

ภาคผนวก ง
เอกสารสอบเทียบเครื่องมือ

เอกสารสอบเทียบเครื่องมือ
บริษัท ทีพีไอ โพลีน จำกัด (มหาชน)

NO. 026/66

35 ()

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 001

MODEL : GILAIR - SRP

SERIAL NO : 16064

PARAMETER RANGE : 1 - 3 L / MIN

CAL DATE : 17 / JUL / 2023

NEXT DUE TIME : 17 / JAN / 2024

STANDARD USED :

AMBIENT CONDITIONS :

PRIMARY FLOW STANDARD (WET CELL) :

TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	1	2	3	AVERAGE	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
1	1.004	1.007	1.009	1.007	0.005	± 0.03	PASS
1.5	1.510	1.508	1.513	1.509	0.009	± 0.03	PASS
2	2.008	2.007	2.006	2.007	0.004	± 0.03	PASS
2.5	2.510	2.508	2.504	2.507	0.007	± 0.03	PASS
3	3.010	3.002	3.004	3.007	0.007	± 0.03	PASS

CAL BY :

CH-CHENBY :

(SIGNATURE AND DATE)

APPROVED BY :

ROTA METER OF PUMP

ACTUAL FLOWRATE (l/min)

3.0

TPI POLENE PUBLIC CO.,LTD.
CEMENT QUALITY DEPARTMENT
PRODUCT CONTROL 3 SECTION (ENVIRONMENTAL)
CERTIFICATE OF CALIBRATION

NO. 027/66

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 002

MODEL : GILAIR - SRP

SERIAL NO : 15944

PARAMETER RANGE : 1 - 3 L / MIN

CAL DATE : 17 / JUL / 2023

NEXT DUE TIME : 17 / JAN / 2024

STANDARD USED :

AMBIENT CONDITIONS :

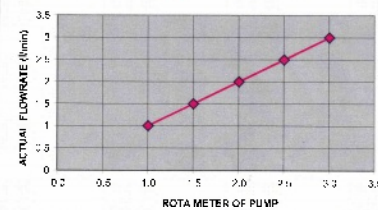
PRIMARY FLOW STANDARD (WET CELL) :

TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	1	2	3	AVERAGE	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
1	1.008	1.007	1.007	1.007	0.005	± 0.03	PASS
1.5	1.507	1.508	1.505	1.507	0.004	± 0.03	PASS
2	2.003	2.006	1.999	2.003	0.003	± 0.03	PASS
2.5	2.504	2.503	2.508	2.505	0.003	± 0.03	PASS
3	3.009	3.002	3.003	3.005	0.002	± 0.03	PASS

CALIBRATION CURVE



CAL BY :

CH-CHENBY :

(SIGNATURE AND DATE)

APPROVED BY :

TPI POLENE PUBLIC CO.,LTD.
CEMENT QUALITY DEPARTMENT
PRODUCT CONTROL 3 SECTION (ENVIRONMENTAL)
CERTIFICATE OF CALIBRATION

NO. 028/66

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 003

MODEL : GILAIR - SRP

SERIAL NO : 15945

PARAMETER RANGE : 1 - 3 L / MIN

CAL DATE : 17 / JUL / 2023

NEXT DUE TIME : 17 / JAN / 2024

STANDARD USED :

AMBIENT CONDITIONS :

PRIMARY FLOW STANDARD (WET CELL) :

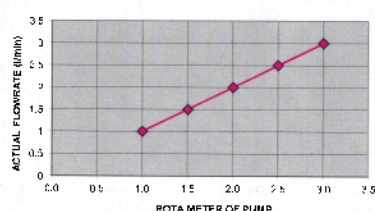
TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	1	2	3	AVERAGE	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
1	1.007	1.006	1.003	1.004	0.004	± 0.03	PASS
1.5	1.507	1.517	1.503	1.509	0.007	± 0.03	PASS
2	2.006	1.999	2.001	2.002	0.003	± 0.03	PASS
2.5	2.506	2.505	2.506	2.506	0.000	± 0.03	PASS
3	3.002	3.008	3.010	3.007	0.008	± 0.03	PASS

3.007

CALIBRATION CURVE



CAL BY :

CH-CHENBY :

(SIGNATURE AND DATE)

APPROVED BY :

TPI POLENE PUBLIC CO.,LTD.
CEMENT QUALITY DEPARTMENT
PRODUCT CONTROL 3 SECTION (ENVIRONMENTAL)
CERTIFICATE OF CALIBRATION

NO. 029/66

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 004

MODEL : GILAIR - SRP

SERIAL NO : 16946

PARAMETER RANGE : 1 - 3 L / MIN

CAL DATE : 17 / JUL / 2023

NEXT DUE TIME : 17 / JAN / 2024

STANDARD USED :

AMBIENT CONDITIONS :

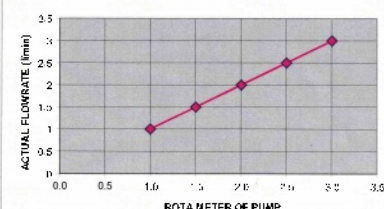
PRIMARY FLOW STANDARD (WET CELL) :

TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	1	2	3	AVERAGE	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
1	1.012	1.008	1.003	1.007	0.008	± 0.03	PASS
1.5	1.527	1.502	1.501	1.509	0.014	± 0.03	PASS
2	2.039	2.004	2.006	2.005	0.015	± 0.03	PASS
2.5	2.527	2.512	2.503	2.509	0.005	± 0.03	PASS
3	3.074	3.001	3.000	3.004	0.007	± 0.03	PASS

CALIBRATION CURVE




CAL BY :

CH-CHENBY :

(SIGNATURE AND DATE)

APPROVED BY :


 TPI POLENE PUBLIC CO.,LTD. CEMENT QUALITY DEPARTMENT PRODUCT CONTROL 3 SECTION (ENVIRONMENTAL) CERTIFICATE OF CALIBRATION	NO. 030/66
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INSTRUMENT NAME : WORKING AREA DUST SAMPLER
 INSTRUMENT CODE : Q1300 / 01 / 023 / 005
 MODEL : GILAIR - SRP
 SERIAL NO : 15947
 PARAMETER RANGE : 1 - 3 L / MIN
 CAL DATE : 17 / JUL / 2023
 NEXT DUE TIME : 17 / JAN / 2024

STANDARD USED : AMBIENT CONDITIONS :
 PRIMARY FLOW STANDARD (WET CELL) TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	ACTUAL FLOWRATE (l/min)			AVERAGE (l/min)	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
	1	2	3				
1	1.000	1.006	1.004	1.004	0.004	± 0.03	PASS
1.5	1.510	1.506	1.502	1.506	0.004	± 0.02	PASS
2	2.000	2.006	2.006	2.006	0.006	± 0.03	PASS
2.5	2.500	2.507	2.504	2.506	0.006	± 0.03	PASS
3	3.006	3.006	3.004	3.006	0.006	± 0.03	PASS

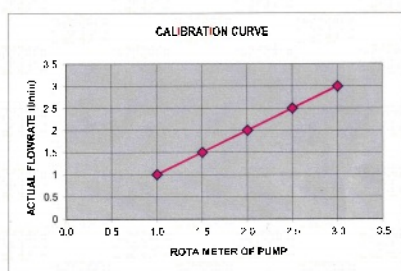
 TPI POLENE PUBLIC CO.,LTD. CEMENT QUALITY DEPARTMENT PRODUCT CONTROL 3 SECTION (ENVIRONMENTAL) CERTIFICATE OF CALIBRATION	NO. 031/66
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INSTRUMENT NAME : WORKING AREA DUST SAMPLER
 INSTRUMENT CODE : Q1300 / 01 / 023 / 006
 MODEL : GILAIR - SRP
 SERIAL NO : 15948
 PARAMETER RANGE : 1 - 3 L / MIN
 CAL DATE : 17 / JUL / 2023
 NEXT DUE TIME : 17 / JAN / 2024

STANDARD USED : AMBIENT CONDITIONS :
 PRIMARY FLOW STANDARD (WET CELL) TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

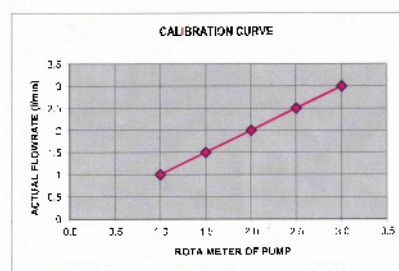
ROTA METER OF PUMP	ACTUAL FLOWRATE (l/min)			AVERAGE (l/min)	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
	1	2	3				
1	1.002	1.004	1.004	1.004	0.004	± 0.03	PASS
1.5	1.502	1.504	1.502	1.504	0.004	± 0.03	PASS
2	2.004	2.007	2.009	2.004	0.004	± 0.02	PASS
2.5	2.510	2.505	2.507	2.507	0.007	± 0.03	PASS
3	3.005	3.002	3.010	3.006	0.006	± 0.03	PASS



CAL BY :

CHECKED BY :


APPROVED BY :



CAL BY :

CHECKED BY :

APPROVED BY :

 TPI POLENE PUBLIC CO.,LTD. CEMENT QUALITY DEPARTMENT PRODUCT CONTROL 3 SECTION (ENVIRONMENTAL) CERTIFICATE OF CALIBRATION	NO. 032/66
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INSTRUMENT NAME : WORKING AREA DUST SAMPLER
 INSTRUMENT CODE : Q1300 / 01 / 023 / 007
 MODEL : GILAIR - SRP
 SERIAL NO : 15950
 PARAMETER RANGE : 1 - 3 L / MIN
 CAL DATE : 18 / JUL / 2023
 NEXT DUE TIME : 18 / JAN / 2024

STANDARD USED : AMBIENT CONDITIONS :
 PRIMARY FLOW STANDARD (WET CELL) TEMPERATURE (°C) : 25.0


CALIBRATION DATA :

ROTA METER OF PUMP	ACTUAL FLOWRATE (l/min)			AVERAGE (l/min)	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
	1	2	3				
1	1.001	1.007	1.000	1.004	0.004	± 0.02	PASS
1.5	1.508	1.492	1.505	1.505	0.007	± 0.03	PASS
2	2.009	2.006	2.006	2.006	0.003	± 0.03	PASS
2.5	2.501	2.506	2.517	2.506	0.006	± 0.03	PASS
3	3.009	3.004	3.016	3.006	0.006	± 0.02	PASS

CAL BY :

CHECKED BY :

APPROVED BY :

 TPI POLENE PUBLIC CO.,LTD. CEMENT QUALITY DEPARTMENT PRODUCT CONTROL 3 SECTION (ENVIRONMENTAL) CERTIFICATE OF CALIBRATION	NO. 033/66
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INSTRUMENT NAME : WORKING AREA DUST SAMPLER
 INSTRUMENT CODE : Q1300 / 01 / 023 / 008
 MODEL : GILAIR - SRP
 SERIAL NO : 20041202010
 PARAMETER RANGE : 1 - 3 L / MIN
 CAL DATE : 18 / JUL / 2023
 NEXT DUE TIME : 18 / JAN / 2024

STANDARD USED : AMBIENT CONDITIONS :
 PRIMARY FLOW STANDARD (WET CELL) TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	ACTUAL FLOWRATE (l/min)			AVERAGE (l/min)	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
	1	2	3				
1	1.002	1.008	1.005	1.004	0.004	± 0.03	PASS
1.5	1.508	1.506	1.501	1.506	0.006	± 0.03	PASS
1.7	1.708	1.704	1.701	1.705	0.006	± 0.03	PASS
2.5	2.507	2.502	2.504	2.504	0.004	± 0.03	PASS
3	3.005	3.017	3.007	3.004	0.004	± 0.02	PASS

CAL BY :

CHECKED BY :

APPROVED BY :

NO. 034/66

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 008

MODEL : GILAIR - SRP

SERIAL NO : 1000

PARAMETER RANGE : 1 - 3 L / MIN

CAL DAT : 18 / JUL / 2023

NEXT DUE TIME : 18 / JAN / 2024

STANDARD USED :

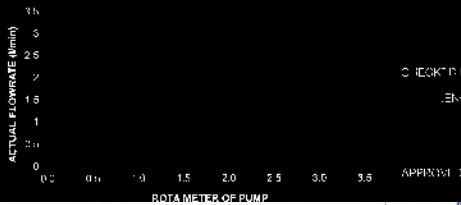
AMBIENT CONDITIONS :

PRIMARY FLOW STANDARD (WET CELL) : TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	1	2	3	AVERAGE	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
1	1.003	1.002	1.001	1.002	0.003	± 0.03	PASS
1.5	1.500	1.501	1.504	1.502	0.006	± 0.05	PASS
1.7	1.701	1.702	1.700	1.701	0.003	± 0.05	PASS
2.5	2.503	2.503	2.504	2.504	0.005	± 0.05	PASS
3	3.002	3.005	3.008	3.005	0.005	± 0.05	PASS

CAL BY :



NO. 036/66

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 011

MODEL : GILAIR - SRP

SERIAL NO : 1008

PARAMETER RANGE : 1 - 3 L / MIN

CAL DAT : 18 / JUL / 2023

NEXT DUE TIME : 18 / JAN / 2024

STANDARD USED :

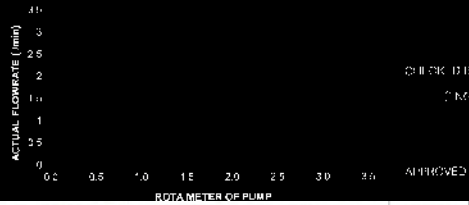
AMBIENT CONDITIONS :

PRIMARY FLOW STANDARD (WET CELL) : TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	1	2	3	AVERAGE	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
1	1.005	1.002	1.003	1.003	0.004	± 0.03	PASS
1.5	1.506	1.501	1.503	1.503	0.006	± 0.05	PASS
1.7	1.708	1.701	1.700	1.704	0.004	± 0.05	PASS
2.5	2.510	2.503	2.504	2.506	0.009	± 0.05	PASS
3	3.004	3.007	3.008	3.002	0.003	± 0.05	PASS

CAL BY :



NO. 037/66

35

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 012

MODEL : GILAIR - SRP

SERIAL NO : 1009

PARAMETER RANGE : 1 - 3 L / MIN

CAL DAT : 18 / JUL / 2023

NEXT DUE TIME : 18 / JAN / 2024

STANDARD USED :

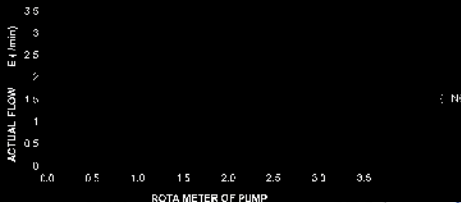
AMBIENT CONDITIONS :

PRIMARY FLOW STANDARD (WET CELL) : TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	1	2	3	AVERAGE	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
1	1.002	1.005	1.003	1.004	0.004	± 0.03	PASS
1.5	1.501	1.508	1.504	1.505	0.009	± 0.05	PASS
1.7	1.703	1.706	1.702	1.704	0.004	± 0.05	PASS
2.5	2.506	2.505	2.501	2.503	0.003	± 0.05	PASS
3	3.002	3.004	3.001	3.002	0.002	± 0.05	PASS

CAL BY :



NO. 038/65

3

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 013

MODEL : GILAIR - SRP

SERIAL NO : 1010

PARAMETER RANGE : 1 - 3 L / MIN

CAL DATE : 18 / JUL / 2023

NEXT DUE TIME : 18 / JAN / 2024

STANDARD USED :

AMBIENT CONDITIONS :

PRIMARY FLOW STANDARD (WET CELL) : TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	1	2	3	AVERAGE	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
1	1.006	1.002	1.001	1.003	0.006	± 0.03	PASS
1.5	1.506	1.502	1.507	1.503	0.006	± 0.05	PASS
2	1.941	2.006	2.010	2.002	0.032	± 0.05	PASS
2.5	2.512	2.508	2.503	2.508	0.005	± 0.05	PASS
3	3.007	3.006	3.002	3.005	0.006	± 0.05	PASS

CAL BY :



NO 039/66

3 S ()

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 016

MODEL : GIL AIR - SRP

SERIAL NO : 20071202001

PARAMETER RANGE : 1 - 3 L / MIN

CAL DATE : 19 / JUL / 2023

NEXT DUE TIME : 19 / JAN / 2024

STANDARD USED : AMBIENT CONDITIONS :

PRIMARY FLOW STANDARD (WET CELL) TEMPERATURE (°C) : 25 °C

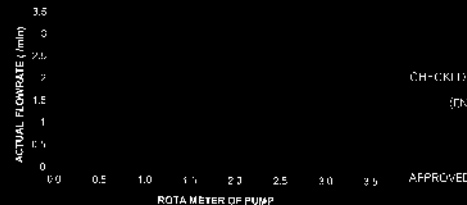
CALIBRATION DATA

ROTA METER	ACTUAL FLOWRATE (l/min)	DEVIATION	PERMISSIBLE	PASS / NOT PASS
OF PUMP	1 2 3 AVERAGE	(l/min)	DEVIATION (l/min)	
1	1.005 1.002 1.004 1.004	0.004	± 0.03	PASS
1.5	1.506 1.504 1.501 1.505	0.006	± 0.03	PASS
2	2.007 2.003 2.008 2.006	0.003	± 0.03	PASS
2.5	2.503 2.511 2.504 2.506	0.006	± 0.03	PASS
3	3.001 3.002 3.004 3.003	0.004	± 0.03	PASS

CAL BY :

CH-CHK-D1

(CN)



ROTA METER OF PUMP

APPROVED

NO. 040/66

3 S ()

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 017

MODEL : GIL AIR - SRP

SERIAL NO : 20071202002

PARAMETER RANGE : 1 - 3 L / MIN

CAL DATE : 19 / JUL / 2023

NEXT DUE TIME : 19 / JAN / 2024

STANDARD USED : AMBIENT CONDITIONS :

PRIMARY FLOW STANDARD (WET CELL) TEMPERATURE (°C) : 25 °C

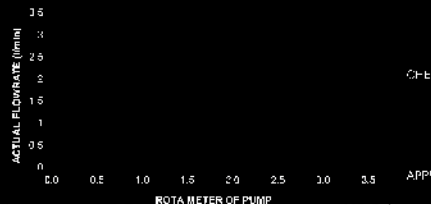
CALIBRATION DATA

ROTA METER	ACTUAL FLOWRATE (l/min)	DEVIATION	PERMISSIBLE	PASS / NOT PASS
OF PUMP	1 2 3 AVERAGE	(l/min)	DEVIATION (l/min)	
1	1.006 1.007 1.009 1.006	0.003	± 0.03	PASS
1.5	1.512 1.504 1.506 1.506	0.006	± 0.03	PASS
2	2.002 2.004 2.003 2.004	0.001	± 0.03	PASS
2.5	2.514 2.506 2.509 2.509	0.007	± 0.03	PASS
3	3.017 3.002 3.004 3.006	0.005	± 0.03	PASS

CAL

CH-CHK-D1

(CN)



ROTA METER OF PUMP

APPROVED

NO 041/66

3 S ()

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 018

MODEL : GIL AIR - SRP

SERIAL NO : 20071202003

PARAMETER RANGE : 1 - 3 L / MIN

CAL DATE : 19 / JUL / 2023

NEXT DUE TIME : 19 / JAN / 2024

STANDARD USED : AMBIENT CONDITIONS :

PRIMARY FLOW STANDARD (WET CELL) TEMPERATURE (°C) : 25 °C

CALIBRATION DATA

ROTA METER	ACTUAL FLOWRATE (l/min)	DEVIATION	PERMISSIBLE	PASS / NOT PASS
OF PUMP	1 2 3 AVERAGE	(l/min)	DEVIATION (l/min)	
1	1.002 1.005 1.005 1.004	0.004	± 0.03	PASS
1.5	1.502 1.504 1.501 1.503	0.003	± 0.03	PASS
2	2.008 2.009 2.001 2.006	0.005	± 0.03	PASS
2.5	2.507 2.500 2.505 2.506	0.006	± 0.03	PASS
3	3.002 3.005 3.004 3.004	0.004	± 0.03	PASS

CAL BY :

CH-CHK-D1

(CN)



ROTA METER OF PUMP

APPROVED

NO. 042/66

3 S ()

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 019

MODEL : GIL AIR - SRP

SERIAL NO : 20071202004

PARAMETER RANGE : 1 - 3 L / MIN

CAL DATE : 19 / JUL / 2023

NEXT DUE TIME : 19 / JAN / 2024

STANDARD USED :

PRIMARY FLOW STANDARD (WET CELL)

CALIBRATION DATA

ROTA METER	ACTUAL FLOWRATE (l/min)	DEVIATION	PERMISSIBLE	PASS / NOT PASS
OF PUMP	1 2 3 AVERAGE	(l/min)	DEVIATION (l/min)	
1	1.006 1.005 1.002 1.005	0.006	± 0.03	PASS
1.5	1.509 1.503 1.501 1.503	0.006	± 0.03	PASS
2	2.012 2.008 2.006 2.006	0.006	± 0.03	PASS
2.5	2.508 2.505 2.504 2.506	0.006	± 0.03	PASS
3	3.002 3.005 3.003 3.003	0.006	± 0.03	PASS

CAL BY :

CH-CHK-D1

(CN)



ROTA METER OF PUMP

APPROVED

NO. 043/66

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 020

MODEL : GILAIR - SRP

SERIAL NO : 20071202005

PARAMETER RANGE : 1 - 3 L / MIN

CAL DAT : 10 / JUL / 2023

NEXT DUE TIME : 10 / JAN / 2024

STANDARD USED :

AMBIENT CONDITIONS :

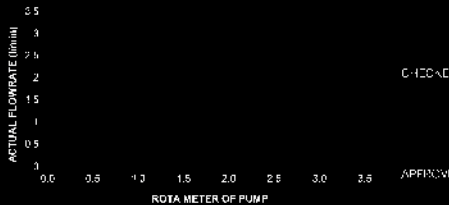
PRIMARY FLOW STANDARD (WET CELL) :

TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	1	2	3	AVERAGE	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
1	1.002	1.003	1.005	1.004	0.004	± 0.03	PASS
1.5	1.508	1.504	1.503	1.505	0.005	± 0.03	PASS
2	2.005	2.008	2.004	2.006	0.006	± 0.03	PASS
2.5	2.508	2.507	2.505	2.507	0.005	± 0.03	PASS
3	3.004	3.007	3.005	3.006	0.006	± 0.03	PASS

CAL BY :



NO 044/66

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INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 021

MODEL : GILAIR - SRP

SERIAL NO : 20160201017

PARAMETER RANGE : 1 - 3 L / MIN

CAL DAT : 20 / JUL / 2023

NEXT DUE TIME : 20 / JAN / 2024

STANDARD USED :

AMBIENT CONDITIONS :

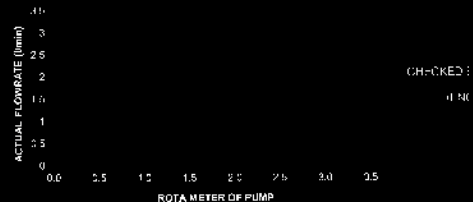
PRIMARY FLOW STANDARD (WET CELL) :

TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	1	2	3	AVERAGE	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
1	1.002	1.004	1.007	1.004	0.002	± 0.03	PASS
1.5	1.503	1.504	1.507	1.505	0.002	± 0.03	PASS
2	2.007	2.002	2.007	2.005	0.007	± 0.03	PASS
2.5	2.504	2.505	2.502	2.504	0.002	± 0.03	PASS
3	3.004	3.003	3.002	3.003	0.002	± 0.03	PASS

CAL BY :



