instrument: True
Zeeman Project: False
900nm Zeeman: False
Internal UltraA: False
Optics Type: Quartz Beam
D2 88 Correction Fitted: True
Boot Block Version:
Turret Type: Automatic
Number Of Lamps: 4
Mono Type: Automatic
GasBox Type: T. Gas Box
Auto Burner Adjuster: false
Main Frequency: 50
Firmware Version: 3.11
Photomultiplier Type: Hamamatsu
PWB Version: 4E

```

EEPROM Data:

Instrument Run Hours: 19330.363	D2 Run Hours: 14966.000
Zero Wavelength Offset: 35.118	D2 Serial Number: not set!
Mirco Correction: 0.780	D2 Install Date: 2/19/1978
Flame Hours: 23687.094	D2 Original Intensity: 1.000
	D2 Last Intensity: 470.000

Frequency:

Averaging Period: 30		Datapoint Count: 33	
Upper Limit: 51.00	Average Frequency: 50.00	Highest Measured Frequency: 50.00	
Lower Limit: 49.00		Lowest Measured Frequency: 49.00	

[illegible]

Received December 4, 1993; accepted March 14, 1994.

เอกสารไม่ควบคุม



Power Supply:

Averaging Period: 30.0
Datapoint Count: 20

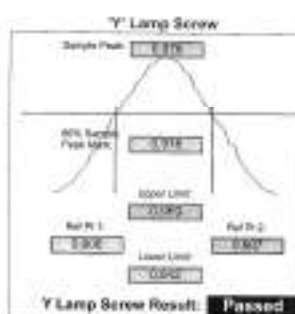
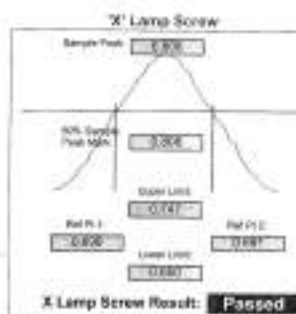
	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00 V Rail	18.80	12.17	12.20	Passed
-12.00 V Rail	-13.20	-11.90	-10.60	Passed
5.00 V Rail	4.50	5.00	5.50	Passed
310.00 V Rail	270.00	326.00	341.00	Passed

Optics

Beam Balance:

Lamp Type:
Lamp Socket Used:

Peak Selected:
Lamp Alignment: **Performed**



Grating Squareness:

Lamp Element(s): CobaltChromium/Copper
Lamp Turret Position: 3
Lamp Current(mA): 10.00
Slit Width(mm): 0.3
1st Order Wavelength(nm): 324.60
Lamp Alignment: **Performed**

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.12	0.00	0.12	Passed
First Order	324.45	324.60	324.75	Passed
Second Order	648.20	649.20	649.60	Passed

Report Generated At: 30/11/2023 0:04:51 AM

2

เอกสารไม่ควบคุม

Report Generated At: 30/11/2023 0:04:51 AM

3

เอกสารไม่ควบคุม

Wavelength Repeatability:

Lamp Used: Copper
Peak Used(nm): 324.700
Connected to Socket: 3
Lamp Current(mA): 4
Slit Width(mm): 5.2
Slit Height: Normal

Lamp Alignment: **Performed**

Lower Limit(nm)	324.700	324.800	Upper Limit(nm)
(Approach from Zero Order)		(Approach from pos)	
Sample 1: 324.620		Sample 2: 324.620	
Sample 3: 324.620		Sample 4: 324.620	
Sample 5: 324.620		Sample 6: 324.620	
Sample 7: 324.620		Sample 8: 324.619	
Sample 9: 324.620		Sample 10: 324.619	

Mean: 324.624 Standard Deviation: 0.002

Result: **Passed**

Mechanical

Wavelength Drive:

Passed

Slit Drive:

Passed

Turret Drive:

Passed

Auto Burner Adjuster Drive:

Untested

Miscellaneous

Signal Processing Linearity:

Calculate Mode: New Calc Mode

	Lower Limit	Actual	Upper Limit	Result:
S0	154	281	287	Passed
S1	166	164	191	Passed
S2	271	236	232	Passed
S3	473	507	479	Passed
S4	625	617	1006	Passed
S5	1435	1525	1754	Passed
S6	2896	2790	2853	Passed
S7	4347	4240	5312	Passed

Interlocks:

Burner Fitted:	Working	Flame Detect:	Working
N2O Burner Fitted:	Untested	OCU Active:	Working
Flame Shield Closed:	Working	Oxidant Pressure:	Working
Gas Control Fitted:	Untested	Oxidant Changeover:	Untested
Pressure Release Bung Fitted:	Working	Ignition:	Working
Liquid Trap Fitted:	Working		

Report Generated At: 30/11/2023 0:04:51 AM

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เอกสารไม่ควบคุม

Report Generated At: 30/11/2023 0:04:51 AM

5

เอกสารไม่ควบคุม

Auto Lamp Recognition:

Lamp 1: Unloaded Lamp/Not Connected
 Lamp 2: 07 - Silver/Cadmium/Lead/Zinc/UltrAA (AgCl)
 Lamp 3: 78 - Cobalt/Chromium/Copper/Iron/Nickel/Silver
 Lamp 4: Unloaded Lamp/Not Connected
 Lamp 5: Not Supported
 Lamp 6: Not Supported
 Lamp 7: Not Supported (Hf)
 Lamp 8: Not Supported

Result: **Passed**

GTA Temperature Monitoring:

Not Performed

Notes:

Signatures:

UNITED ANALYSIS AND ENGINEERING CONSULTANTS
 Date

Requested by time report

30/9/2023 10:58 AM
 Page 1 of 1

SpectRAA

Analyst:
 Date Started: 30/9/2023 10:58 AM GMT: 30/9/2023 10:58 AM
 Worksheet: Cu 5 ppm Sensitivity
 Comment:
 Method: Cu
 Computer Name: HEM-012
 Serial Number: 0012100001

Method: Cu (Flame)

Sample ID	Conc. µg/L	%RSD	Mean Abs
Cu 5 ppm Preflow	UNCAL	0.1	0.0016
Readings			
	0.0004	0.0012	0.0010
			30010000

Report Generated On: 30/9/2023 09:01 AM

9

เอกสารไม่ควบคุม 

Requested by time report

30/9/2023 11:00 AM
 Page 1 of 1

SpectRAA

Analyst:
 Date Started: 30/9/2023 11:00 AM GMT: 30/9/2023 11:00 AM
 Worksheet: Cu 5 ppm Sensitivity 01
 Comment:
 Method: Cu
 Computer Name: HEM-012
 Serial Number: 0012100001

Method: Cu (Flame)

Sample ID	Conc. µg/L	%RSD	Mean Abs			
Cu 5 ppm Preflow	UNCAL	0.1	0.0004			
Readings						
	0.0001	0.0010	0.0007	0.0000	0.0000	0.0075
	0.0000	0.0000	0.0000	0.0007	30010000	

Requested by time report

30/9/2023 12:01 PM
 Page 1 of 1

SpectRAA

Analyst:
 Date Started: 30/9/2023 12:01 PM GMT: 30/9/2023 12:01 PM
 Worksheet: Hg
 Comment:
 Method: Hg
 Computer Name: HEM-012
 Serial Number: 0012100001

Method: Hg (Flame)

CONC. µg	Conc. µg/L	%RSD	Mean Abs
Hg 10 ppm	UNCAL	0.0	0.1113
Readings			
	0.1110	0.0100	0.1110
			30010000

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

DOE Services Co., Ltd.
33 Soi Ladprao-Wongthong 11, Ladprao-Wongthong Rd., Ladprao, Ladprao, Bangkok 10310
Phone : +66-022-138-2024, Email : apornrattakul@gmail.com

CERTIFICATE OF CALIBRATION

Certificate No. : SP25-021 Page 1 of 5

Customer : United Analyst and Engineering Consultant Co., Ltd. (Head Office)

Address : 234 Udonade 41, Sukhumvit Road, Bangkok, Thailand,
Bangkok 10250

Location of calibration : Laboratory 310

Equipment : UV-Vis Spectrophotometer

Manufacturer : Agilent Technologies

Model : Cary 60

Serial No. : MT13410009

ID No. : N/A

Received Date : 20 May 2023

Calibration Date : 20 May 2023

Issue Date : 21 May 2023

Condition Environment : Good

Calibrated by :  (T. M. Tansiri, Thailand)
T. M. Tansiri, Thailand
T. M. Tansiri, Thailand

Approved by :  (Ms. Chantana, Bangkok)
Ms. Chantana, Bangkok
Ms. Chantana, Bangkok

The calibration results are provided for information only and are not intended to be used as a basis for any other purpose.

The measurement capability of the laboratory and its capability to implement the standard is based on the scope of the laboratory's accreditation.

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Phone : +66-022-138-2024, Email : apornrattakul@gmail.com

REPORT OF CALIBRATION

Certificate No. : SP23-021 Page 2 of 3

Environment Condition : Ambient Temperature 23 ± 5 °C

Relative Humidity : 55 ± 20 %RH

Calibration method : reference method (23-41) Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25780	85810	22 October 2023
Absorbance Standard set	25737	85828	22 October 2023
Wavelength Standard set	25886	85816	22 October 2023
Wavelength Standard set	25738	85813	22 October 2023

Traceability : This certification is traceable to the International System of Units (SI) maintained at National Institute of Standards and Technology (NIST) through Scania Scientific Limited.

Spectral Band Width of UVC : 1.5 nm

Scan Speed of UVC : 80 nm/min

Scan Interval of UVC : 0.15 nm

Resolution of UVC : Photometric : 0.0001 Abs.

Wavelength : 0.1 nm

DOE Services Co., Ltd.

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Phone : +66-022-138-2024, Email : apornrattakul@gmail.com

REPORT OF CALIBRATION

Certificate No. : SP23-021 Page 3 of 3

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm)	100% Value (Abs)	11% Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage Factor
420	0.0000	0.0000	0.0000	0.0028	2.00
430	0.0000	0.0000	0.0000	0.0028	2.00
440	0.0000	0.0000	0.0000	0.0028	2.00
450	0.0000	0.0000	0.0000	0.0028	2.00
460	0.0000	0.0000	0.0000	0.0028	2.00
470	0.0000	0.0000	0.0000	0.0028	2.00
480	0.0000	0.0000	0.0000	0.0028	2.00
490	0.0000	0.0000	0.0000	0.0028	2.00
500	0.0000	0.0000	0.0000	0.0028	2.00
510	0.0000	0.0000	0.0000	0.0028	2.00
520	0.0000	0.0000	0.0000	0.0028	2.00
530	0.0000	0.0000	0.0000	0.0028	2.00
540	0.0000	0.0000	0.0000	0.0028	2.00
550	0.0000	0.0000	0.0000	0.0028	2.00
560	0.0000	0.0000	0.0000	0.0028	2.00
570	0.0000	0.0000	0.0000	0.0028	2.00
580	0.0000	0.0000	0.0000	0.0028	2.00
590	0.0000	0.0000	0.0000	0.0028	2.00
600	0.0000	0.0000	0.0000	0.0028	2.00
610	0.0000	0.0000	0.0000	0.0028	2.00
620	0.0000	0.0000	0.0000	0.0028	2.00
630	0.0000	0.0000	0.0000	0.0028	2.00
640	0.0000	0.0000	0.0000	0.0028	2.00
650	0.0000	0.0000	0.0000	0.0028	2.00
660	0.0000	0.0000	0.0000	0.0028	2.00
670	0.0000	0.0000	0.0000	0.0028	2.00
680	0.0000	0.0000	0.0000	0.0028	2.00
690	0.0000	0.0000	0.0000	0.0028	2.00
700	0.0000	0.0000	0.0000	0.0028	2.00
710	0.0000	0.0000	0.0000	0.0028	2.00
720	0.0000	0.0000	0.0000	0.0028	2.00
730	0.0000	0.0000	0.0000	0.0028	2.00
740	0.0000	0.0000	0.0000	0.0028	2.00
750	0.0000	0.0000	0.0000	0.0028	2.00
760	0.0000	0.0000	0.0000	0.0028	2.00
770	0.0000	0.0000	0.0000	0.0028	2.00
780	0.0000	0.0000	0.0000	0.0028	2.00
790	0.0000	0.0000	0.0000	0.0028	2.00
800	0.0000	0.0000	0.0000	0.0028	2.00
810	0.0000	0.0000	0.0000	0.0028	2.00
820	0.0000	0.0000	0.0000	0.0028	2.00
830	0.0000	0.0000	0.0000	0.0028	2.00
840	0.0000	0.0000	0.0000	0.0028	2.00
850	0.0000	0.0000	0.0000	0.0028	2.00
860	0.0000	0.0000	0.0000	0.0028	2.00
870	0.0000	0.0000	0.0000	0.0028	2.00
880	0.0000	0.0000	0.0000	0.0028	2.00
890	0.0000	0.0000	0.0000	0.0028	2.00
900	0.0000	0.0000	0.0000	0.0028	2.00
910	0.0000	0.0000	0.0000	0.0028	2.00
920	0.0000	0.0000	0.0000	0.0028	2.00
930	0.0000	0.0000	0.0000	0.0028	2.00
940	0.0000	0.0000	0.0000	0.0028	2.00
950	0.0000	0.0000	0.0000	0.0028	2.00
960	0.0000	0.0000	0.0000	0.0028	2.00
970	0.0000	0.0000	0.0000	0.0028	2.00
980	0.0000	0.0000	0.0000	0.0028	2.00
990	0.0000	0.0000	0.0000	0.0028	2.00
1000	0.0000	0.0000	0.0000	0.0028	2.00

DOE Services Co., Ltd.
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REPORT OF CALIBRATION

Certificate No. : SP23-021 Page 4 of 3

Photometric Accuracy :

Wavelength (nm)	100% Value (Abs)	11% Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage Factor
220	0.0000	0.0000	0.0000	0.0028	2.00
230	0.0000	0.0000	0.0000	0.0028	2.00
240	0.0000	0.0000	0.0000	0.0028	2.00
250	0.0000	0.0000	0.0000	0.0028	2.00
260	0.0000	0.0000	0.0000	0.0028	2.00
270	0.0000	0.0000	0.0000	0.0028	2.00
280	0.0000	0.0000	0.0000	0.0028	2.00
290	0.0000	0.0000	0.0000	0.0028	2.00
300	0.0000	0.0000	0.0000	0.0028	2.00
310	0.0000	0.0000	0.0000	0.0028	2.00
320	0.0000	0.0000	0.0000	0.0028	2.00
330	0.0000	0.0000	0.0000	0.0028	2.00
340	0.0000	0.0000	0.0000	0.0028	2.00
350	0.0000	0.0000	0.0000	0.0028	2.00
360	0.0000	0.0000	0.0000	0.0028	2.00
370	0.0000	0.0000	0.0000	0.0028	2.00
380	0.0000	0.0000	0.0000	0.0028	2.00
390	0.0000	0.0000	0.0000	0.0028	2.00
400	0.0000	0.0000	0.0000	0.0028	2.00
410	0.0000	0.0000	0.0000	0.0028	2.00
420	0.0000	0.0000	0.0000	0.0028	2.00
430	0.0000	0.0000	0.0000	0.0028	2.00
440	0.0000	0.0000	0.0000	0.0028	2.00
450	0.0000	0.0000	0.0000	0.0028	2.00
460	0.0000	0.0000	0.0000	0.0028	2.00
470	0.0000	0.0000	0.0000	0.0028	2.00
480	0.0000	0.0000	0.0000	0.0028	2.00
490	0.0000	0.0000	0.0000	0.0028	2.00
500	0.0000	0.0000	0.0000	0.0028	2.00
510	0.0000	0.0000	0.0000	0.0028	2.00
520	0.0000	0.0000	0.0000	0.0028	2.00
530	0.0000	0.0000	0.0000	0.0028	2.00
540	0.0000	0.0000	0.0000	0.0028	2.00
550	0.0000	0.0000	0.0000	0.0028	2.00
560	0.0000	0.0000	0.0000	0.0028	2.00
570	0.0000	0.0000	0.0000	0.0028	2.00
580	0.0000	0.0000	0.0000	0.0028	2.00
590	0.0000	0.0000	0.0000	0.0028	2.00
600	0.0000	0.0000	0.0000	0.0028	2.00
610	0.0000	0.0000	0.0000	0.0028	2.00
620	0.0000	0.0000	0.0000	0.0028	2.00
630	0.0000	0.0000	0.0000	0.0028	2.00
640	0.0000	0.0000	0.0000	0.0028	2.00
650	0.0000	0.0000	0.0000	0.0028	2.00
660	0.0000	0.0000	0.0000	0.0028	2.00
670	0.0000	0.0000	0.0000	0.0028	2.00
680	0.0000	0.0000	0.0000	0.0028	2.00
690	0.0000	0.0000	0.0000	0.0028	2.00
700	0.0000	0.0000	0.0000	0.0028	2.00
710	0.0000	0.0000	0.0000	0.0028	2.00
720	0.0000	0.0000	0.0000	0.0028	2.00
730	0.0000	0.0000	0.0000	0.0028	2.00
740	0.0000	0.0000	0.0000	0.0028	2.00
750	0.0000	0.0000	0.0000	0.0028	2.00
760	0.0000	0.0000	0.0000	0.0028	2.00
770	0.0000	0.0000	0.0000	0.0028	2.00
780	0.0000	0.0000	0.0000	0.0028	2.00
790	0.0000	0.0000	0.0000	0.0028	2.00
800	0.0000	0.0000	0.0000	0.0028	2.00
810	0.0000	0.0000	0.0000	0.0028	2.00
820	0.0000	0.0000	0.0000	0.0028	2.00
830	0.0000	0.0000	0.0000	0.0028	2.00
840	0.0000	0.0000	0.0000	0.0028	2.00
850	0.0000	0.0000	0.0000	0.0028	2.00
860	0.0000	0.0000	0.0000	0.0028	2.00
870	0.0000	0.0000	0.0000	0.0028	2.00
880	0.0000	0.0000	0.0000	0.0028	2.00
890	0.0000	0.0000	0.0000	0.0028	2.00
900	0.0000	0.0000	0.0000	0.0028	2.00
910	0.0000	0.0000	0.0000	0.0028	2.00
920	0.0000	0.0000	0.0000	0.0028	2.00
930	0.0000	0.0000	0.0000	0.0028	2.00
940	0.0000	0.0000	0.0000	0.0028	2.00
950	0.0000	0.0000	0.0000	0.0028	2.00
960	0.0000	0.0000	0.0000	0.0028	2.00
970	0.0000	0.0000	0.0000	0.0028	2.00
980	0.0000	0.0000	0.0000	0.0028	2.00
990	0.0000	0.0000	0.0000	0.0028	2.00
1000	0.0000	0.0000	0.0000	0.0028	2.00

DOE Services Co., Ltd.

DOE Services Co., Ltd.

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

DQE Service Co., Ltd.
33 Soi Ladprao-Wongthong 55, Ladprao-Wongthong Rd., Ladprao, Bangkok 10250
Phone : +66 (0)2 212 2044, Email : dqupservice@hotmail.com

REPORT OF CALIBRATION

Certificate No. : SP23-007 Page 4 of 5

Photometric Accuracy :

Wavelength (nm)	CIE Y Value (Y90)	UIC Reading (Y90)	Correction (Y90)	Uncertainty (Y90)	Coverage Factor
255	0.0000	0.000	0.0000	0.0050	2.00
	0.7478	0.743	0.0048	0.0077	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8668	0.861	0.0078	0.0078	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2012	0.291	0.0002	0.0031	2.00
550	0.0000	0.000	0.0000	0.0050	2.00
	0.6448	0.639	0.0058	0.0055	2.00

เอกสารไม่ควบคุม

(SP23-007) (1 of 1)

DQE Service Co., Ltd.
33 Soi Ladprao-Wongthong 55, Ladprao-Wongthong Rd., Ladprao, Bangkok 10250
Phone : +66 (0)2 212 2044, Email : dqupservice@hotmail.com

REPORT OF CALIBRATION

Certificate No. : SP23-007 Page 5 of 5

Wavelength Accuracy :

CIE Y Value (Y90)	UIC Reading (Y90)	Correction (Y90)	Uncertainty (Y90)	Coverage Factor
241.34	240.5	0.74	0.10	2.00
270.40	270.1	0.30	0.10	2.00
280.70	280.0	0.70	0.10	2.00
313.21	313.4	0.73	0.10	2.00
361.20	360.7	0.70	0.10	2.00
403.46	417.8	4.48	0.21	2.00
440.70	440.8	0.08	0.10	2.00
453.20	452.2	0.70	0.10	2.00
480.00	480.0	0.00	0.10	2.00
550.30	550.0	0.00	0.10	2.00
637.94	637.0	0.94	0.10	2.00
640.74	640.0	0.74	0.10	2.00
472.22	471.2	0.72	0.10	2.00
513.70	513.0	0.70	0.10	2.00
528.75	528.0	0.75	0.10	2.00
574.68	574.0	0.68	0.10	2.00
583.38	583.0	0.38	0.10	2.00
604.03	604.0	0.03	0.10	2.00
740.27	740.0	0.27	0.10	2.00
748.39	747.5	0.70	0.10	2.00
807.16	806.5	0.66	0.10	2.00
879.10	879.0	0.10	0.10	2.00

Remarks : UIC = 1 sec Under Calibration
Y90 = 1 sec Under
The tests were performed in accordance with the standard procedure of measurement, including the coverage factor.