NO 045/66

PAGE 1/1

INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 022

MODEL : GILAIR - SRP

SERIAL NO : 20160201018

PARAMETER RANGE : 1 - 3 L / MIN

CAL DAT : 20 / JUL / 2023

NEXT DUE TIME : 20 / JAN / 2024

STANDARD USED :

AMBIENT CONDITIONS :

PRIMARY FLOW STANDARD (WET CELL) :

TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	1	2	3	AVERAGE	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
1	1.001	1.002	1.007	1.004	0.004	± 0.03	PASS
1.5	1.502	1.501	1.505	1.503	0.002	± 0.03	PASS
2	1.999	2.000	2.007	2.004	0.007	± 0.03	PASS
2.5	2.503	2.501	2.502	2.502	0.000	± 0.03	PASS
3	3.002	3.001	3.002	3.002	0.000	± 0.03	PASS

CAL BY :



NO 046/66

PAGE 1/1

INSTRUMENT NAME : WORKING AREA DUST SAMPLER

INSTRUMENT CODE : Q1300 / 01 / 023 / 023

MODEL : GILAIR - SRP

SERIAL NO : 20160201019

PARAMETER RANGE : 1 - 3 L / MIN

CAL DAT : 20 / JUL / 2023

NEXT DUE TIME : 20 / JAN / 2024

STANDARD USED :

AMBIENT CONDITIONS :

PRIMARY FLOW STANDARD (WET CELL) :

TEMPERATURE (°C) : 25.0

CALIBRATION DATA :

ROTA METER OF PUMP	1	2	3	AVERAGE	DEVIATION (l/min)	PERMISSIBLE DEVIATION (l/min)	PASS / NOT PASS
1	1.002	1.004	1.001	1.002	0.002	± 0.03	PASS
1.5	1.500	1.507	1.502	1.504	0.007	± 0.03	PASS
2	2.004	2.007	2.002	2.004	0.007	± 0.03	PASS
2.5	2.502	2.507	2.500	2.504	0.007	± 0.03	PASS
3	3.002	3.007	3.002	3.004	0.002	± 0.03	PASS

CAL BY :



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บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง
คอนซัลแตนท์ จำกัด

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
Ambient									
1	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL150 6457	Innovative Instrument Co.,Ltd.	23-ACT-064	12 May 23	11 May 24	-
2	Sound Level Meter	$L_{Aeq\ 24\ hours}$, L_{Amax} , L_{A90} , L_{Adn}	Larson Davis	LxT2 0006692	Larson Davis-A PCB Piezotronics Div.	2022003094	11 Mar 22	10 Mar 24	-
3	Sound Level Meter	$L_{Aeq\ 24\ hours}$, L_{Amax} , L_{A90} , L_{Adn}	Larson Davis	LxT2 0006693	Larson Davis-A PCB Piezotronics Div.	2022002973	9 Mar 22	8 Mar 24	-
4	Sound Level Meter	$L_{Aeq\ 24\ hours}$, L_{Amax} , L_{A90} , L_{Adn}	Larson Davis	LxT2 0006694	Larson Davis-A PCB Piezotronics Div.	2022003098	11 Mar 22	10 Mar 24	-

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 Particular Matter (PM ₁₀)	Apex Instruments, USA.	XC-572-V A2003277	Envi Equipment Service Co., Ltd.	E23-04045	28 Apr 23	27 Apr 24	-
2	Flue gas Analyzer	Sulphur Dioxide Oxide of Nitrogen as Nitrogen Dioxide	Testo	Testo 350 60899698	Entech Industrial Solution Co., Ltd.	G 660095	17 Feb 23	16 Feb 24	-

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	Horiba	LAQUA-PH210 HA1M0043	Technology Promotion Association (Thailand-Japan)	23CH423	30 Mar 23	29 Mar 24	-
2	DO Meter	DO	Horiba	LAQUA-DO210 HE9M0013	Technology Promotion Association (Thailand-Japan)	23TW50	28 Feb 23	27 Feb 24	-
3	Conductivity Meter	Conductivity	Horiba	LAQUA-EC210 HC9L0015	Technology Promotion Association (Thailand-Japan)	23CH430	29 Mar 23	28 Mar 24	-

Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Expected [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
125	-0.22	-0.20	-1.70	1.30	0.23	Pass
1000	0.12	0.00	-1.00	1.00	0.23	Pass
8000	-3.06	-3.00	-8.00	2.00	0.32	Pass

-- End of measurement results--

Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

Measurement	Test Result [dB]
A-weighted	40.69

-- End of measurement results--

-- End of Report--

Signature: Jacob Cannon

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D0001.8406 Rev F

Calibration Certificate

Certificate Number 2022002971

Customer:

United Analyst and Engineering Consultant Co Ltd

No. 81 Soi Udonsuk 41, Sukhumvit Road,
Bangchak, Phra Khanong,
Bangkok, 10260, Thailand

Model Number LxT2

Serial Number 0006692

Test Results Pass

Initial Condition As Manufactured

Description SoundTrack LxT Class 2
Class 2 Sound Level Meter
Firmware Revision: 2.404

Procedure Number D0001.8378

Technician Jacob Cannon

Calibration Date 9 Mar 2022

Calibration Due

Temperature 23.91 °C ± 0.25 °C

Humidity 50.6 %RH ± 2.0 %RH

Static Pressure 85.35 kPa ± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRMLX2C S/N 071561 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 2	ANSI S1.4-2014 Class 2
IEC 60804:2000 Type 2	ANSI S1.4 (R2006) Type 2
IEC 61252:2002	ANSI S1.25 (R2007)
IEC 61672:2013 Class 2	ANSI S1.43 (R2007) Type 2
IEC 61260:2001 Class 2	ANSI S1.11 (R2009) Class 2

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. Test points marked with a * in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert LxT, I770.01 Rev O Supporting Firmware Version 4.0.5, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa

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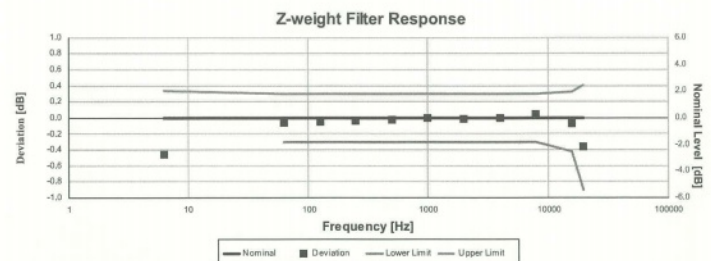
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Certificate Number 2022002971

Certificate Number 2022002971

Description	Standards Used		
	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-H Temperature Probe	2021-02-04	2022-08-04	006767
SRS DS360 Ultra Low Distortion Generator	2021-07-22	2022-07-22	007174



Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4-1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
6.31	-0.45	-0.45	-1.11	0.33	0.15	Pass
63.10	-0.06	-0.06	-0.30	0.30	0.15	Pass
125.89	-0.05	-0.05	-0.30	0.30	0.15	Pass
251.19	-0.04	-0.04	-0.30	0.30	0.15	Pass
501.19	-0.03	-0.03	-0.30	0.30	0.15	Pass
1,000.00	0.00	0.00	-0.30	0.30	0.15	Pass
1,995.26	-0.01	-0.01	-0.30	0.30	0.15	Pass
3,981.07	0.00	0.00	-0.30	0.30	0.15	Pass
7,943.28	0.05	0.05	-0.30	0.30	0.15	Pass
15,848.93	-0.08	-0.08	-0.42	0.32	0.15	Pass
19,952.62	-0.36	-0.36	-0.91	0.41	0.15	Pass

-- End of measurement results--

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Calibration Certificate

Certificate Number 2022002973

Customer:

United Analyst and Engineering Consultant Co Ltd
No. 81 Soi Udonsuk 41, Sukhumvit Road,
Bangchak, Phra Khanong,
Bangkok, 10260, Thailand

Model Number

LxT2

Serial Number

0006893

Test Results**Pass****Initial Condition**

As Manufactured

Description

SoundTrack LxT Class 2
Class 2 Sound Level Meter
Firmware Revision: 2.404

Procedure Number

D0001.8378

Technician

Jacob Cannon

Calibration Date

9 Mar 2022

Calibration Due

23,73 °C ± 0.25 °C

Humidity

49.5 %RH ± 2.0 %RH

Static Pressure

85.37 kPa ± 0.13 kPa

Evaluation Method

Tested electrically using Larson Davis PRMLxT2C S/N 071562 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards

Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 2

IEC 60804:2000 Type 2

IEC 61252:2002

IEC 61672:2013 Class 2

IEC 61260:2001 Class 2

ANSI S1.4-2014 Class 2

ANSI S1.4 (R2006) Type 2

ANSI S1.25 (R2007)

ANSI S1.43 (R2007) Type 2

ANSI S1.11 (R2009) Class 2

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert LxT, I770.01 Rev O Supporting Firmware Version 4.0.5, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa

-- End of Report--

Signatory: Jacob Cannon

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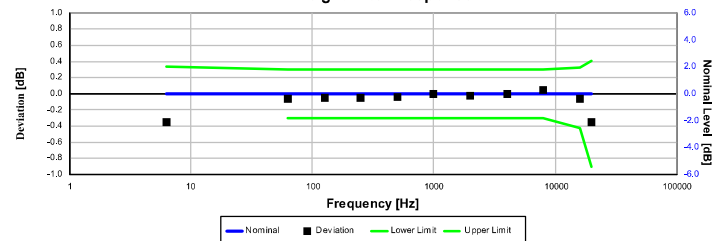
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Z-weight Filter Response



Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
6.31	-0.35	-0.35	-1.11	0.33	0.15	Pass
63.10	-0.06	-0.06	-0.30	0.30	0.15	Pass
125.89	-0.05	-0.05	-0.30	0.30	0.15	Pass
251.19	-0.05	-0.05	-0.30	0.30	0.15	Pass
501.19	-0.03	-0.03	-0.30	0.30	0.15	Pass
1,000.00	0.00	0.00	-0.30	0.30	0.15	Pass
1,995.26	-0.02	-0.02	-0.30	0.30	0.15	Pass
3,981.07	-0.01	-0.01	-0.30	0.30	0.15	Pass
7,943.26	0.04	0.04	-0.30	0.30	0.15	Pass
15,848.93	-0.07	-0.07	-0.42	0.32	0.15	Pass
19,952.62	-0.35	-0.35	-0.91	0.41	0.15	Pass

-- End of measurement results--

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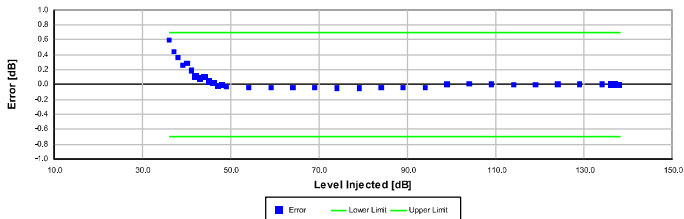
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A-weighted Broadband Log Linearity: 8,000.00 Hz



Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5,6, IEC 60804:2000 6,2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6,9, ANSI S1.4-2014 Part 1: 5,6, ANSI S1.43 (R2007) 6,2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
36,00	0,60	-0,70	0,70	0,16	Pass
37,00	0,44	-0,70	0,70	0,16	Pass
38,00	0,37	-0,70	0,70	0,16	Pass
39,00	0,26	-0,70	0,70	0,16	Pass
40,00	0,28	-0,70	0,70	0,16	Pass
41,00	0,19	-0,70	0,70	0,16	Pass
42,00	0,11	-0,70	0,70	0,16	Pass
43,00	0,08	-0,70	0,70	0,17	Pass
44,00	0,10	-0,70	0,70	0,17	Pass
45,00	0,05	-0,70	0,70	0,16	Pass
46,00	0,02	-0,70	0,70	0,16	Pass
47,00	-0,01	-0,70	0,70	0,16	Pass
48,00	0,00	-0,70	0,70	0,16	Pass
49,00	-0,03	-0,70	0,70	0,16	Pass
54,00	-0,04	-0,70	0,70	0,16	Pass
59,00	-0,04	-0,70	0,70	0,16	Pass
64,00	-0,04	-0,70	0,70	0,16	Pass
69,00	-0,04	-0,70	0,70	0,16	Pass
74,00	-0,05	-0,70	0,70	0,16	Pass
79,00	-0,06	-0,70	0,70	0,16	Pass
84,00	-0,04	-0,70	0,70	0,16	Pass
89,00	-0,04	-0,70	0,70	0,16	Pass
94,00	-0,04	-0,70	0,70	0,16	Pass
99,00	0,01	-0,70	0,70	0,15	Pass
104,00	0,01	-0,70	0,70	0,15	Pass
109,00	0,01	-0,70	0,70	0,15	Pass
114,00	0,00	-0,70	0,70	0,15	Pass
119,00	0,00	-0,70	0,70	0,15	Pass
124,00	0,01	-0,70	0,70	0,15	Pass
129,00	0,01	-0,70	0,70	0,15	Pass
134,00	0,01	-0,70	0,70	0,15	Pass
136,00	0,01	-0,70	0,70	0,15	Pass
137,00	0,00	-0,70	0,70	0,15	Pass
138,00	0,00	-0,70	0,70	0,15	Pass
-- End of measurement results--					

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Certificate Number 2022002973

Peak Rise Time

Peak rise time performed according to IEC 60651:2001 8,4,4 and ANSI S1.4:1983 (R2006) 8,4,4

Amplitude [dB]	Duration [μs]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
136,95	40	Negative Pulse	135,01	133,52	135,52	0,15 ± Pass
		Positive Pulse	134,99	133,51	135,51	0,15 ± Pass
30		Negative Pulse	134,07	133,52	135,52	0,15 ± Pass
		Positive Pulse	134,07	133,51	135,51	0,15 ± Pass
-- End of measurement results--						

Positive Pulse Crest Factor

200 μs pulse tests at 2,0, 12,0, 22,0, 32,0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9,4,2 and ANSI S1.4:1983 (R2006) 8,4,2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
135,95	3	OVLVD	± 1,00	0,15 ±	Pass
	5	OVLVD	± 1,00	0,15 ±	Pass
125,95	3	-0,13	± 1,00	0,15 ±	Pass
	5	-0,15	± 1,00	0,16 ±	Pass
115,95	3	-0,14	± 1,00	0,15 ±	Pass
	5	-0,14	± 1,00	0,15 ±	Pass
105,95	3	-0,15	± 1,00	0,15 ±	Pass
	5	-0,14	± 1,00	0,15 ±	Pass
-- End of measurement results--					

Negative Pulse Crest Factor

200 μs pulse tests at 2,0, 12,0, 22,0, 32,0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9,4,2 and ANSI S1.4:1983 (R2006) 8,4,2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
135,95	3	OVLVD	± 1,00	0,15 ±	Pass
	5	OVLVD	± 1,00	0,15 ±	Pass
125,95	3	-0,13	± 1,00	0,15 ±	Pass
	5	-0,11	± 1,00	0,15 ±	Pass
115,95	3	-0,13	± 1,00	0,15 ±	Pass
	5	-0,13	± 1,00	0,15 ±	Pass
105,95	3	-0,14	± 1,00	0,15 ±	Pass
	5	-0,13	± 1,00	0,15 ±	Pass
-- End of measurement results--					

Gain

Gain measured according to IEC 61672-3:2013 17,3 and 17,4 and ANSI S1.4-2014 Part 3: 17,3 and 17,4

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0 dB Gain	93,96	93,92	94,12	0,15	Pass
0 dB Gain, Linearity	40,29	39,42	40,82	0,16	Pass
OBA Low Range	94,02	93,92	94,12	0,15	Pass
OBA Normal Range	94,02	93,20	94,80	0,15	Pass
-- End of measurement results--					

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Certificate Number 2022002973

Broadband Noise Floor

Self-generated noise measured according to IEC 61672-3:2013 11,2 and ANSI S1.4-2014 Part 3: 11,2

Measurement	Test Result [dB]	Upper limit [dB]	Result
A-weight Noise Floor	27,08	36,00	Pass
C-weight Noise Floor	26,90	35,00	Pass
Z-weight Noise Floor	32,76	39,00	Pass

-- End of measurement results--

Total Harmonic Distortion

Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	135,53	134,15	135,75	0,15	Pass
THD	-67,24	-58,00	-58,00	0,01 ±	Pass
THD+N	-63,03	-58,00	-58,00	0,01 ±	Pass

-- End of measurement results--

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Calibration Certificate

Certificate Number 2022003098

Customer:

United Analyst and Engineering Consultant Co Ltd
No. 81 Soi Udonsuk 41, Sukhumvit Road,
Bangchak, Phra Khanong,
Bangkok, 10260, Thailand

Model Number LxT2
Serial Number 0006694
Test Results Pass

Initial Condition As Manufactured

Description SoundTrack LxT Class 2
Class 2 Sound Level Meter
Firmware Revision: 2.404

Procedure Number D0001.8384
Technician Jacob Cannon
Calibration Date 11 Mar 2022
Calibration Due
Temperature 23.64 °C ± 0.25 °C
Humidity 50.9 %RH ± 2.0 %RH
Static Pressure 87.2 kPa ± 0.13 kPa

Evaluation Method Tested with: Data reported in dB re 20 µPa.

Larson Davis PRLxT2C, S/N 071563
PCB 375A04, S/N 335078
Larson Davis CAL291, S/N 0108
Larson Davis CAL200, S/N 9079

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 2	ANSI S1.4-2014 Class 2
IEC 60804:2000 Type 2	ANSI S1.4 (R2006) Type 2
IEC 61252:2002	ANSI S1.11 (R2009) Class 2
IEC 61260:2001 Class 2	ANSI S1.25 (R2007)
IEC 61672:2013 Class 2	ANSI S1.43 (R2007) Type 2

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017.

Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert LxT, I770.01 Rev J Supporting Firmware Version 2.301, 2015-04-30

Signature: Jacob Cannon

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Certificate Number 2022003098

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to 1/2" adaptor is used with the preamplifier.

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

No Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 available.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 2 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3 cover only a limited subset of the specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used			
Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	2021-09-10	2022-09-10	001250
Hart Scientific 2626-H Temperature Probe	2021-02-04	2022-08-04	006767
Larson Davis CAL200 Acoustic Calibrator	2021-07-21	2022-07-21	007027
Larson Davis Model 831	2022-02-21	2023-02-21	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2022-03-02	2023-03-02	007185
SRS DS360 Ultra Low Distortion Generator	2021-04-13	2022-04-13	007635
Larson Davis 1/2" Preamplifier for Model 831 Type I	2021-09-28	2022-09-28	PCB0004783

Acoustic Calibration

Measured according to IEC 61672-3:2013 10 and ANSI S1.4-2014 Part 3: 10

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
1000 Hz	114.01	113.80	114.20	0.14	Pass

Loaded Circuit Sensitivity

Measurement	Test Result [dB re 1 V / Pa]	Lower Limit [dB re 1 V / Pa]	Upper Limit [dB re 1 V / Pa]	Expanded Uncertainty [dB]	Result
1000 Hz	-51.12	-52.44	-48.33	0.14	Pass

— End of measurement results—

— End of Report—

Signature: Jacob Cannon

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Certificate Number 2022003098

Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Expected [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
125	-0.22	-0.20	-1.70	1.30	0.23	Pass
1000	0.16	0.00	-1.00	1.00	0.23	Pass
8000	-2.84	-3.00	-8.00	2.00	0.32	Pass

— End of measurement results—

Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

Measurement	Test Result [dB]
A-weighted	40.78

— End of measurement results—

— End of Report—

Signature: Jacob Cannon

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Calibration Certificate

Certificate Number 2022002974

Customer:

United Analyst and Engineering Consultant Co Ltd
No. 81 Soi Udomsak 41, Sukhumvit Road,
Bangchak, Phra Khanong,
Bangkok, 10260, Thailand

Model Number LxT2
Serial Number 0006694

Test Results Pass

Initial Condition As Manufactured

Description SoundTrack LxT Class 2
Class 2 Sound Level Meter
Firmware Revision: 2.404

Procedure Number D0001.8378

Technician Jacob Cannon

Calibration Date 9 Mar 2022

Calibration Due

Temperature 23.79 °C ± 0.25 °C

Humidity 50.3 %RH ± 2.0 %RH

Static Pressure 85.37 kPa ± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRLMT2C S/N 071563 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 2
IEC 60804:2000 Type 2
IEC 61252:2002
IEC 61672:2013 Class 2
IEC 61260:2001 Class 2

ANSI S1.4-2014 Class 2
ANSI S1.4 (R2006) Type 2
ANSI S1.25 (R2007)
ANSI S1.43 (R2007) Type 2
ANSI S1.11 (R2009) Class 2

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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

Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert LxT, I770.01 Rev O Supporting Firmware Version 4.0.5, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa

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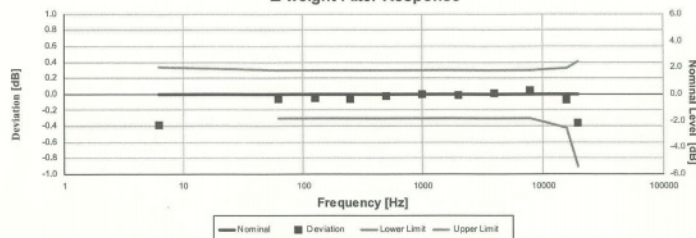
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Certificate Number 2022002974

Z-weight Filter Response



Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
6.31	-0.39	-0.39	-1.11	0.33	0.15	Pass
63.10	-0.06	-0.06	-0.30	0.30	0.15	Pass
125.89	-0.05	-0.05	-0.30	0.30	0.15	Pass
251.19	-0.06	-0.06	-0.30	0.30	0.15	Pass
501.19	-0.03	-0.03	-0.30	0.30	0.15	Pass
1,000.00	0.00	0.00	-0.30	0.30	0.15	Pass
1,995.26	-0.01	-0.01	-0.30	0.30	0.15	Pass
3,981.07	0.01	0.01	-0.30	0.30	0.15	Pass
7,943.28	0.05	0.05	-0.30	0.30	0.15	Pass
15,848.93	-0.08	-0.08	-0.42	0.32	0.15	Pass
19,952.62	-0.36	-0.36	-0.91	0.41	0.15	Pass

-- End of measurement results--

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Standards Used			
Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-H Temperature Probe	2021-02-04	2022-08-04	006767
SRS DS360 Ultra Low Distortion Generator	2021-07-22	2022-07-22	007174

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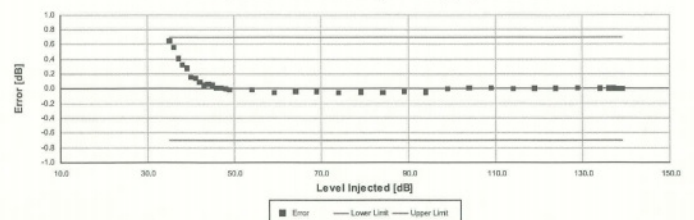
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Certificate Number 2022002974

A-weighted Broadband Log Linearity: 8,000.00 Hz



Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6; IEC 60804:2000 6.2; IEC 61252:2002 8; ANSI S1.4 (R2006) 6.9; ANSI S1.4-2014 Part 1: 5.6; ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
35.00	0.65	-0.70	0.70	0.16	Pass
36.00	0.56	-0.70	0.70	0.16	Pass
37.00	0.41	-0.70	0.70	0.16	Pass
38.00	0.32	-0.70	0.70	0.16	Pass
39.00	0.28	-0.70	0.70	0.16	Pass
40.00	0.15	-0.70	0.70	0.16	Pass
41.00	0.14	-0.70	0.70	0.16	Pass
42.00	0.09	-0.70	0.70	0.16	Pass
43.00	0.04	-0.70	0.70	0.17	Pass
44.00	0.06	-0.70	0.70	0.17	Pass
45.00	0.05	-0.70	0.70	0.16	Pass
46.00	0.01	-0.70	0.70	0.16	Pass
47.00	0.01	-0.70	0.70	0.16	Pass
48.00	0.00	-0.70	0.70	0.16	Pass
49.00	-0.01	-0.70	0.70	0.16	Pass
50.00	-0.02	-0.70	0.70	0.16	Pass
59.00	-0.05	-0.70	0.70	0.16	Pass
64.00	-0.04	-0.70	0.70	0.16	Pass
69.00	-0.04	-0.70	0.70	0.16	Pass
74.00	-0.05	-0.70	0.70	0.16	Pass
79.00	-0.05	-0.70	0.70	0.16	Pass
84.00	-0.05	-0.70	0.70	0.16	Pass
89.00	-0.04	-0.70	0.70	0.16	Pass
94.00	-0.05	-0.70	0.70	0.16	Pass
99.00	0.00	-0.70	0.70	0.15	Pass
104.00	0.01	-0.70	0.70	0.15	Pass
109.00	0.01	-0.70	0.70	0.15	Pass
114.00	0.00	-0.70	0.70	0.15	Pass
119.00	0.01	-0.70	0.70	0.15	Pass
124.00	0.00	-0.70	0.70	0.15	Pass
129.00	0.01	-0.70	0.70	0.15	Pass
134.00	0.01	-0.70	0.70	0.15	Pass
136.00	0.01	-0.70	0.70	0.15	Pass
137.00	0.01	-0.70	0.70	0.15	Pass
138.00	0.00	-0.70	0.70	0.15	Pass
139.00	0.00	-0.70	0.70	0.15	Pass

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Peak Rise Time

Peak rise time performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration [µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
136.95	40	Negative Pulse	134.96	133.48	135.48	0.15	Pass
		Positive Pulse	134.95	133.50	135.50	0.15	Pass
	30	Negative Pulse	134.03	133.48	135.48	0.15	Pass
		Positive Pulse	134.05	133.50	135.50	0.15	Pass

- End of measurement results -

Positive Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor		Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
135.95	3	OVL	OVLD	± 1.00	0.15 ±	Pass
	5	OVL	OVLD	± 1.00	0.15 ±	Pass
125.95	3		-0.15	± 1.00	0.15 ±	Pass
	5		-0.15	± 1.00	0.16 ±	Pass
115.95	3		-0.16	± 1.00	0.15 ±	Pass
	5		-0.13	± 1.00	0.15 ±	Pass
105.95	3		-0.13	± 1.00	0.15 ±	Pass
	5		-0.14	± 1.00	0.15 ±	Pass

- End of measurement results -

Negative Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor		Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
135.95	3	OVL	OVLD	± 1.00	0.15 ±	Pass
	5	OVL	OVLD	± 1.00	0.15 ±	Pass
125.95	3		-0.17	± 1.00	0.15 ±	Pass
	5		-0.17	± 1.00	0.15 ±	Pass
115.95	3		-0.18	± 1.00	0.15 ±	Pass
	5		-0.16	± 1.00	0.15 ±	Pass
105.95	3		-0.16	± 1.00	0.15 ±	Pass
	5		-0.17	± 1.00	0.15 ±	Pass

- End of measurement results -

Gain

Gain measured according to IEC 61672-3:2013 17.3 and 17.4 and ANSI S1.4-2014 Part 3: 17.3 and 17.4

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0 dB Gain	93.94	93.89	94.09	0.15	Pass
0 dB Gain, Linearity	40.26	39.39	40.79	0.16	Pass
OBA Low Range	93.99	93.89	94.09	0.15	Pass
OBA Normal Range	93.99	93.20	94.80	0.15	Pass

- End of measurement results -

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Broadband Noise Floor

Self-generated noise measured according to IEC 61672-3:2013 11.2 and ANSI S1.4-2014 Part 3: 11.2

Measurement	Test Result [dB]	Upper limit [dB]	Result
A-weight Noise Floor	27.00	36.00	Pass
C-weight Noise Floor	26.90	35.00	Pass
Z-weight Noise Floor	32.83	39.00	Pass

- End of measurement results -

Total Harmonic Distortion

Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	135.53	134.15	135.75	0.15	Pass
THD	-65.89	-58.00	-58.00	0.01 ±	Pass
THD+N	-62.16	-58.00	-58.00	0.01 ±	Pass

- End of measurement results -

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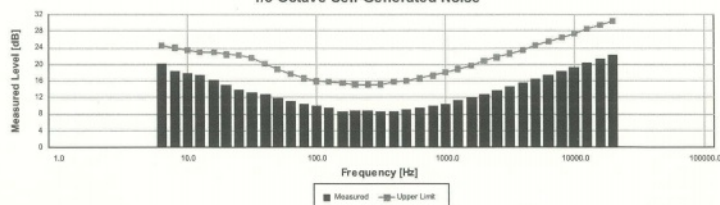
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1/3-Octave Self-Generated Noise



The SLM is set to low range.

Frequency [Hz]	Test Result [dB]	Upper limit [dB]	Result
6.30	20.27	24.60	Pass
8.00	18.34	24.00	Pass
10.00	17.81	23.50	Pass
12.50	17.29	23.00	Pass
16.00	16.26	22.90	Pass
20.00	15.07	22.40	Pass
25.00	13.95	22.30	Pass
31.50	13.28	21.50	Pass
40.00	12.72	20.20	Pass
50.00	11.82	18.80	Pass
63.00	11.17	17.60	Pass
80.00	10.50	16.60	Pass
100.00	9.94	15.90	Pass
125.00	9.53	15.70	Pass
160.00	8.63	15.50	Pass
200.00	8.89	15.20	Pass
250.00	8.71	15.20	Pass
315.00	8.54	15.20	Pass
400.00	8.68	15.70	Pass
500.00	8.96	16.00	Pass
630.00	9.43	16.60	Pass
800.00	9.93	17.30	Pass
1,000.00	10.44	18.10	Pass
1,250.00	11.27	18.90	Pass
1,600.00	12.00	19.80	Pass
2,000.00	12.86	20.80	Pass
2,500.00	13.72	21.70	Pass
3,150.00	14.59	22.60	Pass
4,000.00	15.48	23.50	Pass
5,000.00	16.42	24.50	Pass
6,300.00	17.46	25.50	Pass
8,000.00	18.37	26.50	Pass
10,000.00	19.35	27.40	Pass
12,500.00	20.37	28.50	Pass
16,000.00	21.36	29.50	Pass
20,000.00	22.33	30.40	Pass

- End of measurement results -

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- End of Report -

Signatory: Jacob Cannon

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Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tumbon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110
Tel. 098 362 9152, 089 478 7885
E-mail: sales@envi-ees.com

Certificate No. : E23-04045
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Certificate No. : E23-04045
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CERTIFICATE OF CALIBRATION

Customer : United Analyst and Engineering Consultant Co., Ltd.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Description of Equipment : Console meter
Manufacturer : Apex Instrument
Model Number : XC-572-V
Serial Number : A2003277
ID/Control No. : -
Environment Conditions : Temperature (25 ± 2) °C
: Humidity (50 ± 15) % RH
Cal. Date : 28/04/2023
Issue Date : 28/04/2023

METHOD 5 CONSOLE CALIBRATION USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425 5-POINT METRIC UNIT

Meter Console Information		Calibration Conditions				Factors/Conversions	
Console Model Number	XC-572-V	Date	Time	28/04/2023	09:50 AM	Std Temp	293 K
Console Serial Number	A2003277	Calibration Reference No.	SER23-04017			Std Press	760 mm Hg
DGM Model Number	SK25EX	Barometric Pressure	758.99	mm Hg	K ₁ 0.386		
DGM Serial Number	00005781	Calibration Meter Gamma	0.999		Console Leak Check	PASS	

Calibration Data									
Run Time		Metering Console				Calibration Meter			
Elapsed	DGM Orifice DH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final
(Q)	(P _m)	(V _m)	(V _{ref})	(t _m)	(t _{ref})	(V _{wi})	(V _{wf})	(t _m)	(t _{ref})
min	mm H ₂ O	m ³	m ³	°C	°C	m ³	m ³	°C	°C
11.75	13.0	967.7180	967.8580	28	28	139.35512	139.49214	29	28
11.75	13.0	967.8580	967.9980	28	28	139.62974	139.76746	29	28
8.05	26.0	968.0060	968.1460	28	28	139.62974	139.76746	28	28
8.03	26.0	968.1460	968.2860	29	29	139.90464	140.04236	28	28
13.30	40.0	968.2950	968.5750	29	29	139.91146	140.18482	27	27
13.25	40.0	968.5750	968.8550	29	29	140.18482	140.45718	27	27
9.98	70.0	968.8660	969.1460	30	30	140.46730	140.73824	27	27
9.97	70.0	969.1460	969.4260	30	30	140.73824	141.00758	26	26
8.80	90.0	969.4380	969.7180	31	31	141.01872	141.28718	26	26
8.80	90.0	969.7180	969.9980	31	31	141.28718	141.55604	26	26

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

This certificate is traceable to national standard, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by :

(Mr. Mana Fuekhud)
Technical Manager

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เอกสารไม่ควบคุม

Certificate No. : E23-04045
Page : 3 of 6

Certificate No. : E23-04045
Page : 4 of 6

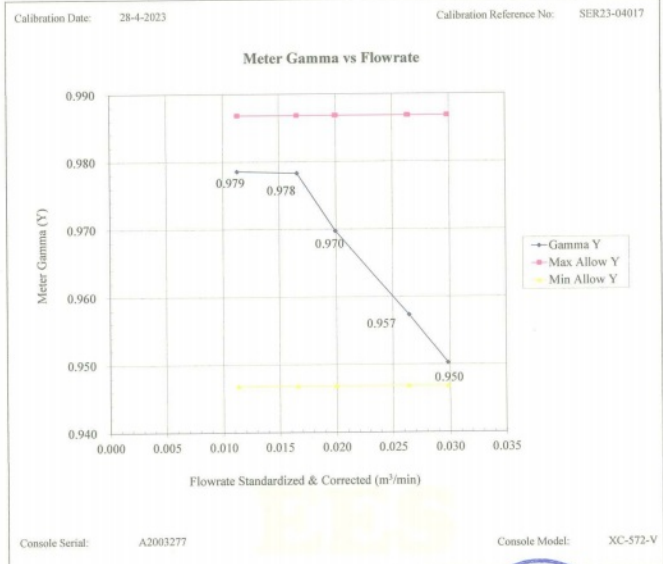
METHOD 5 CONSOLE CALIBRATION USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425 5-POINT METRIC UNIT

Meter Console Information		Calibration Conditions				Factors/Conversions	
Console Model Number	XC-572-V	Date	Time	28/04/2023	09:50 AM	Std Temp	293 K
Console Serial Number	A2003277	Calibration Reference No.	SER23-04017			Std Press	760 mm Hg
DGM Model Number	SK25EX	Barometric Pressure	758.99	mm Hg	K ₁ 0.386		
DGM Serial Number	00005781	Calibration Meter Gamma	0.999		Console Leak Check	PASS	

Calibration Data									
Results									
Dry Gas Meter									
Standardized Data		Calibration Factor		Flowrate					
Dry Gas Meter	Calibration Meter	Value	Variation	Std & Corr	.0212 m ³ /min	Variation			
(V _m) _{std}	(Q _{ref}) _{std}	(V _w) _{std}	(Q _w) _{std}	(Y)	(ΔY)	(Q _{ref}) _{std}	(ΔH _g)	(ΔH _g)	
m ³	m ³ /min	m ³	m ³ /min			m ³ /min	mm H ₂ O		
0.136	0.012	0.133	0.011	0.977	0.010	0.011	44.617	0.528	
0.136	0.012	0.133	0.011	0.981	0.014	0.011	44.242	0.152	
0.136	0.017	0.134	0.017	0.980	0.013	0.017	41.495	-2.595	
0.136	0.017	0.133	0.017	0.976	0.010	0.017	41.649	-2.441	
0.273	0.021	0.265	0.020	0.972	0.005	0.020	44.350	0.260	
0.274	0.021	0.265	0.020	0.968	0.001	0.020	44.193	0.104	
0.275	0.028	0.264	0.026	0.960	-0.007	0.026	44.624	0.534	
0.275	0.028	0.262	0.026	0.954	-0.012	0.026	45.005	0.915	
0.275	0.031	0.262	0.030	0.950	-0.017	0.030	45.429	1.339	
0.276	0.031	0.263	0.030	0.951	-0.016	0.030	45.294	1.204	
		0.967	Y Average			44.090	ΔH _g Average		

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.
For ΔH_g, orifice pressure differential that equates to 0.75 cfm (0.0212 m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2 inches (5.08 mm) H₂O.

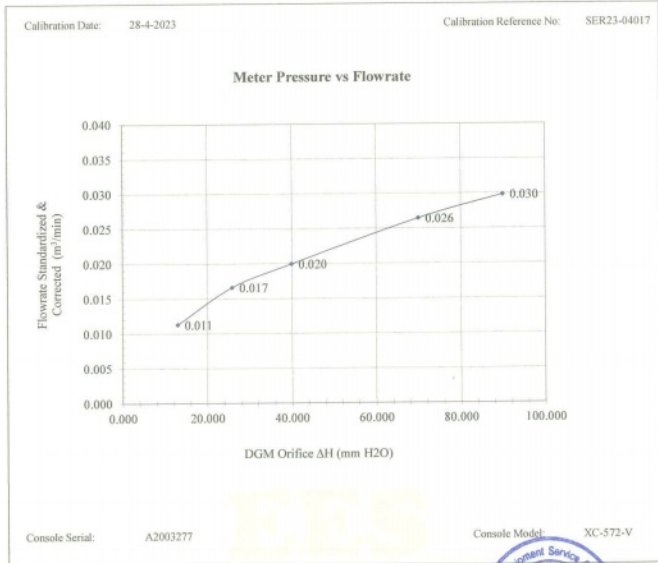
Meter Console Information		Calibration Conditions				Factors/Conversions	
Console Model Number	XC-572-V	Date	Time	28/04/2023	09:50 AM	Std Temp	293 K
Console Serial Number	A2003277	Calibration Reference No.	SER23-04017			Std Press	760 mm Hg
DGM Model Number	SK25EX	Barometric Pressure	758.99	mm Hg	K ₁ 0.386		
DGM Serial Number	00005781	Calibration Meter Gamma	0.999		Console Leak Check	PASS	



เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Meter Console Information		Calibration Conditions				Factors/Conversions		
Console Model Number	XC-572-V	Date	Time	28/04/2023	09:50 AM	Std Temp	293	K
Console Serial Number	A2003277	Calibration Reference No.		SER23-04017		Std Press	760	mm Hg
DGM Model Number	SK25EX	Barometric Pressure		758.99	mmHg	K _i	0.386	
DGM Serial Number	00005781	Calibration Meter Gamma		0.999		Console Leak Check		PASS



เอกสารไม่ควบคุม

THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information		Calibration Conditions			
Console Model Number	XC-572-V	Date	Time	28/04/2023	12:00 PM
Console Serial Number	A2003277	Calibration Reference No.	SER23-04017		
DGM Model Number	SK25EX	Reference Thermometer	DIGICON		
DGM Serial Number	00005781	Serial Number	183169105		
Meter Box Model Number	JENCO 765 KF				
Meter Box Serial Number	JC 19039				

Results											
Console Thermocouple Simulator											
Channel and test point	Meter Box Channel Temperature Reading (°C)										
	-18.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0	593.0	816.0	1038.0
Stack	-18.0	23.0	36.0	91.0	149.0	259.0	369.0	480.0	592.0	815.0	1038.0
Aux	-18.0	23.0	36.0	91.0	149.0						
Probe	-18.0	23.0	36.0	91.0	149.0						
Filter	-18.0	23.0	36.0	91.0	149.0						
Oven	-18.0	23.0	36.0	91.0	149.0						
Exit	-18.0	23.0	36.0								

Tolerance Range			
Stack	± 1.50%	Absolute	Meter ± 3.0 °C
Probe	± 3.0 °C		Exit ± 2.0 °C
Filter	± 3.0 °C		



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Certificate No: G 660095
Date of issue : 20-Feb-23

Instrument description : Flue gas Analyzer
Instrument model : Testo 350 New
Instrument serial no. : 60899698
ID no. or control no. : UAE.EFM.008/2560
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial : -
Customer name : UNITED ANALYST CONSULTANT CO.,LTD.
Customer address : 81 SOI UDQMSUK41,SUKHUMVIT ROAD,BANGCHAK PRAKANONG BANGKOK 10260

Total pages of certificate : 3 Pages
Receiving no. : L-230327
Receiving date. : 15-Feb-23
Parameter of calibration : Gas Calibration(Oxygen 2.498,10.04,21.02 %vol, Carbon Monoxide 80.14,309.9,1003 ppm, Nitrogen Dioxide 30.34,80.96,202.2 ppm, Nitric Oxide 30.08,150.9,320.6 ppm, Sulphur Dioxide 50.04,100.8,601.1 ppm)

Condition of UUC. : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 ± 5 °C
Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210

Calibration procedure no. : WI-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement.
Multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.
This certificate is applied only to item under test Environmental condition.
This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory.
Calibration certificates without signature and seal not valid.
This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 17-Feb-23

Mr. Sedawut Nueathong
Calibration Technician

Mrs. Nongluck Wongsettee
Technical Manager

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Certificate No.: G 660095

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O2) 2.498 % Vol	4219/21	Linde	30-Sep-25
Oxygen (O2) 10.04 % Vol	CG-0153-21	Nimt	18-Nov-26
Oxygen (O2) 21.02 % Vol	CG-0041-22	Nimt	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0040-22	Nimt	14-Feb-27
Carbon monoxide (CO) 309.9 ppm	2803/21	Linde	22-Jun-23
Carbon monoxide (CO) 1003 ppm	2583/22	Linde	09-Aug-24
Nitrogen Dioxide (NO2) 30.34 ppm	2703/22	Linde	22-Aug-24
Nitrogen Dioxide (NO2) 80.96 ppm	2041/22	Linde	26-Jun-24
Nitrogen Dioxide (NO2) 202.2 ppm	3239/21	Linde	20-Jul-23
Nitric Oxide (NO) 30.08 ppm	CG-0089-22	Nimt	13-Jun-24
Nitric Oxide (NO) 150.9 ppm	2857/21	Linde	27-Jun-23
Nitric Oxide (NO) 320.6 ppm	2944/21	Linde	02-Jul-23
Sulphur Dioxide (SO2) 50.04 ppm	3205/21	Linde	25-Jul-23
Sulphur Dioxide (SO2) 100.8 ppm	3507/22	Linde	09-Nov-24
Sulphur Dioxide (SO2) 601.1 ppm	3204/21	Linde	20-Jul-23

Measured room conditions

Temperature : 22.3 °C Humidity : 58.5 %RH Pressure : 1012.4 mbar
Gas Temperature : 23 °C Flow rate : 1,200 ml/min Gas pressure : 1020.4 mbar

Calibration Results Before Adjustment (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.498	2.54	0.042	0.20
O2 (%Vol)	10.04	10.08	0.04	0.40
O2 (%Vol)	21.02	21.13	0.11	0.80
CO (ppm)	80.14	80	-0.14	3.0
CO (ppm)	309.9	309	-0.9	6.0
CO (ppm)	1003	1002	-1	12
NO2 (ppm)	30.34	29.2	-1.14	8.0
NO2 (ppm)	80.96	79.3	-1.66	8.0
NO2 (ppm)	202.2	198.5	-3.7	12
NO (ppm)	30.08	26	-4.08	8.0
NO (ppm)	150.9	145	-5.9	8.0
NO (ppm)	320.6	297	-23.6	12
SO2 (ppm)	50.04	49	-1.04	6.0
SO2 (ppm)	100.8	100	-0.8	6.0
SO2 (ppm)	601.1	598	-3.1	13

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Calibration Results After Adjustment (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.498	2.54	0.042	0.20
O2 (%Vol)	10.04	10.08	0.04	0.40
O2 (%Vol)	21.02	21.13	0.11	0.80
CO (ppm)	80.14	80	-0.14	3.0
CO (ppm)	309.9	309	-0.9	6.0
CO (ppm)	1003	1002	-1	12
NO2 (ppm)	30.34	29.2	-1.14	8.0
NO2 (ppm)	80.96	79.3	-1.66	8.0
NO2 (ppm)	202.2	198.5	-3.7	12
NO (ppm)	30.08	32	1.90	8.0
NO (ppm)	150.9	152	1.1	8.0
NO (ppm)	320.6	317	-3.6	12
SO2 (ppm)	50.04	49	-1.04	6.0
SO2 (ppm)	100.8	100	-0.8	6.0
SO2 (ppm)	601.1	598	-3.1	13

Remark : 1 cmol/mol = 1 %vol., 1 µmol/mol = 1 ppm.

End of Report



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23CH423
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA1M0043
ID No. : UAE EFM 013/2565(EFM.pH.03/65)
Condition As-Received: Used Item
Received Date : 28 March 2023
Calibration Date : 30 March 2023
Reference : 2303-1001WSC-6
Submitted by : United Analyst and Engineering Consultant Co.,Ltd
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lerngagtrakul

Approved by :
Approved Signatory

(/) Malee Bulkruea
() Saitthip Meangmai
() Warakorn Lerngagtrakul

Issue Date : 31 March 2023

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

FM-CL-09-C Rev.8

Page 3 of 3

Issued Date 26/02/16

Entech Industrial Solution Co.,Ltd.

17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Lakki, Bangkok 10210 THAILAND Tel. 0-2779-8688 Calibration@entech.co.th
Tax ID : 0105536035591 www.entech.co.th

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เอกสารไม่ควบคุม



Cert.No.: 23CH423
Page: 2 of 3

Condition of this calibration result

- Reference Standard Instrument : -
Instrument Serial No. ID No. Cert. No. Due Date
1) Document Process Calibrator 54030049 130RC116 22E2769 24 Aug 2023
2) Ref. Standard Thermometer 4982054 110RC044 22I1306 27 Oct 2023
This certification is traceable to the International System of Unit maintained at:-
- Traceable to National Institute of Metrology (Thailand), NIMT

- Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	863832	28 Dec 2024
pH 6.987	CPA chem	826589	09 July 2023
pH 10.010	CPA chem	863835	28 Dec 2023

- This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4.7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N : HA1M0043	4.00	177.48	177.4	4.01	0.058	2.00
	7.00	0.00	-0.2	7.00	0.058	2.00
	7.00	0.00	-0.2	7.00	0.058	2.00
	10.00	-177.48	-177.6	10.01	0.058	2.00



Cert.No.: 23CH423
Page: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode S/N : Q92M0159	4.008	4.01	180.8	0.0085	2.05
	6.987	6.99	6.8	0.011	2.00
	6.987	7.00	6.3	0.011	2.00
	10.010	10.00	-168.9	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652-10D
- Serial No. : Q92M0159
- Dimension of probe:
- Length : 107 mm
- Diameter : 16 mm
- Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.004	25.0	-0.004	0.13	2.00
30.0	30.001	30.0	-0.001	0.13	2.00
35.0	35.004	35.0	-0.004	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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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Malee

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Malee

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Cert.No.: 23TW50
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : Horiba
Model : LAQUA-DO210
Serial No. : HE9M0013
ID No. : UAE.EFM.016/2563 (EFM.DO.05/63)
Received Date : 27 February 2023
Test Date : 28 February 2023
Reference : 2302-0944WSC-7
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Walalak Sirthean
Approved by :
(/) Malee Butkruea
() Saitthip Meangmai
() Warakorn Lemgagtrakul
Issue Date : 3 March 2023

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B 0308931



Cert.No.: 23TW50
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :
This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1) Burette	-	130BU10	21CG1389	25 Mar 2023
2) Balance	1126143764	140RC004	22MM50	20 Sep 2023

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 9K9G0097

Titration Method (Azide Modification Method)	DO Meter Reading	Standard Deviation
(mg/L)	(mg/L)	(mg/L)
8.12	8.13	0.011

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concerned intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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a 1150776



Cert. No.: 23LM33
Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : Horiba
Model : LAQUA-DO210
Serial No. : HE9M0013
ID No. : UAE.EFM.016/2563 (EFM.DO.05/63)
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : TPA On Site Calibration Laboratory
Received Order : 27 February 2023
Calibrated Date : 3 March 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Kunchit Promprat
Approved by :
(/) Pornthippa Tameyakul
(/) Malee Butkruea
() Suwit Imjai
Issue Date : 7 March 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

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A 0051656



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2302-0944WSC-8

Cert. No.: 23LM33
Page.: 2 of 2

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.
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) Digital Thermometer	1502A	A7B843	23124	04 Jan 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 Unit.