UIC = 1 sec Under Calibration
Y90 = 1 sec Under

> End of Certificate <

เอกสารไม่ควบคุม

(SP23-007) (1 of 1)

DQE Service Co., Ltd.
33 Soi Ladprao-Wongthong 55, Ladprao-Wongthong Rd., Ladprao, Bangkok 10250
Phone : +66 (0)2 212 2044, Email : dqupservice@hotmail.com

CERTIFICATE OF CALIBRATION

Certificate No. : SP23-008 Page 1 of 3

Customer : United Analyst and Engineering Consultant Co., Ltd. (Head Office)

Address : 3 Soi Udonnong-41, Sakdhanon Road, Bangkok, Phnompenh, Bangkok 10200

Location of calibration : Laboratory 213

Equipment : UV-Vis Spectrophotometer

Manufacturer : (Black)

Model : U-2900

Serial No. : 21023-008

ID No. : UAB.WAT.051/2564

Received Date : 6 January 2023

Calibration Date : 6 January 2023

Issue Date : 10 January 2023

Condition Instrument : Used

Calibrated by :  (Ms. Thanyarat Sangsri)
Technician Manager

Approved by :  (Ms. Chantika Sangsri)
Quality Manager

The calibration must be performed only in the above calibration instrument and location and place of calibration only.

Measurement capability of the laboratory and its capability to measurement standard and its use of measurement method in the corresponding standard methods laboratory. This certificate may also be reproduced after that the date and place of approval of the DQE Service Co., Ltd.

เอกสารไม่ควบคุม

(SP23-008) (1 of 1)

DQE Service Co., Ltd.
33 Soi Ladprao-Wongthong 55, Ladprao-Wongthong Rd., Ladprao, Bangkok 10250
Phone : +66 (0)2 212 2044, Email : dqupservice@hotmail.com

REPORT OF CALIBRATION

Certificate No. : SP23-008 Page 2 of 3

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity : 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No	Certificate No.	Due Date
Absorbance Standard set	25780	95925	22 October 2023
Absorbance Standard set	25757	95929	22 October 2023
Wavelength Standard set	25656	95816	22 October 2023
Wavelength Standard set	25756	95815	22 October 2023

Traceability : This certification is traceable to the International System of Unit maintained at National Institute of Standards and Technology (NIST) through Bureau Scientific Limited.

Spectral Band Width of UIC : 1.7 nm

Scan Speed of UIC : 200 nm/min

Scan Interval of UIC : 0.1 nm

Resolution of UIC : Photometric 0.001 Abs.

Wavelength : 0.1 nm

เอกสารไม่ควบคุม

(SP23-008) (1 of 1)

DQE Service Co., Ltd.
32 Soi Ladprao-Wongthong 15, Ladprao-Wongthong Rd., Ladprao, Ladprao, Bangkok 10210
Phone : +66 (0)2 278 2785, Email : dqa@serviceco.com

REPORT OF CALIBRATION

Certificate No. : SP23-008 Page: 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRM Value (Abs)	UIC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.000	0.000	0.000	0.0028	2.00
	0.5787	0.574	0.0047	0.0011	2.00
	1.0491	1.044	0.0050	0.0029	2.00
	2.1900	2.182	0.0080	0.0040	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.2407	0.235	0.0057	0.0014	2.00
	1.0347	1.031	0.0037	0.0025	2.00
	2.1229	2.114	0.0089	0.0079	2.00
460	0.0000	0.000	0.0000	0.0028	2.00
	0.5236	0.520	0.0036	0.0030	2.00
	0.9834	0.980	0.0034	0.0029	2.00
	1.9783	1.969	0.0093	0.0070	2.00
545.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5191	0.518	0.0011	0.0031	2.00
	1.0003	0.997	0.0033	0.0022	2.00
	1.9907	1.993	0.0077	0.0044	2.00
580	0.0000	0.000	0.0000	0.0028	2.00
	0.2525	0.250	0.0025	0.0030	2.00
	1.0809	1.078	0.0029	0.0030	2.00
	2.0391	2.032	0.0071	0.0060	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.3803	0.358	0.0221	0.0031	2.00
	1.0512	1.048	0.0022	0.0030	2.00
	1.9294	1.922	0.0074	0.0070	2.00

เอกสารไม่ควบคุม

DQE Service Co., Ltd.
32 Soi Ladprao-Wongthong 15, Ladprao-Wongthong Rd., Ladprao, Ladprao, Bangkok 10210
Phone : +66 (0)2 278 2785, Email : dqa@serviceco.com

REPORT OF CALIBRATION

Certificate No. : SP23-008 Page: 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRM Value (Abs)	UIC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
258	0.0000	0.000	0.0000	0.0009	2.00
	0.7478	0.744	0.0038	0.0007	2.00
267	0.0000	0.000	0.0000	0.0009	2.00
	0.8688	0.865	0.0038	0.0009	2.00
311	0.0000	0.000	0.0000	0.0009	2.00
	0.2912	0.290	0.0012	0.0001	2.00
338	0.0000	0.000	0.0000	0.0009	2.00
	0.6448	0.639	0.0058	0.0005	2.00

เอกสารไม่ควบคุม

DQE Service Co., Ltd.
32 Soi Ladprao-Wongthong 15, Ladprao-Wongthong Rd., Ladprao, Ladprao, Bangkok 10210
Phone : +66 (0)2 278 2785, Email : dqa@serviceco.com

REPORT OF CALIBRATION

Certificate No. : SP23-008 Page: 5 of 5

Wavelength Accuracy :

CRM Value (nm.)	UIC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.32	241.5	-0.18	0.18	2.00
279.45	279.8	-0.35	0.18	2.00
287.81	287.9	-0.09	0.18	2.00
344.86	344.3	0.56	0.18	2.00
380.93	380.3	0.63	0.18	2.00
408.29	408.8	-0.51	0.18	2.00
445.84	445.8	0.04	0.18	2.00
473.80	473.9	-0.09	0.18	2.00
490.02	490.2	-0.18	0.18	2.00
536.39	536.7	-0.31	0.18	2.00
607.26	607.9	-0.63	0.18	2.00
651.18	650.4	0.78	0.30	2.00
672.29	672.9	-0.59	0.30	2.00
713.47	713.9	-0.47	0.30	2.00
738.88	739.3	-0.44	0.30	2.00
773.17	773.7	-0.53	0.30	2.00
805.33	805.8	-0.47	0.30	2.00
864.48	864.9	-0.40	0.30	2.00
948.72	949.2	-0.48	0.30	2.00
1046.16	1046.5	-0.34	0.30	2.00
1077.03	1077.6	-0.57	0.30	2.00
1179.28	1179.2	0.08	0.30	2.00

เอกสารไม่ควบคุม

nfi National Forensic Institute
National Forensic Institute
National Forensic Institute
National Forensic Institute

Calibration Certificate

Certificate No.: 230100-001-01
Client name: ENTER ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 2 Bat Uthong 11, Sukhumvit Road, Bangkok, Phrasang, Bangkok 10000

Page: 1 of 5

Equipment: pH Meter
Manufacturer: HANNA
Model: HI9142
Serial No.: 10000000
ID No.: UAC-WAT-000000
Order No.: 230100
Operation No.: 230100-001
Date of Receipt: 11 February 2023
Date of Calibration: 24 February 2023

Calibrated by: Mr. Praporn Boonlert
Approved by: Mr. Praporn Boonlert
Specialist, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 24 February 2023

The measurement is for a confidence probability of approximately 95%.

The Calibration is in accordance with the conditions of calibration given by the Calibration Laboratory. The Calibration is in accordance with the conditions of calibration given by the Calibration Laboratory. The Calibration is in accordance with the conditions of calibration given by the Calibration Laboratory.

เอกสารไม่ควบคุม



Certificate of Calibration

Certificate No.: G24230059

Page: 2 of 2

Equipment: CONDUCTIVITY METER
Model: Lab 986
Serial No. (or ID.): 16000356
Manufacturer: SI Analytics
Electrode Serial No.: 16070067
Condition: In Condition

Certificate No.: C24230059
Issued Date: 18 March 2023
Job No.: KSPF0304472
Page: 1 of 2
Model: LP4137 **Brand:** SI Analytics

Customer: United Analyst and Engineering Consultant Company Limited
 3 Soi Udomsak 41, Sukhumvit Road,
 Bangkok, Prakhong, Bangkok 10260 Thailand

Environment Conditions: Temperature 23 °C ± 2 °C
 Humidity 52 %RH ± 15 %RH

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

Calibration By: Mr. Atchul Niamschanal
Calibration Date: 18 March 2023
The Method used: In house method, CAL-WI-48, base on ASTM D 1125-14 and D 5091-14
Traceability: This certificate is traceable to the SI Units maintained by CMAA of NIST (SRM) through
 CPA Chem Co., Ltd. (ISO/IEC 17034) Certificate No. 030312, 030313, 030318

(Mr. Atchul Niamschanal)
 Person in charge

(Mr. Hissus Schwaner)
 Authorized signatory

This certificate is issued for the sole of measurement according to the international system of units (SI), to provide traceability of measurement to
 International or national standards or other recognized national standards laboratories.
 The measurement uncertainty stated in 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 variations from specified conditions. The results were only for the items tested, calibrated or sampled. The report shall
 not be reproduced or used without approval of DKSH Technology Limited.
 DKSH Technology Limited
 2533 Sukhumvit Road, Bangkok, Prakhong, Bangkok 10260
 Phone: +66 225 1155 Email: info@dksh.com Website: www.dksh.com/thailand

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CAL-FW-024-08-12 Sep 2022

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Calibration Results:

Before Adjustment

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor (k)	Uncertainty (±)
25.000 µS/cm	24.5 µS/cm	0.500 µS/cm	2.00	0.21 µS/cm
1413.0 µS/cm	1400 µS/cm	13.0 µS/cm	2.00	9.8 µS/cm
111.3 mS/cm	109.5 mS/cm	1.80 mS/cm	2.00	0.87 mS/cm

After Adjustment : at 1413 µS/cm

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor (k)	Uncertainty (±)
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	9.8 µS/cm
111.3 mS/cm	109.6 mS/cm	1.60 mS/cm	2.00	0.87 mS/cm

The End of Certificate

With Signature and Seal:
 (Signature and Seal)
 2533 Sukhumvit Road, Bangkok, Prakhong, Bangkok 10260
 Phone: +66 225 1155 Email: info@dksh.com Website: www.dksh.com/thailand

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CAL-FW-024-08-12 Sep 2022

ใบตรวจสอบสภาพเครื่องวัดค่าความนำ

เลขที่ใบตรวจ: KSPF0304472

ชื่อเครื่องวัด: CONDUCTIVITY METER		ยี่ห้อ: Lab 986	หมายเลขเครื่อง: 16000356	
ตรวจสอบ (ปี)		ตรวจสอบ (ปี)		หมายเหตุ
18 Mar 2023		18 Mar 2023		
วันที่	เวลา	วันที่	เวลา	
General				
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1. การเชื่อมต่อสายไฟ
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2. การเชื่อมต่อ (ขั้วต่อสายไฟ, ขั้วต่อสายไฟ)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3. การเชื่อมต่อ (ขั้วต่อสายไฟ, ขั้วต่อสายไฟ)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	4. ฟังก์ชัน (Range)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)
อุปกรณ์เสริม				
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	6. แบตเตอรี่ (Battery Backup) >= 3.5 VDC
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	7. การเชื่อมต่อสายไฟ (Wavelength Control)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	8. การเชื่อมต่อสายไฟ (Wavelength Check)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9. เวลาใช้งาน (LTV = 3,000 hour)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	10. เวลาใช้งาน (LTV = 5,000 hour)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11. การเชื่อมต่อสายไฟ (Carousal Module)
pH Meter and Conductivity Meter				
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	12. สายไฟ (Electrode and Connection Cable)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	13. การเชื่อมต่อสายไฟ (Electrode Level KCl)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14. การเชื่อมต่อสายไฟ (Electrode Protection Hood)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	15. การเชื่อมต่อสายไฟ (Stand)
Autoburette				
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	16. การเชื่อมต่อสายไฟ (No Sample)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	17. การเชื่อมต่อสายไฟ (pH = 2.8, 3.0)
Automatic Strainer				
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	18. การเชื่อมต่อสายไฟ (Strainer)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	19. Function Filling and Dosing
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	20. การเชื่อมต่อสายไฟ (Strainer)

หมายเหตุ: Electrode Reagent: 25.1°C Tap Control Water: 25.1°C

Mr. Atchul Niamschanal
 Senior Engineer

With Signature and Seal:
 (Signature and Seal)
 2533 Sukhumvit Road, Bangkok, Prakhong, Bangkok 10260
 Phone: +66 225 1155 Email: info@dksh.com Website: www.dksh.com/thailand

Delivering Scope: - In Asia and Beyond

CAL-FW-024-08-12 Sep 2022

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAI AND JAPAN)
 CERTIFICATE OF CALIBRATION
 2533 Sukhumvit Road, Bangkok, Prakhong, Bangkok 10260
 Phone: +66 225 1155 Email: info@dksh.com Website: www.dksh.com/thailand



Cert No.: 23MAR192
 Page: 1 of 2

Certificate of Calibration

Equipment: Electronic Balance
Manufacturer: Mettler Toledo
Model: N2000
Serial No.: C30081872
ID No.: URE-WAO-0125968
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
 3 Soi Udomsak 41, Sukhumvit Road,
 Bangkok, Prakhong, Bangkok 10260
Location: Balance Room
Received order: 20 Apr 2023
Calibration Date: 20 Apr 2023
Ambient Temperature: 15 °C to 40 °C
Relative Humidity: 30 % to 90 %
Calibrated by: Man Pichayapongwongwong

Approved by:
 () Pichayapongwongwong
 () Man Pichayapongwongwong
 () Surek Intip

Issue Date: 2 May 2023

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

This certificate may not be reproduced without the DKSH Group logo and DKSH Group
 Authority by DKSH Technology Services Ltd. - Bangkok, Thailand

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-04930G-1

Cert.No.: 23060112
Page: 2 of 3

Procedure used :-

Calibration were conducted using in-house calibration procedure CP-0001 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instrument(s):

Instrument	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (S2)	15894	24553	70PC307	SM-0013-23	30 Jun 2024

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made as requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.

5. This certificate is traceable to the International System of Unit.

Result of calibration : () Without Adjustment () After Adjustment by Internal Calibration

Range capacity :	0 g to 01 g	Resolution : 0.0001 g
	01 g to 220 g	Resolution : 0.001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (mg)	Coverage Factor (K)
80	80.0008	-0.0008	0.19	2.08
200	199.9999	+0.0001	0.39	2.08

After Adjustment :

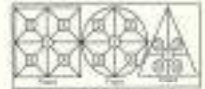
1. Determination of the standard deviation of weighing machine (n = 10)

Applied Weight (g)	Standard Deviation of Reading (g)
80	0.00007
200	0.00090



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-04930G-1

Cert.No.: 23060112
Page: 3 of 3



Maximum difference between off-center and central loading (g)

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	
-0.0001	-0.0001	0.0000	-0.0001	-0.0001	0.0001

2. Effect of off-center loading

A mass of 100 g was placed in various position on the pan. The weighing machine reading once obtained is given in the table.

Balance Reading (g)	Correction (g)	Measurement Uncertainty (mg)	Coverage Factor (K)
100.0000	0.0000	0.014	2.13
8.85	0.0000	0.015	2.09
0.1	-0.0001	0.019	2.04
1	-0.0001	0.019	2.04
5	-0.0003	0.020	2.05
20	-0.0006	0.049	2.06
80	-0.0006	0.080	2.08
80	-0.0004	0.15	2.06
100	0.0000	0.16	2.06
190	0.0000	0.39	2.06
300	0.0000	0.39	2.06

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

-o-o-

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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
COMPARED STANDARD & EQUIPMENT CALIBRATION AND TESTING SERVICE
1001 KJ THAILAND BUILDING 11, 12/101-1012, CHAIBURI ROAD, BANGKOK
TEL: 02-077-006-07 FAX: 02-077-0440



Cert. No.: 23T0103
Page: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Mammert
Model : UF 50
Serial No. : 80723411
ID No. : UAE-AWG 3052506
Submitted by : United Analytic and Engineering Consultant Co., Ltd.
3 Soi Udomsak 41, Sakulnvej Road,
Bangkok, Phraekhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 11 April 2023
Calibration Date : 11 / 12 April 2023
Ambient Temperature : $28 \pm 1.1^\circ\text{C}$
Relative Humidity : $58 \pm 3.1\%$
Calibrated by : Anisa Mubina

Approved by :

() Peritippan, Tanayakul
() Mubina, Mubina
() Sawi Injai

Issue Date : 24 April 2023

The 1 uncertainties are for a confidence probability of approximately 95 %

This certificate is valid only to the item calibrated on date and place of calibration.
Approved by the head of Technology Promotion Association (Thailand-Japan)

เอกสารไม่ควบคุม

A 0093359



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2304-01960G-1

Cert. No.: 23T0103
Page: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-0102 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument(s):

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY50003411	23T0103	26 Nov 2023

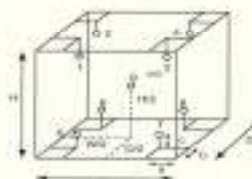
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certificate is traceable to the International System of Unit.

Result of Calibration : () Without Adjustment

Position of OLC : Temperature Source

Fresh air setting : Close



Probe Installation Details	Dimension of Chamber :
4" 0.0 in	D = 6.50 in
5" 0.0 in	W = 8.80 in
5.5" 0.0 in	H = 9.75 in
	Capacity = 0.30 cu

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	28
REL. Humid. (%)	45	44
AC Supply (Vol)	221	220

Ref. Std. ID No.: 02 Calibration Point		
Position	120 to 140 °C	160 °C
1	10-20TC-01	20RTD-01
2	10-20TC-02	20RTD-02
3	10-20TC-03	20RTD-03
4	10-20TC-04	20RTD-04
5	10-20TC-05	20RTD-05
6	10-20TC-06	20RTD-06
7	10-20TC-07	20RTD-07
8	10-20TC-08	20RTD-08
9 (Ref)	10-20TC-09	20RTD-09

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A 1136251



Equipment: Hot Air Oven
 Condition As Received: Used Item
 Reference: 2304-015600-1
 Result of Calibration: (°) Without Adjustment
 Function of UUC*: Temperature Exposed
 Fresh air setting: Open

Cert. No.: 2303113-001-02
 Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor
104.0	104.0	104.0	0.084	0.59	0.86	2
128.0	128.0	128.0	0.12	0.88	1.5	2
188.0	188.0	188.0	0.12	1.5	2.6	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref)	
104.0	104.512	104.030	104.542	104.421	103.704	103.728	105.187	104.158	104.001	0.42
128.0	128.317	119.780	120.524	120.232	118.360	119.208	119.680	118.750	119.738	1.1
188.0	188.678	179.879	181.357	180.871	178.303	176.158	180.230	180.055	179.800	1.1

Average*: The average of 30 values in each position.
 Temperature stability: One-half of the greatest maximum difference of measured temperature at any one sensor.
 Temperature uniformity: The maximum difference of measured temperature of any sensors and its measured temperature at the reference location which are observed at the same time or at its close on observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
 Overall Variation: The difference of the maximum and minimum measured temperature throughout observation.
 UUC*: Unit Under Calibration
 Note: The reported uncertainty of measurement was included stability and standard uncertainty.
 The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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 # 1158280



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 มูลนิธิเพื่อการพัฒนาประเทศไทย
 Foundation for National Development Institute
 Food Institute Laboratory Service Center

Verification Certificate

Certificate No.: 2303113-001-02
 Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
 Address: 3 Soi Sidosmek 43, Sukhumvit Road, Bangkok, Prachinong, Bangkok 10260

Page 1 of 4

Equipment: HEATING BLOCK DIGESTION
 Manufacturer: PONS
 Model: 2530
 Serial No.: 81794489
 ID No.: GME.WKS.012/2560
 Order No.: 2303113
 Operation No.: 2303113-001
 Date of Receipt: 28 March 2023
 Date of Calibration: 30-31 March 2023

Calibrated by: Mr. Pongsakorn Pongpradit Specialist
 Approved by: (Mr. Pongsakorn Pongpradit) Manager, Division of Calibration Laboratory
 Date of Issue: 30 April 2023
 Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95 %.
 This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its capability to recognize national standards and to the use of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.