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 9K9G0097

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
25.0	60	25.004	25.0	-0.004	0.16	2.00
30.0	60	30.001	30.0	-0.001	0.16	2.00
35.0	60	34.996	35.0	0.004	0.16	2.00

UUC* : Unit Under Calibration

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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a 1151549



Cert.No.: 23CH430

Page.: 1 of 3

Certificate of Calibration

Equipment : Conductivity Meter
Manufacturer : Horiba
Model : LAQUA-EC210
Serial No. : HC8L0015
ID No. : UAE.EFM.010/2563(EFM.SCT.04/63)
Condition As-Received: Used Item
Received Date : 28 March 2023
Calibration Date : 29 March 2023
Reference : 2303-0999WSC-4
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260

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

Calibration Procedure: In-house method ;
- CP-CH6 by direct measurement
with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Walalak Sirithean

Approved by : Malee Butkruea
Approved Signatory

(/) Malee Butkruea
() Saitip Meangmai
() Warakorn Lerngagtrakul

Issue Date : 31 March 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.



Cert.No.: 23CH430

Page.: 2 of 3

Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	9549224	130RC003	221484	17 Apr 2023
2) Ref. Std. Thermometer	4982054	110RC044	2211306	27 Oct 2023

This certification is traceable to the International System of Unit maintained at:-

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials :-

- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI
through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Conductivity Solution	Manufacturer	Lot No.	Exp. date
1413.0 µS/cm	CPA Chem	826595	09 July 2023
12.880 mS/cm	CPA Chem	823329	20 June 2023

- Control Conductivity calibration solution temperature by Water bath (25.0 ± 0.1) °C

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration results

Function : Conductivity Measurement

(*) After Adjustment at 1413.0 µS/cm

Conductivity Electrode Serial No.: 9B9F0277

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (±)	Coverage factor k
1413.0 µS/cm	1384 µS/cm	1413 µS/cm	9.2 µS/cm	2.00
12.880 mS/cm	12.38 mS/cm	12.72 mS/cm	0.086 mS/cm	2.00

Remark - UUC* = Unit Under Calibration

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เอกสารไม่ควบคุม



Cert.No.: 23CH430

Page.: 3 of 3

Calibration Results

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9383
- Serial No. : 9B9F0277

Dimension of probe;

- Length : 110 mm
- Diameter : 16 mm
- Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (± °C)	Coverage factor k
25.0	25.001	25.0	-0.001	0.13	2.00
30.0	29.999	30.0	0.001	0.13	2.00
35.0	34.999	35.0	0.001	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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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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	ความเป็นกรด-ด่าง (pH) อุณหภูมิ(Temperature)	Mettler-Toledo	Seven Easy S20 / 1231155210	National Food Institute, Ministry of Industry, Thailand	2301846-001-01	24 Feb 23	23 Feb 24	-
2	Ion Selective Electrode Meter (ISE)		Orion	Star A214 / X36836	Science Tech Co.,Ltd.	FT005/22	29 May 23	28 May 24	-
3	BOD Incubator	Biochemical Oxygen Demand (BOD)		UR-1320 / (UAE.WAO.018/2551)	Technology Promotion Association (Thailand-Japan)	23TM375	12 Apr 23	10 Apr 24	-
4	BOD Incubator	Biochemical Oxygen Demand (BOD)	Arco	UR-1320 / (UAE.WAO.006/2553)	Technology Promotion Association (Thailand-Japan)	23TM372	11 Apr 23	9 Apr 24	-
5	Analytical Balance (Repeatability 0.1 mg)	น้ำมันและไขมัน (Oil & Grease)	Mettler-Toledo	XSR204 / C117635043	National Food Institute, Ministry of Industry, Thailand	2302827-001-01	10 May 23	8 May 24	7 May 25
6	COD Reactor (Heating Block)	ซีโอดี (COD)	Hanna	HI839800-02 / H018500I	Hanna Instruments (Thailand) Ltd.	HIT-2312-0342	10 Mar 23	9 Mar 24	-
7	Analytical Balance (Repeatability 0.01 mg)	ของแข็งแขวนลอยทั้งหมด (TSS) ของแข็งละลายทั้งหมด (TDS)	Mettler-Toledo	XSR205DU / C009071872	Technology Promotion Association (Thailand-Japan)	23MM112	26 Apr 23	24 Apr 24	-
8	Hot Air Oven	ของแข็งทั้งหมด (TS)	Memmert	UF55 / B216.1666	Technology Promotion Association (Thailand-Japan)	2400141-001-01	11 Oct 23	10 Oct 24	-
9	Digestor Unit	ทีเคเอ็น (TKN)	FOSS TECATOR	2520auto / 91794469	National Food Institute, Ministry of Industry, Thailand	2302413-001-01	30 Mar 23	29 Mar 24	-
10	Distillation Unit (Kjeldahl Method)	ทีเคเอ็น (TKN)	FOSS TECATOR	KT8100 / 91889052	FOSS South East Asia	8411	29 May 23	28 May 24	-
11	Conductivity Meter	ความเค็ม (Salinity)	SI Analytics	Lab955 / 16300356	DKSH Technology Limited	C24230059	16 Mar 23	14 Mar 24	-
12	UV-VIS Spectrophotometer	ฟอสฟอรัสทั้งหมด (Total P), สี (Color), ไนโตรเจนทั้งหมด (Total N),	Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	SP23-021	20 May 23	18 May 24	
13	UV-VIS Spectrophotometer	ซัลเฟต (Sulfate)	Hitachi	U-1900 / 2021-064	DQE Services Co.,Ltd.	SP23-007	6 Jan 23	5 Jan 24	-

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									
14	Turbidity Meter	Turbidity	Oakton	T100IR / 1120501017	Technology Promotion Association (Thailand-Japan)	23CH1184	14 Sep 23	13 Sep 24	-
15	Gas Chromatography - Mass Spectrometer (GC-MS)	สารประกอบอินทรีย์ระเหยง่าย (VOCs)	Agilent Technologies	System ID: CN17100005 vu 9000 (G3950A) / CN17100 5977B MSD (G7077B) / US1715M030	Agilent Technologies (Thailand) Co.,Ltd.	Certificate of System Qualification GSMS-OQ	24 Apr 23	22 Apr 24	-
16	Inductively Coupled Plasma (ICP)	เหล็ก (Fe)	Agilent Technologies	System ID:G8015A G8015AA / MY18030001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	13 Nov 23	12 Nov 24	-
17	Cold Vapor Atomic Absorption Spectrophotometer (CVAAS)	ปรอท (Mercury)	Milestone	DMA-80 / 11030982	Sithiporn Associates Co.,Ltd.	Service Protocol Report	17 Nov 23	16 Nov 24	-
18	Cold Vapor Atomic Absorption Spectrophotometer (CVAAS)	ปรอท (Mercury)	Analytik Jena	mercur DUO plus / K170A0153	Analytik Jena FarEast Thailand Ltd.	Maintenance Protocol	2 Feb 23	1 Feb 24	-
19	Incubator	โคลิฟอร์มแบคทีเรียทั้งหมด (Coliform Bacteria)	Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	23TM378	12 Apr 23	11 Apr 24	-
20	Incubator	ฟีคัลโคลิฟอร์มแบคทีเรีย (Fecal Coliform Bacteria)	Memmert	IPP 260 / V618.0033	Technology Promotion Association (Thailand-Japan)	23TM729	27 Apr 23	25 Apr 24	-
21	Water Bath		Memmert	WNE 14 / L407.0756	Technology Promotion Association (Thailand-Japan)	23TM1079	27 Apr 23	25 Apr 24	-
22	Analytical Balance		OHAUS	PX623 / C236754745	DKSH (Thailand) Ltd.	C01223732	7 Dec 23	6 Dec 24	-

Calibration Certificate

Certificate No.: 2301846-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakanhong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenEasy TM S20 pH
Serial No.: 1231155210
ID No.: UAE.WAT.010/2553
Order No.: 2301846
Operation No.: 2301846-001
Date of Receipt: 17 February 2023
Date of Calibration: 24 February 2023

Calibrated by: Mr.Worapob Sooktong
Approved by: N. Niyomchart (Mr.Nuttapol Niyomchart)
Specialist, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 24 February 2023

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory.

F-CS-009 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2301846-001-01
Equipment: pH Meter
Resolution: 0.01 pH ; 1 mV
Manufacturer: Mettler Toledo
Model: SevenEasy TM S20 pH
Serial No.: 1231155210
Type: Bench top
ID No.: UAE.WAT.010/2553

Page 2 of 5

Date of Calibration: 24 February 2023
Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature: (25.1 ± 1.5) °C Relative Humidity: (50 ± 5) %
Condition of Equipment: Good Condition
Condition of this Results of Calibration

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

Table with 5 columns: Instruments, Serial / ID No., Manufacturer, Certificate No., Due Date. Rows include DC Voltage Calibrator, Digital Thermometer, Thermo-Hygro Meter, and various pH buffer solutions.

- 3. This certification is traceable to The International System of Unit (SI Unit)
3.1 Instruments No.2.1 through NSC-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0008
3.2 Instruments No.2.2 through NSC-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0061
3.3 Instruments No.2.3 through NSC-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0292
3.4 Certified Reference Material No. 2.4 to 2.6 traceable to Primary measurement method- Homed cell using calibrated thermometer, barometer, and nanovoltmeter The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
3.5 Certified Reference Material No.2.7 traceable to BIM RefN H-27 LotN 04.06.2021; BIM RefN H-28 LotN 28.05.2021; BIM RefN H-27 LotN 04.06.2021; BIM RefN H-28 LotN 28.05.2021, the Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

- 4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.

F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2301846-001-01
Equipment: pH Meter
Resolution: 0.01 pH ; 1 mV
Manufacturer: Mettler Toledo
Model: SevenEasy TM S20 pH
Serial No.: 1231155210
Type: Bench top
ID No.: UAE.WAT.010/2553

Page 3 of 5

Date of Calibration: 24 February 2023
Calibration Results: 1. Calibration of pH Meter (Manual Temperature Compensation at 25 °C)

Table with 5 columns: Nominal pH, DC Voltage Standard (mV), Average Indicator Reading (mV, pH), Uncertainty (±mV), Coverage Factor (k). Rows show pH values from 0 to 14.

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

Equipment: pH Electrode
Type: Combined Electrode
Manufacturer: Mettler Toledo
Model: InLab Solids
Serial No.: 9018311
ID.No.: N/A
Performance of Electrode system (Three-Point Calibration at pH 4, pH 7 and pH 10)

Table with 5 columns: Certified Value @25 °C (pH), Average Indicator Reading (pH, mV), Relative Slope (%), Uncertainty (±pH), Coverage Factor (k). Rows show pH values 4.008, 6.865, 10.008, 6.985.

F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2301846-001-01
Equipment: Digital Thermometer with RTD
Resolution: 0.1 °C
Model: SevenEasy TM S20 pH
Serial No.: 1231155210
ID No.: UAE.WAT.010/2553
Manufacturer: Mettler Toledo

Page 4 of 5

Date of Calibration: 24 February 2023
Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature 25 °C ± 1 °C
Relative Humidity 48 % ± 3 %

Condition of this results of Calibration:

- 1. Calibration Method : - In house method: W-TE-025 by comparison with standard thermometer.
- The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.
- The temperature scale in use at this laboratory is the International Temperature scale of 1990 (ITS-90).

2. Reference Standard Instrument :

Table with 6 columns: Instrument, Model, Serial No., Certificate No., Due Date, Through. Rows include HANDHELD THERMOMETER and Platinum Resistance Thermometer (PRT).

Support Equipment : - Low Temperature Bath (Micro Bath), Model: 7103, S/N: A39538,AN65 A85181.

- 3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibrated item : Good
7. Result of Calibration : [X] Without adjustment [] After adjustment

F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2301846-001-01
Equipment: Digital Thermometer with RTD
Resolution: 0.1 °C Model: SevenEasy TM S20 pH
Serial No.: 1231155210 ID No.: UAE.WAT.010/2553
Manufacturer: Mettler Toledo
Date of Calibration: 24 February 2023 Page 5 of 5

Calibration point: 15.0, 25.0 and 35.0 °C

Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.
- Description of probe, model : - S/N : -
Dimension of probe : Diameter 9 mm., Length 120 mm.,
Sheath material : Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.015	- 0.1	0.11
25.0	25.014	0.0	0.11
35.1	35.016	- 0.1	0.11

Note

- UUC* : Unit Under Calibration

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

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F-CS-012 Revision: 01 Date: 20-04-65

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Job No. : JF002/22

Certificate No. : FT002/22

Page : 1 of 2

Certificate of Calibration

Equipment : pH/ISE Meter
Manufacturer : Orion
Made in : USA.
Model : STAR A214
Serial No. : X36836
ID No. : UAE.WAT.025/2560
Ion Selective Model : 9409BN
Serial No. : ZW1-18420
Reference Electrode Model : 900100
Serial No. : VX1-19809
Range : 0 to 14 pH
Resolution : 0.001 pH 0.1 mV
Submitted by : บริษัท ยูนิค แอนาไลติก แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด
3 ซอยอุดมสุข 41 ถนนสุขุมวิท แขวงบางจาก
เขตพระโขนง กรุงเทพฯ 10260
Ambient Temperature : (25 ± 3) °C
Relative Humidity : (50 ± 15) %
Issue date : Tuesday, May 31, 2022
Calibrated by : Khannika Sangkham
Approved by : *[Signature]*
(Khannika Sangkham)
Laboratory manager

เอกสารไม่ควบคุม



Certificate of Calibration

Job No. : JF002/22 **Certificate No. :** FT002/22
Received date : Monday, May 30, 2022 **Page : 2 of 2**
Calibration date : Tuesday, May 31, 2022

Condition of this calibration result

- 1 Reference standard materials : Certified Fluoride standard reference solution (Directly measured by differential potentiometry with the aid of potassium fluoride "quasi without transference" against solutions prepared from primary reference materials from NIST)
- 2 This certificate was certified only for the instrument we calibrated
- 3 This result of calibration was found accurate as shown on date and place of calibration only

Result of Calibration

Function : pH/ISE Meter with Probe

Direct Measurement

First Standard concentrated = 10 ppm
Secondary Standard concentrated = 100 ppm
Slope = -52.6 mV/Dec.

Channel : 1

Unit Under Calibration	Standard Concentrated (ppm)	UUC Reading (ppm)	Correction (ppm)	Stdev (ppm)
Model :				
9409BN S/N. ZW1-18420	10	10.06	-0.06	0.21
900100 S/N. VX1-19809	100	100.50	-0.50	1.24

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[Signature]

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM375
Page : 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : ARCO
Model : UR-1320
Serial No. : -
ID No. : UAE.WAO.018/2551
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 11 April 2023
Calibration Date : 12 April 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krisda Malee
Approved by : *[Signature]*
Approved Signatory
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 24 April 2023

The Uncertainties are for a confidence probability of approximately 95 %

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

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A 0053360



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2304-0156OC-2
Procedure Used :-

Cert. No.: 23TM375
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

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	34972A	MY59003411	22LM165	26 Nov 2023

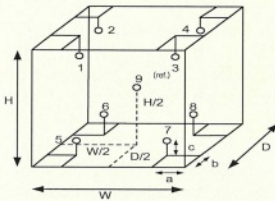
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	27
REL.Humid. (%)	42	45
AC Supply (Volt)	219	220

Position :	Ref. Std. ID No.:
1	20RTD-2/1
2	20RTD-2/2
3	20RTD-2/3
4	20RTD-2/4
5	20RTD-2/5
6	20RTD-2/6
7	20RTD-2/7
8	20RTD-2/8
9 (ref.)	20RTD-2/9

Probe Installation Details :

Dimension of Chamber :

a = 10 cm
b = 10 cm
c = 10 cm
D = 0.62 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

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a 1158259



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2304-0156OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 23TM375
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	20.0	0.48	0.42	1.2	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.040	20.170	20.263	20.093	19.749	19.704	19.920	20.191	20.020	0.66

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 temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state 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 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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a 1158258



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2711-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM372
Page : 1 of 3

Certificate of Calibration

Equipment : BOD Incubator

Manufacturer : ARCO

Model : UR-1320

Serial No. : -

ID No. : UAE.WAO.006/2553

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Lab Floor 2

Received Order : 11 April 2023

Calibration Date : 11 April 2023

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Krisda Malee

Approved by :
Approved Signatory

() Porthippa Tameyakul
() Malee Butkruea
() Suwit Imjai

Issue Date : 24 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

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A 0053361



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2304-0156OC-3
Procedure Used :-

Cert. No.: 23TM372
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

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	34972A	MY59003411	22LM165	26 Nov 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

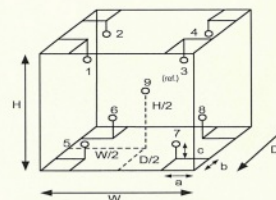
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	28
REL.Humid. (%)	44	41
AC Supply (Volt)	221	220



Probe Installation Details :

Dimension of Chamber :

a = 10 cm
b = 10 cm
c = 10 cm
D = 0.62 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

Position :	Ref. Std. ID No.:
1	20RTD-2/1
2	20RTD-2/2
3	20RTD-2/3
4	20RTD-2/4
5	20RTD-2/5
6	20RTD-2/6
7	20RTD-2/7
8	20RTD-2/8
9 (ref.)	20RTD-2/9

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a 1158257

Calibration Certificate

Certificate No.: 2302827-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR204
Serial No.: C117635043
ID No.: UAE.WAS.012/2564
Order No.: 2302827
Operation No.: 2302827-001
Date of Receipt: 10 May 2023
Date of Calibration: 10 May 2023

Calibrated by Mr. Manas Somsak Specialist
Approved by (Mr. Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 18 May 2023

The uncertainties are for a confidence probability of approximately 95%

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

F-CS-009 Revision: 01 Date: 20-04-65

รายละเอียดการสอบเทียบ (Scope of Accreditation for Testing)
ใบรับรองเลขที่ 21-LB0022
(Certification No. 21-LB0022)

ฉบับที่ 06 (Issue No. 06)
ออกให้ตั้งแต่วันที่ 29 พฤษภาคม พ.ศ. 2566 (Valid from) (29 May B.E. 2566 (2023))
มีวันที่ 17 พฤษภาคม พ.ศ. 2571 (Valid till) (17 May B.E. 2571 (2028))

สถานภาพห้องปฏิบัติการ (Laboratory status)
☒ถาวร (Permanent)
☐นอกสถานที่ (Site)
☐ชั่วคราว (Temporary)
☐เคลื่อนที่ (Mobile)
☐หลายสถานที่ (Multiple)

สาขาการทดสอบ (Field of Testing)	รายการทดสอบ (Parameter)	วิธีทดสอบ (Test Method)
สาขาสิ่งแวดล้อม (Environmental field) 5. สิ่ง (ของ) (Soil (cont.))	- Volatile organic compounds (VOCs) • cis-1,2-Dichloroethene (cis-1,2-Dichloroethylene) 0.001 mg/kg to 0.200 mg/kg • 1,1,1-Trichloroethane 0.001 mg/kg to 0.200 mg/kg • Carbon tetrachloride 0.002 mg/kg to 0.400 mg/kg	- US EPA Method 5021A, Revision 2:2014 and US EPA Method 8260D, Revision 4:2018

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2302827-001-01
Equipment: Electronic Balance
Model: XSR204
Serial No.: C117635043
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.WAS.012/2564

Date of Calibration: 10 May 2023 Page 2 of 4

Environment Condition: Ambient Temperature: 21.4 ± 0.2 °C Relative Humidity: 43.4 ± 0.9 %

Place of Calibration: Balance room (Water Analysis Unit), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14: 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B505567572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH 016/23	Quality Reborn	QR23-0489	21 February 2024

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

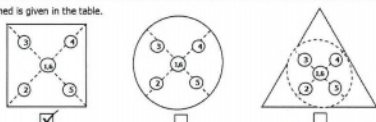
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000032
200	0.000032

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0002	100.0002	100.0002	100.0003	100.0002	0.0001

F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2302827-001-01
Equipment: Electronic Balance
Model: XSR204
Serial No.: C117635043
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.WAS.012/2564

Date of Calibration: 10 May 2023 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Uncal	0.00000	0.0000	0.0000	0.000085	2.00
0.01	0.01000	0.0100	0.0000	0.000085	2.00
0.02	0.02001	0.0200	0.0000	0.000085	2.00
0.05	0.05000	0.0500	0.0000	0.000085	2.00
0.1	0.10001	0.1000	0.0000	0.000085	2.00
0.2	0.20001	0.2000	0.0000	0.000085	2.00
0.5	0.50002	0.5000	0.0000	0.000085	2.00
1	1.00000	1.0000	0.0000	0.000086	2.00
2	2.00002	2.0000	0.0000	0.000086	2.00
3	3.00003	3.0000	0.0000	0.000087	2.00
5	5.00002	5.0000	0.0000	0.000087	2.00
10	10.00001	10.0000	0.0000	0.000088	2.00
20	20.00003	20.0000	0.0000	0.000092	2.00
30	30.00004	30.0000	0.0000	0.000098	2.00
40	40.00007	40.0000	0.0000	0.00011	2.00
45	45.00009	45.0001	0.0000	0.00013	2.00

F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2302827-001-01

Equipment: Electronic Balance
 Model: XSR204
 Serial No.: C117635043
 Capacity: 220 g

Manufacturer: METTLER TOLEDO
 Resolution: 0.0001 g
 ID No.: UAE.WAS.012/2564

Date of Calibration: 10 May 2023

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
50	50.00003	50.00000	0.00000	0.00011	2.00
55	55.00005	55.00000	0.00000	0.00012	2.00
60	60.00004	60.00000	0.00000	0.00012	2.00
65	65.00005	65.00000	0.00000	0.00013	2.00
70	70.00006	70.00001	-0.00001	0.00013	2.00
75	75.00008	75.00002	-0.00001	0.00013	2.00
80	80.00007	80.00002	-0.00001	0.00014	2.00
85	85.00009	85.00002	-0.00001	0.00014	2.00
90	90.00010	90.00002	-0.00001	0.00015	2.00
100	100.00006	100.00002	-0.00001	0.00016	2.00
120	120.00009	120.00002	-0.00001	0.00018	2.00
150	150.00009	150.00002	-0.00001	0.00021	2.00
200	200.00016	200.00003	-0.00001	0.00028	2.00

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

F-CS-012 Revision: 01 Date: 20-04-65

Handwritten signature

Certificate No.: HIT-2312-0342

Page: 1 of 2

CERTIFICATE OF CALIBRATION

Equipment: COD Test Tube Heater
 Meter Model: HI839800-02
 Tube Heater: 25 Vial Capacity
 Temperature Range: -10 °C to 160 °C
 Ambient Temperature: (25 ± 2) °C
 Manufacturer: Hanna Instruments
 Condition As-Received: Used Product
 Customer name: United Analyst and Engineering Consultant Co., Ltd.
 3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak,
 Phrakhanong, Bangkok 10260

Serial No.: H0185001
 Accuracy: ± 2 °C
 Temperature of Reaction: 150 °C
 Relative Humidity: (50 ± 15) % RH
 Made in: Romania
 Reference: RE230392

Received date: 8 March 2023
 Calibrate date: 10 March 2023
 Issue date: 20 March 2023
 Calibrated Location: Hanna Instruments (Thailand) Ltd.
 Calibration Procedure: This calibrator was conducted by using in-house: calibration procedure CP-04 by using certified reference material.

Calibrated by: ☒ Mr. Pichit Petthong
☐ Mr. Jakkapob Pentisan
☐ Mr. Channarong Soinak

Approved by: Mr. Anan Suwanchaisakul
 Authorized Signatory
HANNA
 instruments
 (Thailand) Limited

This certificate was certified only for the instrument we calibrated.

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

** This certificate may not be reproduced other than in full, except with the prior written approval of the head of Hanna Instrument (Thailand).

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Certificate No.: HIT-2312-0342

Page: 2 of 2

Condition of this calibration result

Reference Standard Instruments:

Instruments	Model	Serial No.	Certificate No.	Traceable
Data Acquisition Switch Unit	34970A	MY44065265	WK2207-065-1	WK Electric Co., Ltd.

Calibration Result:

Measurement Temperature Source Accuracy for COD Reactor

Capacity (Vial)	Nominal Value (°C)	Average Value (°C)	Uncertainty (°C)	Tolerance of UUC (°C)	Acceptance Criteria
25 Vial	150.0	150.3	0.59	2	Pass

Figure: Shows the location of the temperature source.

(1A)	(2A)	(3A)	(4A)	(5A)
149.78 °C	150.31 °C	150.63 °C	149.93 °C	150.31 °C
(1B)	(2B)	(3B)	(4B)	(5B)
150.35 °C	150.18 °C	149.93 °C	150.18 °C	150.21 °C
(1C)	(2C)	(3C)	(4C)	(5C)
150.24 °C	151.10 °C	150.80 °C	150.36 °C	150.86 °C
(1D)	(2D)	(3D)	(4D)	(5D)
150.16 °C	149.77 °C	150.22 °C	150.67 °C	150.43 °C
(1E)	(2E)	(3E)	(4E)	(5E)
149.94 °C	150.44 °C	150.06 °C	150.63 °C	149.29 °C

Remark: The Acceptance criteria is the error value plus or minus the Measurement Uncertainty, and then Not More than the Tolerance value of UUC, therefore concluded that pass.

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

** End of certificate **

เอกสารไม่ควบคุม

Cert.No.: 23MM112

Page: 1 of 3

Certificate of Calibration

Equipment: Electronic Balance
 Manufacturer: Mettler Toledo
 Model: XSR205
 Serial No.: C009071872
 ID No.: UAE.WAO.012/2563
 Submitted by: United Analyst and Engineering Consultant Co., Ltd.
 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangchak, Phrakhanong,
 Bangkok 10260

Location: Balance Room

Received order: 26 April 2023
 Calibration Date: 26 April 2023
 Ambient Temperature: 15 °C to 40 °C
 Relative Humidity: 30 % to 90 %

Calibrated by: Man Pattanapongpaiboon

Approved by:
 Approved Signatory

() Pornthippa Tameyakul
 () Malee Butkruea
 (✓) Suwit Imjai

Issue Date: 2 May 2023

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-0459OC-1

Cert.No.: 23MM112
Page: 2 of 3

Procedure used :-

Calibration were conducted using in-house calibration procedure CP-OB01 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0010-22	20 Jan 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This result of calibration was made on requested at the point specified by customer.

4. This certificate is not certified for any commercial transaction.

5. This certification is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity : 0 g to 81 g Resolution 0.00001 g
81 g to 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
80	80.00005	-0.00005	0.15	2.00
200	199.9999	+0.0001	0.29	2.00

After Adjustment :

1. Determination of the standard deviation of weighing machine

(n = 10)

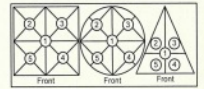
Applied Weight (g)	Standard Deviation of Reading (g)
80	0.000007
200	0.00000

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-0459OC-1

Cert.No.: 23MM112
Page: 3 of 3



Maximum difference between
off-center and central loading
(g)
0.0001

2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.
The weighing machine reading error obtained is given in the table

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

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.00000	0.00000	0.014	2.13
0.05	0.05001	-0.00001	0.015	2.09
0.1	0.10001	-0.00001	0.015	2.09
1	1.00001	-0.00001	0.018	2.04
5	5.00003	-0.00003	0.026	2.00
20	20.00006	-0.00006	0.045	2.00
50	50.00006	-0.00006	0.080	2.00
80	80.00004	-0.00004	0.15	2.00
100	100.0000	0.0000	0.16	2.00
150	150.0000	0.0000	0.29	2.00
200	200.0000	0.0000	0.29	2.00

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

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เอกสารไม่ควบคุม



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



Calibration Certificate

Certificate No.: 2400141-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udumsk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: CHAMBER (Hot Air Oven)
Manufacturer: MEMMERT
Model: UF 55
Serial No.: B216.1666
ID No.: UAE.WAO.027/2559
Order No.: 2400141
Operation No.: 2400141-001
Date of Receipt: 11 October 2023
Date of Calibration: 11 October 2023

Calibrated by Mr.Worapob Sooktong
Scientist
Approved by (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 16 October 2023

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

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

F-C5-009 Revision: 01 Date: 20-04-65



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



Calibration Report

Certificate No.: 2400141-001-01
Equipment: CHAMBER (Hot Air Oven)
Model: UF 55 Serial No.: B216.1666
Resolution: 0.1 °C ID No.: UAE.WAO.027/2559
Manufacturer: MEMMERT

Date of Calibration: 11 October 2023

Page 2 of 3

Location: Laboratory, Floor 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Environment Condition: Ambient Temperature (28 ± 1) °C
Relative Humidity (63 ± 2) %
Line Voltage (228 ± 1) Volt

Condition of this results of Calibration:

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

2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016894	TE 660380-01	22 April 2024	NATIONAL FOOD INSTITUTE
	RTD	CH#201-209/ RTD#201-209			

3. This certificate is traceable to International System of Units (SI Units).

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

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

6. Condition of Calibrated item : Good

UUC Description :

Time of Record 1 Hour 9 Minute At 104.0, 140.0 and 180.0 °C
Fresh air Damper - Open Position -
X Close
- Not Available

7. Result of Calibration : X Without adjustment After adjustment

F-C5-012 Revision: 01 Date: 20-04-65



Calibration Report

Certificate No.: 2400141-001-01
Equipment: CHAMBER (Hot Air Oven)
Model: UF 55 **Serial No.:** B216.1666
Resolution: 0.1 °C **ID No.:** UAE.WAO.027/2559
Manufacturer: MEMMERT

Date of Calibration: 11 October 2023
Calibration point: 104.0, 140.0 and 180.0 °C

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	28.2	61.4	227.4
MAX	28.3	65.1	229.3

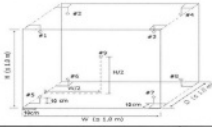


Table 1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
104.0	104.05	103.98	104.02	104.08	104.00	104.05	103.99	104.17	104.00	0.53
140.0	140.09	139.99	139.91	140.05	139.99	139.91	139.97	140.26	139.97	0.73
180.0	180.46	180.33	180.25	180.28	180.33	179.96	180.31	180.64	180.16	0.90

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
104.0	104.0	104.0	104.0	0.090	0.18	0.38
140.0	140.0	140.1	140.0	0.075	0.28	0.47
180.0	180.0	180.1	180.0	0.13	0.48	0.88

Note: The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "
UUC* = Unit Under Calibration
Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.
Uniformity = The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.
Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.
The report uncertainty of measurement was based on standard uncertainty multiplied by coverage factor k = 2, providing a level of confidence of approximately 95 %.

----- End -----

F-CS-012 Revision: 01 Date: 20-04-65

2008 ซอย 36, ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10710
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phat District, Bangkok 10710, Thailand
Tel +66(0) 2422 8568 Fax +66(0) 2422 8545

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nfi.cdm

Verification Certificate

Certificate No.: 2302413-001-01
Client name: UNITED ADALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: HEATING BLOCK DIGESTION

Manufacturer: FOSS

Model: 2520

Serial No.: 91794469

ID No.: UAE.WAS.011/2560

Order No.: 2302413

Operation No.: 2302413-001

Date of Receipt: 28 March 2023

Date of Calibration: 30-31 March 2023

Calibrated by Mr.Nuttapol Niyomchat **Approved by** (Mr.Pheraphat Tuanjit)
Specialist Manager, Division of Calibration Laboratory
Date of Issue: 10 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 traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

2008 ซอย 36, ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10710
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phat District, Bangkok 10710, Thailand
Tel +66(0) 2422 8568 Fax +66(0) 2422 8545

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Verification Report

Certificate No.: 2302413-001-01
Equipment: HEATING BLOCK DIGESTION
Model: 2520 **Serial No.:** 91794469
Resolution: 1 °C **ID No.:** UAE.WAS.011/2560
Manufacturer: FOSS

Date of Calibration: 30-31 March 2023 **Page 2 of 4**

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:

- This instrument was calibrated by insert standard thermocouples type R into its heating block digestion compared to temperature obtained from reference standards thermometer at calibrated point.
- The temperature scale used was based on ITS - 90 .
- All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	34970A	HY44045576/MY41194452	TC22/0044	5-May-2023	N.M. Technical Center Laboratory
Type R	TC#180-103 / CH#180-103				

- This certificate is traceable to international system of units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good

UUC* Description
Time of Record - Hour 30 Minute At 380 °C

- Result of Calibration : ☒ Without adjustment ☐ After adjustment

F-CS-009 Revision: 01 Date: 20-04-65

2008 ซอย 36, ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10710
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phat District, Bangkok 10710, Thailand
Tel +66(0) 2422 8568 Fax +66(0) 2422 8545

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Verification Report

Certificate No.: 2302413-001-01
Equipment: HEATING BLOCK DIGESTION
Model: 2520 **Serial No.:** 91794469
Resolution: 1 °C **ID No.:** UAE.WAS.011/2560
Manufacturer: FOSS

Date of Calibration: 30-31 March 2023 **Page 3 of 4**

Calibration point:

380 °C

Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (± °C)	Standard Thermometer (°C)	Uncertainty (± °C)
1	380	380	0.96	377.74	2.1
2	380	380	0.40	377.28	2.1
3	380	380	1.18	377.82	2.1
4	380	380	0.44	377.19	1.6
5	380	380	0.11	377.30	1.6
6	380	380	0.14	377.90	1.6
7	380	380	1.17	373.85	2.1
8	380	380	0.33	376.96	2.1
9	380	380	0.14	374.18	2.1
10	380	380	0.96	378.56	2.0
11	380	380	1.04	378.34	2.0
12	380	380	0.35	378.06	2.0
13	380	380	0.48	377.05	1.6
14	380	380	0.38	379.19	1.6
15	380	380	0.50	377.48	1.6
16	380	380	0.48	378.33	1.7
17	380	380	0.71	377.60	1.7
18	380	380	0.35	376.77	1.7
19	380	380	0.84	377.06	1.8
20	380	380	0.41	378.58	1.8

Note:

- UUC* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

F-CS-009 Revision: 01 Date: 20-04-65

2008 ซอย 36, ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10710
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phat District, Bangkok 10710, Thailand
Tel +66(0) 2422 8568 Fax +66(0) 2422 8545

เอกสารไม่ควบคุม

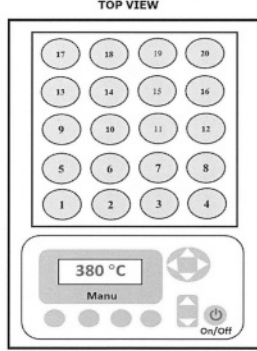


nfi.cdm

Verification Report

Certificate No.: 2302413-001-01
Equipment: HEATING BLOCK DIGESTION
Model: 2520 **Serial No.:** 91794469
Resolution: 1 °C **ID No.:** UAE.WAS.011/2560
Manufacturer: FOSS
Date of Calibration: 30-31 March 2023 **Page 4 of 4**
Calibration point: 380 °C
Calibration result: Continued

Figure 1. Location of Reference Standard and Block Diagram of Digestion Unit



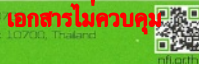
Sensor Installation Location

Note:
 - UUC* = Unit Under Calibration
 - Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
 - Stability = One-half of the greatest maximum difference of measured temperatures at one sensor, for at least half an hour after reaching steady state.

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

----- End -----

FCS-009 Revision: 01 Date: 20-04-65



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FOSS

Customer Service Report

FOSS South East Asia
 3388 Sirinrat Building, 25th - 26th Floor, Unit No. 3388/90,
 Rama IV Road, Klongton , Klongtoey, Bangkok, Thailand 10110

Report No: 8411

Date: 27/05/23
Customer: UAE
Instrument: KT8100

Address: Bangkok, Thailand
Serial: 91829052

Hours	Travel To Customer	Labour	Travel From Customer
Start	07:00	08:00	16:30
Finish	08:30	15:00	18:30
	1.5 hr	6 hr	2 hr

Application	Special	Job Type	Standard
Normal	Courtesy Visit	Installation	Training
Distributor	PMA Onboarding	Quote	In House
Internal	Warranty	Repair	PM
Digital Service	Sales Support	Remote	Other

PO/Quote Number: If applicable

PMA Type: If applicable **Contract No.:** If applicable

Details of Work / Test	Condition / Status
- ตรวจสอบ Function Test เครื่องวัด PM	OK
- ตรวจสอบส่วน Part ของ PM - kit 8100/8200 12 M.	OK
- ตรวจสอบอุณหภูมิ Heating Coil = 32.3 °C	OK
- ตรวจสอบอุณหภูมิ Steam Head, Steam Generator	OK
- ตรวจสอบอุณหภูมิ Steam Valve = 54.8 °C	OK
- ตรวจสอบอุณหภูมิ Condenser Water Cooling Valve A, B = 54.2 °C	OK
- ตรวจสอบอุณหภูมิ water ka ml → 100 ml At 101 °C → 51 ml	OK
- ตรวจสอบอุณหภูมิ water ka ml → 170 ml	OK
- ตรวจสอบ block = 0.12 Recovery = 100 %	
Instrument Ready for Use	OK Not OK

Part No.	Batch	Description	Qty
60051807	18.07.2022	Foss PM kit KT8100/8200 12 Mo	1

I confirm this report is accurate and complete
Signed FOSS: **Signed Customer:** 12/07/23
Name: Potchana A. Kongsak **Name:**

Would you be willing to participate in a brief survey in order to tell us how we performed? karnphong.b@vare.consuant.co.th

เอกสารไม่ควบคุม



Certificate of Calibration

Equipment: CONDUCTIVITY METER **Certificate No.:** C24230059
Model: Lab 955 **Issued Date:** 16 March 2023
Serial No. (or ID.): 16300356 **Job No.:** KSPR2304472
Manufacturer: SI Analytics **Page:** 1 of 2
Electrode Serial No. 16070067 **Model:** LF413T **Brand:** SI Analytics
Condition: In Condition

Customer: United Analyst and Engineering Consultant Company Limited
 3 Soi Udomsuk 41 Sukhumvit Road,
 Bangkok, Prakanong, Bangkok 10260 Thailand

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

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

Calibration By: Mr. Atachai Ngamchanat
Calibration Date: 16 March 2023
The Method used: In house method, CAL-WI-49, base on ASTM D 1125-14 and D 5391-14
Traceability: This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 838312, 838313, 838316

(Mr. Atachai Ngamchanat)
 Person in charge

(Mr. Nitinun Srihawan)
 Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
 The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
 These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.
 บริษัท ดีเคเอส อีเซีย จำกัด
 DKSH Technology Limited
 2533 ซอยสุขุมวิท แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10260
 2533 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
 Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

เอกสารไม่ควบคุม

CAL-FM-C24-09: 12 Sep 2022

Calibration Results:

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading		(k)	
25.000 µS/cm	24.5 µS/cm	0.500 µS/cm	2.00	0.21 µS/cm
1413.0 µS/cm	1403 µS/cm	10.0 µS/cm	2.00	9.0 µS/cm
111.3 mS/cm	108.5 mS/cm	2.80 mS/cm	2.00	0.67 mS/cm

After Adjustment ; at 1413 µS/cm

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading		(k)	
25.000 µS/cm	24.8 µS/cm	0.200 µS/cm	2.00	0.21 µS/cm
1413.0 µS/cm	1413 µS/cm	0.0 µS/cm	2.00	9.0 µS/cm
111.3 mS/cm	108.8 mS/cm	2.50 mS/cm	2.00	0.67 mS/cm

The End of Certificate

บริษัท ดีเคเอส อีเซีย จำกัด
 DKSH Technology Limited
 2533 ซอยสุขุมวิท แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10260
 2533 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
 Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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เอกสารไม่ควบคุม

CAL-FM-C24-09: 12 Sep 2022

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2304472

ชนิดเครื่องมือ: CONDUCTIVITY METER

รุ่น: Lab 955

หมายเลขเครื่อง: 16300356

ตรวจสอบ (วัน)		รายการตรวจเช็ค	ตรวจสอบ (ตั้ง)		หมายเหตุ
16 Mar 2023			16 Mar 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด – เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
		pH Meter and Conductivity Meter			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันเปื้อน Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ: Electrode วัดอุณหภูมิได้ 25.1°C โดย Control Waterbath ที่ 25.0 ±0.1°C

Mr.Atachai Ngamchanat

Service Engineer

เอกสารไม่ควบคุม

CAL-FM-R31-03: 20 Jul 2022

บริษัท ดีเคเอสเอช (ประเทศไทย) จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Phone: +66 2638 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certify-thailand

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CERTIFICATE OF CALIBRATION

Certificate No.: SP23-021

Page 1 of 5

Customer: United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,

Bangkok 10260

Location of calibration: Laboratory 315

Equipment: UV-Vis Spectrophotometer

Manufacturer: Agilent Technologies

Model: Cary 60

Serial No.: MY15410009

ID No.: N/A

Received Date: 20 May 2023

Calibration Date: 20 May 2023

Issue Date: 23 May 2023

Condition Instrument: Good

Calibrated by:

(Mr. Tanawat Rittidach)

Technical Manager

Approved by:

(Ms. Chonthicha Sangnorn)

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit 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 DQE Services Co., Ltd.

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

DQE Services Co., Ltd.

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230

Phone: +66 (0)2 538 2054, Email: dqeservicesinfo@gmail.com



REPORT OF CALIBRATION

Certificate No.: SP23-021

Page 2 of 5

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	25760	95935	22 October 2023
Absorbance Standard set	25757	95929	22 October 2023
Wavelength Standard set	25806	95916	22 October 2023
Wavelength Standard set	25758	95915	22 October 2023

Traceability This certification is traceable to the International System of Unit maintained at National -

Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC: 1.5 nm.

Scan Speed of UUC: 60 nm/min

Scan Interval of UUC: 0.15 nm.

Resolution of UUC: Photometric 0.0001 Abs.

Wavelength 0.1 nm.

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

DQE Services Co., Ltd.

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230

Phone: +66 (0)2 538 2054, Email: dqeservicesinfo@gmail.com



REPORT OF CALIBRATION

Certificate No.: SP23-021

Page 3 of 5

Calibration Results: Without adjustment


Photometric Accuracy:

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.0000	0.0000	0.0028	2.00
	0.5787	0.5742	0.0045	0.0031	2.00
	1.0490	1.0423	0.0067	0.0029	2.00
	2.1900	2.1847	0.0053	0.0075	2.00
440	0.0000	0.0000	0.0000	0.0028	2.00
	0.5607	0.5577	0.0030	0.0034	2.00
	1.0247	1.0234	0.0013	0.0035	2.00
	2.1229	2.1171	0.0058	0.0088	2.00
465	0.0000	0.0000	0.0000	0.0028	2.00
	0.5236	0.5184	0.0052	0.0029	2.00
	0.9634	0.9607	0.0027	0.0029	2.00
	1.9763	1.9715	0.0048	0.0081	2.00
546.1	0.0000	-0.0001	0.0001	0.0028	2.00
	0.5191	0.5159	0.0032	0.0031	2.00
	1.0003	0.9980	0.0023	0.0033	2.00
	1.9987	1.9917	0.0070	0.0087	2.00
590	0.0000	0.0000	0.0000	0.0028	2.00
	0.5523	0.5501	0.0022	0.0030	2.00
	1.0809	1.0808	0.0001	0.0030	2.00
	2.0391	2.0336	0.0055	0.0081	2.00
635	0.0000	0.0000	0.0000	0.0028	2.00
	0.5601	0.5585	0.0016	0.0031	2.00
	1.0512	1.0485	0.0027	0.0030	2.00
	1.9294	1.9317	-0.0023	0.0083	2.00

FM-708-02 R01 1/11/2021

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DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com


NSC-FM-708-02 R01
CALIBRATION DATA

REPORT OF CALIBRATION

Certificate No. : SP23-021Page 4 of 5


Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000 0.7478	0.0000 0.7436	0.0000 0.0042	0.0050 0.0058	2.00 2.00
257	0.0000 0.8686	0.0000 0.8648	0.0000 0.0038	0.0050 0.0064	2.00 2.00
313	0.0000 0.2912	0.0000 0.2908	0.0000 0.0004	0.0050 0.0052	2.00 2.00
350	0.0000 0.6448	0.0000 0.6398	0.0000 0.0050	0.0050 0.0058	2.00 2.00

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com


NSC-FM-708-02 R01
CALIBRATION DATA

REPORT OF CALIBRATION

Certificate No. : SP23-021Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	242.0	-0.28	0.18	2.00
279.45	279.5	-0.05	0.18	2.00
287.81	287.5	0.31	0.18	2.00
334.06	333.5	0.56	0.18	2.00
360.93	360.3	0.63	0.18	2.00
418.59	418.0	0.59	0.18	2.00
445.94	445.3	0.64	0.18	2.00
453.66	453.0	0.66	0.18	2.00
460.02	459.6	0.42	0.18	2.00
536.59	536.4	0.19	0.18	2.00
637.98	638.3	-0.32	0.18	2.00
431.38	431.0	0.38	0.18	2.00
472.50	472.5	0.00	0.18	2.00
513.47	513.5	-0.03	0.18	2.00
528.88	529.0	-0.12	0.18	2.00
573.17	573.0	0.17	0.18	2.00
585.35	585.0	0.35	0.20	2.00
684.40	684.5	-0.10	0.18	2.00
740.72	741.0	-0.28	0.20	2.00
748.55	748.5	0.05	0.18	2.00
807.03	807.0	0.03	0.18	2.00
879.28	879.5	-0.22	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%


- * Indicates non TISI accredited

- End of Certificate -

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com


NSC-FM-708-02 R01
CALIBRATION DATA

CERTIFICATE OF CALIBRATION

Certificate No. : SP23-007Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Location of calibration : Laboratory 315

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-1900

Serial No. : 2021-064


ID No. : UAE.WAS.006/2552


Received Date : 6 January 2023

Calibration Date : 6 January 2023

Issue Date : 10 January 2023

Condition Instrument : Used

Calibrated by : 
(Mr.Tanawat Ritidach)
Technical Manager

Approved by : 
(Ms. Chonthicha Sangngern)
Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit 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 DQE Services Co., Ltd.

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com


NSC-FM-708-02 R01
CALIBRATION DATA

REPORT OF CALIBRATION

Certificate No. : SP23-007Page 2 of 5

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	25760	95935	22 October 2023
Absorbance Standard set	25757	95929	22 October 2023
Wavelength Standard set	25806	95916	22 October 2023
Wavelength Standard set	25758	95915	22 October 2023

Traceability This certification is traceable to the International System of Unit maintained at National -
Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 4.0 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.
Wavelength 0.1 nm.