 P-01-001 Version 31 Date: 30-04-20



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 Foundation for National Development Institute
 Food Institute Laboratory Service Center

Verification Report

Certificate No.: 2303113-001-01
 Equipment: HEATING BLOCK DIGESTION
 Model: 2530 Serial No.: 81794489
 Resolution: 1 °C ID No.: GME.WKS.012/2560
 Manufacturer: PONS

Date of Calibration: 30-31 March 2023
 Calibration point: 200 °C
 Calibration result:
 Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (± °C)	Standard Thermometer (°C)	Uncertainty (± °C)
1	200	200	0.96	177.34	2.1
2	200	200	0.90	177.38	2.1
3	200	200	1.30	177.82	2.1
4	200	200	0.44	177.38	2.6
5	200	200	0.31	177.30	2.6
6	200	200	0.39	177.30	2.6
7	200	200	1.17	175.80	2.1
8	200	200	0.33	176.96	2.1
9	200	200	0.14	175.30	2.1
10	200	200	0.90	176.38	2.0
11	200	200	1.34	176.34	2.0
12	200	200	0.35	176.88	2.0
13	200	200	0.40	177.80	2.6
14	200	200	0.30	176.38	2.0
15	200	200	0.50	177.86	2.6
16	200	200	0.49	176.23	2.7
17	200	200	0.71	177.80	2.7
18	200	200	0.30	176.77	2.7
19	200	200	0.84	177.86	2.8
20	200	200	0.41	176.88	2.8

UUC*: Unit Under Calibration
 Immersion depth of standard thermometer is less than 1/3 of total length of sensor to avoid thermal gradient of UUC.
 Stability = One-half of the greatest maximum difference of measured temperature at any sensors for at least half an hour after reaching steady state.

P-01-001 Version 31 Date: 30-04-20

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 Foundation for National Development Institute
 Food Institute Laboratory Service Center

Verification Report

Certificate No.: 2303113-001-03
 Equipment: HEATING BLOCK DIGESTION
 Model: 2530 Serial No.: 81794489
 Resolution: 1 °C ID No.: GME.WKS.012/2560
 Manufacturer: PONS

Date of Calibration: 30-31 March 2023
 Calibration point: 200 °C
 Calibration result:
 Reporting of Temperature

Location: Laboratory Room, NATIONAL FOOD INSTITUTE
 Environment Condition:
 Ambient Temperature: (25 ± 3) °C
 Relative Humidity: (55 ± 15) %
 Line Voltage: (220 ± 10) Volt

Condition of this results of Calibration:
 1. This instrument was calibrated by using standard thermocouples type E and its heating block digestion and compared to temperature obtained from reference standard thermometer at calibration point.
 - The temperature value used was based on 270 ± 10 °C.
 - All data above before were final values and the initial data may be obtained upon request.

Equipment	Model	Serial No.	Certificate No.	Exp. Date	Through
Digital Thermocouple with Thermocouple	340708	XXXXXXXXXXXX	TC-02/2014	9 May 2023	NFI, Technical Center Laboratory

2. This certificate is invalid to international system of units (SI Units).
 3. This certificate was issued only for the instrument we calibrated.
 4. This result of calibration was found accurate as shown on data and place of calibration only.
 5. Condition of Calibration date: 1: Good

UUC* Description:
 Time of record: Hour: 30 Minute: At: 200 °C
 F. Result of Calibration: ☒ Without adjustment ☐ After adjustment

P-01-001 Version 31 Date: 30-04-20

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-048100-8

Cert. No. : 23TM078
Page : 2 of 3

Procedure Used :-
Calibration was conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
This temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument :-

Instrument	Model	Serial No.	Cert. No.	Exp. Date
1) Data Acquisition	54872A	MY5701371-1	23LM03	02 Jul 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Units.

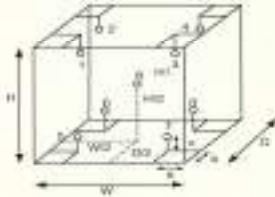
Result of Calibration :- (°) Without Adjustment

Function of UUC :- Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	22
REL Humid. (%)	70	80
AC Supply (Vol)	220	220

Position	Ref. Std. ID No.
1	16RTD-215
2	16RTD-212
3	16RTD-210
4	16RTD-214
5	16RTD-216
6	16RTD-218
7	16RTD-217
8	16RTD-219
9 (ref.)	16RTD-213



Probe Installation Details :

a = 10 cm
b = 10 cm
c = 10 cm

Dimension of Chamber :

D = 0.90 m
W = 0.64 m
H = 0.80 m
Capacity = 0.28 m³

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
COMPARABLE SERVICES, EQUIPMENT CALIBRATION AND TESTING SERVICES
1044 PATTANAKARN ROAD, 10, BANGKOK 10110, THAILAND
TEL. 0-2777-9999-0 FAX 0-2777-9999-1



Cert. No. : 23TM078
Page : 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Mammart

Model : IPP-260

Serial No. : V015.0167

ID No. : UAE-MC-000/0554

Submitted by : United Analyst and Engineering Consultation Co., Ltd.
3 Set Udonruek 41, Subansiri Road,
Bangkok, Phrasarang,
Bangkok 11000

Location : Microbiology Laboratory

Received Order : 11 April 2023

Calibration Date : 12 April 2023

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Procha Hahib

Approved by :
Approved Signature

() Pongthip Tanasakul
() Mee Sutvorn
() Suwit Inga

Issue Date : 24 April 2023

The Uncertainty are for a confidence probability of approximately 95 %

This certificate is only valid for the purpose and for the item and location stated on this page.
Approved by the Head of Calibration Service : Equipment Calibration and Testing Service

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-015500-1

Cert. No. : 23TM078
Page : 2 of 3

Procedure Used :-
Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
This temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument :-

Instrument	Model	Serial No.	Cert. No.	Exp. Date
1) Data Acquisition	54872A	MY49031401	23LM07	05 Feb 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Units.

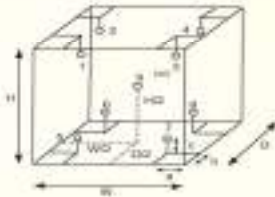
Result of Calibration :- (°) Without Adjustment

Function of UUC :- Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	21
REL Humid. (%)	57	61
AC Supply (Vol)	220	220

Position	Ref. Std. ID No.
1	16RTD-211
2	16RTD-212
3	16RTD-210
4	16RTD-214
5	16RTD-216
6	16RTD-218
7	16RTD-217
8	16RTD-219
9 (ref.)	16RTD-213



Probe Installation Details :

a = 5.0 cm
b = 5.0 cm
c = 5.0 cm

Dimension of Chamber :

D = 0.58 m
W = 0.64 m
H = 0.68 m
Capacity = 0.28 m³

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-015500-1

Cert. No. : 23TM078
Page : 3 of 3

Result of Calibration :- (°) Without Adjustment
Function of UUC :- Temperature Source
Fresh air setting : Not Available

Calibration Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor
35.0	35.0	35.0	0.003	0.43	0.60	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.082	35.148	34.917	35.149	34.894	35.333	34.773	35.098	34.900	0.50

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperatures at any one instant.

Temperature uniformity : The maximum difference of measured temperatures of any sensor 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 conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and included uniformity.

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

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Cert. No.: 23TM192
Page: 1 of 3

Certificate of Calibration

Equipment: Water Bath
Manufacturer: Memmert
Model: WNC 14
Serial No.: L416.0602
ID No.: UAE.MC.0020500
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
356 Udonrak 41, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10250
Location: Microbiology Laboratory
Received Order: 15 February 2023
Calibration Date: 15 February 2023
Ambient Temperature: $(25 \pm 10) ^\circ\text{C}$
Relative Humidity: $(50 \pm 30) \%$
Calibrated by: David Ingo

Approved by:
Pannipon Tanayakul
Maha Subura

Issue Date: 24 February 2023

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

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Approved by the Technical Committee (TC) - Equipment Calibration and Testing Services

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Equipment: Water Bath
Condition As-Received: Used Item
Reference: 2302-02500-2
Procedure Used: 1

Cert. No.: 23TM193
Page: 2 of 3

Calibration were conducted using In-house calibration procedure CP-0704 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:

Instrument	Model	Serial No.	Cert. No.	Exp. Date
1) Data Acquisition	34072A	M78503411	23UM166	25 Nov 2023

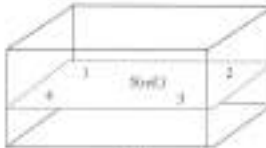
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certificate is traceable to the International System of Unit.

Result of Calibration: (*) Without Adjustment

Function of UUC: Temperature Source

	Revised result		AC Voltage Supply (Volt)
	($^{\circ}\text{C}$)	(% R.H.)	
Beginning of Calibration	22	60	221
Finished of Calibration	23	61	231



Fixed

Position	Ref. Std. ID No.
1	4804339-001
2	4804339-002
3	4804339-003
4	4804339-004
5	4804339-005

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Equipment: Water Bath
Condition As-Received: Used Item
Reference: 2302-02500-2
Result of Calibration: (*) Without Adjustment
Function of UUC: Temperature Source

Cert. No.: 23TM194
Page: 2 of 3

Calibration point ($^{\circ}\text{C}$)	UUC Setting ($^{\circ}\text{C}$)	UUC Reading ($^{\circ}\text{C}$)	Average Standard Reading ($^{\circ}\text{C}$)				
			Position				
44.5	44.5	44.5	44.452	44.427	44.420	44.477	44.459

Calibration point ($^{\circ}\text{C}$)	Uniformity ($^{\circ}\text{C}$)	Stability (Δ $^{\circ}\text{C}$)	Uncertainty (Δ $^{\circ}\text{C}$)	Coverage Factor K
44.5	0.078	0.089	0.15	2

Average: The average of 30 values in each position.

Uniformity: The maximum difference of measured temperatures of 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 conditions.

Stability: One-half of the greatest maximum difference of measured temperatures at any one probe.

UUC: Unit Under Calibration

Note: The reported uncertainty of measurement was included stability and excluded uniformity.

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

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Certificate of Calibration

Equipment: Water Bath
Manufacturer: Memmert
Model: WNC 14
Serial No.: L416.0602
ID No.: UAE.MC.0020500
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
356 Udonrak 41, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10250
Location: Microbiology Laboratory
Received Order: 15 February 2023
Calibration Date: 15 February 2023
Ambient Temperature: $(25 \pm 10) ^\circ\text{C}$
Relative Humidity: $(50 \pm 30) \%$
Calibrated by: David Ingo

Approved by:
Pannipon Tanayakul
Maha Subura

Issue Date: 24 February 2023

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

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Approved by the Technical Committee (TC) - Equipment Calibration and Testing Services

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เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2302-02590C-3
Page: 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure (CP-0704), according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:

Instrument	Model	Serial No.	Cert. No.	Due Date
1 Data Acquisition	54073A	MY5003411	231M106	26 Nov 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration : (°) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%RH)	(Vol)
Beginning of Calibration	22	66	231
Finished of Calibration	22	65	236



Free

Position	Ref. Std. ID No.
1	4804330-001
2	4804330-002
3	4804330-003
4	4804330-004
30st	4804330-005

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Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2302-02590C-3
Page: 3 of 3

Result of Calibration :-

(°) Without Adjustment

Function of UUC* : Temperature Source

Calibration point (°C)	UUC* Reading (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.520	44.530	44.494	44.502	44.520

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor
44.5	0.077	0.037	0.16	2

Average* : The average of 30 values in each position.

Uniformity : The maximum difference of measured temperatures of any sensors and the measured temperature at the reference location, which are observed at the same time or at its close on observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Stability : One-half of the greatest maximum difference of measured temperature at any one point.

UUC* : UUT Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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Certificate of Calibration

Equipment : Balance
Model : PR323
Serial No. (or ID.): C238764745
Manufacturer : Ohaus
Condition : New

Certificate No. : C01233732
Issued Date : 08 December 2022
Job No. : KSPR2215576
Page : 1 of 2

Customer : United Analytical and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,
Phraekhanong District, Bangkok, THAILAND 10260

Environment Condition : Temperature : 28 °C ± 0.5 °C
Humidity : 52 %RH ± 3.0 %RH

Calibration Place : United Analytical and Engineering Consultant Co., Ltd. (301 Microbiology Room)
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,
Phraekhanong District, Bangkok, THAILAND 10260

Calibration By : Mr. Adair Malini
Calibration Date : 09 December 2022
The Method used : In-house method, CAL-86-47, based on OIML Lab 14
Traceability : This certificate is traceable to the SI units maintained by National Institute of Metrology (NIM), Thailand through DKSH Technology Co., Ltd. Certificate No. C02221788

(Mr. Adair Malini)
Person in charge

(Mr. Rungroj Jantakulchai)
Authorized signatory

This certificate is issued in the unit 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.
The measurement uncertainty stated in the reported uncertainty when it 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 the Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. This result valid only in the terms stated, calibration is complete. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

Unit Address and Contact Info
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CAL-PH-024-16 12 Sep 2021

Calibration Results:

Without Adjustment

Excessive Error: Weight in the 10% or 10% of Maximum capacity, taken from the center of the pan as a zero reference.

Maximal Test Value	Reference Points (g)				
	A	B	C	D	E
100	0.008	0.000	0.008	0.000	0.000

Repeatability: Determination of the standard deviation of weighing reference. Repeatability : 0.001 (g)

Maximal test value (g)	Standard Deviation
50	0.0004
100	0.0008

Error of indication from nominal or conventional mass value. Repeatability : 0.001 (g)

Nominal Value	Conventional Mass	Displayed Value	Error of Indication	Uncertainty	k
g	g	g	g	g	
1	1.0000	1.000	0.000	0.0010	2.00
5	5.0001	5.000	0.000	0.0010	2.00
10	10.0001	10.000	0.000	0.0010	2.00
20	20.0001	20.000	0.000	0.0010	2.00
50	50.0001	50.000	0.000	0.0010	2.00
100	100.0001	100.000	0.000	0.0011	2.00
200	200.0004	200.000	0.000	0.0011	2.00
500	500.0008	500.000	-0.001	0.0015	2.00
1000	1000.0008	1000.000	0.000	0.0016	2.00
2000	2000.0008	2000.000	0.000	0.0017	2.00
5000	5000.0008	5000.000	0.000	0.0018	2.00

The End of Certificate

Unit Address and Contact Info
Unit Address and Contact Info
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Unit Address and Contact Info

Delivering Growth - In Asia and Beyond

CAL-PH-024-16 12 Sep 2021

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เอกสารไม่ควบคุม

Statements of conformity:

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

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

Tolerances and Decision rules:

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

Default rule: ☐ Choice A: Every Statement is Strong Assistance Rule (e = 0). Specific Risk = 50%/75%

☐ Choice B: Narrative statement with guard bands ± 1 U, Pass or Fail Specific Risk $< 2.0\%$ PPA, and

☐ Choice C: Customer delay. Customers may define arbitrary multiple of 1 to be applied as point lead for 1 UE.

Ringrad

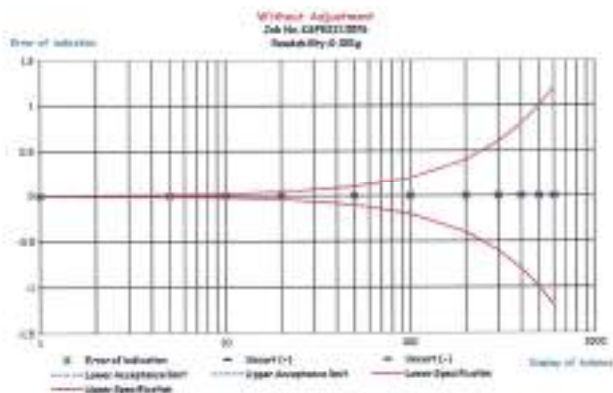
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Delivering Growth – In Asia and Beyond

CAL-PH-CDFV-14-12 (Rev. 2013)

เอกสารไม่ควบคุม



เอกสารไม่ควบคุม

Statements of conformity:

Without Adjustment

Flexibility: 8.00t 3

Nominal Value	Order of adjustment	Guard band (σ)	Tolerance (σ)	Conformity
0	0	0	0	
1	0.000	0.0030	0.003	Pass
5	0.000	0.0030	0.010	Fail
10	0.000	0.0030	0.030	Pass
20	0.000	0.0030	0.040	Pass
50	0.000	0.0030	0.100	Pass
100	0.000	0.0011	0.200	Fail
200	0.000	0.0011	0.400	Pass
300	-0.001	0.0013	0.600	Pass
400	0.000	0.0013	0.800	Pass
500	0.000	0.0017	1.000	Pass
600	0.000	0.0019	1.200	Pass

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

The End of Statements of conformity

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Delivering Growth — in Asia and Beyond

CALPACID: 16-12 Dec 2003

เอกสารไม่ควบคุม



Certificate of Calibration

Equipment	Autoclave
Model	CL-400
Serial No. (or ID.)	810010
Manufacturer	ALP
Condition	In Condition

Certificate No.: CFT230109
Issued Date: 11 June 2023
Job No.: HSPR2308T70
Page: 1 of 4

Customer: United Analyst and Engineering Consultant Company Limited,
3 Soi Udomsak 41 Sukhumvit Road,
Bangkok, Pratinong, Bangkok 10260 Thailand.

Environment Condition:	Temperature:	22 °C	±	0.5 °C
	Humidity:	50 %RH	±	4.0 %RH
	Voltage:	220 VAC	±	1.0 VAC

Collaboration Partner: United Analyst and Engineering Consultant Company Limited, (381 Room)
3-Soi Udomsak 41 Sukhumvit Road,
Bangkok, Prakanong, Bangkok 10260 Thailand.

Calibration By:	Dr. Anantach Phumphi
Calibration Date:	09 June 2023
The Method used:	In-house method, GUM-W-18, based on ISO 9001:2015, Part 8
Traceability:	This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Quality System Co., Ltd. Certificate No. QMS-0008

(Mr. Amos) Thompson
Person in charge

This article is to be used only for measurement purposes in the International System of Units (SI). It is not intended for measurement in International or national standards or other non-SI national standard documents.

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).

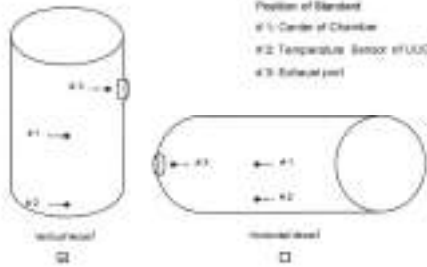
this feature will be
 (1) having
 and (2) having
 (3) having
 (4) having

Delivery details – in 1988 and beyond

(Jm. Uicker, Sr.)
Author(s) biography

เอกสารไม่ควบคุม

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Position of Standard
P1: Center of Chamber
P2: Temperature Sensor (TUUC)
P3: Exhaust port

Standard Installation Locations

Standard Location (P1):	Geometric center of the chamber
Standard Location (P2):	Distance from temperature sensor of (AUO 2 (cm))
Standard Location (P3):	Distance from the wall 5 (cm)

Position of Std	#1	#2	#3
Channel of Lagger	4	5	6

Definitions

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

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

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

Lab Location: 301/101/102/103/104/105/106/107/108/109/110/111/112/113/114/115/116/117/118/119/120/121/122/123/124/125/126/127/128/129/130/131/132/133/134/135/136/137/138/139/140/141/142/143/144/145/146/147/148/149/150/151/152/153/154/155/156/157/158/159/160/161/162/163/164/165/166/167/168/169/170/171/172/173/174/175/176/177/178/179/180/181/182/183/184/185/186/187/188/189/190/191/192/193/194/195/196/197/198/199/200/201/202/203/204/205/206/207/208/209/210/211/212/213/214/215/216/217/218/219/220/221/222/223/224/225/226/227/228/229/230/231/232/233/234/235/236/237/238/239/240/241/242/243/244/245/246/247/248/249/250/251/252/253/254/255/256/257/258/259/260/261/262/263/264/265/266/267/268/269/270/271/272/273/274/275/276/277/278/279/280/281/282/283/284/285/286/287/288/289/290/291/292/293/294/295/296/297/298/299/300/301/302/303/304/305/306/307/308/309/310/311/312/313/314/315/316/317/318/319/320/321/322/323/324/325/326/327/328/329/330/331/332/333/334/335/336/337/338/339/340/341/342/343/344/345/346/347/348/349/350/351/352/353/354/355/356/357/358/359/360/361/362/363/364/365/366/367/368/369/370/371/372/373/374/375/376/377/378/379/380/381/382/383/384/385/386/387/388/389/390/391/392/393/394/395/396/397/398/399/400/401/402/403/404/405/406/407/408/409/410/411/412/413/414/415/416/417/418/419/420/421/422/423/424/425/426/427/428/429/430/431/432/433/434/435/436/437/438/439/440/441/442/443/444/445/446/447/448/449/450/451/452/453/454/455/456/457/458/459/460/461/462/463/464/465/466/467/468/469/470/471/472/473/474/475/476/477/478/479/480/481/482/483/484/485/486/487/488/489/490/491/492/493/494/495/496/497/498/499/500/501/502/503/504/505/506/507/508/509/510/511/512/513/514/515/516/517/518/519/520/521/522/523/524/525/526/527/528/529/530/531/532/533/534/535/536/537/538/539/540/541/542/543/544/545/546/547/548/549/550/551/552/553/554/555/556/557/558/559/560/561/562/563/564/565/566/567/568/569/570/571/572/573/574/575/576/577/578/579/580/581/582/583/584/585/586/587/588/589/590/591/592/593/594/595/596/597/598/599/600/601/602/603/604/605/606/607/608/609/610/611/612/613/614/615/616/617/618/619/620/621/622/623/624/625/626/627/628/629/630/631/632/633/634/635/636/637/638/639/640/641/642/643/644/645/646/647/648/649/650/651/652/653/654/655/656/657/658/659/660/661/662/663/664/665/666/667/668/669/670/671/672/673/674/675/676/677/678/679/680/681/682/683/684/685/686/687/688/689/690/691/692/693/694/695/696/697/698/699/700/701/702/703/704/705/706/707/708/709/710/711/712/713/714/715/716/717/718/719/720/721/722/723/724/725/726/727/728/729/730/731/732/733/734/735/736/737/738/739/740/741/742/743/744/745/746/747/748/749/750/751/752/753/754/755/756/757/758/759/760/761/762/763/764/765/766/767/768/769/770/771/772/773/774/775/776/777/778/779/780/781/782/783/784/785/786/787/788/789/790/791/792/793/794/795/796/797/798/799/800/801/802/803/804/805/806/807/808/809/810/811/812/813/814/815/816/817/818/819/820/821/822/823/824/825/826/827/828/829/830/831/832/833/834/835/836/837/838/839/840/841/842/843/844/845/846/847/848/849/850/851/852/853/854/855/856/857/858/859/860/861/862/863/864/865/866/867/868/869/870/871/872/873/874/875/876/877/878/879/880/881/882/883/884/885/886/887/888/889/890/891/892/893/894/895/896/897/898/899/900/901/902/903/904/905/906/907/908/909/910/911/912/913/914/915/916/917/918/919/920/921/922/923/924/925/926/927/928/929/930/931/932/933/934/935/936/937/938/939/940/941/942/943/944/945/946/947/948/949/950/951/952/953/954/955/956/957/958/959/960/961/962/963/964/965/966/967/968/969/970/971/972/973/974/975/976/977/978/979/980/981/982/983/984/985/986/987/988/989/990/991/992/993/994/995/996/997/998/999/1000/1001/1002/1003/1004/1005/1006/1007/1008/1009/1010/1011/1012/1013/1014/1015/1016/1017/1018/1019/1020/1021/1022/1023/1024/1025/1026/1027/1028/1029/1030/1031/1032/1033/1034/1035/1036/1037/1038/1039/1040/1041/1042/1043/1044/1045/1046/1047/1048/1049/1050/1051/1052/1053/1054/1055/1056/1057/1058/1059/1060/1061/1062/1063/1064/1065/1066/1067/1068/1069/1070/1071/1072/1073/1074/1075/1076/1077/1078/1079/1080/1081/1082/1083/1084/1085/1086/1087/1088/1089/1090/1091/1092/1093/1094/1095/1096/1097/1098/1099/1100/1101/1102/1103/1104/1105/1106/1107/1108/1109/1110/1111/1112/1113/1114/1115/1116/1117/1118/1119/1120/1121/1122/1123/1124/1125/1126/1127/1128/1129/1130/1131/1132/1133/1134/1135/1136/1137/1138/1139/1140/1141/1142/1143/1144/1145/1146/1147/1148/1149/1150/1151/1152/1153/1154/1155/1156/1157/1158/1159/1160/1161/1162/1163/1164/1165/1166/1167/1168/1169/1170/1171/1172/1173/1174/1175/1176/1177/1178/1179/1180/1181/1182/1183/1184/1185/1186/1187/1188/1189/1190/1191/1192/1193/1194/1195/1196/1197/1198/1199/1200/1201/1202/1203/1204/1205/1206/1207/1208/1209/1210/1211/1212/1213/1214/1215/1216/1217/1218/1219/1220/1221/1222/1223/1224/1225/1226/1227/1228/1229/1230/1231/1232/1233/1234/1235/1236/1237/1238/1239/1240/1241/1242/1243/1244/1245/1246/1247/1248/1249/1250/1251/1252/1253/1254/1255/1256/1257/1258/1259/1260/1261/1262/1263/1264/1265/1266/1267/1268/1269/1270/1271/1272/1273/1274/1275/1276/1277/1278/1279/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Equipment : Autoclave
Condition As Received : Used Item
Reference : 2304-04810C-2
Cert. No.: 23TH033
Page: 2 of 2

Procedure Used :-

Calibration were conducted using in-house calibration procedure QP-0123 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard calibration:-

Standard	Model	Serial No.	Cert. No.	Exp. Date
1. Data Acquisition	34872A	80760003A11	22LM163	28 Nov 2023

2. This certificate is valid only in the form outlined on date and place of calibration.

3. This certificate is traceable to the International System of Unit.

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**.

** = Categorization of organisms according to hazard and categories of containment, second edition, 1990. It does not cover autoclaves for use with material infected with organisms in Hazard Group 4, for which complex containment and sterilization of infectant condensate is considered to be essential.

This result of calibration does not apply to sterilizers or decontaminators used for medical, dental, pharmaceutical or veterinary purposes which are directly connected with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%RH)	(Vol)
Beginning of Calibration	27	60	230
Finished of Calibration	27	58	230

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	18-237C-04
2 =	Temperature sensor	18-237C-05
3 =	Exhaust port	16-237C-00

Val.

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Equipment : Autoclave
Condition As Received : Used Item
Reference : 2304-04810C-2
Cert. No.: 23TH033
Page: 2 of 2

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Operating parameter Set : Temperature = 121.0 °C

Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
121.0	121.0	1	121.275	0.22	0.80	0.78	2
		2	121.160				
		3	121.260				

Operating parameter Set : Temperature = 121.0 °C

Sterilization period = 30 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
121.0	121.0	1	121.260	0.28	1.1	0.78	2
		2	121.225				
		3	121.294				

Average* : The average of 30 values in each position.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

Val.

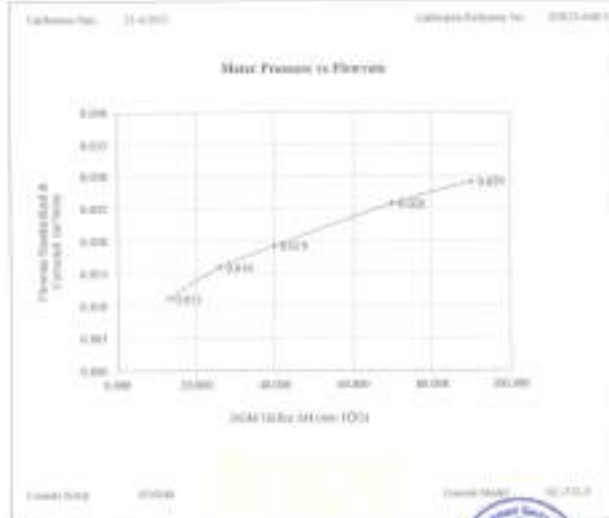
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List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	YSI	LAQUA-PH210 HA0D0081	Technology Promotion Association (Thailand-Japan)	23CH6	5 Jan 23	4 Jan 24	-
2	DO Meter	DO	YSI	Pro 20i 18H110491	Technology Promotion Association (Thailand-Japan)	22TW166	26 Jul 22	25 Jul 23	-
3	Conductivity Meter	Conductivity	YSI	Pro30 18C103131	Technology Promotion Association (Thailand-Japan)	22CH1155	31 Aug 22	30 Aug 23	-

Device/Channel Information	Calibration Information	Parameter Information
Console Model Number: AC-475-V	Date/Time: 21/04/2023 18:13 AM	Std Temp: 20.0 °C
Console Serial Number: 8707628	Calibration Reference No.: 8003144015	Std Power: 750 mW
DCM Model Number: 86200-0	Reference Pressure: 700.00 mmHg	R: 0.596
DCM Serial Number: 80007118	Calibration Mean Gamma: 0.999	Console Leak Check: PASS



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THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Temperature Information	Calibration Information
Console Model Number: AC-475-V	Date/Time: 21/04/2023 11:14 PM
Console Serial Number: 8707628	Calibration Reference No.: 8003144015
DCM Model Number: 86200-0	Reference Thermometer: 86120006
DCM Serial Number: 80007118	Serial Number: 181149186
Water Box Model Number: JSTC31 150 L	
Water Box Serial Number: AC 18768	

Results	
Console Thermocouple Standards	
Channel and Test point	Water Box Channel Temperature Reading (°C)
	18.8 21.8 24.8 27.8 30.8 33.8 36.8 39.8 42.8 45.8 48.8 51.8 54.8 57.8 60.8 63.8 66.8 69.8 72.8 75.8 78.8 81.8 84.8 87.8 90.8 93.8 96.8 99.8 102.8 105.8 108.8 111.8 114.8 117.8 120.8 123.8 126.8 129.8 132.8 135.8 138.8 141.8 144.8 147.8 150.8 153.8 156.8 159.8 162.8 165.8 168.8 171.8 174.8 177.8 180.8 183.8 186.8 189.8 192.8 195.8 198.8 201.8 204.8 207.8 210.8 213.8 216.8 219.8 222.8 225.8 228.8 231.8 234.8 237.8 240.8 243.8 246.8 249.8 252.8 255.8 258.8 261.8 264.8 267.8 270.8 273.8 276.8 279.8 282.8 285.8 288.8 291.8 294.8 297.8 300.8 303.8 306.8 309.8 312.8 315.8 318.8 321.8 324.8 327.8 330.8 333.8 336.8 339.8 342.8 345.8 348.8 351.8 354.8 357.8 360.8 363.8 366.8 369.8 372.8 375.8 378.8 381.8 384.8 387.8 390.8 393.8 396.8 399.8 402.8 405.8 408.8 411.8 414.8 417.8 420.8 423.8 426.8 429.8 432.8 435.8 438.8 441.8 444.8 447.8 450.8 453.8 456.8 459.8 462.8 465.8 468.8 471.8 474.8 477.8 480.8 483.8 486.8 489.8 492.8 495.8 498.8 501.8 504.8 507.8 510.8 513.8 516.8 519.8 522.8 525.8 528.8 531.8 534.8 537.8 540.8 543.8 546.8 549.8 552.8 555.8 558.8 561.8 564.8 567.8 570.8 573.8 576.8 579.8 582.8 585.8 588.8 591.8 594.8 597.8 600.8 603.8 606.8 609.8 612.8 615.8 618.8 621.8 624.8 627.8 630.8 633.8 636.8 639.8 642.8 645.8 648.8 651.8 654.8 657.8 660.8 663.8 666.8 669.8 672.8 675.8 678.8 681.8 684.8 687.8 690.8 693.8 696.8 699.8 702.8 705.8 708.8 711.8 714.8 717.8 720.8 723.8 726.8 729.8 732.8 735.8 738.8 741.8 744.8 747.8 750.8 753.8 756.8 759.8 762.8 765.8 768.8 771.8 774.8 777.8 780.8 783.8 786.8 789.8 792.8 795.8 798.8 801.8 804.8 807.8 810.8 813.8 816.8 819.8 822.8 825.8 828.8 831.8 834.8 837.8 840.8 843.8 846.8 849.8 852.8 855.8 858.8 861.8 864.8 867.8 870.8 873.8 876.8 879.8 882.8 885.8 888.8 891.8 894.8 897.8 900.8 903.8 906.8 909.8 912.8 915.8 918.8 921.8 924.8 927.8 930.8 933.8 936.8 939.8 942.8 945.8 948.8 951.8 954.8 957.8 960.8 963.8 966.8 969.8 972.8 975.8 978.8 981.8 984.8 987.8 990.8 993.8 996.8 999.8 1002.8 1005.8 1008.8 1011.8 1014.8 1017.8 1020.8 1023.8 1026.8 1029.8 1032.8 1035.8 1038.8 1041.8 1044.8 1047.8 1050.8 1053.8 1056.8 1059.8 1062.8 1065.8 1068.8 1071.8 1074.8 1077.8 1080.8 1083.8 1086.8 1089.8 1092.8 1095.8 1098.8 1101.8 1104.8 1107.8 1110.8 1113.8 1116.8 1119.8 1122.8 1125.8 1128.8 1131.8 1134.8 1137.8 1140.8 1143.8 1146.8 1149.8 1152.8 1155.8 1158.8 1161.8 1164.8 1167.8 1170.8 1173.8 1176.8 1179.8 1182.8 1185.8 1188.8 1191.8 1194.8 1197.8 1200.8 1203.8 1206.8 1209.8 1212.8 1215.8 1218.8 1221.8 1224.8 1227.8 1230.8 1233.8 1236.8 1239.8 1242.8 1245.8 1248.8 1251.8 1254.8 1257.8 1260.8 1263.8 1266.8 1269.8 1272.8 1275.8 1278.8 1281.8 1284.8 1287.8 1290.8 1293.8 1296.8 1299.8 1302.8 1305.8 1308.8 1311.8 1314.8 1317.8 1320.8 1323.8 1326.8 1329.8 1332.8 1335.8 1338.8 1341.8 1344.8 1347.8 1350.8 1353.8 1356.8 1359.8 1362.8 1365.8 1368.8 1371.8 1374.8 1377.8 1380.8 1383.8 1386.8 1389.8 1392.8 1395.8 1398.8 1401.8 1404.8 1407.8 1410.8 1413.8 1416.8 1419.8 1422.8 1425.8 1428.8 1431.8 1434.8 1437.8 1440.8 1443.8 1446.8 1449.8 1452.8 1455.8 1458.8 1461.8 1464.8 1467.8 1470.8 1473.8 1476.8 1479.8 1482.8 1485.8 1488.8 1491.8 1494.8 1497.8 1500.8 1503.8 1506.8 1509.8 1512.8 1515.8 1518.8 1521.8 1524.8 1527.8 1530.8 1533.8 1536.8 1539.8 1542.8 1545.8 1548.8 1551.8 1554.8 1557.8 1560.8 1563.8 1566.8 1569.8 1572.8 1575.8 1578.8 1581.8 1584.8 1587.8 1590.8 1593.8 1596.8 1599.8 1602.8 1605.8 1608.8 1611.8 1614.8 1617.8 1620.8 1623.8 1626.8 1629.8 1632.8 1635.8 1638.8 1641.8 1644.8 1647.8 1650.8 1653.8 1656.8 1659.8 1662.8 1665.8 1668.8 1671.8 1674.8 1677.8 1680.8 1683.8 1686.8 1689.8 1692.8 1695.8 1698.8 1701.8 1704.8 1707.8 1710.8 1713.8 1716.8 1719.8 1722.8 1725.8 1728.8 1731.8 1734.8 1737.8 1740.8 1743.8 1746.8 1749.8 1752.8 1755.8 1758.8 1761.8 1764.8 1767.8 1770.8 1773.8 1776.8 1779.8 1782.8 1785.8 1788.8 1791.8 1794.8 1797.8 1800.8 1803.8 1806.8 1809.8 1812.8 1815.8 1818.8 1821.8 1824.8 1827.8 1830.8 1833.8 1836.8 1839.8 1842.8 1845.8 1848.8 1851.8 1854.8 1857.8 1860.8 1863.8 1866.8 1869.8 1872.8 1875.8 1878.8 1881.8 1884.8 1887.8 1890.8 1893.8 1896.8 1899.8 1902.8 1905.8 1908.8 1911.8 1914.8 1917.8 1920.8 1923.8 1926.8 1929.8 1932.8 1935.8 1938.8 1941.8 1944.8 1947.8 1950.8 1953.8 1956.8 1959.8 1962.8 1965.8 1968.8 1971.8 1974.8 1977.8 1980.8 1983.8 1986.8 1989.8 1992.8 1995.8 1998.8 2001.8 2004.8 2007.8 2010.8 2013.8 2016.8 2019.8 2022.8 2025.8 2028.8 2031.8 2034.8 2037.8 2040.8 2043.8 2046.8 2049.8 2052.8 2055.8 2058.8 2061.8 2064.8 2067.8 2070.8 2073.8 2076.8 2079.8 2082.8 2085.8 2088.8 2091.8 2094.8 2097.8 2100.8 2103.8 2106.8 2109.8 2112.8 2115.8 2118.8 2121.8 2124.8 2127.8 2130.8 2133.8 2136.8 2139.8 2142.8 2145.8 2148.8 2151.8 2154.8 2157.8 2160.8 2163.8 2166.8 2169.8 2172.8 2175.8 2178.8 2181.8 2184.8 2187.8 2190.8 2193.8 2196.8 2199.8 2202.8 2205.8 2208.8 2211.8 2214.8 2217.8 2220.8 2223.8 2226.8 2229.8 2232.8 2235.8 2238.8 2241.8 2244.8 2247.8 2250.8 2253.8 2256.8 2259.8 2262.8 2265.8 2268.8 2271.8 2274.8 2277.8 2280.8 2283.8 2286.8 2289.8 2292.8 2295.8 2298.8 2301.8 2304.8 2307.8 2310.8 2313.8 2316.8 2319.8 2322.8 2325.8 2328.8 2331.8 2334.8 2337.8 2340.8 2343.8 2346.8 2349.8 2352.8 2355.8 2358.8 2361.8 2364.8 2367.8 2370.8 2373.8 2376.8 2379.8 2382.8 2385.8 2388.8 2391.8 2394.8 2397.8 2400.8 2403.8 2406.8 2409.8 2412.8 2415.8 2418.8 2421.8 2424.8 2427.8 2430.8 2433.8 2436.8 2439.8 2442.8 2445.8 2448.8 2451.8 2454.8 2457.8 2460.8 2463.8 2466.8 2469.8 2472.8 2475.8 2478.8 2481.8 2484.8 2487.8 2490.8 2493.8 2496.8 2499.8 2502.8 2505.8 2508.8 2511.8 2514.8 2517.8 2520.8 2523.8 2526.8 2529.8 2532.8 2535.8 2538.8 2541.8 2544.8 2547.8 2550.8 2553.8 2556.8 2559.8 2562.8 2565.8 2568.8 2571.8 2574.8 2577.8 2580.8 2583.8 2586.8 2589.8 2592.8 2595.8 2598.8 2601.8 2604.8 2607.8 2610.8 2613.8 2616.8 2619.8 2622.8 2625.8 2628.8 2631.8 2634.8 2637.8 2640.8 2643.8 2646.8 2649.8 2652.8 2655.8 2658.8 2661.8 2664.8 2667.8 2670.8 2673.8 2676.8 2679.8 2682.8 2685.8 2688.8 2691.8 2694.8 2697.8 2700.8 2703.8 2706.8 2709.8 2712.8 2715.8 2718.8 2721.8 2724.8 2727.8 2730.8 2733.8 2736.8 2739.8 2742.8 2745.8 2748.8 2751.8 2754.8 2757.8 2760.8 2763.8 2766.8 2769.8 2772.8 2775.8 2778.8 2781.8 2784.8 2787.8 2790.8 2793.8 2796.8 2799.8 2802.8 2805.8 2808.8 2811.8 2814.8 2817.8 2820.8 2823.8 2826.8 2829.8 2832.8 2835.8 2838.8 2841.8 2844.8 2847.8 2850.8 2853.8 2856.8 2859.8 2862.8 2865.8 2868.8 2871.8 2874.8 2877.8 2880.8 2883.8 2886.8 2889.8 2892.8 2895.8 2898.8 2901.8 2904.8 2907.8 2910.8 2913.8 2916.8 2919.8 2922.8 2925.8 2928.8 2931.8 2934.8 2937.8 2940.8 2943.8 2946.8 2949.8 2952.8 2955.8 2958.8 2961.8 2964.8 2967.8 2970.8 2973.8 2976.8 2979.8 2982.8 2985.8 2988.8 2991.8 2994.8 2997.8 3000.8 3003.8 3006.8 3009.8 3012.8 3015.8 3018.8 3021.8 3024.8 3027.8 3030.8 3033.8 3036.8 3039.8 3042.8 3045.8 3048.8 3051.8 3054.8 3057.8 3060.8 3063.8 3066.8 3069.8 3072.8 3075.8 3078.8 3081.8 3084.8 3087.8 3090.8 3093.8 3096.8 3099.8 3102.8 3105.8 3108.8 3111.8 3114.8 3117.8 3120.8 3123.8 3126.8 3129.8 3132.8 3135.8 3138.8 3141.8 3144.8 3147.8 3150.8 3153.8 3156.8 3159.8 3162.8 3165.8 3168.8 3171.8 3174.8 3177.8 3180.8 3183.8 3186.8 3189.8 3192.8 3195.8 3198.8 3201.8 3204.8 3207.8 3210.8 3213.8 3216.8 3219.8 3222.8 3225.8 3228.8 3231.8 3234.8 3237.8 3240.8 3243.8 3246.8 3249.8 3252.8 3255.8 3258.8 3261.8 3264.8 3267.8 3270.8 3273.8 3276.8 3279.8 3282.8 3285.8 3288.8 3291.8 3294.8 3297.8 3300.8 3303.8 3306.8 3309.8 3312.8 3315.8 3318.8 3321.8 3324.8 3327.8 3330.8 3333.8 3336.8 3339.8 3342.8 3345.8 3348.8 3351.8 3354.8 3357.8 3360.8 3363.8 3366.8 3369.8 3372.8 3375.8 3378.8 3381.8 3384.8 3387.8 3390.8 3393.8 3396.8 3399.8 3402.8 3405.8 3408.8 3411.8 3414.8 3417.8 3420.8 3423.8 3426.8 3429.8 3432.8 3435.8 3438.8 3441.8 3444.8 3447.8 3450.8 3453.8 3456.8 3459.8 3462.8 3465.8 3468.8 3471.8 3474.8 3477.8 3480.8 3483.8 3486.8 3489.8 3492.8 3495.8 3498.8 3501.8 3504.8 3507.8 3510.8 3513.8 3516.8 3519.8 3522.8 3525.8 3528.8 3531.8 3534.8 3537.8 3540.8 3543.8 3546.8 3549.8 3552.8 3555.8 3558.8 3561.8 3564.8 3567.8 3570.8 3573.8 3576.8 3579.8 3582.8 3585.8 3588.8 3591.8 3594.8 3597.8 3600.8 3603.8 3606.8 3609.8 3612.8 3615.8 3618.8 3621.8 3624.8 3627.8 3630.8 3633.8 3636.8 3639.8 3642.8 3645.8 3648.8 3651.8 3654.8 3657.8 3660.8 3663.8 3666.8 3669.8 3672.8 3675.8 3678.8 3681.8 3684.8 3687.8 3690.8 3693.8 3696.8 3699.8 3702.8 3705.8 3708.8 3711.8 3714.8 3717.8 3720.8 3723.8 3726.8 3729.8 3732.8 3735.8 3738.8 3741.8 3744.8 3747.8 3750.8 3753.8 3756.8 3759.8 3762.8 3765.8 3768.8 3771.8 3774.8 3777.8 3780.8 3783.8 3786.8 3789.8 3792.8 3795.8 3798.8 3801.8 3804.8 3807.8 3810.8 3813.8 3816.8 3819.8 3822.8 3825.8 3828.8 3831.8 3834.8 3837.8 3840.8 3843.8 3846.8 3849.8 3852.8 3855.8 3858.8 3861.8 3864.8 3867.8 3870.8 3873.8 3876.8 3879.8 3882.8 3885.8 3888.8 3891.8 3894.8 3897.8 3900.8 3903.8 3906.8 3909.8 3912.8 3915.8 3918.8 3921.8 3924.8 3927.8 3930.8 3933.8 3936.8 3939.8 3942.8 3945.8 3948.8 3951.8 3954.8 3957.8 3960.8 3963.8 3966.8 3969.8 3972.8 3975.8 3978.8 3981.8 3984.8 3987.8 3990.8 3993.8 3996.8 3999.8 4002.8 4005.8 4008.8 4011.8 4014.8 4017.8 4020.8 4023.8 4026.8 4029.8 4032.8 4035.8 4038.8 4041.8 4044.8 4047.8 4050.8 4053.8 4056.8 4059.8 4062.8 4065.8 4068.8 4071.8 4074.8 4077.8 4080.8 4083.8 4086.8 4089.8 4092.8 4095.8 4098.8 4101.8 4104.8 4107.8 4110.8 4113.8 4116.8 4119.8 4122.8 4125.8 4128.8 4131.8 4134.8 4137.8 4140.8 4143.8 4146.8 4149.8 4152.8 4155.8 4158.8 4161.8 4164.8 4167.8 4170.8 4173.8 4176.8 4179.8 4182.8 4185.8 4188.8 4191.8 4194.8 4197.8 4200.8 4203.8 4206.8 4209.8 4212.8 4215.8 4218.8 4221.8 4224.8 4227.8 4230.8 4233.8 4236.8 4239.8 4242.8 4245.8 4248.8 4251.8 4254.8 4257.8 4260.8 4263.8 4266.8 4269.8 4272.8 4275.8 4278.8 4281.8 4284.8 4287.8 4290.8 4293.8 4296.8 4299.8 4302.8 4305.8 4308.8 4311.8 4314.8 4317.8 4320.8 4323.8 4326.8 4329.8 4332.8 4335.8 4338.8 4341.8 4344.8 4347.8 4350.8 4353.8 4356.8 4359.8 4362.8 4365.8 4368.8 4371.8 4374.8 4377.8 4380.8 4383.8 4386.8 4389.8 4392.8 4395.8 4398.8 4401.8 4404.8 4407.8 4410.8 4413.8 4416.8 4419.8 4422.8 4425.8 4428.8 4431.8 4434.8 4437.8 4440.8 4443.8 4446.8 4449.8 4452.8 4455.8 4458.8 4461.8 4464.8 4467.8 4470.8 4473.8 4476.8 4479.8 4482.8 4485.8 4488.8 4491.8 4494.8 4497.8 4500.8 4503.8 4506.8 4509.8 4512.8 4515.8 4518.8 4521.8 4524.8 4527.8 4530.8 4533.8 4536.8 4539.8 4542.8 4545.8 4548.8 4551.8 4554.8 4557.8 4560.8 4563.8 4566.8 4569.8 4572.8 4575.8 4578.8 4581.8 4584.8 4587.8 4590.8 4593.8 4596.8 4599.8 4602.8 4605.8 4608.8 4611.8 4614.8 4617.8 4620.8 4623.8 4626.8 4629.8 4632.8 4635.8 4638.8 4641.8 4644.8 4647.8 4650.8 4653.8 4656.8 4659.8 4662.8 4665.8 4668.8 4671.8 4674.8 4677.8 4680.8 4683.8 4686.8 4689.8 4692.8 4695.8 4698.8 4701.8 4704.8 4707.8 4710.8 4713.8 4716.8 4719.8 4722.8 4725.8 4728.8 4731.8 4734.8 4737.8 4740.8 4743.8 4746.8 4749.8 4752.8 4755.8 4758.8 4761.8 4764.8 4767.8 4770.8 4773.8 4776.8 4779.8 4782.8 4785.8 4788.8 4791.8 4794.8 4797.8 4800.8 4803.8 4806.8 4809.8 4812.8 4815.8 4818.8 4821.8 4824.8 4827.8 4830.8 4833.8 4836.8 4839.8 4842.8 4845.8 4848.8 4851.8 4854.8 4857.8 4860.8 4863.8 4866.8 4869.8 4872.8 4875.8 4878.8 4881.8 4884.8 4887.8 4890.8 4893.8 4896.8 4899.8 4902.8 4905.8 4908.8 4911.8 4914.8 4917.8 4920.8 49