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

Certificate No. : SP23-007

Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5787	0.575	0.0037	0.0031	2.00
	1.0490	1.044	0.0050	0.0029	2.00
	2.1900	2.181	0.0090	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5607	0.558	0.0027	0.0034	2.00
	1.0247	1.021	0.0037	0.0035	2.00
	2.1229	2.115	0.0079	0.0081	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5236	0.520	0.0036	0.0030	2.00
	0.9634	0.961	0.0024	0.0029	2.00
	1.9763	1.968	0.0083	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5191	0.518	0.0011	0.0031	2.00
	1.0003	1.000	0.0003	0.0033	2.00
	1.9987	1.993	0.0057	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5523	0.552	0.0003	0.0030	2.00
	1.0809	1.082	-0.0011	0.0030	2.00
	2.0391	2.031	0.0081	0.0080	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5601	0.562	-0.0019	0.0032	2.00
	1.0512	1.052	-0.0008	0.0030	2.00
	1.9294	1.923	0.0064	0.0079	2.00

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FM-708-02 R01 1/11/2021



REPORT OF CALIBRATION

Certificate No. : SP23-007

Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7478	0.743	0.0048	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8686	0.861	0.0076	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2912	0.291	0.0002	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6448	0.639	0.0058	0.0055	2.00

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FM-708-02 R01 1/11/2021



REPORT OF CALIBRATION

Certificate No. : SP23-007

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Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.54	240.8	0.74	0.18	2.00
279.40	278.5	0.90	0.18	2.00
288.70	288.0	0.70	0.18	2.00
334.22	333.5	0.72	0.18	2.00
361.26	360.5	0.76	0.18	2.00
418.48	417.8	0.68	0.21	2.00
446.70	445.9	0.80	0.18	2.00
453.20	452.5	0.70	0.18	2.00
460.06	459.5	0.56	0.18	2.00
536.90	536.0	0.90	0.18	2.00
637.94	637.1	0.84	0.18	2.00
440.74	440.0	0.74	0.18	2.00
472.22	471.5	0.72	0.18	2.00
513.70	513.0	0.70	0.18	2.00
528.72	528.0	0.72	0.18	2.00
574.60	574.0	0.60	0.18	2.00
585.48	584.6	0.88	0.20	2.00
684.63	684.0	0.63	0.18	2.00
740.27	740.0	0.27	0.20	2.00
748.28	747.5	0.78	0.18	2.00
807.16	806.5	0.66	0.18	2.00
879.70	879.0	0.70	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- * Indicates non TISI accredited

- End of Certificate -

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FM-708-02 R01 1/11/2021

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000-29 FAX. 0-2719-9484

Certificate of Calibration

Cert.No.: 23CH1148
Page: 1 of 2

Equipment : Turbidity Meter
 Manufacturer : Oakton
 Model : T100IR
 Serial No. : 1120501017
 ID. No. : UAE.WAT.056/2563
 Condition As-Received: Used Item
 Received Date : 13 September 2023
 Calibration Date : 14 September 2023
 Reference : 2309-0458DSC-1
 Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangchak, Phrakhanong, Bangkok 10260
 Ambient Temperature : (25 ± 2.5) °C
 Relative Humidity : (50 ± 20) %
 Calibration Procedure : In - house method : CP-CH11
 based on direct measurement by
 using Formazin standard solution
 Calibrated by : Walalak Sirinthean
 Approved by : Warakorn Lemgagtrakul
 Approved Signatory
 () Saithip Meangmai
 (✓) Warakorn Lemgagtrakul
 () Ponpan Paipim
 Issue Date : 15 September 2023

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

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration and Testing Equipment Services.

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A 0011853



Cert.No. : 23CH1148
Page : 2 of 2

Condition of this calibration result

1. Reference Standard Instruments :

This certification is traceable to the International System of unit (SI unit) through:-
- Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due date
1) Thermo-Hygrograph	1103328	130EC010	23C1361	13 June 2024
2) Electronic Balance	1124013382	140RC006	23MM18	20 Feb 2024

2. Standard Material : The Formazin suspension has been prepared gravimetric from

Material	Manufacturer	Lot No.	Assay
1) Hexamethylenetetramine	HIMEDIA	0000493947	99.65%
2) Hydrazinium Sulfate	HIMEDIA	0000522014	99.40%

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration result

Performing five - Formazin suspension standard curve by using 0,20,100,400,800 NTU
Turbidity Meter Serial Number : 1120501017

Standard Formazine suspension (NTU)	UUC* Reading (NTU)	Uncertainty of Measurement (± NTU)	Coverage Factor k
0	0.00	0.0067	2.00
20	20.3	0.39	2.00
100	101	0.76	2.00
400	401	1.5	2.05
800	800	2.1	2.23

Remark
- UUC* = Unit Under Calibration
- NTU = Nephelometric Turbidity Units

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 %.

-000-

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Agilent CrossLab Start Up Services

Agilent GCMS Preventive Maintenance Checklist

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

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

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Agilent GCMS Preventive Maintenance Checklist

Introduction

Select the appropriate PM to be done and then perform the checklist under that section

- ☐ Interim Preventive Maintenance 6 months
☒ Major Preventive Maintenance Yearly

This checklist covers the following model(s):

Type	Model
SQ	5973 Series MSD
SQ	5975 Series MSD
SQ	5977 Series MSD
TQ	7000 Series MS/MS
TO	7010 Series MS/MS
QTOF	7200 Series QTOF
QTOF	7250 Series QTOF

Customer Information

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



Agilent GCMS 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/en-us/products/crosslab-instrument-services/service-repair>
- To access Agilent University, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful Agilent Resource Center web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>
- Need technical support, FAQs, supplies? – visit our Support Home page at <http://www.agilent.com/search/support>
- Get answers. Share insights. Build connections: Join the Agilent Community at <https://community.agilent.com/welcome>

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in the most logical order relevant to the individual system service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Ask the customer to sign the Service Completion section including the customer's and your signature.

Additional Instruction Notes

- Preventive maintenance is a factory recommended procedure designed to reduce the likelihood of electromechanical failures. Failure to perform preventive maintenance may reduce the long-term reliability of certain instruments and systems. Two preventative maintenances (PMs) per year are recommended, the Major PM Service will be performed annually with an Interim PM performed 6 months after the Major PM.



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System Information

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

Instrument System Name and ID	US2009M037
Instrument System Site and Location	United Analyst And Engineering/GCMS

List System Component Product Numbers	List the Serial Numbers of each Component
1. 67097B	US2009M037
2.	
3.	
4.	
5.	
6.	
7.	
8.	

Preparation

- ☒ Discuss any specific issues with the customer before starting.
☒ Review the instrument logbook for recorded problems and comments.
☒ Save instrument control settings before starting the procedure.
☒ Perform a general inspection of the system for cleanliness.
☒ Check for proper installation of parts, assemblies, sensors etc.
☒ Check system for required installation of components and settings as defined by current Service Notes
☒ Check for firmware updates and verify with customers if they would like them installed. Firmware update(s) are strongly recommended.

Customer Responsibilities

Customers should ensure that all necessary operating supplies, consumables, and usage-dependent items such as gases, vials, syringes, calibrant solution and solvents required for successful preventive maintenance are available. A customer representative should be available while the preventive maintenance is being performed.



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Important notice for customers

The customer should complete the following before the Support Provider arrives on site:

- ☒ Perform an autotune and retain the printed tune report just prior to the start of the PM to verify performance of the equipment.

Note: It is recommended to have the customer run the autotune and tune evaluation prior to the PM and then start the vent cycle so that the instrument will be ready for the service representative.

Definition of the Task/Recommended items within the document

Task	Recommended	
Yes	No	Interim / Major / As needed
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Yes selected means that the task was done or the part was required.
No selected means that the task was not done or the part was not required.
Interim selected means that this task is recommended to be done at 6-month intervals.
Major selected means that this task is recommended to be done yearly; if the customer would like a service to be done at the 6-month interval then the service could be purchased.
As needed selected means that the task was done or the part was used as needed. For example, there could be two types of filters that could be used and this was the one selected.

Preventive Maintenance Procedures

Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Perform general inspection of system for cleanliness
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Discuss any problems the customer is having with the instrument
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Review customer maintenance records and exclude maintenance on recently serviced items
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Review the most recent autotune report. This will give a starting point for evaluating spectral peaks, baseline noise, peak shape, mass assignments and resolution.

Yes/No	Interim/Major	GCMS
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Record instrument model no.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Record instrument serial no.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Record Rough Vacuum
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Record Manifold Vacuum
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Type of Column installed



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Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Verify that calibration peaks were seen prior to starting the PM
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Vent the instrument
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Inspect vacuum hoses, pump, exhaust tubing, and power cords for excessive wear
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Visually inspect calibrant levels – PF1 BA PF-DTD (if appl.), IRM (if appl.). Refill if available.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Look for any obvious external damage or problems.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Clean air intake(s). Cosmetic cover(s) may need to be removed.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Verify system line voltage meets instrument specifications. Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

Yes/No	Interim/Major	Wet Mechanical vacuum pumps
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check for evidence of oil leakage. Check pump gasket for leakage.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Drain and replace mechanical pump oil.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Replace Oil Mist Filter if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Discuss with customer the need for more frequent oil changes if the oil is dirty.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Don't use mist filters with Chemical Ionization.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed. Visually confirm that no oil returns up vacuum hose.

Yes/No	Interim/Major	Dry Mechanical vacuum pumps - Diaphragm
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check for evidence of poor vacuum – Turbo power demand, poor manifold vacuum, etc.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Clear air flow paths of dust.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	If vacuum is poor, then replace the diaphragm pump.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed.

Yes/No	Interim/Major	Dry Mechanical vacuum pumps - Scroll
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Replace the tips seal on the IDP pump.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check for evidence of poor vacuum – Turbo power demand, poor manifold vacuum, etc.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Replace the Exhaust Filter if required.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Discuss with customer the need for more frequent changes, if needed.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Inform customer that pump gas ballast should be installed all the time.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed.

Yes/No	Interim/Major	Cleaning System and Filters
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Fans
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Remove dust from fans and vent covers.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Verify fans are functional and that there is enough space around the instrument for proper cooling.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Source cleaning
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Open analyzer and remove the source.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Disassemble, Clean, re-assemble source.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Re-install source and close analyzer.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Filters
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Replace RMSH-2 Helium gas filter – if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Replace RMSH-2 Nitrogen gas filter – if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Replace RMSH-2 Hydrogen gas filter – if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CP17988 – Gas Clean Carrier Gas Kit for 7890 for Nitrogen or Helium; Bracket, Mount, and Filter – if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CP17974 – Gas Clean Filter Kit GC/MS 1/8", Mount and Filter – if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CP17973 – Gas Clean Filter, Replacement Filter – if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	S190-9071 – Methane Gas Filter – if applicable

Guidance: If gas filter is replaced, write the change date on the filter using a permanent marker.



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Yes/No	Interim/Major	System post-check
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pump system back down. Wait until system stability has been achieved.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Verify system vacuum reading(s) via the gauge controller.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Leak Check
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Verify system in manual tune
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Compare against previous tune file report(s)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Change to Tune and verify that all temperatures, pressures, and gas flows reach method set points
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check manually that you have calibration peaks.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	EI Autotune Performed

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

Service Review

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

Agilent Test Results Table

Test Description	Expected Test Result	Actual Test Result
Auto tune	pass	pass
Evaluate tune	pass	pass



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Agilent Consumed Parts List Table

☒ Section not applicable

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

Signature Page

Service Engineer Comments (optional)

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

Service Completion

Service request number 6009453509 Date service completed 14 June 2023

Agilent signature [Signature] Customer signature วราห์ พงษ์อ้วน

Total number of pages in this document 9 pages



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Agilent CrossLab Start Up Services Agilent 8890 Gas Chromatograph Preventive Maintenance Checklist

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

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

Agilent 8890 GC Preventive Maintenance Checklist

Introduction

Customer Information

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

Important Customer Web Links

- For more information about Agilent Technologies services, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- The Agilent Community is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- To access Agilent University, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful Agilent Resource Center web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>.
- Need technical support, FAQs, supplies? – visit our Support Home page <http://www.agilent.com/search/support>.
- วิดีโอ สอนวิธี อุปกรณ์ที่จำเป็นต้องใช้ อุปกรณ์สำหรับ ระบบ เครื่องมือ และ ใบ้ คู่มือ โดย วิศวกรฝ่าย บริการ Agilent YouTube channel at <https://www.youtube.com/user/agilent>.



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Service Engineer's Responsibilities

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

Additional Instruction Notes

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

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System Information

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

Instrument System Name and ID	CN1945A066
Instrument System Site and Location	VAE GCMS (405)

List System Component Product Numbers	List the Serial Numbers of each Component
1. 83922A	CN1945A066
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Preparation

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

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Preventive Maintenance Procedure

Clean and inspect GC

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

Inlet and detector consumable replacement

- ✓ Replace the split vent trap cartridge filter using the Maintenance procedure from either the Browser User interfaces on units with these inlets: Split/Splitless Capillary (SSL), Multi-Mode Inlet (MMI), Programmed Temperature Vaporizer (PTV), Volatiles Interface (VI).
- ✓ If the inlet system is used in Split Mode with viscous samples, inspect and clean the split vent tube on the inlet and flush or replace the tubing between the inlet and the split vent trap.
For the inlets installed, perform inlet maintenance using the Maintenance procedure from the Browser User interfaces. Record the results. (Leak and Restriction Test)
- ✓ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the ignitor shows any buildup of sample or corrosion, replace the ignitor. Examine the FID collector and castle assemblies for contamination - clean as necessary.

Zero Sensors and Leak test

- ✓ Zero all pressure sensors using the Browser interface.
- ✓ Perform inlet pressure decay test(s) from the diagnostics screen on the Browser User interface. Record if test passed or failed in the results table.

Note: If the PM is done in preparation for an Operational Qualification, then the pressure decay test defined within that protocol can be used for the PM.

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ALS Maintenance

- ✓ Section NOT applicable
- ☐ Check all cabling and configuration settings between GC, tray, and injectors.
- ☐ Vacuum or remove any dust, especially around fans.
- ☐ Check operation of all fans.
- ☐ Check syringe for smooth plunger operation.
- ☐ Check for smooth operation of the needle support - clean if necessary

Restore Instrument

- ✓ Restore the normal operating conditions or customer method using the Browser interface or Data System.
- ✓ Purge the system with carrier flow for 15 minutes
- ✓ Bake out the system, then restore the normal operating conditions
- ✓ After equilibration, check and record the post PM detector signal output values. Results should be similar or lower than the detector outputs recorded prior to PM.
- ☐ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

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

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เอกสารไม่ควบคุม

Signature Page

Service Review

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

PM Test Results Table

Test description	Before PM Service	After PM Service
Front detector output	N/A	N/A
Back detector output	N/A	N/A
AUX 1 detector output	N/A	N/A
AUX 2 detector output	N/A	N/A
Test description	Expected test result	Actual test result
Leak and Restriction Test after front inlet maintenance	Pass	Pass
Leak and Restriction Test after back inlet maintenance	Pass	N/A
Leak and Restriction Test after front inlet Split Vent Trap replacement	Pass	Pass
Leak and Restriction Test after back inlet Split Vent Trap replacement	Pass	N/A
Front inlet pressure decay test	Pass	Pass
Back inlet pressure decay test	Pass	N/A

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PM Parts List Table

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

Part description	Part number	Product or model# where used	Quantity consumed
SSL Capillary Inlet PM kit, Split	5188-6496	8890 GC	1
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	8890 GC	1
SSL Capillary Ultra Inert Inlet Splitless Inlet - Single Tap with Glass Wool	5190-2295	8890 GC	N/A
SSL Capillary Ultra Inert Inlet Low Pressure Drop Split Liner - with Glass Wool	5190-2295	8890 GC	N/A
PP Inlet PM kit	5188-6498	8890 GC	N/A
Parts used from PM kit: single cartridge (for MMI, PTV & V)	5188-6495	8890 GC	N/A
MMI Cleaning Kit	G3510-60820	8890 GC	N/A
PTV Septumless Head Rebuild Kit	5182-9747	8890 GC	N/A
PTV Septumless Head Rebuild Kit	5182-9747	8890 GC	N/A
Ignitor (glow plug) assembly with O-ring	19231-60680	8890 GC	N/A
FID Collector Rebuild/Cleaning Kit	G1531-67000	8890 GC	N/A
FID Collector Replacement Kit	G1531-67001	8890 GC	N/A
Standard .011-inch FID Jet	5200-0176	8890 GC	N/A
Universal .018-inch FID Jet	5200-0177	8890 GC	N/A

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Service Engineer Comments

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

Service Completion

Service request number 6005953599 Date service completed 14 June 2023
 Agilent signature SM Customer signature _____
 Total number of pages in this document 9 pages

เอกสารไม่ควบคุม

Agilent CrossLab Start Up Services

Agilent 5100 5110 ICP-OES
Preventive Maintenance

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

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

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

เอกสารไม่ควบคุม

Introduction

Customer Information

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

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Important Customer Web Links

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

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Service Engineer's Responsibilities

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

เอกสารไม่ควบคุม

Instrument Maintenance

System Information

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

Instrument System Name and ID	5110 VDV ICP-OES
Instrument System Site and Location	UAE

List System Component Product Numbers	List the Serial Numbers of each Component
1. G 8013A	77 1603 0001
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

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

เอกสารไม่ควบคุม

Preparation

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

เอกสารไม่ควบคุม

Preventive Maintenance Procedures

Record Pre-PM instrument performance

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

Clean and inspect ICP-OES system

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

Agilent Water Recirculator

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

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SPS 3 Auto Sampler

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

SPS 4 Auto sampler

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

AVS 4, 6, 7 Advanced Valve System

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

เอกสารไม่ควบคุม

ICP-OES adjustment

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

Record Post-PM instrument performance

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

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Restore Instrument

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

Service Review

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

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Test Results

Instrument Performance Test Results Table

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

	Pre PM Sensitivity Check		Post PM Sensitivity Check	
	Radial	Axial *	Radial	Axial*
Zn 213.857 nm SRBR	4190.3	6849.9	4700.8	7564.2
Mn 257.610 nm SRBR	13681.0	27295.3	14569.1	29992.5
Al 396.152 nm SBR	12.1	14.6	11.5	15.6
K 766.491 nm SBR	8.0	31.2	7.4	39.7

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

Instrument Test Results Table

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

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

เอกสารไม่ควบคุม

ICP-OES Status Results Table

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

Measurement	Standby Mode	Plasma On
Mains Voltage	225.153 VAC	226.613 VAC
Mains Current	0.090 A	0.219 A
Instrument Temperature	24.0 °C	25.1 °C
RF Air Flow (sensor speed)	15.0 Hz	19.0 Hz
Plasma Exhaust Temperature	No measurement	39.2 °C
Water Flow Oscillator	No measurement	1.37 L/min
Water Flow Detector	0.84 L/min	0.81 L/min
Water Inlet Temperature	17.3 °C	17.8 °C
Polychromator Temperature	35.0 °C	35.0 °C
CCD Temperature	-39.8 °C	-39.8 °C
Thermal Stabilizer	35.0 °C	35.0 °C
Argon Supply Pressure	659.52 kPa	608.63 kPa
Purge Gas Supply Pressure*1	656.41 kPa	627.71 kPa
Option Gas Supply Pressure*1	- kPa	- kPa
Nebulizer Flow	No measurement	0.70 L/min
Nebulizer Back Pressure	No measurement	166.30 kPa
Plasma Gas Flow	No measurement	11.98 L/min
Auxiliary Gas Flow	No measurement	1.00 L/min
RF Power	No measurement	1199.5 W
RF Supply Current	No measurement	5.223 A
RF Supply Voltage	No measurement	194.481 V

*1 If option installed

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Consumed PM Parts

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

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

☐ Section Not Applicable

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

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Signature Page

Service Engineer Comments (optional)

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

Service Verification

Service Request Number:

600637120

Date Service Completed:

15 Nov 2023

Service Engineer Name:

Kanyakorn S.

Customer Name:

Aphorn Onkong

Service Engineer Signature:

Kanyakorn S.