Calibration Results After Adjustment : (Table 3)

Parameter of Standard	Standard Value	Mean of 50%	Max	Uncertainty (%)
Q1 (99%)	1.00	1.11	0.011	0.20
Q2 (99%)	10.00	10.05	0.05	0.40
Q3 (99%)	20.00	20.25	0.25	0.60
Q4 (99%)	50.00	50	0.03	0.06
Q5 (99%)	100.0	100	0.0	0
Q6 (99%)	200.0	199	0.11	0.05
Q7 (99%)	500.0	499	0.09	0.03
Q8 (99%)	1000.0	1000	0.0	0
Q9 (99%)	2000.0	2000	0.0	0
Q10 (99%)	5000.0	5000	0.0	0
Q11 (99%)	10000.0	10000	0.0	0
Q12 (99%)	20000.0	20000	0.0	0
Q13 (99%)	50000.0	50000	0.0	0
Q14 (99%)	100000.0	100000	0.0	0
Q15 (99%)	200000.0	200000	0.0	0
Q16 (99%)	500000.0	500000	0.0	0
Q17 (99%)	1000000.0	1000000	0.0	0
Q18 (99%)	2000000.0	2000000	0.0	0
Q19 (99%)	5000000.0	5000000	0.0	0
Q20 (99%)	10000000.0	10000000	0.0	0

Remark : 1. standard = 1. Max. = 1. standard = 1.00%

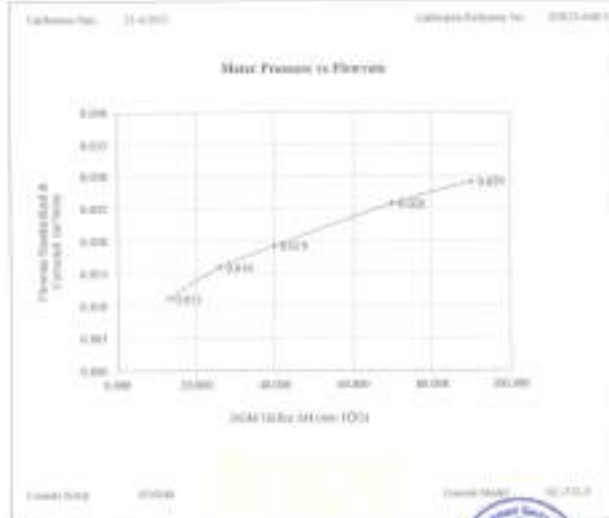
End of Report

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List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Stack									
1	Pre-Test Console	Total Suspended Particulate Hydrogen Sulphide Methanethiol Dimethyl Sulfide Chloride	Apex Instruments, USA.	XC-572-V 0707048	Envi Equipment Service Co., Ltd.	E23-04043	21 Apr 23	20 Apr 24	-
2	Flue gas Analyzer	Sulphur Dioxide Oxide of Nitrogen as Nitrogen Dioxide Carbon Monoxide	Testo	Testo 350 60899615	Entech Industrial Solution Co., Ltd.	G 650186	24 Mar 22	23 Mar 23	-

Client's Equipment Information	Calibration Conditions	Parameter Information
Console Model Number: AC-475-V	Date: Time: 21/04/2023 18:13 AM	Std Temp: 20.0 °C
Console Serial Number: 8707628	Calibration Reference No.: 8003144015	Std Power: 750 mW
DCM Model Number: 86200-0	Reference Thermistor: 70000	R ₀ : 0.596
DCM Serial Number: 80007110	Calibration Motor Current: 0.000	Console Load Class: P-000



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THERMOCOUPLES SYSTEM CALIBRATION

Calibrating System Temperature Information	Calibration Conditions
Console Model Number: AC-475-V	Date: Time: 21/04/2023 18:13 AM
Console Serial Number: 8707628	Calibration Reference No.: 8003144015
DCM Model Number: 86200-0	Reference Thermistor: 70000
DCM Serial Number: 80007110	Serial Number: 101149100
Motor Box Model Number: JSTC31 150 0.0	
Motor Box Serial Number: AC 18700	

Results	
Console Thermocouple Standards	
Channel and Test point	Motor Box Channel Temperature Reading (°C)
	18.8 21.8 24.8 27.8 30.8 33.8 36.8 39.8 42.8 45.8 48.8 51.8 54.8 57.8 60.8 63.8 66.8 69.8 72.8 75.8 78.8 81.8 84.8 87.8 90.8 93.8 96.8 99.8 102.8 105.8 108.8 111.8 114.8 117.8 120.8 123.8 126.8 129.8 132.8 135.8 138.8 141.8 144.8 147.8 150.8 153.8 156.8 159.8 162.8 165.8 168.8 171.8 174.8 177.8 180.8 183.8 186.8 189.8 192.8 195.8 198.8 201.8 204.8 207.8 210.8 213.8 216.8 219.8 222.8 225.8 228.8 231.8 234.8 237.8 240.8 243.8 246.8 249.8 252.8 255.8 258.8 261.8 264.8 267.8 270.8 273.8 276.8 279.8 282.8 285.8 288.8 291.8 294.8 297.8 300.8 303.8 306.8 309.8 312.8 315.8 318.8 321.8 324.8 327.8 330.8 333.8 336.8 339.8 342.8 345.8 348.8 351.8 354.8 357.8 360.8 363.8 366.8 369.8 372.8 375.8 378.8 381.8 384.8 387.8 390.8 393.8 396.8 399.8 402.8 405.8 408.8 411.8 414.8 417.8 420.8 423.8 426.8 429.8 432.8 435.8 438.8 441.8 444.8 447.8 450.8 453.8 456.8 459.8 462.8 465.8 468.8 471.8 474.8 477.8 480.8 483.8 486.8 489.8 492.8 495.8 498.8 501.8 504.8 507.8 510.8 513.8 516.8 519.8 522.8 525.8 528.8 531.8 534.8 537.8 540.8 543.8 546.8 549.8 552.8 555.8 558.8 561.8 564.8 567.8 570.8 573.8 576.8 579.8 582.8 585.8 588.8 591.8 594.8 597.8 600.8 603.8 606.8 609.8 612.8 615.8 618.8 621.8 624.8 627.8 630.8 633.8 636.8 639.8 642.8 645.8 648.8 651.8 654.8 657.8 660.8 663.8 666.8 669.8 672.8 675.8 678.8 681.8 684.8 687.8 690.8 693.8 696.8 699.8 702.8 705.8 708.8 711.8 714.8 717.8 720.8 723.8 726.8 729.8 732.8 735.8 738.8 741.8 744.8 747.8 750.8 753.8 756.8 759.8 762.8 765.8 768.8 771.8 774.8 777.8 780.8 783.8 786.8 789.8 792.8 795.8 798.8 801.8 804.8 807.8 810.8 813.8 816.8 819.8 822.8 825.8 828.8 831.8 834.8 837.8 840.8 843.8 846.8 849.8 852.8 855.8 858.8 861.8 864.8 867.8 870.8 873.8 876.8 879.8 882.8 885.8 888.8 891.8 894.8 897.8 900.8 903.8 906.8 909.8 912.8 915.8 918.8 921.8 924.8 927.8 930.8 933.8 936.8 939.8 942.8 945.8 948.8 951.8 954.8 957.8 960.8 963.8 966.8 969.8 972.8 975.8 978.8 981.8 984.8 987.8 990.8 993.8 996.8 999.8 1002.8 1005.8 1008.8 1011.8 1014.8 1017.8 1020.8 1023.8 1026.8 1029.8 1032.8 1035.8 1038.8 1041.8 1044.8 1047.8 1050.8 1053.8 1056.8 1059.8 1062.8 1065.8 1068.8 1071.8 1074.8 1077.8 1080.8 1083.8 1086.8 1089.8 1092.8 1095.8 1098.8 1101.8 1104.8 1107.8 1110.8 1113.8 1116.8 1119.8 1122.8 1125.8 1128.8 1131.8 1134.8 1137.8 1140.8 1143.8 1146.8 1149.8 1152.8 1155.8 1158.8 1161.8 1164.8 1167.8 1170.8 1173.8 1176.8 1179.8 1182.8 1185.8 1188.8 1191.8 1194.8 1197.8 1200.8 1203.8 1206.8 1209.8 1212.8 1215.8 1218.8 1221.8 1224.8 1227.8 1230.8 1233.8 1236.8 1239.8 1242.8 1245.8 1248.8 1251.8 1254.8 1257.8 1260.8 1263.8 1266.8 1269.8 1272.8 1275.8 1278.8 1281.8 1284.8 1287.8 1290.8 1293.8 1296.8 1299.8 1302.8 1305.8 1308.8 1311.8 1314.8 1317.8 1320.8 1323.8 1326.8 1329.8 1332.8 1335.8 1338.8 1341.8 1344.8 1347.8 1350.8 1353.8 1356.8 1359.8 1362.8 1365.8 1368.8 1371.8 1374.8 1377.8 1380.8 1383.8 1386.8 1389.8 1392.8 1395.8 1398.8 1401.8 1404.8 1407.8 1410.8 1413.8 1416.8 1419.8 1422.8 1425.8 1428.8 1431.8 1434.8 1437.8 1440.8 1443.8 1446.8 1449.8 1452.8 1455.8 1458.8 1461.8 1464.8 1467.8 1470.8 1473.8 1476.8 1479.8 1482.8 1485.8 1488.8 1491.8 1494.8 1497.8 1500.8 1503.8 1506.8 1509.8 1512.8 1515.8 1518.8 1521.8 1524.8 1527.8 1530.8 1533.8 1536.8 1539.8 1542.8 1545.8 1548.8 1551.8 1554.8 1557.8 1560.8 1563.8 1566.8 1569.8 1572.8 1575.8 1578.8 1581.8 1584.8 1587.8 1590.8 1593.8 1596.8 1599.8 1602.8 1605.8 1608.8 1611.8 1614.8 1617.8 1620.8 1623.8 1626.8 1629.8 1632.8 1635.8 1638.8 1641.8 1644.8 1647.8 1650.8 1653.8 1656.8 1659.8 1662.8 1665.8 1668.8 1671.8 1674.8 1677.8 1680.8 1683.8 1686.8 1689.8 1692.8 1695.8 1698.8 1701.8 1704.8 1707.8 1710.8 1713.8 1716.8 1719.8 1722.8 1725.8 1728.8 1731.8 1734.8 1737.8 1740.8 1743.8 1746.8 1749.8 1752.8 1755.8 1758.8 1761.8 1764.8 1767.8 1770.8 1773.8 1776.8 1779.8 1782.8 1785.8 1788.8 1791.8 1794.8 1797.8 1800.8 1803.8 1806.8 1809.8 1812.8 1815.8 1818.8 1821.8 1824.8 1827.8 1830.8 1833.8 1836.8 1839.8 1842.8 1845.8 1848.8 1851.8 1854.8 1857.8 1860.8 1863.8 1866.8 1869.8 1872.8 1875.8 1878.8 1881.8 1884.8 1887.8 1890.8 1893.8 1896.8 1899.8 1902.8 1905.8 1908.8 1911.8 1914.8 1917.8 1920.8 1923.8 1926.8 1929.8 1932.8 1935.8 1938.8 1941.8 1944.8 1947.8 1950.8 1953.8 1956.8 1959.8 1962.8 1965.8 1968.8 1971.8 1974.8 1977.8 1980.8 1983.8 1986.8 1989.8 1992.8 1995.8 1998.8 2001.8 2004.8 2007.8 2010.8 2013.8 2016.8 2019.8 2022.8 2025.8 2028.8 2031.8 2034.8 2037.8 2040.8 2043.8 2046.8 2049.8 2052.8 2055.8 2058.8 2061.8 2064.8 2067.8 2070.8 2073.8 2076.8 2079.8 2082.8 2085.8 2088.8 2091.8 2094.8 2097.8 2100.8 2103.8 2106.8 2109.8 2112.8 2115.8 2118.8 2121.8 2124.8 2127.8 2130.8 2133.8 2136.8 2139.8 2142.8 2145.8 2148.8 2151.8 2154.8 2157.8 2160.8 2163.8 2166.8 2169.8 2172.8 2175.8 2178.8 2181.8 2184.8 2187.8 2190.8 2193.8 2196.8 2199.8 2202.8 2205.8 2208.8 2211.8 2214.8 2217.8 2220.8 2223.8 2226.8 2229.8 2232.8 2235.8 2238.8 2241.8 2244.8 2247.8 2250.8 2253.8 2256.8 2259.8 2262.8 2265.8 2268.8 2271.8 2274.8 2277.8 2280.8 2283.8 2286.8 2289.8 2292.8 2295.8 2298.8 2301.8 2304.8 2307.8 2310.8 2313.8 2316.8 2319.8 2322.8 2325.8 2328.8 2331.8 2334.8 2337.8 2340.8 2343.8 2346.8 2349.8 2352.8 2355.8 2358.8 2361.8 2364.8 2367.8 2370.8 2373.8 2376.8 2379.8 2382.8 2385.8 2388.8 2391.8 2394.8 2397.8 2400.8 2403.8 2406.8 2409.8 2412.8 2415.8 2418.8 2421.8 2424.8 2427.8 2430.8 2433.8 2436.8 2439.8 2442.8 2445.8 2448.8 2451.8 2454.8 2457.8 2460.8 2463.8 2466.8 2469.8 2472.8 2475.8 2478.8 2481.8 2484.8 2487.8 2490.8 2493.8 2496.8 2499.8 2502.8 2505.8 2508.8 2511.8 2514.8 2517.8 2520.8 2523.8 2526.8 2529.8 2532.8 2535.8 2538.8 2541.8 2544.8 2547.8 2550.8 2553.8 2556.8 2559.8 2562.8 2565.8 2568.8 2571.8 2574.8 2577.8 2580.8 2583.8 2586.8 2589.8 2592.8 2595.8 2598.8 2601.8 2604.8 2607.8 2610.8 2613.8 2616.8 2619.8 2622.8 2625.8 2628.8 2631.8 2634.8 2637.8 2640.8 2643.8 2646.8 2649.8 2652.8 2655.8 2658.8 2661.8 2664.8 2667.8 2670.8 2673.8 2676.8 2679.8 2682.8 2685.8 2688.8 2691.8 2694.8 2697.8 2700.8 2703.8 2706.8 2709.8 2712.8 2715.8 2718.8 2721.8 2724.8 2727.8 2730.8 2733.8 2736.8 2739.8 2742.8 2745.8 2748.8 2751.8 2754.8 2757.8 2760.8 2763.8 2766.8 2769.8 2772.8 2775.8 2778.8 2781.8 2784.8 2787.8 2790.8 2793.8 2796.8 2799.8 2802.8 2805.8 2808.8 2811.8 2814.8 2817.8 2820.8 2823.8 2826.8 2829.8 2832.8 2835.8 2838.8 2841.8 2844.8 2847.8 2850.8 2853.8 2856.8 2859.8 2862.8 2865.8 2868.8 2871.8 2874.8 2877.8 2880.8 2883.8 2886.8 2889.8 2892.8 2895.8 2898.8 2901.8 2904.8 2907.8 2910.8 2913.8 2916.8 2919.8 2922.8 2925.8 2928.8 2931.8 2934.8 2937.8 2940.8 2943.8 2946.8 2949.8 2952.8 2955.8 2958.8 2961.8 2964.8 2967.8 2970.8 2973.8 2976.8 2979.8 2982.8 2985.8 2988.8 2991.8 2994.8 2997.8 3000.8 3003.8 3006.8 3009.8 3012.8 3015.8 3018.8 3021.8 3024.8 3027.8 3030.8 3033.8 3036.8 3039.8 3042.8 3045.8 3048.8 3051.8 3054.8 3057.8 3060.8 3063.8 3066.8 3069.8 3072.8 3075.8 3078.8 3081.8 3084.8 3087.8 3090.8 3093.8 3096.8 3099.8 3102.8 3105.8 3108.8 3111.8 3114.8 3117.8 3120.8 3123.8 3126.8 3129.8 3132.8 3135.8 3138.8 3141.8 3144.8 3147.8 3150.8 3153.8 3156.8 3159.8 3162.8 3165.8 3168.8 3171.8 3174.8 3177.8 3180.8 3183.8 3186.8 3189.8 3192.8 3195.8 3198.8 3201.8 3204.8 3207.8 3210.8 3213.8 3216.8 3219.8 3222.8 3225.8 3228.8 3231.8 3234.8 3237.8 3240.8 3243.8 3246.8 3249.8 3252.8 3255.8 3258.8 3261.8 3264.8 3267.8 3270.8 3273.8 3276.8 3279.8 3282.8 3285.8 3288.8 3291.8 3294.8 3297.8 3300.8 3303.8 3306.8 3309.8 3312.8 3315.8 3318.8 3321.8 3324.8 3327.8 3330.8 3333.8 3336.8 3339.8 3342.8 3345.8 3348.8 3351.8 3354.8 3357.8 3360.8 3363.8 3366.8 3369.8 3372.8 3375.8 3378.8 3381.8 3384.8 3387.8 3390.8 3393.8 3396.8 3399.8 3402.8 3405.8 3408.8 3411.8 3414.8 3417.8 3420.8 3423.8 3426.8 3429.8 3432.8 3435.8 3438.8 3441.8 3444.8 3447.8 3450.8 3453.8 3456.8 3459.8 3462.8 3465.8 3468.8 3471.8 3474.8 3477.8 3480.8 3483.8 3486.8 3489.8 3492.8 3495.8 3498.8 3501.8 3504.8 3507.8 3510.8 3513.8 3516.8 3519.8 3522.8 3525.8 3528.8 3531.8 3534.8 3537.8 3540.8 3543.8 3546.8 3549.8 3552.8 3555.8 3558.8 3561.8 3564.8 3567.8 3570.8 3573.8 3576.8 3579.8 3582.8 3585.8 3588.8 3591.8 3594.8 3597.8 3600.8 3603.8 3606.8 3609.8 3612.8 3615.8 3618.8 3621.8 3624.8 3627.8 3630.8 3633.8 3636.8 3639.8 3642.8 3645.8 3648.8 3651.8 3654.8 3657.8 3660.8 3663.8 3666.8 3669.8 3672.8 3675.8 3678.8 3681.8 3684.8 3687.8 3690.8 3693.8 3696.8 3699.8 3702.8 3705.8 3708.8 3711.8 3714.8 3717.8 3720.8 3723.8 3726.8 3729.8 3732.8 3735.8 3738.8 3741.8 3744.8 3747.8 3750.8 3753.8 3756.8 3759.8 3762.8 3765.8 3768.8 3771.8 3774.8 3777.8 3780.8 3783.8 3786.8 3789.8 3792.8 3795.8 3798.8 3801.8 3804.8 3807.8 3810.8 3813.8 3816.8 3819.8 3822.8 3825.8 3828.8 3831.8 3834.8 3837.8 3840.8 3843.8 3846.8 3849.8 3852.8 3855.8 3858.8 3861.8 3864.8 3867.8 3870.8 3873.8 3876.8 3879.8 3882.8 3885.8 3888.8 3891.8 3894.8 3897.8 3900.8 3903.8 3906.8 3909.8 3912.8 3915.8 3918.8 3921.8 3924.8 3927.8 3930.8 3933.8 3936.8 3939.8 3942.8 3945.8 3948.8 3951.8 3954.8 3957.8 3960.8 3963.8 3966.8 3969.8 3972.8 3975.8 3978.8 3981.8 3984.8 3987.8 3990.8 3993.8 3996.8 3999.8 4002.8 4005.8 4008.8 4011.8 4014.8 4017.8 4020.8 4023.8 4026.8 4029.8 4032.8 4035.8 4038.8 4041.8 4044.8 4047.8 4050.8 4053.8 4056.8 4059.8 4062.8 4065.8 4068.8 4071.8 4074.8 4077.8 4080.8 4083.8 4086.8 4089.8 4092.8 4095.8 4098.8 4101.8 4104.8 4107.8 4110.8 4113.8 4116.8 4119.8 4122.8 4125.8 4128.8 4131.8 4134.8 4137.8 4140.8 4143.8 4146.8 4149.8 4152.8 4155.8 4158.8 4161.8 4164.8 4167.8 4170.8 4173.8 4176.8 4179.8 4182.8 4185.8 4188.8 4191.8 4194.8 4197.8 4200.8 4203.8 4206.8 4209.8 4212.8 4215.8 4218.8 4221.8 4224.8 4227.8 4230.8 4233.8 4236.8 4239.8 4242.8 4245.8 4248.8 4251.8 4254.8 4257.8 4260.8 4263.8 4266.8 4269.8 4272.8 4275.8 4278.8 4281.8 4284.8 4287.8 4290.8 4293.8 4296.8 4299.8 4302.8 4305.8 4308.8 4311.8 4314.8 4317.8 4320.8 4323.8 4326.8 4329.8 4332.8 4335.8 4338.8 4341.8 4344.8 4347.8 4350.8 4353.8 4356.8 4359.8 4362.8 4365.8 4368.8 4371.8 4374.8 4377.8 4380.8 4383.8 4386.8 4389.8 4392.8 4395.8 4398.8 4401.8 4404.8 4407.8 4410.8 4413.8 4416.8 4419.8 4422.8 4425.8 4428.8 4431.8 4434.8 4437.8 4440.8 4443.8 4446.8 4449.8 4452.8 4455.8 4458.8 4461.8 4464.8 4467.8 4470.8 4473.8 4476.8 4479.8 4482.8 4485.8 4488.8 4491.8 4494.8 4497.8 4500.8 4503.8 4506.8 4509.8 4512.8 4515.8 4518.8 4521.8 4524.8 4527.8 4530.8 4533.8 4536.8 4539.8 4542.8 4545.8 4548.8 4551.8 4554.8 4557.8 4560.8 4563.8 4566.8 4569.8 4572.8 4575.8 4578.8 4581.8 4584.8 4587.8 4590.8 4593.8 4596.8 4599.8 4602.8 4605.8 4608.8 4611.8 4614.8 4617.8 4620.8 4623.8 4626.8 4629.8 4632.8 4635.8 4638.8 4641.8 4644.8 4647.8 4650.8 4653.8 4656.8 4659.8 4662.8 4665.8 4668.8 4671.8 4674.8 4677.8 4680.8 4683.8 4686.8 4689.8 4692.8 4695.8 4698.8 4701.8 4704.8 4707.8 4710.8 4713.8 4716.8 4719.8 4722.8 4725.8 4728.8 4731.8 4734.8 4737.8 4740.8 4743.8 4746.8 4749.8 4752.8 4755.8 4758.8 4761.8 4764.8 4767.8 4770.8 4773.8 4776.8 4779.8 4782.8 4785.8 4788.8 4791.8 4794.8 4797.8 4800.8 4803.8 4806.8 4809.8 4812.8 4815.8 4818.8 4821.8 4824.8 4827.8 4830.8 4833.8 4836.8 4839.8 4842.8 4845.8 4848.8 4851.8 4854.8 4857.8 4860.8 4863.8 4866.8 4869.8 4872.8 4875.8 4878.8 4881.8 4884.8 4887.8 4890.8 4893.8 4896.8 4899.8 4902.8 4905.8 4908.8 4911.8 4914.8

Parameter of Standard	Estimated Value	Mean of Data	Stdev	Skewness (s)
Q1 (Q100)	1.000	1.33	0.032	0.20
Q2 (Q50)	10.00	10.05	0.07	0.00
Q3 (Q10)	20.00	21.25	0.25	0.00
Q4 (Q25)	60.57	60	0.03	0.0
Q5 (Q10)	999.9	999	0.0	0
Q6 (Q5)	1000	1000	0	0
Q7 (Q20)	19.35	19.0	0.01	0.1
Q8 (Q15)	60.63	61.2	0.00	0.0
Q9 (Q12)	202.3	203.0	1.2	0.0
Q10 (Q10)	19.99	6	0.00	0.0
Q11 (Q8)	100.9	1.0	0.0	0.0
Q12 (Q6)	330.6	3.0	0.0	0
Q13 (Q5)	99.94	0	0.00	0.0
Q14 (Q4)	999.9	100	1.1	0.2
Q15 (Q3)	60.1	600	0.0	0

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End of Report

ภาคผนวก ฉ

หนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด

ข้อมูลทั่วไป ๒๖.๖๖๖๖

ลำดับที่	สารเคมี	วิธีการ
1	Asenic	Digestion, Inductively Coupled Plasma Method ¹
2	Barium	Digestion, Inductively Coupled Plasma Method ¹
3	Biochemical Oxygen Demand	5-Day BOD Test, Azide Modification Method ¹
4	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ¹ 2) Digestion, Inductively Coupled Plasma Method ¹
5	Chemical Oxygen Demand	1) Open reflux, Colorimetric Method ¹ 2) Open reflux, Titrimetric Method ¹
6	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ¹ 2) Digestion, Inductively Coupled Plasma Method ¹
7	Cobalt	AAW Weighted-Online Spectrophotometric Method ¹
8	Copper	1) Digestion, Direct Air-Acetylene Flame Method ¹ 2) Digestion, Inductively Coupled Plasma Method ¹
9	Cyanide	Distillation, Colorimetric Method ¹
10	Formaldehyde	Distillation, Colorimetric Method ¹
11	Free Chlorine	1) Iodometric Method ¹ 2) DPD Colorimetric Method ¹
12	Hexavalent Chromium	Colorimetric Method ¹
13	Lead	1) Digestion, Direct Air-Acetylene Flame Method ¹ 2) Digestion, Inductively Coupled Plasma Method ¹
14	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ¹ 2) Digestion, Inductively Coupled Plasma Method ¹
15	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ¹
16	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ¹ 2) Digestion, Inductively Coupled Plasma Method ¹
17	Oil & Grease	1) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹ 2) Soxhlet Extraction, Gravimetric Method ¹
18	pH	Comparison Method ¹

Environmental and Medical Expert
EMEX LABORATORY CO., LTD.
กรมการแพทย์
กองการปฏิบัติการวิจัยและพัฒนาเทคโนโลยีทางการแพทย์

1) Phorbol...

ลำดับที่	สารเคมี	วิธีการ
19	Phenol	Distillation, Direct Photometric Method ¹
20	Selenium	Digestion, Inductively Coupled Plasma Method ¹
21	Sulfide	Indometric Method ¹
22	Temperature	Laboratory and Field Methods ¹
23	Total Dissolved Solids	Dried at 180 °C ¹
24	Total Kjeldahl Nitrogen	Macro Kjeldahl Method ¹
25	Total Suspended Solids	Dried at 105-105 °C ¹
26	Trisilver Chloride	1) Digestion, Direct Air-Acetylene Flame Method ¹ Colorimetric Method, Calculation ¹ 2) Digestion, Inductively Coupled Plasma Method ¹ Colorimetric Method, Calculation ¹
27	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ¹ 2) Digestion, Inductively Coupled Plasma Method ¹

ข้อมูลทั่วไป ๒๖.๖๖๖๖

ลำดับที่	สารเคมี	วิธีการ
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ¹
3	Albin	Liquid-Liquid Extraction, Gas Chromatographic Method ¹
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
5	Arsenine	Digestion, Inductively Coupled Plasma Method ¹
6	Asenic	Digestion, Inductively Coupled Plasma Method ¹
7	Ataxine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
8	Barium	Digestion, Inductively Coupled Plasma Method ¹
9	Benzanthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹

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1) Phorbol...

ลำดับที่	สารเคมี	วิธีการ
30	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ¹
31	Benzofluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
32	Benzofluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
33	Benzic Acid	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
34	Benzobiphenylene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
35	Benzofluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
36	Beryllium	Digestion, Inductively Coupled Plasma Method ¹
37	Bis(2-Chloroethyl) Ether	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
38	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
39	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ¹
40	Bromobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ¹
41	Butoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
42	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
43	Cadmium	Digestion, Inductively Coupled Plasma Method ¹
44	Calcium	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
45	Carbon disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ¹
46	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ¹

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1) Phorbol...

ลำดับที่	สารเคมี	วิธีการ
47	Chlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic Method ¹
48	p-Chlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
49	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ¹
50	Chlorobenzonitrile	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ¹
51	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ¹
52	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
53	Chromium	Digestion, Inductively Coupled Plasma Method ¹
54	Chromium (II)	Digestion, Inductively Coupled Plasma Method ¹ Colorimetric Method, Calculation ¹
55	Chromium (VI)	Colorimetric Method ¹
56	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic Method ¹
57	Cyanide	Distillation, Colorimetric Method ¹
58	DDO	Liquid-Liquid Extraction, Gas Chromatographic Method ¹
59	DEE	Liquid-Liquid Extraction, Gas Chromatographic Method ¹
60	DOT	Liquid-Liquid Extraction, Gas Chromatographic Method ¹
61	Dibenzodioxin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
62	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹
63	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ¹
64	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ¹
65	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ¹
66	1,3-Dichlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ¹

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1) Phorbol...

ลำดับ	สารเคมี	วิธีการ
47	1,1-Dichloroethane	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
48	1,2-Dichloroethane	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
49	1,1-Dichloromethane	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
50	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
51	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
52	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
53	1,2-Dichloropropane	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
54	1,3-Dichloropropane	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
56	Dieldrin	Liquid-Liquid Extraction, Gas Chromatography Method ²¹
57	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
58	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
60	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
61	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
62	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹

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63 Endosulfan...

ลำดับ	สารเคมี	วิธีการ
63	Endosulfan	Liquid-Liquid Extraction, Gas Chromatography Method ²¹
64	Enthal	Liquid-Liquid Extraction, Gas Chromatography Method ²¹
65	Phthalic anhydride	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
66	Fluorenone	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
67	Fluorene	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
68	Heptachlor	Liquid-Liquid Extraction, Gas Chromatography Method ²¹
69	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatography Method ²¹
70	Heachlorobenzene	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
71	Heachloro-1,3-butadiene	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
72	n-Hexane	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
73	o-HCH	Liquid-Liquid Extraction, Gas Chromatography Method ²¹
74	p-HCH	Liquid-Liquid Extraction, Gas Chromatography Method ²¹
75	γ-HCH	Liquid-Liquid Extraction, Gas Chromatography Method ²¹
76	Heachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
77	Heachloroethane	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
78	Indeno[1,2,3-cd]pyrene	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
79	Isophorone	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
80	Lead	Digestion, Inductively Coupled Plasma Method ²¹
81	Manganese	Digestion, Inductively Coupled Plasma Method ²¹
82	Mercury	Digestion, Cold Vaporization, Gas Chromatography/ Spectrometric Method ²¹

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83 Methanol...

ลำดับ	สารเคมี	วิธีการ
83	Methanol	Liquid-Liquid Extraction, Gas Chromatography Method ²¹
84	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatography Method ²¹
85	Methyl bromide	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
86	Methylene chloride	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
87	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
88	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
89	Methyl tert-butyl ether	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
90	Naphthalene	Purge and Trap Gas Chromatography/Mass spectrometric Method ²¹
91	Nickel	Digestion, Inductively Coupled Plasma Method ²¹
92	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
93	Nitroiodophenylamine	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
94	Nitroiodo-n-propylamine	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
95	Polychlorinated Biphenyls -Aroclor 9916 -Aroclor 1221 -Aroclor 1232 -Aroclor 1242 -Aroclor 1248 -Aroclor 1254 -Aroclor 1260	Liquid-Liquid Extraction, Gas Chromatography Method ²¹
96	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹

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97 pH...

ลำดับ	สารเคมี	วิธีการ
97	pH	Spectrometric Method ²¹
98	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
99	Phenol	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
100	Pyrene	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²¹
101	Selenium	Digestion, Inductively Coupled Plasma Method ²¹
102	Silver	Digestion, Inductively Coupled Plasma Method ²¹
103	Styrene	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
105	Tetachlorophenylene	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
106	Toluene	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
107	Toxaphene	Liquid-Liquid Extraction, Gas Chromatography Method ²¹
108	TRI (C ₁₀ -C ₁₇)	Purge and Trap, Gas Chromatography/ Mass spectrometric Method ^{21,22}
109	TRI (C ₁₈ -C ₂₉)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatography Method ^{21,22}
110	TRI (C ₁₀ -C ₂₉)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatography Method ^{21,22}
111	2,3,4-Trichlorobenzene	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
112	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹
114	Trichloroethylene	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²¹

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115 2,4,5-Trichlorophenol...


ลำดับที่	สารเคมี	วิธีการ
113	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²⁰
114	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatography/ Mass Spectrometric Method ²⁰
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²⁰
118	Vanadium	Digestion, Inductively Coupled Plasma Method ²⁰
119	Wet acetate	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²⁰
120	Wet chloride	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²⁰
121	Wet cyanide	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²⁰
122	o-Xylene	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²⁰
123	p-Xylene	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²⁰
124	Xylene (Total)	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²⁰
125	Zinc	Digestion, Inductively Coupled Plasma Method ²⁰

สารเคมีอันตราย/สารพิษ

ลำดับที่	สารเคมี	วิธีการ
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²⁰
2	Arsenic	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²⁰
3	Beryllium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²⁰
4	Cadmium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²⁰



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ลำดับที่	สารเคมี	วิธีการ
5	Cyano Monoxide	Instrumental Analysis Method ²⁰
6	Chlorine	Absorption Sampling, Ion Chromatographic Method ²⁰
7	Chromium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²⁰
8	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²⁰
9	Copper	Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ²⁰
10	Creosol	Absorption Sampling, Gas Chromatographic Method ²⁰
11	Hydrogen Chloride	Absorption Sampling, Ion Chromatographic Method ²⁰
12	Hydrogen Fluoride	Absorption Sampling, Ion Chromatographic Method ²⁰
13	Hydrogen Sulfide	Absorption Sampling, Isokinetic Method ²⁰
14	Lead	Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ²⁰
15	Manganese	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²⁰
16	Mercury	Isokinetic Sampling, Digestion, Cold Vapor Atomic Absorption Spectrometric Method ²⁰
17	Nickel	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²⁰
18	Opacify	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²⁰
19	Order of Nitrogen	Absorption Sampling, Wavelength Specific Method ²⁰
20	Selenium	Isokinetic Sampling, Inductively Coupled Plasma Method ²⁰
21	Sulfur Dioxide	1) Absorption Sampling, Barium-Thion Thimetric Method ²⁰ 2) Isokinetic Sampling, Barium-Thion Thimetric Method ²⁰
22	Sulfuric Acid	Isokinetic Sampling, Barium-Thion Thimetric Method ²⁰
23	Ti	Isokinetic Sampling, Inductively Coupled Plasma Method ²⁰
24	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ²⁰
25	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²⁰
26	Xylene	Absorption Sampling, Gas Chromatographic Method ²⁰


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สารเคมีอันตราย/สารพิษ


ลำดับที่	สารเคมี	วิธีการ
1	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
2	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
3	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
4	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
5	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
6	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
7	Chromium (II)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method, Waste Extraction, Colorimetric Method, Calculation Method ^{20,21,22} 2) Digestion, Inductively Coupled Plasma Method, Alkaline Digestion, Colorimetric Method, Calculation Method ^{20,21,22}
8	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^{20,21} 2) Alkaline Digestion, Colorimetric Method ^{20,21}
9	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
10	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}


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ลำดับที่	สารเคมี	วิธีการ
11	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
12	Mercury	1) Waste Extraction, Digestion, Cold Vapor Atomic Absorption Spectrometric Method ^{20,21} 2) Digestion, Cold Vapor Atomic Absorption Spectrometric Method ^{20,21}
13	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
14	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
15	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
16	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
17	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}
18	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{20,21} 2) Digestion, Inductively Coupled Plasma Method ^{20,21}

สารเคมีอันตราย/สารพิษ

ลำดับที่	สารเคมี	วิธีการ
1	Acetophenone	Solvent Extraction, Gas Chromatography/ Mass Spectrometric Method ²⁰
2	Acetone	Purge and Trap, Gas Chromatography/ Mass Spectrometric Method ²⁰


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ល.រ	ឈ្មោះ	វិធាន
3	Acet	Solvent Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾
4	Anthracene	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
5	Antimony	Digestion, Inductively Coupled Plasma Method ⁽¹⁾⁽²⁾
6	Aniline	Digestion, Inductively Coupled Plasma Method ⁽¹⁾⁽²⁾
7	Asoline	Solvent Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾
8	Babun	Digestion, Inductively Coupled Plasma Method ⁽¹⁾⁽²⁾
9	Benzoanthracene	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
11	Benzo[fluoranthene]	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
12	Benzo[fluoranthene]	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
13	Benzoic acid	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
14	Benzo[a]pyrene	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
15	Benzo[ghi]perylene	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
16	Beryllium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾⁽²⁾
17	Bis(2-chloroethyl) ether	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
18	Bis(2-chloroethyl) phosphate	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
19	Bisnaphthylmethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
20	Bismuth	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
21	Butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾

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សាកលវិទ្យាល័យ ព្រះសីហនុ

ល.រ	ឈ្មោះ	វិធាន
22	Butyl benzyl Phthalate	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
23	Cadmium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾⁽²⁾
24	Cetane	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
25	Gallic Acid	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
27	Chlorane	Solvent Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾
28	p-Chloraniline	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
30	Chlorobenzonitrile	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
32	2-Chlorophenol	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
33	Chromium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾⁽²⁾
34	Chromium (III)	Digestion, Inductively Coupled Plasma Method/ Alkaline Digestion, Colorimetric Method, Calibration Method ⁽¹⁾⁽²⁾⁽³⁾
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ⁽¹⁾⁽²⁾
36	Cisplatin	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
37	Cyanide	Extraction, Distillation, Colorimetric Method ⁽¹⁾⁽²⁾⁽³⁾
38	DDT	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
39	DDT	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
40	DDT	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾

សាកលវិទ្យាល័យ ព្រះសីហនុ
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សាកលវិទ្យាល័យ ព្រះសីហនុ

ល.រ	ឈ្មោះ	វិធាន
41	Dibenz[anthracene]	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
42	D-n-Butyl Phthalate	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
43	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
44	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
45	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
46	3,5-Dichlorobenzidine	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
47	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
48	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
49	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
50	cis-1,3-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
51	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
52	2,4-Dichlorophenol	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
53	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
54	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
56	Dieldrin	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾

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ល.រ	ឈ្មោះ	វិធាន
57	Dibutyl Phthalate	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
58	2,4-Dimethylphenol	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
59	2,4-Dinitrophenol	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
60	2,4-Dinitrotoluene	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
61	2,6-Dinitrotoluene	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
62	D-n-Octyl Phthalate	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
63	Endosulfen	Solvent Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾
64	Endrin	Solvent Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾
65	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
66	Fluoranthene	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
67	Fluorene	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
68	Heptachlor	Solvent Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾
69	Heptachlor Epoxide	Solvent Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾
70	Hexachlorobenzene	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
71	Hexachloro-2,3-dioxane	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
72	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
73	HCH	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
74	HCH	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾
75	HCH	Solvent Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾

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សាកលវិទ្យាល័យ ព្រះសីហនុ

ลำดับ	สารเคมี	วิธีการ
76	Hexachlorocyclopentadiene	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
77	Hexachloroethane	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
78	Indeno(1,2,3-cd)pyrene	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
79	Isohexane	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
80	Lead	Digestion, Inductively Coupled Plasma Method ⁽¹⁴⁾
81	Manganese	Digestion, Inductively Coupled Plasma Method ⁽¹⁴⁾
82	Mercury	Digestion, Cold Vapor Atomic Absorption Spectrometric Method ⁽¹⁴⁾
83	Methanol	Azeotropic Distillation, Gas Chromatographic Method ⁽¹⁴⁾
84	Methoxychlor	Sohlet Extraction, Gas Chromatographic Method ⁽¹⁴⁾
85	Methyl bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
86	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
87	2-methylphenol	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
88	2-Methylnaphthalene	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
89	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
90	Naphthalene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
91	Nickel	Digestion, Inductively Coupled Plasma Method ⁽¹⁴⁾
92	Nitrobenzene	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
93	n-Nitrosodiphenylamine	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾

สำนักงานสิ่งแวดล้อม
จังหวัดสุพรรณบุรี
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กรมส่งเสริมการค้าระหว่างประเทศ