Customer Signature:

Aphorn Onkong

Total number of pages in this document:

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เอกสารไม่ควบคุม

Report Summary

Instrument Model	Agilent 5100/5110 VDV ICP-OES
Instrument ID	G8011A/G8015A
Instrument Serial Number	MY18030001
Software Version	7.3.1.9507
Firmware Version	3442
Tested By	Kanyakorn S.
Test Completed On	11/13/2023 9:18:24 AM

Result Summary

Subsystem Communications Test	Skipped
Air Flow Test	Skipped
Water Flow Test	Skipped
Gas Flows Test	Skipped
RF Generator Test	Skipped
Camera Test	Skipped
Optics Test	Skipped
Advanced Valve System Test	Skipped
Resolution Test	Pass
Sensitivity Test	Fail
Precision Test	Pass

เอกสารไม่ควบคุม

Resolution Test			Pass
Element Wavelength	Specification	Width	
N (174.213 nm)	≤ 9.40	6.92	
As (188.980 nm)	≤ 8.20	6.12	
C (193.027 nm)	≤ 11.50	8.31	
Mo (202.032 nm)	≤ 8.20	6.35	
Cr (206.158 nm)	≤ 13.40	8.99	
Zn (213.857 nm)	≤ 8.70	6.64	
Pb (220.353 nm)	≤ 9.50	7.06	
Co (228.615 nm)	≤ 17.20	11.68	
Ba (230.424 nm)	≤ 9.40	7.27	
Mn (257.610 nm)	≤ 13.30	9.46	
Mn (260.568 nm)	≤ 20.30	14.18	
Cr (267.716 nm)	≤ 11.00	8.01	
Cu (324.754 nm)	≤ 25.00	18.89	
Cu (327.395 nm)	≤ 14.20	11.29	
Sr (338.071 nm)	≤ 33.50	24.46	
Ba (455.403 nm)	≤ 44.00	33.62	
Sr (460.733 nm)	≤ 36.00	17.37	
Ba (493.408 nm)	≤ 36.00	25.47	
Ba (514.171 nm)	≤ 42.00	25.43	
Ar (675.283 nm)	≤ 74.00	60.50	
K (766.491 nm)	≤ 80.00	65.33	

เอกสารไม่ควบคุม

Sensitivity Test			Fail		
Radial					
Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 46.0	SRBR	142.0	958.5	41.7
Se (196.026 nm)	≥ 41.0	SRBR	105.9	937.4	67.5
Zn (213.857 nm)	≥ 1421.0	SRBR	4190.3	44372.5	111.6
Pb (220.353 nm)	≥ 46.0	SRBR	213.9	2521.3	125.4
Mn (257.610 nm)	≥ 3518.0	SRBR	13681.0	279651.7	416.6
Al (396.152 nm)	≥ 3.4	SBR	12.1	52269.7	3994.3
Ba (493.408 nm)	≥ 34.0	SBR	185.8	2294372.8	12280.0
K (766.491 nm)	≥ 1.8	SBR	8.0	107401.4	11876.7
Axial					
Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 208.0	SRBR	189.4	2285.0	129.5
Se (196.026 nm)	≥ 159.0	SRBR	168.7	2813.7	233.8
Zn (206.200 nm)	≥ 234.0	SRBR	905.0	10158.4	123.0
Zn (213.857 nm)	≥ 1743.0	SRBR	6849.9	135760.6	390.5
Cd (214.439 nm)	≥ 4227.0	SRBR	5597.6	92921.3	273.9
Pb (220.353 nm)	≥ 320.0	SRBR	454.8	10111.2	451.1
Mn (257.610 nm)	≥ 10625.0	SRBR	27295.3	1126118.1	1697.0
Cr (267.716 nm)	≥ 1048.0	SRBR	3948.2	144875.3	1322.0
Cu (324.754 nm)	≥ 19.0	SBR	49.2	341489.7	6798.2
Al (396.152 nm)	≥ 6.0	SBR	14.6	235321.6	15043.9
Ba (493.408 nm)	≥ 60.0	SBR	183.3	8393101.3	45538.3
K (766.491 nm)	≥ 24.0	SBR	31.2	1447045.2	44917.1

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Precision Test		Pass
Radial		
Element Wavelength	Specification	Measured Value % RSD
As (188.980 nm)	≤ 2.60	1.22
Se (196.026 nm)	≤ 2.60	0.76
Zn (213.857 nm)	≤ 1.50	0.33
Pb (220.353 nm)	≤ 2.60	0.86
Mn (257.610 nm)	≤ 1.50	0.45
Al (396.152 nm)	≤ 1.50	0.37
Ba (493.408 nm)	≤ 1.50	0.68
K (766.491 nm)	≤ 1.50	0.33
Axial		
Element Wavelength	Specification	Measured Value % RSD
As (188.980 nm)	≤ 1.50	0.63
Se (196.026 nm)	≤ 1.50	0.87
Zn (206.200 nm)	≤ 1.50	0.59
Zn (213.857 nm)	≤ 1.50	0.46
Cd (214.439 nm)	≤ 1.50	0.70
Pb (220.353 nm)	≤ 1.50	0.36
Mn (257.610 nm)	≤ 1.50	0.95
Cr (267.716 nm)	≤ 1.50	0.56
Cu (324.754 nm)	≤ 1.50	0.69
Al (396.152 nm)	≤ 1.50	0.63
Ba (493.408 nm)	≤ 1.50	0.86
K (766.491 nm)	≤ 1.50	1.13

เอกสารไม่ควบคุม

Report Summary		
Instrument Model	Agilent 5100/5110 VDV ICP-OES	
Instrument ID	G8011A/G8015A	
Instrument Serial Number	MY18030001	
Software Version	7.3.1.9507	
Firmware Version	3442	
Tested By	Kanyakorn S.	
Test Completed On	11/13/2023 11:10:02 AM	
Result Summary		
Subsystem Communications Test		Pass
Air Flow Test		Skipped
Water Flow Test		Skipped
Gas Flows Test		Skipped
RF Generator Test		Skipped
Camera Test		Skipped
Optics Test		Pass
Advanced Valve System Test		Skipped
Resolution Test		Pass
Sensitivity Test		Pass
Precision Test		Pass
Subsystem Communications Test		Pass
Optics Test		Pass
	Radial	Axial
Intensity	3522064	4003312
Wavelength	737.212	737.212

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Resolution Test	Pass	
Element Wavelength	Specification	Width
N (174.213 nm)	≤ 9.40	6.92
As (188.980 nm)	≤ 8.20	6.08
C (193.027 nm)	≤ 11.50	8.33
Mo (202.032 nm)	≤ 8.20	6.31
Cr (206.158 nm)	≤ 13.40	8.98
Zn (213.857 nm)	≤ 8.70	6.73
Pb (220.353 nm)	≤ 9.50	7.02
Co (228.615 nm)	≤ 17.20	11.65
Ba (230.424 nm)	≤ 9.40	7.38
Mn (257.610 nm)	≤ 13.30	9.46
Mn (260.568 nm)	≤ 20.30	14.05
Cr (267.716 nm)	≤ 11.00	7.92
Cu (324.754 nm)	≤ 25.00	18.84
Cu (327.395 nm)	≤ 14.20	11.31
Sr (338.071 nm)	≤ 33.50	24.18
Ba (455.403 nm)	≤ 44.00	33.28
Sr (460.733 nm)	≤ 36.00	17.41
Ba (493.408 nm)	≤ 36.00	25.43
Ba (614.171 nm)	≤ 42.00	25.27
Ar (675.283 nm)	≤ 74.00	56.87
K (766.491 nm)	≤ 80.00	65.88

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Sensitivity Test			Pass		
Radial					
Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 46.0	SRBR	168.6	1284.6	53.3
Se (196.026 nm)	≥ 41.0	SRBR	122.4	1256.0	90.7
Zn (213.857 nm)	≥ 1421.0	SRBR	4700.8	53870.1	130.7
Pb (220.353 nm)	≥ 46.0	SRBR	236.0	3100.6	155.7
Mn (257.610 nm)	≥ 3518.0	SRBR	14569.1	318398.1	476.2
Al (396.152 nm)	≥ 3.4	SBR	11.5	59510.5	4761.6
Ba (493.408 nm)	≥ 34.0	SBR	170.6	2490835.6	14514.2
K (766.491 nm)	≥ 1.8	SBR	7.4	117698.7	14024.1
Axial					
Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 208.0	SRBR	214.5	2706.2	142.8
Se (196.026 nm)	≥ 159.0	SRBR	188.0	3262.8	255.9
Zn (206.200 nm)	≥ 234.0	SRBR	1088.2	12794.8	135.3
Zn (213.857 nm)	≥ 1743.0	SRBR	7564.2	156883.9	427.8
Cd (214.439 nm)	≥ 4227.0	SRBR	6647.3	116281.7	304.4
Pb (220.353 nm)	≥ 320.0	SRBR	519.3	12490.2	530.3
Mn (257.610 nm)	≥ 10625.0	SRBR	29992.5	1305852.5	1890.2
Cr (267.716 nm)	≥ 1048.0	SRBR	4366.6	173343.4	1547.9
Cu (324.754 nm)	≥ 19.0	SBR	46.8	361093.0	7560.5
Al (396.152 nm)	≥ 6.0	SBR	15.6	274029.5	16498.6
Ba (493.408 nm)	≥ 60.0	SBR	203.6	9028914.5	44122.1
K (766.491 nm)	≥ 24.0	SBR	39.7	1701521.4	41771.8

เอกสารไม่ควบคุม

Precision Test			Pass
Radial			
Element Wavelength	Specification	Measured Value % RSD	
As (188.980 nm)	≤ 2.60	0.85	
Se (196.026 nm)	≤ 2.60	1.26	
Zn (213.857 nm)	≤ 1.50	0.42	
Pb (220.353 nm)	≤ 2.60	0.54	
Mn (257.610 nm)	≤ 1.50	0.60	
Al (396.152 nm)	≤ 1.50	0.47	
Ba (493.408 nm)	≤ 1.50	0.68	
K (766.491 nm)	≤ 1.50	0.50	
Axial			
Element Wavelength	Specification	Measured Value % RSD	
As (188.980 nm)	≤ 1.50	0.42	
Se (196.026 nm)	≤ 1.50	0.66	
Zn (206.200 nm)	≤ 1.50	0.42	
Zn (213.857 nm)	≤ 1.50	0.54	
Cd (214.439 nm)	≤ 1.50	0.42	
Pb (220.353 nm)	≤ 1.50	0.22	
Mn (257.610 nm)	≤ 1.50	0.54	
Cr (267.716 nm)	≤ 1.50	0.49	
Cu (324.754 nm)	≤ 1.50	0.85	
Al (396.152 nm)	≤ 1.50	0.61	
Ba (493.408 nm)	≤ 1.50	0.78	
K (766.491 nm)	≤ 1.50	1.00	

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เอกสารไม่ควบคุม

Report Summary		
Instrument Model	Agilent 5100/5110 VDV ICP-OES	
Instrument ID	G8011A/G8015A	
Instrument Serial Number	MY18030001	
Software Version	7.3.1.9507	
Firmware Version	3442	
Tested By	Kanyakorn S.	
Test Completed On	11/13/2023 11:15:43 AM	
Result Summary		
Subsystem Communications Test	Pass	
Air Flow Test	Pass	
Water Flow Test	Pass	
Gas Flows Test	Pass	
RF Generator Test	Pass	
Camera Test	Pass	
Optics Test	Skipped	
Advanced Valve System Test	Skipped	
Resolution Test	Skipped	
Sensitivity Test	Skipped	
Precision Test	Skipped	
Subsystem Communications Test	Pass	
Air Flow Test	Pass	
30% Air Flow (relative speed)	75% Air Flow (relative speed)	
14.00	20.00	
Water Flow Test	Pass	
RF Water Flow(L/min)	Camera Water Flow (L/min)	Water Inlet Temperature (°C)
1.27	0.81	20.37

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เอกสารไม่ควบคุม

Gas Flows Test			Pass		
Nebulizer Target Flow	Actual Flow	Back Pressure	Auxiliary Target Flow	Actual Flow	Back Pressure
0.70	0.70	271.62	2.00	2.00	111.13
Makeup Target Flow	Actual Flow	Back Pressure	Plasma Target Flow	Actual Flow	Back Pressure
2.00	2.00	116.00	18.00	17.94	23.11
RF Generator Test			Pass		
RF Power Supply Test	Passed				
RF Power Supply (V)	147.380				
RF Oscillator Test	Passed				
RF Oscillator Frequency (MHz)	25.843				
Work Coil Current (A)	44.410				
RF Power Supply Current (A)	1.999				
Camera Test			Pass		
	Integration Time (ms)	Standard Deviation	Status		
Electronic Offset Test	1000	5.361	Passed		
Dark Current Test	6000	0.779	Passed		
Array Test	5	0.025	Passed		
Linearity Test		0.118	Passed		

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เอกสารไม่ควบคุม

analytikjena
An Endress+Hauser Company

Maintenance Protocol

Atomic Fluorescence Spectrometer
mercur DUO /
mercur DUO plus

เอกสารไม่ควบคุม

Serial-No.: K170A0153 Customer-No.: _____
Date: 2 February 2023 Carried out by: Mr. Srichai Fak-On

Maintenance with following Operational Qualification (OQ) ☐
(requires a separate OQ protocol)

Company	บริษัท ยูนิเทค แอนาไลติกส์ แอนด์ เอ็นจิเนียริงคอนซัลแตนท์ จำกัด
User	คุณณเรณีน สุจริต
Department	ห้องปฏิบัติการ (Mercur Analysis)
Street	3 ซอยอุดมสุข 44 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง
Zip Code, City	กรุงเทพมหานคร 10260
Country	ประเทศไทย
Phone	
Fax	
E-mail	

Maintenance works basic unit

tightness visual check inside the Mercur ☒
visual check if gold-traps are broken ☒
visual check if spectrometer is contaminated ☒
visual check of the fluorescence cell ☒
visual check of the absorption cell, incl. window ☒
reactor cleaning ☒
check pump-hose, if necessary change it ☒
check swivel drive (SEV) ☒
check drying-hose, output gas-liquid-separator ☒
test Bubble-Sensor ☒
check gas flows ☒
check volume flows, reagents ☒
recording stray light values ☒
measurement with 30 ng/l ☒

Maintenance works AutosamplerSerial No.: N/A

lubricate the dosing-winding (Teflon-grease-spray) ☐
clean the dosing cylinder, if necessary exchange it ☐
lubricate the winding system of the height drive with some drops of oil ☐
check the toothed belt ☐
check the position of the mechanical stopper (height: 13mm) ☐
check the pump rate of mixing pump (<14s AS52, typ.7s/<20s AS52S, typ.10s) ☐
check the pump rate of washing cup ☐
check the electrical hose connections for good contact ☐
check the connectors of the magnetic valves ☐
check the dosing hose for buckling, if necessary exchange it ☐

Device parameter	nominal value	actual value
visual check general tightness inside the Mercur	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
visual check Goldtraps	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
visual check spectrometer		
Fluorescence cell	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
Absorption cell, incl. window	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
lens	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
Swivel drive (SEV)	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
check pump hoses	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
check hoses and hose connectors	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
check and clean reactor	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
check drying hose output Gas-liquid-separator	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
check bubble-sensor	o.k.: <input checked="" type="checkbox"/>	not o.k.: <input type="checkbox"/>
Check gasflow		
Argon pressure valve 4	1.2 – 1.5 bar	1.5 bar
Valve 1	10 Nl/h or 0.166 NL/min	0.167 NL/min
Valve 2	50 Nl/h or 0.833 NL/min	0.833 NL/min
Valve 3	5 Nl/h or 0.083 NL/min	0.084 NL/min
Valve 4	10 Nl/h or 0.166 NL/min	0.166 NL/min
Check liquidflow		
Acid	2.5ml/min ± 1 ml	2.5 ml/min
Red.-agent	2.5ml/min ± 1 ml	2.5 ml/min
Sample	10ml/min ± 2 ml	10 ml/min
Adventitious light - values	(V)	from file
100	0	0
200	0	0
300	0	0
350	0	0
400	1	1
450	3	3
500	8	8
550	18	18
575	26	26
600	37	35

Device parameter	nominal value	actual value
Analytical parameters Fluorescence cell		
Conditions.: max.conc.: 10µg/L PMT-voltage:453.....V		
Blank-solution		Int. 0.0007.....
without enrichment / FBR 30 ng/L	Int > 0.0015 RSD < 3 %	Int. 0.0031..... RSD 1.13.....%
Conditions.: max.conc.: 1.7µg/L PMT-voltage:444.....V		
Blank-solution		Int. 0.0012.....
with enrichment / FBR 30 ng/L	Int > 0.008 RSD < 3 %	Int. 0.0117..... RSD 2.90.....%
Fok.- factor (Int ₂ / Int ₁)	> 3.5	3.77
Analytical parameters Absorption cell		
Blank-solution		Ext. 0.00168.....
without enrichment / FBR 100 ng/L	Ext. > 0.0012 RSD < 5 %	Ext. 0.00500..... RSD 1.39.....%
Comments		
# Sensitivity check (Without enrichment / FBR / 100 ng/L)		
Int. Blank = 0.000811		
Int. 100 ng/L = 0.009981		

Mr. Srichai Fak-On.
Signature Technician

3 February 2023

Place, Date (DD/MM/YYYY)

Shirlyn Sugiant.
Signature Customer

3 February 2023

Place, Date (DD/MM/YYYY)

Mercur

Report file: C:\WinAAS\TMP\2023\Result\WO\Pro_019
 Program version: 4.7.9.0 Printed on: 8/02/2023 10:16
 Recording started on 8/02/2023 10:07 GMT+7.0
 Operator:
 Laboratory:
 Code:
 Remarks:

Method parameters

Method Without Enrichment / FBR / 30 µg/L_PM_3-02-2023
 Created on 8/02/2023 Time 10:06
 Program ---

Parameters Mercur Technique: Hg fluorescence

Line	253.7 nm		
Lamp type	Hg-LP		
Integr. mode	Peak height	Integr. time	35 s
PMT	451 V		
AZ time	5 s	Peak smoothing	12/5
Delay	0 s		

Working mode	w/o enrich.	System cleaning	Off
FBR technique	on	Wash time acid	10 s
Pump speed	3	Soaking time	20 s
Sample load time	12 s	Gas load time	10 NL/h
Reaction time	12 s		
Waiting time AZ	5 s		
Delay	0 s		
Purge time1	30 s		
Purge time2	15 s	Gas wash time2	10 NL/h

Hg**QC parameters**

QC type	Conc. check		
QC check samp. 1	---	QC check samp. 2	---
Conc.	---	Conc.	---
Error limit	---	Error limit	---
Rep. measurement	off	Reaction	flag + continue
QC std.1 no.	1(30.000 ng/L)	QC std.2 no.	3(0.100 ng/L)
QC std.1 limit	± 20.00%	QC std.2 limit	± 20.00%
QC std. act.	flag + continue		
Expect. blank abs.	0.0100± 0.0100	Reaction	flag + continue
QC precision	off	Reaction	off
		QC Recal.factor	Off

Calibration settings

Calib. meth	Standard calib.	Calibr. unit	ng/L
No. standards	1	Conversion fac.	1000000
Type of standards	---	Standard prep.	Premixed
		Blank correct.	---
		Recalib. std. no.	---
Output unit	µg/L	Conversion fac.	1000
Calib. stat.	Mean	Meas. cycles	3
		Blind cycles	1
Stock sol. 1	---	Stock sol. 2	---
Stock sol. 3	---	Stock sol. 4	---
Type of cal. curve	linear	Intercept	Zero
Weighted cal.	off	Grubbs stat.	off
Check of cal. curve	no outlier test		

Sample statistics

Stat. mode	Mean	Meas. cycles	3
Confd. level	95.4 %	Blind cycles	1
Grubbs stat.	off		

Calibration standards**Hg**

No	Name	State	Pos	Conc./ng/L	Ints	SD	RSD/%
1	Cal-Zero	(--)	##	0.000	H: 0.000774 A: 0.01847	0.000038 0.000554	4.995 3.002
2	Cal-Std1	(--)	##	30.000	H: 0.003169 A: 0.05036	0.000036 0.000069	1.137 0.138

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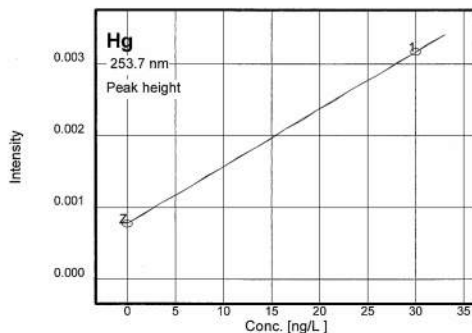
Calibration function 1**8/02/2023 10:16 Calibration (Peak height)**

Ints=k1+k2*conc

k1=0.000775 k2=0.000080

Recal. factor: ---

Slope	0.00008 Ints/(ng/L)	R2-adjusted	1.0000
sc0	1.00000 ng/L		
Lower limit	0 ng/L	Upper limit	33.0 ng/L
Detection limit	---	Deter. limit	---

**Measurements and events (sorted by time)**

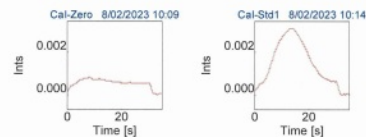
Hg	Without Enrichment / FBR / 30 µg/L_PM_3-02-2023	8/02/2023	10:07
ID	Conc.	Ints	BG SD RSD/% Int. type Time
Cal-Zero		0.000816	PkH 10:09
		0.000765	10:10
		0.000741	10:11
	0ng/L	0.000774	0.000038690 4.995 10:11
Cal-Std1		0.003130	PkH 10:14
		0.003177	10:15
		0.003201	10:16
	30.00ng/L	0.003169	0.000036050 1.137 10:16
Calibration	Calibration function: 01		10:16

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Peak plots**Hg**

Mercur

Report file: C:\WinAAS\TMP\2023\Result\WOIPro_017
 Program version: 4.7.9.0 Printed on: 3/02/2023 14:44
 Recording started on 3/02/2023 14:25 GMT+7.0
 Operator:
 Laboratory:
 Code:
 Remarks:

Method parameters

Method Enrichment / FBR /30 µg/L_PM 3-02-2023
 Created on 3/02/2023 Time 13:41
 Program ---

Parameters Mercur Technique: Hg fluorescence

Line	253.7 nm		
Lamp type	Hg-LP		
Integr. mode	Peak height	Integr. time	20 s
PMT	444 V		
AZ time	5 s	Peak smoothing	8/5
Delay	0 s		

Working mode	Enr. w/o reload.	System cleaning	Off
FBR technique	on	Wash time acid	10 s
Pump speed	3	Soaking time	20 s
Sample load time	10 s	Gas load time	10 NL/h
Reaction time	10 s		
Waiting time AZ	5 s		
Delay	0 s		
Purge time1	20 s		
Purge time2	15 s	Gas wash time2	10 NL/h
Purge time3	10 s	Gas wash time3	10 NL/h
Heat.time coll.1	20 s	Cool. time coll.1	30 s

Hg**QC parameters**

QC type	Conc. check		
QC check samp. 1	---	QC check samp. 2	---
Conc.	---	Conc.	---
Error limit	---	Error limit	---
Rep. measurement	off	Reaction	flag + continue
QC std.1 no.	1(30.000 ng/L)	QC std.2 no.	1(30.000 ng/L)
QC std.1 limit	± 50.00%	QC std.2 limit	± 50.00%
QC std. act.	flag + continue		
Expect. blank abs.	0.0100± 0.0100	Reaction	flag + continue
QC precision	off	Reaction	off
		QC Recal.factor	Off

Calibration settings

Calib. meth	Standard calib.	Calibr. unit	ng/L
No. standards	1	Conversion fac.	1000000
Type of standards	---	Standard prep.	Premixed
		Blank correct.	---
		Recalib. std. no.	---
Output unit	µg/L	Conversion fac.	1000
Calib. stat.	Mean	Meas. cycles	3
		Blind cycles	1
Stock sol. 1	---	Stock sol. 2	---
Stock sol. 3	---	Stock sol. 4	---
Type of cal. curve	linear	Intercept	calculated
Weighted cal.	off	Grubbs stat.	off
Check of cal. curve	no outlier test		

Sample statistics

Stat. mode	off	Meas. cycles	1
Confd. level	95.4 %	Blind cycles	1
Grubbs stat.	---		

Calibration standards**Hg**

No	Name	State	Pos	Conc./ ng/L	Ints	SD	RSD/%
1	Cal-Zero	(--)	##	0.000	H: 0.001256 A: 0.003771	0.000060 0.000252	4.833 6.708
2	Cal-Std1	(--)	##	30.000	H: 0.01174 A: 0.03281	0.000341 0.000721	2.909 2.200

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Calibration function 1

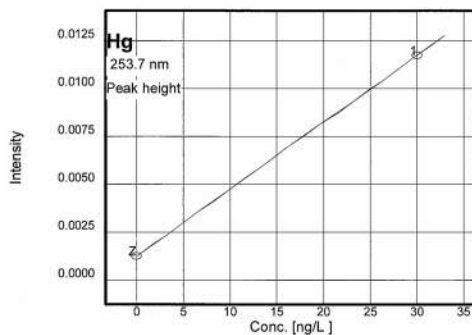
3/02/2023 14:38 Calibration (Peak height)

Ints=k1+k2*conc

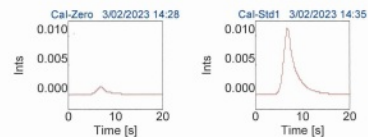
k1=0.001256 k2=0.000349

Recal. factor: ---

Slope	0.00035 Ints/(ng/L)	R2-adjusted	1.0000
sc0	1.00000 ng/L		
Lower limit	0 ng/L	Upper limit	33.0 ng/L
Detection limit	---	Deter. limit	---

**Measurements and events (sorted by time)**

Hg	Enrichment / FBR /30 µg/L_PM 3-02-2023	3/02/2023 14:25	
ID	Conc.	Ints	BG SD RSD/% Int. type Time
Cal-Zero		0.001263	
		0.001313	
		0.001192	
	0ng/L	0.001256	0.000060700 4.833
Cal-Std1		0.01135	
		0.01189	
		0.01198	
	30.00ng/L	0.01174	0.0003415 2.909
Calibration	Calibration function: 01		14:38

Peak plots**Hg**

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Mercur

Report file: C:\WinAAS\TMP\2023\Result\WO\Pro_025
 Program version: 4.7.9.0 Printed on: 8/02/2023 11:44
 Recording started on 8/02/2023 11:31 GMT+7.0
 Operator:
 Laboratory:
 Code:
 Remarks:

Method parameters

Method Without enrichment / FBR 100 ng/L PM_3-02-2023
 Created on 3/02/2023 Time 11:53
 Program

Parameters Mercur Technique: Hg absorption

Line	253.7 nm		
Lamp type	Hg-LP		
Integr. mode	Peak height	Integr. time	55 s
PMT	238 V		
AZ time	5 s	Peak smoothing	12/5
Delay	0 s		

Working mode	w/o enrich.	System cleaning	Acid
FBR technique	off	Wash time acid	15 s
Pump speed	4	Soaking time	20 s
Sample load time	8 s	Gas load time	10 NL/h
Reaction time	12 s		
Waiting time AZ	15 s		
Purge time1	40 s		