เลขที่ใบอนุญาต ๖-๒๔๔
๙๙ MROcod-n-propylamine...

ลำดับ	สารเคมี	วิธีการ
94	n-Nitrosod-n-propylamine	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
95	Polychlorinated biphenyls (PCBs)	-Acutor 3018 -Acutor 3221 -Acutor 3232 -Acutor 3242 -Acutor 3268 -Acutor 3291 -Acutor 3293
96	Pentachlorophenol	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
97	Permethrin	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
98	Phenol	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
99	Pyrene	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
100	Selenium	Digestion, Inductively Coupled Plasma Method ⁽¹⁴⁾
101	Silver	Digestion, Inductively Coupled Plasma Method ⁽¹⁴⁾
102	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
103	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
104	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
105	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
106	Triphenylamine	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
107	TPH (C ₁₀ -C ₁₄)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾

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เลขที่ใบอนุญาต ๖-๒๔๔
106 TPH (C₁₀-C₁₄)

ลำดับ	สารเคมี	วิธีการ
108	TPH (C ₁₀ -C ₁₄)	Sohlet Extraction, Gas Chromatographic Method ⁽¹⁴⁾
109	TPH (C ₁₀ -C ₁₄)	Sohlet Extraction, Gas Chromatographic Method ⁽¹⁴⁾
110	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
111	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
112	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
113	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
114	2,4,5-Trichlorophenol	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
115	2,4,6-Trichlorophenol	Sohlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
116	1,2,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
117	Vanadium	Digestion, Inductively Coupled Plasma Method ⁽¹⁴⁾
118	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
119	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
120	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
121	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
122	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
123	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁴⁾
124	Zinc	Digestion, Inductively Coupled Plasma Method ⁽¹⁴⁾

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บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

to be *in vivo* and *in vitro* activities

doi:10.1371/journal.pone.0142011.g001

These assumptions were made possible through several methodological choices:

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Figure 1. The study area, showing the location of the study area in the north of Iran.

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การดำเนินงานด้าน CSR ของ บริษัท ไทยเบฟเวอเรจ จำกัด (มหาชน) ได้มีผลต่อการดำเนินงานด้าน CSR ของ บริษัท ไทยเบฟเวอเรจ จำกัด (มหาชน) ดังนี้

mailto:aguest@openwetware.org: Germinalist

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สำนักงาน ก.ค.ศ.

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Phrynosoma hernandesi (Bourc.)
Phrynosoma macleayi (Bourc.)
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ចំណាត់ថ្នាក់នៃការងារត្រូវបានកំណត់ដោយអង្គការសហប្រជាជាតិ។

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จำนวน ๑๐๐๐๐



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1997ခု ဇွန်လထိ အောက်ဖော်ပြပါ အချက်အလက်များအရ ခန့်မှန်းချက်များကို တွက်ချက်ရရှိခဲ့သည်။

For details, see page 10

actual to be stress level.

การดำเนินการวิจัยครั้งนี้ได้เป็นประโยชน์แก่การพัฒนาระบบสารสนเทศ สำหรับงานวิจัย

Fig. 1. *Staph. aureus* strains.

ลำดับ	สารเคมี	วิธีการวิเคราะห์
1	Benzene	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
2	Carbon tetrachloride	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
3	1,2-Dichloroethane	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
4	1,1-Dichloroethylene	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
5	cis-1,2-Dichloroethylene	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
6	trans-1,2-Dichloroethylene	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
7	Ethylbenzene	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
8	Methylene chloride	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
9	Styrene	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
10	Tetrachloroethylene	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
11	Toluene	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
12	Trichloroethylene	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
13	m-Xylene	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
14	p-Xylene	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
15	o-Xylene	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0
16	Xylene (Total)	Equilibrium Headspace, Gas Chromatography/ Mass Spectrometric Method 5.0

Abstract

unmarked valley

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John Doe
President, ABC Company
123 Main Street, Suite 456
City, State, ZIP



อำนาจสุทธิเพื่อ



ผู้เขียน: **ดร. นันทวัฒน์ ปิณฑะกุล**


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 Bill Gaudin
 President, American
 Pharmaceutical Manufacturers Association

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จำนวนถูกคือ:

1. *Spizella socialis*
 2. *Spizella socialis*
 3. *Spizella socialis*

เอกสารนี้เป็นทรัพย์สินของกรมส่งเสริมการค้าระหว่างประเทศ กระทรวงพาณิชย์
ฉบับนี้ ถูกแก้ไข และปรับปรุง โดย กรมส่งเสริมการค้าระหว่างประเทศ กระทรวงพาณิชย์
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หน้า 1 จาก 1

ข้อมูลทั่วไป

ลำดับ	สารเคมี	วิธีการ
1	Acetic	Liquid-Liquid Extraction, Gas Chromatography Method ¹
2	Acetic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometry Method ² 2) Digestion, Inductively Coupled Plasma Method ³
3	Acetic	Digestion, Inductively Coupled Plasma Method ³
4	Acetic	Liquid-Liquid Extraction, Gas Chromatography Method ¹
5	Acetic	Liquid-Liquid Extraction, Gas Chromatography Method ¹
6	Acetic	Liquid-Liquid Extraction, Gas Chromatography Method ¹
7	Acetic	Liquid-Liquid Extraction, Gas Chromatography Method ¹
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Reduction Method ¹ 2) 5-Day BOD Test, Membrane Electrode Method ²
9	Cadmium	1) Digestion, Direct Ar-Arbitrary Flame Method ¹ 2) Digestion, Electrothermal Atomic Absorption Spectrometry Method ² 3) Digestion, Inductively Coupled Plasma Method ³
10	Chemical Oxygen Demand	1) Closed Reflux, Titrimetric Method ¹ 2) Closed Reflux, Colorimetric Method ² 3) Open Reflux, Titrimetric Method ³
11	Chloride	Liquid-Liquid Extraction, Gas Chromatography Method ¹
12	Chromium	1) Digestion, Direct Ar-Arbitrary Flame Method ¹ 2) Digestion, Electrothermal Atomic Absorption Spectrometry Method ² 3) Digestion, Inductively Coupled Plasma Method ³
13	Cobalt	AAS Neutron-Activated Spectrometry Method ¹
14	Copper	1) Digestion, Direct Ar-Arbitrary Flame Method ¹ 2) Digestion, Electrothermal Atomic Absorption Spectrometry Method ² 3) Digestion, Inductively Coupled Plasma Method ³
15	Copper	1) Digestion, Direct Ar-Arbitrary Flame Method ¹ 2) Digestion, Electrothermal Atomic Absorption Spectrometry Method ² 3) Digestion, Inductively Coupled Plasma Method ³

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ลำดับ	สารเคมี	วิธีการ
16	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
17	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
18	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
19	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
20	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
21	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
22	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
23	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
24	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
25	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
26	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
27	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
28	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
29	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
30	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
31	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
32	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
33	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
34	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
35	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
36	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
37	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
38	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
39	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
40	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
41	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
42	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
43	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
44	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
45	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
46	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
47	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
48	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
49	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
50	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹

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ลำดับ	สารเคมี	วิธีการ
51	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
52	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
53	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
54	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
55	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
56	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
57	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
58	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
59	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
60	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
61	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
62	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
63	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
64	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
65	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
66	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
67	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
68	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
69	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
70	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
71	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
72	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
73	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
74	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
75	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
76	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
77	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
78	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
79	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹
80	Cu ²⁺	Liquid-Liquid Extraction, Gas Chromatography Method ¹

ข้อมูลทั่วไป

ลำดับ	สารเคมี	วิธีการ
1	Acrylonitrile	1) Liquid-Liquid Extraction, Gas Chromatography Method ¹ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²
2	Acrylonitrile	Purge and Trap Gas Chromatography/Mass Spectrometry Method ³
3	Acrylonitrile	1) Liquid-Liquid Extraction, Gas Chromatography Method ¹ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ² 3) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ³

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ลำดับ	สารเคมี	วิธีการ
4	Acrylonitrile	1) Liquid-Liquid Extraction, Gas Chromatography Method ¹ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²
5	Acrylonitrile	Digestion, Inductively Coupled Plasma Method ³
6	Acrylonitrile	1) Digestion, Hydride Generation/Atomic Absorption Spectrometry Method ¹ 2) Digestion, Inductively Coupled Plasma Method ²
7	Acrylonitrile	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ³
8	Acrylonitrile	1) Digestion, Electrothermal Atomic Absorption Spectrometry Method ¹ 2) Digestion, Inductively Coupled Plasma Method ²
9	Acrylonitrile	1) Liquid-Liquid Extraction, Gas Chromatography Method ¹ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²
10	Acrylonitrile	Purge and Trap Gas Chromatography/Mass Spectrometry Method ³
11	Acrylonitrile	1) Liquid-Liquid Extraction, Gas Chromatography Method ¹ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²
12	Acrylonitrile	1) Liquid-Liquid Extraction, Gas Chromatography Method ¹ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²
13	Acrylonitrile	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ³
14	Acrylonitrile	1) Liquid-Liquid Extraction, Gas Chromatography Method ¹ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²

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สาร	การวิเคราะห์	วิธีการ
13. Benzyl n-butylamine		1) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁾
14. Benzylamine		2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁾
15. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
16. Benzyltrimethylammonium chloride		1) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁾
17. Benzyltrimethylammonium chloride		1) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁾
18. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
19. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
20. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
21. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
22. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
23. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
24. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
25. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
26. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
27. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
28. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
29. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾
30. Benzyltrimethylammonium chloride		1) Digester, Inductively Coupled Plasma Method ²⁾

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30	Chlorodimethylsilane	Pyrolytic Trap Gas Chromatography/Mass Spectrometric Method ²⁰
31	Chloroform	Pyrolytic Trap Gas Chromatography/Mass Spectrometric Method ²⁰
32	β-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometric Method ²⁰
33	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ²⁰ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ²⁰ 3) Digestion, Inductively-Coupled Plasma Method ²⁰
34	Chromium III	1) Digestion, Direct Air-Acetylene Flame Method, Colorimetric Method, Calculation ²⁰ 2) Digestion, Inductively-Coupled Plasma Method, Colorimetric Method, Calculation ²⁰
35	Chromium VI	1) Colorimetric Method ²⁰ 2) Extraction, Air-Acetylene Flame Method ²⁰
36	Chrysene	1) Liquid-Liquid Extraction, Gas Chromatography Method ²⁰ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometric Method ²⁰ 3) Extraction, Colorimetric Method ²⁰
37	Cisole	Liquid-Liquid Extraction, Gas Chromatography Method ²⁰
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatography Method ²⁰
39	DDE	1) Liquid-Liquid Extraction, Gas Chromatography Method ²⁰ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometric Method ²⁰
40	DDE	1) Liquid-Liquid Extraction, Gas Chromatography Method ²⁰ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometric Method ²⁰
41	DDE	1) Liquid-Liquid Extraction, Gas Chromatography Method ²⁰ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometric Method ²⁰

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สาร	ชนิดสาร	วิธีการ
42	Diethylbenzene	1) Liquid-Liquid Extraction, Gas Chromatography/Method ²⁾ 2) Liquid-Liquid Extractor, Gas Chromatography/Mass Spectrometry, Method ²⁾
43	Diethylbenzene	Liquid-Liquid Extractor, Gas Chromatography/Mass Spectrometry, Method ²⁾
44	1,2-Dichlorobenzene	Purge and Trap Gas Chromatography/Mass Spectrometry, Method ²⁾
45	1,3-Dichlorobenzene	Purge and Trap Gas Chromatography/Mass Spectrometry, Method ²⁾
46	1,4-Dichlorobenzene	Purge and Trap Gas Chromatography/Mass Spectrometry, Method ²⁾
47	1,2-Dichloroethane	Liquid-Liquid Extractor, Gas Chromatography/Mass Spectrometry, Method ²⁾
48	1,1-Dichloroethane	Purge and Trap Gas Chromatography/Mass Spectrometry, Method ²⁾
49	1,2-Dichloroethane	Purge and Trap Gas Chromatography/Mass Spectrometry, Method ²⁾
50	1,1-Dichloroethylene	Purge and Trap Gas Chromatography/Mass Spectrometry, Method ²⁾
51	1,2-Dichloroethylene	Purge and Trap Gas Chromatography/Mass Spectrometry, Method ²⁾
52	1,3-Dichloroethylene	Purge and Trap Gas Chromatography/Mass Spectrometry, Method ²⁾
53	2,3-Dichloropropene	Purge and Trap Gas Chromatography/Mass Spectrometry, Method ²⁾
54	1,3-Dichloropropene	Purge and Trap Gas Chromatography/Mass Spectrometry, Method ²⁾
55	1,3-Dichloropropene	Purge and Trap Gas Chromatography/Mass Spectrometry, Method ²⁾
56	1,3-Dichloropropene	Purge and Trap Gas Chromatography/Mass Spectrometry, Method ²⁾
57	Dioxin	1) Liquid-Liquid Extraction, Gas Chromatography/Method ²⁾ 2) Liquid-Liquid Extractor, Gas Chromatography/Mass Spectrometry, Method ²⁾

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Index	Compound	Method
38	Dihydroquinone	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁵
39	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁵
40	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁵
41	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁵
42	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁵
43	Chlorobenzyl alcohol	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁵
44	Isobutanol	1) Liquid-Liquid Extraction, Gas Chromatography Method ²⁵ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁵
45	Isopropanol	1) Liquid-Liquid Extraction, Gas Chromatography Method ²⁵ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁵
46	Thylbenzene	Purge and Trap Gas Chromatography/Mass Spectrometry Method ²⁵
47	Hexamethane	1) Liquid-Liquid Extraction, Gas Chromatography Method ²⁵ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁵
48	Hexanol	1) Liquid-Liquid Extraction, Gas Chromatography Method ²⁵ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁵
49	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatography Method ²⁵ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁵

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สารเคมี	วิธีการ
10. Heptachlor epoxide	1) Liquid-Liquid Extraction, Gas Chromatography/Method ²⁾ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ³⁾
11. Heptachlorobenzene	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ⁴⁾
12. Heptachlor 1,3 Epoxide	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁵⁾
13. Dieldrin	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁶⁾
14. D-DEP	1) Liquid-Liquid Extraction, Gas Chromatography/Method ⁷⁾ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ⁸⁾
15. D-DEP	1) Liquid-Liquid Extraction, Gas Chromatography/Method ⁹⁾ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ¹⁰⁾
16. D-DEP	1) Liquid-Liquid Extraction, Gas Chromatography/Method ¹¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ¹²⁾
17. Heptachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ¹³⁾
18. Heptachlorobenzene	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ¹⁴⁾
19. Endosulfan 1,2-Epoxide	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ¹⁵⁾
20. Endosulfan	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ¹⁶⁾
21. Endosulfan	1) Digestion, Direct Air-Acetylene Flame Method ¹⁷⁾ 2) Digestion, Inductively Coupled Plasma Method ¹⁸⁾

22. Manganese...

สารเคมี	วิธีการ
22. Manganese	1) Digestion, Direct Air-Acetylene Flame Method ¹⁹⁾ 2) Digestion, Inductively Coupled Plasma Method ²⁰⁾
23. Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometry Method ²¹⁾
24. Methoxy	Purge and Trap Gas Chromatography/Mass Spectrometry Method ²²⁾
25. Methoxyphenol	Liquid-Liquid Extraction, Gas Chromatography/Method ²³⁾
26. Methyl bromide	Purge and Trap Gas Chromatography/Mass Spectrometry Method ²⁴⁾
27. Methylene chloride	Purge and Trap Gas Chromatography/Mass Spectrometry Method ²⁵⁾
28. 2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁶⁾
29. 2-Methylheptachlor	1) Liquid-Liquid Extraction, Gas Chromatography/Method ²⁷⁾ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ²⁸⁾
30. Methyl isobutyl ether	Purge and Trap Gas Chromatography/Mass Spectrometry Method ²⁹⁾
31. Naphthalene	1) Liquid-Liquid Extraction, Gas Chromatography/Method ³⁰⁾ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ³¹⁾
32. Nilot	1) Digestion, Direct Air-Acetylene Flame Method ³²⁾ 2) Digestion, Inductively Coupled Plasma Method ³³⁾
33. Nilot	1) Digestion, Direct Air-Acetylene Flame Method ³⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ³⁵⁾
34. Nilot	1) Digestion, Direct Air-Acetylene Flame Method ³⁶⁾ 2) Digestion, Inductively Coupled Plasma Method ³⁷⁾
35. Nilot	1) Digestion, Direct Air-Acetylene Flame Method ³⁸⁾ 2) Digestion, Inductively Coupled Plasma Method ³⁹⁾
36. Nilot	1) Digestion, Direct Air-Acetylene Flame Method ⁴⁰⁾ 2) Digestion, Inductively Coupled Plasma Method ⁴¹⁾
37. Nilot	1) Digestion, Direct Air-Acetylene Flame Method ⁴²⁾ 2) Digestion, Inductively Coupled Plasma Method ⁴³⁾
38. Nilot	1) Digestion, Direct Air-Acetylene Flame Method ⁴⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁴⁵⁾
39. Nilot	1) Digestion, Direct Air-Acetylene Flame Method ⁴⁶⁾ 2) Digestion, Inductively Coupled Plasma Method ⁴⁷⁾
40. Nilot	1) Digestion, Direct Air-Acetylene Flame Method ⁴⁸⁾ 2) Digestion, Inductively Coupled Plasma Method ⁴⁹⁾

36. Polychlorinated Biphenyls...

สารเคมี	วิธีการ
40. Polychlorinated Biphenyls - PCB 214 - PCB 221 - PCB 232 - PCB 242 - PCB 254 - PCB 264 - PCB 274	1) Liquid-Liquid Extraction, Gas Chromatography/Method ⁵⁰⁾ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ⁵¹⁾
41. Polychlorinated Biphenyls	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ⁵²⁾
42. PCB	Electrometric Method ⁵³⁾
43. Phenanthrene	1) Liquid-Liquid Extraction, Gas Chromatography/Method ⁵⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ⁵⁵⁾
44. Pyrene	1) Oxidation, Chromatography/Method ⁵⁶⁾ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ⁵⁷⁾
45. Pyrene	1) Liquid-Liquid Extraction, Gas Chromatography/Method ⁵⁸⁾ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ⁵⁹⁾
46. Selenium	1) Digestion, Inductively Coupled Plasma Method ⁶⁰⁾ 2) Digestion, Inductively Coupled Plasma Method ⁶¹⁾
47. Silver	Digestion, Inductively Coupled Plasma Method ⁶²⁾
48. Styrene	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁶³⁾
49. 1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁶⁴⁾
50. Tetrachloroethylene	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁶⁵⁾
51. Triazole	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁶⁶⁾

52. Toxaphene...

สารเคมี	วิธีการ
52. Toxaphene	1) Liquid-Liquid Extraction, Gas Chromatography/Method ⁶⁷⁾ 2) Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ⁶⁸⁾
53. Tri-C ₁₀ -C ₁₂	1) Purge and Trap, Gas Chromatography/Method ⁶⁹⁾ 2) Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁷⁰⁾
54. Tri-C ₁₀ -C ₁₂	Separatory Funnel, Liquid-Liquid Extraction, Gas Chromatography/Method ⁷¹⁾
55. Tri-C ₁₀ -C ₁₂	Separatory Funnel, Liquid-Liquid Extraction, Gas Chromatography/Method ⁷²⁾
56. 1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁷³⁾
57. 1,1,1-Trichloroethane	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁷⁴⁾
58. 1,1,2-Trichloroethane	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁷⁵⁾
59. Trichloroethylene	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁷⁶⁾
60. 2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ⁷⁷⁾
61. 2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatography/Mass Spectrometry Method ⁷⁸⁾
62. 1,3,5-Trichlorobenzene	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁷⁹⁾
63. Waxes	Digestion, Inductively Coupled Plasma Method ⁸⁰⁾
64. Vinyl acetate	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁸¹⁾
65. Vinyl chloride	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁸²⁾
66. m-Xylene	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁸³⁾
67. o-Xylene	Purge and Trap Gas Chromatography/Mass Spectrometry Method ⁸⁴⁾

52. Toxaphene...

ธาตุ	สารเคมี	วิธีการ
126	n-Hexane	Purge and Trap/Gas Chromatography/Mass Spectrometric Method ²¹
128	Hexene (THO)	Purge and Trap/Gas Chromatography/Mass Spectrometric Method ²¹
129	Zinc	2) Digestion, Direct Air-Acetylene Flame Method ²¹ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ²¹ 2) Digestion, Inductively Coupled Plasma Method ²¹

ธาตุเหล็ก (Iron) ธาตุสังกะสี (Zinc)

ธาตุ	สารเคมี	วิธีการ
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²¹
2	Arsenic	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ²¹ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²¹
3	Cadmium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ²¹ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²¹
4	Cobalt/Manganese	Instrumental Analysis Method ²¹
5	Chromium	Isokinetic Sampling, Gas Chromatography Method ²¹
6	Chromium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ²¹ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²¹
7	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²¹
8	Copper	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ²¹ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²¹
9	Cadmium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²¹

30 Digestion/Leads...

ธาตุ	สารเคมี	วิธีการ
10	Diethyl/Luene	Isokinetic Sampling ²¹
11	Hydrogen Chloride	Isokinetic Sampling, Gas Chromatography Method ²¹
12	Hydrogen Fluoride	Isokinetic Sampling, Gas Chromatography Method ²¹
13	Hydrogen Sulfide	Absorption Sampling, Isokinetic Method ²¹
14	Lead	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ²¹ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²¹
15	Manganese	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ²¹ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²¹
16	Mercury	Isokinetic Sampling, Digestion, Cold Vapor Atomic Absorption Spectrometric Method ²¹
17	Nickel	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ²¹ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²¹
18	Opacity	Ringbom's Method ²¹
19	Salts of Nitrogen	1) Absorption Sampling, Phenanthroline acid Method ²¹ 2) Instrumental Analysis Method ²¹
20	Selenium	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ²¹ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²¹
21	Sulfur Dioxide	1) Absorption Sampling, Barium Chloride Thimble Method ²¹ 2) Instrumental Analysis Method ²¹
22	Sulfuric Acid	Isokinetic Sampling, Barium Chloride Thimble Method ²¹
23	Total Suspended Matter	Isokinetic Sampling, Gravimetric Method ²¹
24	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ²¹
25	Xylene	1) Isokinetic Sampling, Gas Chromatography Method ²¹ 2) Isokinetic Sampling, Gas Chromatography Method ²¹

30 Digestion/Leads...

ธาตุสังกะสี (Zinc) ธาตุสังกะสี (Zinc)

ธาตุ	สารเคมี	วิธีการ
1	Asim	1) Waste Extraction, Sequentially Funnel Liquid-Liquid Extraction, Gas Chromatography Method ^{21,22} 2) Waste Extraction, Gas Chromatography Method ^{21,22}
2	Antimony	Digestion, Inductively Coupled Plasma Method ^{21,22}
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}
4	Boron	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Digestion, Inductively Coupled Plasma Method ^{21,22}
5	Bismuth	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Digestion, Inductively Coupled Plasma Method ^{21,22}
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 3) Digestion, Flame Atomic Absorption Spectrometric Method ^{21,22}
7	Chromium	1) Waste Extraction, Sequentially Funnel Liquid-Liquid Extraction, Gas Chromatography Method ^{21,22} 2) Waste Extraction, Gas Chromatography Method ^{21,22}
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}

31 Digestion/Leads...

ธาตุ	สารเคมี	วิธีการ
9	Chromium (II)	3) Digestion, Flame Atomic Absorption Spectrometric Method ^{21,22} 4) Digestion, Inductively Coupled Plasma Method ^{21,22}
10	Chromium (VI)	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method, Waste Extraction, Columnar Method, Calculation ^{21,22,23} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method, Waste Extraction, Columnar Method, Calculation ^{21,22,23} 3) Digestion, Flame Atomic Absorption Spectrometric Method, Alkaline Digestion, Columnar Method, Calculation ^{21,22,23} 4) Digestion, Inductively Coupled Plasma Method, Alkaline Digestion, Columnar Method, Calculation ^{21,22,23}
11	Cobalt	1) Waste Extraction, Columnar Method ^{21,22} 2) Digestion, Inductively Coupled Plasma Method ^{21,22}
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}
13	Diethyl/Luene	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}
14	Hydrogen Chloride	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}
15	Hydrogen Fluoride	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}
16	Hydrogen Sulfide	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}
17	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}
18	Manganese	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}
19	Mercury	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}
20	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}
21	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}
22	Xylene	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22} 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{21,22}

31 Digestion/Leads...

ลำดับ	เทคนิค	วิธีการ
15	GC	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[244] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[245]
16	GC	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[246] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[247]
17	GC	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[248] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[249]
18	GC	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[250] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[251]
19	GC	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[252] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[253]
20	GC	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometry Method ^[254] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[255] 3) Digestion, Flame Atomic Absorption Spectrometry Method ^[256] 4) Digestion, Inductively Coupled Plasma Method ^[257]
21	GC	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[258] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[259]
22	GC	1) Waste Extraction, Digestion, Cold Vapor-Mercury Spectrophotometry Method ^[260] 2) Waste Extraction, Digestion, Cold Vapor-Mercury Spectrophotometry Method ^[261] 3) Waste Extraction, Digestion, Cold Vapor-Mercury Spectrophotometry Method ^[262] 4) Waste Extraction, Digestion, Cold Vapor-Mercury Spectrophotometry Method ^[263]

11. Discussion

รหัส	สารเคมี	วิธีการ
		3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ¹⁰ 4) Digestion, Inductively Coupled Plasma Method ^{21,22} 5) Thermal Decomposition Volatilization and Atomic Absorption Spectrometric Method ²³
22	Methylenechloride	1) Waste Extractor, Separatory Funnel Liquid Liquid Extraction, Gas Chromatographic Method ^{1,2,4,24} 2) Ultrasonic Extraction, Gas Chromatographic Method ^{25,26}
23	Methylenechloride	1) Waste Extractor, Digestion, Inductively Coupled Plasma Method ^{24,27} 2) Digestion, Inductively Coupled Plasma Method ^{27,28}
25	Nickel	1) Waste Extractor, Digestion, Flame Atomic Absorption Spectrometric Method ^{24,29} 2) Waste Extractor, Digestion, Inductively Coupled Plasma Method ^{24,30} 3) Digestion, Flame Atomic Absorption Spectrometric Method ^{11,31} 4) Digestion, Inductively Coupled Plasma Method ^{1,2,32}
26	Poly(chlorinated Biphenyls) -Acetone 1215 -Acetone 1221 -Acetone 1270 -Acetone 1282 -Acetone 1288 -Acetone 1293 -Acetone 1295 -1-Chlorobiphenyl -1,2-Dichlorobiphenyl -1,2,3-Trichlorobiphenyl -1,2,4-Trichlorobiphenyl -1,2,5-Trichlorobiphenyl -1,2,6-Trichlorobiphenyl -1,3,4-Trichlorobiphenyl -1,2,3,4-Tetrachlorobiphenyl	1) Waste Extractor, Separatory Funnel Liquid Liquid Extractor, Gas Chromatography Method ^{1,2,4,24} 2) Ultrasonic Extraction, Gas Chromatography Method ^{25,26,33,34}




สำนักงานกองทุนวิจัย

(HPAS)

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ลำดับ	สารเคมี	วิธีการ
30	Clover	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ²⁴⁻²⁵ 2) Digestion, Inductively Coupled Plasma Method ²²⁻²³
31	Thiourea	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ²⁴⁻²⁵ 2) Digestion, Inductively Coupled Plasma Method ²²⁻²³
32	Isophtalene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatography Method ²⁴⁻²⁵ 2) Ultrasonic Extraction, Gas Chromatography Method ²⁴⁻²⁵
33	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatography/Mass Spectrometry Method ²⁴⁻²⁵ 2) Purge and Trap, Gas Chromatography/Mass Spectrometry Method ²⁴⁻²⁵
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ²⁴⁻²⁵ 2) Digestion, Inductively Coupled Plasma Method ²²⁻²³
35	Silicic	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometry Method ²⁴⁻²⁵ 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ²⁴⁻²⁵ 3) Digestion, Flame Atomic Absorption Spectrometry Method ²⁴⁻²⁵ 4) Digestion, Inductively Coupled Plasma Method ²⁴⁻²⁵

ดูรายชื่อ 125 สารพิษ

ลำดับ	สารเคมี	วิธีการ
1	Acetophenone	1) Ultrasonic Extraction, Gas Chromatography Method ²⁴⁻²⁵ 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ²⁴⁻²⁵
2	Acetone	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ²⁴⁻²⁵




กรมทรัพยากรธรรมชาติและสิ่งแวดล้อม
 กระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม

We Agree To

Keywords: *Self-esteem, self-esteem threat, self-esteem threat sensitivity, self-esteem threat sensitivity scale, self-esteem threat sensitivity scale-2*

Ref.	Structure	Method
1	Alcane	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[100] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[101]
2	Aromatic	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[102] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[103]
3	Aromatic	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[104] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[105]
4	Alcane	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[106] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[107]
5	Alcane	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[108] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[109]
6	Alcane	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[110] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[111]
7	Alcane	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[112] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[113]
8	Alcane	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[114] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[115]
9	Alcane	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[116] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[117]
10	Alcane	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[118] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[119]
11	Alcane	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[120] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[121]
12	Alcane	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[122] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[123]
13	Alcane	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[124] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[125]
14	Alcane	1) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[126] 2) Ultra-rapid Extraction, Gas Chromatography/ Mass Spectrometry ^[127]

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สาร	วิธีการ	วิธีการ
12. Benzyl Hydroxide	1) Ultrasound Extraction, Gas Chromatography/Mass Spectrometry Method ^[1,10] 2) Ultrasound Extraction, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
13. Benzyl	Digestion, Inductively Coupled Plasma Method ^[1,10]	
17. BaCl ₂ chromophosphate	Ultrasound Extraction, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
18. BaCl ₂ ethylenephosphate	Ultrasound Extraction, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
19. Ironochloroethane	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
20. Bromoform	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
21. Butanol	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
22. Butyl benzyl phosphate	Ultrasound Extraction, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
23. Calcium	1) Digestion, Flame Atomic Absorption Spectrometry Method ^[1,10] 2) Digestion, Inductively Coupled Plasma Method ^[1,10]	
24. Calcium	Ultrasound Extraction, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
25. Calcium chloride	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
26. Calcium hydroxide	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
27. Chloride	1) Ultrasound Extraction, Gas Chromatography Method ^[1,10] 2) Ultrasound Extraction, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
28. p-Chlorophenol	Ultrasound Extraction, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
29. Chlorobenzene	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ^[1,10]	
30. Chlorobenzonitrile	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ^[1,10]	

2. Literature

Index	analyzer	TFWard
31	Chlorobenzene	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁽¹⁾⁽⁴⁾
32	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ⁽⁴⁾⁽⁵⁾
33	Chloroethane	Digestion, Flame Atomic Absorption Spectrometry Method ⁽¹⁾⁽²⁾
34	Chromium III	Digestion, Inductively Coupled Plasma Method ⁽¹⁾⁽²⁾ D Digestion, Flame Atomic Absorption Spectrometry Method, Alkaline Digestion, Colorimetric Method, Colorimetry ⁽¹⁾⁽⁴⁾⁽⁵⁾
35	Chromium IV	Alkaline Digestion, Colorimetric Method ⁽¹⁾⁽²⁾
36	Cisplatin	1) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ⁽¹⁾⁽²⁾ 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ⁽¹⁾⁽²⁾
37	Cyanide	Extraction, Distillation, Colorimetric Method ⁽¹⁾⁽²⁾⁽³⁾
38	DAE	Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ⁽⁴⁾⁽⁵⁾
39	DBP	1) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ⁽⁴⁾⁽⁵⁾ 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ⁽¹⁾⁽²⁾
40	DBP	1) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ⁽¹⁾⁽²⁾ 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ⁽⁴⁾⁽⁵⁾
41	DEP	1) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ⁽¹⁾⁽²⁾ 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ⁽⁴⁾⁽⁵⁾
42	Diethylstilbestrol	1) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ⁽¹⁾⁽²⁾ 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ⁽⁴⁾⁽⁵⁾

83 David G. Hall, *et al.*, *supra* note 1.

क्रमांक	संयोजक	विश्लेषण
43	B-methyl anthracene	Ultimate Extraction Gas Chromatography/Mass Spectrometry Method ⁽²⁰⁾
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁽²²⁾
45	1,5-Dichlorobenzene	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁽²²⁾
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁽²²⁾
47	8,9-Dichlorodibenzofuran	Ultimate Extraction Gas Chromatography/Mass Spectrometry Method ⁽²⁰⁾
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁽²²⁾
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁽²²⁾
50	1,1-Dichloroethanol	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁽²²⁾
51	m-1,2-Dichloroethylene	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁽²²⁾
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁽²²⁾
53	1,4-Dichlorophenol	Ultimate Extraction Gas Chromatography/Mass Spectrometry Method ⁽²⁰⁾
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁽²²⁾
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁽²²⁾
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ⁽²²⁾
57	Dibutyl	Ultimate Extraction Gas Chromatography/Mass Spectrometry Method ⁽²⁰⁾
58	Diallyl phthalate	Ultimate Extraction Gas Chromatography/Mass Spectrometry Method ⁽²⁰⁾
59	1,4-Dimethylbenzene	Ultimate Extraction Gas Chromatography/Mass Spectrometry Method ⁽²⁰⁾

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21. Immunofluorescence

#/by	analyse	Therapy
11	Heuchenzereone	1) Ultrasonic Extraction, Gas Chromatography/Method ^{11,12} 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^{11,12}
12	Heuchenzereone (3-Esterone)	Purge and Trap, Gas Chromatography/MS Spectrometry Method ^{11,12}
13	n-Heptane	Purge and Trap, Gas Chromatography/MS Spectrometry Method ^{11,12}
14	Gl-CH	1) Ultrasonic Extraction, Gas Chromatography/Method ^{11,12} 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^{11,12}
15	β -CH	1) Ultrasonic Extraction, Gas Chromatography/Method ^{11,12} 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^{11,12}
16	γ -CH	1) Ultrasonic Extraction, Gas Chromatography/Method ^{11,12} 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^{11,12}
17	Heuchenzereone (3-Esterone)	Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^{11,12}
18	Heuchenzereone	Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^{11,12}
19	Indole (1,2,3-Esterone)	1) Ultrasonic Extraction, Gas Chromatography/Method ^{11,12} 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^{11,12}
20	Isoprene	Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^{11,12}
21	Leaf	1) Digestion, Flame Atomic Absorption Spectrometry/Method ^{11,12} 2) Digestion, Inductively Coupled Plasma Atomic Absorption Spectrometry/Method ^{11,12}
22	Vergewiss	1) Digestion, Inductively Coupled Plasma Atomic Absorption Spectrometry/Method ^{11,12} 2) Digestion, Inductively Coupled Plasma Atomic Absorption Spectrometry/Method ^{11,12}

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#	Formula	Method
81	Hexacy	1) Distillation, Gas-Mass Spectrometry, Spectrometric Method ⁽¹⁾ 2) Distillation, Infraredly Coupled Plasma Method ^(1,2) 3) Thermal Decomposition, Gas-liquid Chromatography, Mass Spectrometry Method ⁽³⁾
82	Methanol	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ^(1,2,3)
83	Methoxyphenol	1) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^(1,2,3) 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^(1,2,3)
84	Methyl formate	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ^(1,2)
85	Methylene chloride	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ^(1,2,3)
86	2-Methoxyphenol	1) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^(1,2,3) 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^(1,2,3)
87	2-Methoxyphenol	1) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^(1,2,3) 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^(1,2,3)
88	Methyl tert-butyl ether	Purge and Trap, Gas Chromatography/Mass Spectrometry Method ^(1,2,3)
89	Naphthalene	1) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^(1,2,3) 2) Ultrasonic Extraction, Gas Chromatography/Mass Spectrometry Method ^(1,2,3)
90	None	1) Distillation, Gas-Mass Spectrometry, Spectrometric Method ⁽¹⁾ 2) Distillation, Infraredly Coupled Plasma Method ^(1,2) 3) Thermal Decomposition, Gas-liquid Chromatography, Mass Spectrometry Method ⁽³⁾
91	None	1) Distillation, Gas-Mass Spectrometry, Spectrometric Method ⁽¹⁾ 2) Distillation, Infraredly Coupled Plasma Method ^(1,2) 3) Thermal Decomposition, Gas-liquid Chromatography, Mass Spectrometry Method ⁽³⁾
92	None	1) Distillation, Gas-Mass Spectrometry, Spectrometric Method ⁽¹⁾ 2) Distillation, Infraredly Coupled Plasma Method ^(1,2) 3) Thermal Decomposition, Gas-liquid Chromatography, Mass Spectrometry Method ⁽³⁾
93	None	1) Distillation, Gas-Mass Spectrometry, Spectrometric Method ⁽¹⁾ 2) Distillation, Infraredly Coupled Plasma Method ^(1,2) 3) Thermal Decomposition, Gas-liquid Chromatography, Mass Spectrometry Method ⁽³⁾
94	None	1) Distillation, Gas-Mass Spectrometry, Spectrometric Method ⁽¹⁾ 2) Distillation, Infraredly Coupled Plasma Method ^(1,2) 3) Thermal Decomposition, Gas-liquid Chromatography, Mass Spectrometry Method ⁽³⁾
95	None	1) Distillation, Gas-Mass Spectrometry, Spectrometric Method ⁽¹⁾ 2) Distillation, Infraredly Coupled Plasma Method ^(1,2) 3) Thermal Decomposition, Gas-liquid Chromatography, Mass Spectrometry Method ⁽³⁾
96	None	1) Distillation, Gas-Mass Spectrometry, Spectrometric Method ⁽¹⁾ 2) Distillation, Infraredly Coupled Plasma Method ^(1,2) 3) Thermal Decomposition, Gas-liquid Chromatography, Mass Spectrometry Method ⁽³⁾
97	None	1) Distillation, Gas-Mass Spectrometry, Spectrometric Method ⁽¹⁾ 2) Distillation, Infraredly Coupled Plasma Method ^(1,2) 3) Thermal Decomposition, Gas-liquid Chromatography, Mass Spectrometry Method ⁽³⁾
98	None	1) Distillation, Gas-Mass Spectrometry, Spectrometric Method ⁽¹⁾ 2) Distillation, Infraredly Coupled Plasma Method ^(1,2) 3) Thermal Decomposition, Gas-liquid Chromatography, Mass Spectrometry Method ⁽³⁾
99	None	1) Distillation, Gas-Mass Spectrometry, Spectrometric Method ⁽¹⁾ 2) Distillation, Infraredly Coupled Plasma Method ^(1,2) 3) Thermal Decomposition, Gas-liquid Chromatography, Mass Spectrometry Method ⁽³⁾
100	None	1) Distillation, Gas-Mass Spectrometry, Spectrometric Method ⁽¹⁾ 2) Distillation, Infraredly Coupled Plasma Method ^(1,2) 3) Thermal Decomposition, Gas-liquid Chromatography, Mass Spectrometry Method ⁽³⁾

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