QC parameters

QC type	Conc. check		
QC check samp. 1	---	QC check samp. 2	---
Conc.	---	Conc.	---
Error limit	---	Error limit	---
Rep. measurement	off	Reaction	flag + continue
QC std.1 no.	1(100.00 ng/L)	QC std.2 no.	1(100.00 ng/L)
QC std.1 limit	± 50.00%	QC std.2 limit	± 0.00%
QC std. act.	flag + continue		
Expect. blank abs.	0.0100± 0.0100	Reaction	flag + continue
QC precision	off	Reaction	off
		QC Recal.factor	Off

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Calibration settings

Calibr. meth	Standard calib.	Calibr. unit	ng/L
No. standards	1	Conversion fac.	1000000
Type of standards	---	Standard prep.	Premixed
		Blank correct.	---
		Recalib. std. no.	---
Output unit	µg/L	Conversion fac.	1000
Calib. stat.	Mean	Meas. cycles	3
		Blind cycles	1
Stock sol. 1	---	Stock sol. 2	---
Stock sol. 3	---	Stock sol. 4	---
Type of cal. curve	linear	Intercept	calculated
Weighted cal.	off	Grubbs stat.	off
Check of cal. curve	no outlier test		

Sample statistics

Stat. mode	Mean	Meas. cycles	2
Confid. level	95.4 %	Blind cycles	1
Grubbs stat.	---		

Calibration standards

No	Name	State	Pos	Conc./ng/L	Abs	SD	RSD/%
1	Cal-Zero	(--)	##	0.00	H: 0.000383 A: 0.009152	0.000070 0.002492	18.47 27.24
2	Cal-Std1	(--)	##	100.00	H: 0.002931 A: 0.040677	0.000034 0.002788	1.163 6.855

Calibration function

1 8/02/2023 11:43 Calibration (Peak height)

Abs=k1+k2*conc

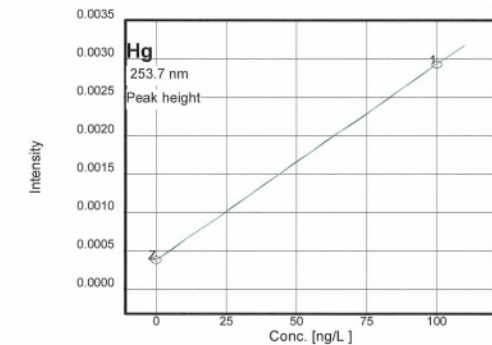
k1=0.000383 k2=0.000025

Recal. factor: ---

Slope	0.00003 Abs/(ng/L)	R2-adjusted	1.0000
sc0	1.00000 ng/L	Charact. conc.	171.082 (ng/L)/1%
Lower limit	0 ng/L	Upper limit	110. ng/L
Detection limit	---	Deter. limit	---

Mercur

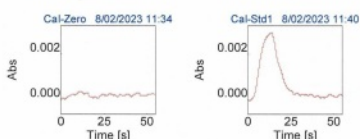
เอกสารไม่ควบคุม

**Measurements and events (sorted by time)**

Hg	Without enrichment / FBR 100 ng/L PM_3-02-2023					8/02/2023	11:31
ID	Conc.	Abs	BG	SD	RSD/%	Int. type	Time
Cal-Zero		0.000383				PkH	11:34
		0.000324					11:35
		0.000461					11:37
	0ng/L	0.000383		0.000070827	18.47		11:37
Cal-Std1		0.002954				PkH	11:40
		0.002948					11:41
		0.002892					11:43
	100.ng/L	0.002931		0.000034104	1.163		11:43
Calibration	Calibration function: 01						
Peak plots	Hg						

Peak plots

Hg



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Mercur

Report file: C:\WinAAS\TMP\2023\Result\WO\Pro_024
 Program version: 4.7.9.0 Printed on: 8/02/2023 11:22
 Recording started on 8/02/2023 11:13 GMT+7.0
 Operator:
 Laboratory:
 Code:
 Remarks:

Method parameters

Method Without Enrichment / FBR / 100 µg/L_PM_3-02-2023
 Created on 8/02/2023 Time 10:56
 Program

Parameters Mercur Technique: Hg fluorescence

Line	253.7 nm		
Lamp type	Hg-LP		
Integr. mode	Peak height	Integr. time	35 s
PMT	451 V		
AZ time	5 s	Peak smoothing	12/5
Delay	0 s		

Working mode	w/o enrich.	System cleaning	Off
FBR technique	on	Wash time acid	10 s
Pump speed	3	Soaking time	20 s
Sample load time	12 s	Gas load time	10 NL/h
Reaction time	12 s		
Waiting time AZ	5 s		
Delay	0 s		
Purge time1	30 s		
Purge time2	15 s	Gas wash time2	10 NL/h

Mercur

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QC parameters

QC type	Conc. check	QC check samp. 2	---
QC check samp. 1	---	Conc.	---
Conc.	---	Error limit	---
Error limit	---	Reaction	flag + continue
Rep. measurement	off	QC std.2 no.	3(0.100 ng/L)
QC std.1 no.	1(100.000 ng/L)	QC std.2 limit	± 20.00%
QC std.1 limit	± 20.00%	Reaction	flag + continue
QC std. act.	flag + continue	QC Recal.factor	Off
Expect. blank abs.	0.0100± 0.0100		
QC precision	off		

Calibration settings

Calib. meth	Standard calib.	Calibr. unit	ng/L
No. standards	1	Conversion fac.	1000000
Type of standards	---	Standard prep.	Premixed
		Blank correct.	---
		Recalib. std. no.	---
Output unit	µg/L	Conversion fac.	1000
Calib. stat.	Mean	Meas. cycles	3
		Blind cycles	1
Stock sol. 1	---	Stock sol. 2	---
Stock sol. 3	---	Stock sol. 4	---
Type of cal. curve	linear	Intercept	Zero
Weighted cal.	off	Grubbs stat.	off
Check of cal. curve	no outlier test		

Sample statistics

Stat. mode	Mean	Meas. cycles	3
Confid. level	95.4 %	Blind cycles	1
Grubbs stat.	off		

Calibration standards

No	Name	State	Pos	Conc./ ng/L	Ints	SD	RSD/%
1	Cal-Zero	(--)	##	0.000	H: 0.000811 A: 0.01927	0.000020 0.000649	2.545 3.371
2	Cal-Std1	(--)	##	100.000	H: 0.009981 A: 0.1406	0.000073 0.001352	0.739 0.961

Hg

Calibration function 1

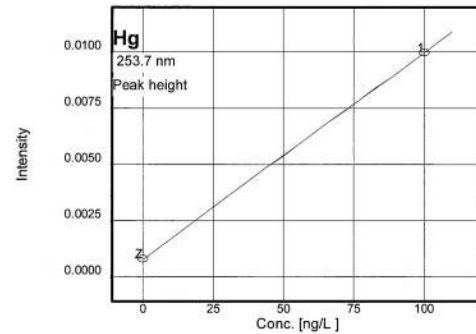
8/02/2023 11:22 Calibration (Peak height)

Ints=k1+k2*conc

k1=0.000812 k2=0.000092

Recal. factor: ---

Slope	0.00009 Ints/(ng/L)	R2-adjusted	1.0000
sc0	1.00000 ng/L		
Lower limit	0 ng/L	Upper limit	110. ng/L
Detection limit	---	Deter. limit	---



Measurements and events (sorted by time)

Hg ID	Without Enrichment / FBR / 100 µg/L_PM_3-02-2023	8/02/2023	11:13
Cal-Zero	0.000796 0.000803 0.000835	PkH	11:15
	0ng/L		11:16
Cal-Std1	0.000811 0.009957 0.008921 0.01008	PkH	11:17
	100.0ng/L		11:20
	0.009981		11:21
	0.000073720		11:21
Calibration	Calibration function: 01		11:22

Mercur

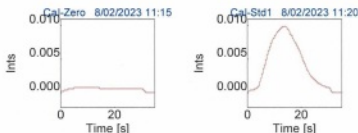
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Mercur

เอกสารไม่ควบคุม

Peak plots

Hg



analytikjena

An Endress+Hauser Company
Analytik Jena Instruments (Thailand) Ltd.
35 Moo 5, 345 Road, Khlong Khro, Pak Kret,
Nonthaburi, 11120 Thailand
Phone: +66(2) 1062970-72
Fax: +66(2) 1062973
www.analytik-jena.com

Service Report

Customer's address:		Customer's Ref. No.	
E-mail:		Phone:	Fax:
Job No. 230135 PM	User: งามวิจิตร	Service Engineer: นส/วิจิตร	Date: 2/2/2023 Page: 1/1
Instrument model: Mercur 10	Serial No. K190A0153	Software Version No. 4.7.9.0	
<input type="checkbox"/> Repair (RE) <input checked="" type="checkbox"/> Maintenance (PM) <input type="checkbox"/> Installation (IN) <input type="checkbox"/> Warranty <input type="checkbox"/> Application (AP) <input type="checkbox"/> Site Prep.(SP) <input type="checkbox"/> Visit(VI)			
Fault / Claim: Preventive Maintenance (PM 2/6)		<input type="checkbox"/> Error Code	
Action taken: <ul style="list-style-type: none"> - Maintenance Plan Basic Unit - Check Device parameter. - Check gas flow. - Check liquid flow. - Check Adventitious light - valves 			
# Test run Analytical parameter Fluorescence cell Test run Analytical parameter Absorption cell			
Action Pending / Recommendation: ควบคุมค่าการไหล.			
<input type="checkbox"/> Spare Part <input type="checkbox"/> Instrument Configuration			
Item No.	Name	Quantity	Unit Price
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Herewith the undersigned confirm the time devoted, the work performed, the perfect function of the device, and the receipt/delivery of the specified spare parts. *Traveled hours and kilometers can only be entered after the return of the service engineer.		Date / Signature of Customer Sherin Sagent 3/2/2023	Date / Signature of Service Engineer นส/วิจิตร 3/2/2023
		Work completed?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Services are subject to the General Terms and Conditions of Analytik Jena AG, which will be sent on request.

Mercur

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เอกสารไม่ควบคุม

DMA-80 DIRECT MERCURY ANALYZER System



SITHIPORN ASSOCIATES CO.,LTD.
451-451/1 Sirinthorn Road, Bangbunru, Bangplud, Bangkok 10700 Thailand
Tel. (662) 433-8331, 434-9191 fax: (662) 433-1679, 434-9510

1. VISUAL INSPECTION

	Good	Damaged	Corroded/Dirty
External chassis	✓		
Inside	✓		
Electric parts	✓		
Screws	✓		

2. ELECTRICAL SAFETY TEST

Using a suitable testing device check the below reported parameters and take note of the results.

Parameter	Result	OK	Not OK
Voltage : 230 VAC (±10%)	Actual value : 224 VAC	✓	
Ground : ≤ 2	Actual value: 0,9 VAC	✓	

3. PRESSURE CHECK

	Oxygen (purity O ₂ >99,95%)	Milestone air compressor
Gas carrier	Purity:	✓

The pressure at the supply source manometer should be approx. 4.0bar
The flow rate depends by type of cuvette installed on the DMA-80 unit.

	Correct value	Actual value	Final value	Correct value	Actual value	Final value	Correct value	Actual value	Final value
Inlet pressure	3,1 bar	-	-	3,1 bar	-	-	3,1 bar	3,1 bar	Pass
Flow rate	10-12 l/h	-	-	8-10 l/h	-	-	6-8 l/h	6 l/h	Pass

Check all possible leakage points and their conditions:

	Good	Damaged	Corroded
Tubing	✓		
Silicon joints	✓		
O-rings	✓		
Cuvette sealing O-rings	✓		
Gas connections	✓		
Valves	✓		
Sample boat carrier	✓		
Catalyst flange	✓		

DMA-80 Direct Mercury Analyzer

SERVICE PROTOCOL REPORT

To be filled in before service visit (1st page)

Customer information:

Company:	บ.ยูไนเต็ด แอนาไลซิส จก. (สนง.ใหญ่)
Department:	LAB
Person in charge:	คุณ กุชงค์ พานิชย์เลิศอำไพ
Address:	ซอยอุดมสุข 41 ถนนสุขุมวิท กรุงเทพมหานคร 10260
Tel.:	+66 (86) 3191292
E-mail:	bhuchonk@uaeconsultant.co.th

Technical data:

Unit Serial Number:	11030982		
Terminal type or USB-640 Gateway:	Terminal-640	SN	1012000091
Software, type and revision:	Easy Control	Rev.	
Air Compressor (if present)	-	SN	-
Gas system pump (if present)	-	SN	-
Installation and last maintenance dates:	Inst. on: -	Maint. on:	17-11-66

NOTE: after achievement of the following protocol a filled and signed copy of this report has to be sent to Milestone srl at: service@milestonesrl.com

For the best result of the test below we recommended to use the Milestone DMA-80 Service Kit (PN DMA-SKIT).

4. AUTOSAMPLER SYSTEM

	OK	Not OK	Re-Adjusted
Calibration of autosampler motor	✓		
Cylinders alignment	✓		

	Fast	Slow	Normal
Speed of pneumatic cylinders			✓


Using the maintenance grease, periodically lightly lubricate all exposed steel rods of the horizontal and vertical cylinders.


5. COMPONENTS CHECK

Conditions of the different parts used/installed on DMA unit:

	OK	Not OK	Replaced	Cleaned
Catalyst tube	✓			
Amalgamator	✓			
Quartz boats	✓			
Nickel boats	-			
Autosampler plate	✓			
Gas kit accessories	-			

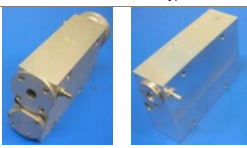

6. TEMPERATURES

	Correct value	Actual value	Final value (Pass)
Drying/ Decomposition furnace	If controlled by Infrared sensor 850°C ± 10°C	-	-
	If controlled by thermocouple 650°C ± 10°C	650	Pass
Catalyst furnace	Type 1  515°C ± 5°C	-	-
	Type 2,3 565°C ± 10°C	565°C	Pass

				
Amalgamator stand by temperature	If controlled by Infrared sensor	170°C ± 10°C	170°C	Pass
	If IR sensor is not present	145°C ± 25°C	-	-
Amalgamator heating temperature	850°C ± 10°C		850°C	Pass
Cuvette	125°C ± 5°C		125°C	Pass

7. SPECTROMETER

The spectrometer can be equipped with a single beam system (ducon lamp) or with a dual beam system (tricon lamp)

	Old cuvette type						Actual cuvette type					
												
	Gain			Offset			Gain			Offset		
	Correct value	Actual value	Final value	Correct value	Actual value	Final value	Correct value	Actual value	Final value	Correct value	Actual value	Final value
Dual-cell system	3,6VDC	-	-	0,015VDC ± 0,005VDC	-	-	3,93VDC	3,9V	Pass	0,015VDC ± 0,005VDC	0,015V	Pass
Tricell system*	-	-	-	-	-	-	3,96VDC	-	-	-	-	-

(*) The recommended Hg lamp operating signal should be around 3,96VDC (for detector 2) and 3,93VDC (for detector 1).

	OK	Not OK
Conditions of the spectrometer system	✓	
Alignment between lamp, cuvette and detector	✓	
Cuvette cleaning (glass windows, sealing O-rings...)	✓	
Lamp intensity	✓	
Operation of the mechanical shutter (if present)	✓	

8. MILESTONE AIR COMPRESSOR (N.A.)

Maintenance	OK	Date last service
Drain (compressor)		
Replacing air filters (air purification module)		
Check sealing connections		

9. PARTS TO BE REPLACED

PN	DESCRIPTION	Replaced	Not Replaced
DMA8133	Catalyst tube: 6 months if the unit runs daily, 1 year if the unit is used rarely. <i>In case of analyse of sample with high organic concentration the lifetime of the catalyst can be less than 6 months.</i>	✓	
DMA8134	Amalgamator: 6 months if the unit runs daily 1 year if the unit is used rarely	✓	
DMA8195A	Hg lamp tri-cell (model 2011): 5 years		✓
DMA8137	Hg lamp dual-cell: 5 years	-	-
70200	Hg trap 1 year		✓
DMA8058/B	Amalgamator coil 6 months/1 year or as soon as the heating is not more homogeneous		✓
DMA8142	Nickel sample boats (set of 40pcs) 2 years if strongly used, replace after 1 year	-	-
DMA8347	Quartz sample boats (set of 10pcs) 2/3 years		✓
DMA8335	Metal sample boat carrier 2 years		✓
SL0108	PU-tube diam. 6/4 mm for internal O ₂ /air supply 2 years		✓
SO0376D	Heating coil for drying/decomposition 2 years		✓

10. TESTING PROCEDURE

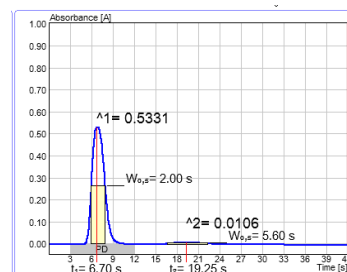
It consists to run some measurements for the evaluation of the analytical performance of the unit, like: absorbance, peaks shape, temperatures, lamp signal and verify the proper working of whole system.

- Run minimum 2 blanks on the same sample boat (quartz if possible) in manner to clean it
- Run blanks until absorbance value (Height) decrease under 0.0030 in cell 1
- Set a fresh and stabilized 100µg/L Hg standard according to the prescriptions reported on the DMA80 User Manual. The quality of the used standard is fundamental for the success of the entire procedure
- Weight approximately 100µg of the fresh 100µg/L – Standard (10ng) and start the analysis as a single measurement mode
- Repeat five times the test
- Run again two blanks measurements

Pos	Sample name	Amount	State	Remarks
1	clean boat	1.0000g		POINT 1-2
2	clean boat	1.0000g		
3	10ng	0.1000g		POINT 4 - 5
4	10ng	0.1000g		
5	10ng	0.1000g		
6	10ng	0.1000g		
7	10ng	0.1000g		POINT 6
8	clean boat	1.0000g		
9	clean boat	1.0000g		

Now, it is possible to evaluate:

- Peaks



- The shape of the peak must be regular.
- The distance between Peak Cell 1 and Peak Cell 2 must be between 11 to 15 seconds.

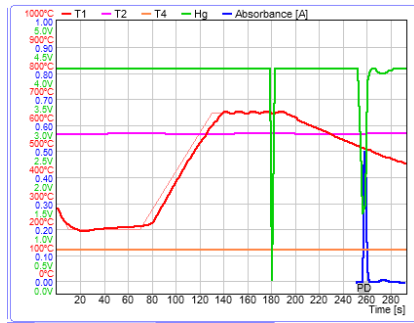
- Results

Pos	Sample name	Amount	State	Height	Hg [ng]	µg/kg	Cal-Factor	Σ
1	Stability10ng		M			100.290	0.92%	
2	Stability10ng	0.1000g	✓	0.4931	9.9095	99.0951	1.0000	Σ
3	Stability10ng	0.1000g	✓	0.4965	9.9934	99.9335	1.0000	Σ
4	Stability10ng	0.1000g	✓	0.4991	10.059	100.597	1.0000	Σ
5	Stability10ng	0.1000g	✓	0.4976	10.022	100.221	1.0000	Σ
6	Stability10ng	0.1000g	✓	0.5031	10.160	101.602	1.0000	Σ

- The obtained absorbance (height) must be > 0.42 in cell 1 for each 100ppb analysis (0.22 with cuvette installed until December 2005, DMA s/n 05120292.)
- The relative standard deviation (rsd) is < 3 %.
- After two blanks (after 10ng measurements), the absorbance is < 0.0030 in cell 1(*).

(*) This condition is valid only in case the unit has: catalyst and amalgamator new, conditioned and never use before, sample boat carrier new and/or perfectly cleaned, catalyst flange new and/or perfectly cleaned, cuvette new and/or perfectly cleaned, tubes, silicon joints and o-rings replaced. Otherwise other blanks (more than 2) might be necessary.

- Temperatures & signal profiles



- The Hg lamp signal must be between 3.8 and 4.5V and stable. A few minutes after the start of the analysis the lamp does switch off because of the zero detection but then it instantly returns to the original condition. In case of Tricell configuration two green colour graphics are reported. After the zero shuttering the time necessary to return to full signal is longer on Tricell compare to Ducon lamp.
- During the run the catalyst oven temperature must be stable around to 565°C or 515°C.
- The drying and ashing furnace must be follow the set temperature method.
- During the run the Amalgamator furnace temperature must be stable at the stand by temperature (170°C or 145°C). Then at the release step it must raise up to 850/900°C.
- The Cuvette temperature must be stable at approximately 125°C.
- The Hg absorbance peaks must be correctly detected and reported.

11. FINAL REPORT

All screws inserted and tightened	✓
All tubing sealing connections checked, cleaned or replaced and tightened	✓
All heating elements are working	✓
Sensors installed, checked and tightened	✓
Safety devices (thermo switch) fully checked	✓
All cooling fans are functioning	✓
Testing procedure successfully passed	✓
Necessary tools available at customer's site	✓
Last revision of User Manual available at customer's site	✓
Advised customer about care and maintenance instructions	✓

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Remarks:

Working hours of Service Engineer

Service Engineer Name	Signature	Date
ชำนาญเฉลิม วิสัยศรี	ชำนาญเฉลิม วิสัยศรี	17-11-2023

Laboratory Manager / Operator
acceptance signature:

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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3000-29 FAX: 0-2719-9484



Cert. No.: 23TM378
Page : 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : IPP 260

Serial No. : V615.0187

ID No. : UAE.MIC.003/2559

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 11 April 2023
Calibration Date : 12 April 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :
Approved Signatory

() Pornthippa Tameyakul
() Malee Butkruea
() Suwit Imjai

Issue Date : 24 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment: Calibration and Testing Services.

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-0155OC-1

Cert. No.: 23TM378
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).
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	34972A	MY49001451	23LM27	25 Feb 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.

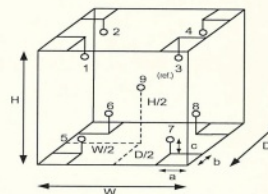
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	26
REL.Humid. (%)	57	61
AC Supply (Volt)	220	220



Probe Installation Details :

a = 5.0 cm
b = 5.0 cm
c = 5.0 cm

Dimension of Chamber :

D = 0.50 m
W = 0.64 m
H = 0.80 m
Capacity = 0.26 m³

Position :	Ref. Std. ID No.:
1	19RTD-2/1
2	19RTD-2/2
3	19RTD-2/3
4	19RTD-2/4
5	19RTD-2/5
6	19RTD-2/6
7	19RTD-2/7
8	19RTD-2/8
9 (ref.)	19RTD-2/9

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-0155OC-1
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 23TM378
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.052	0.53	0.60	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.092	35.148	34.817	35.149	34.894	35.323	34.773	35.058	34.802	0.30

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 temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state 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 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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM729
Page : 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : Memmert
Model : IPP 260
Serial No. : V618.0033
ID No. : UAE.MIC.021/2561
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory (302)
Received Order : 27 April 2023
Calibration Date : 27 April 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Tawatchai Pama
Approved by :
() Pornthippa Tameyakul
(✓) Malee Butkrua
() Suwit Imjai
Issue Date : 11 May 2023

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-0461OC-7
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).

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	34972A	MY57013711	22LM93	02 Jul 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

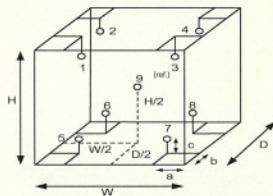
3. This certification is traceable to the International System of Unit.

Result of Calibration : (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	20	21
REL.Humid. (%)	72	77
AC Supply (Volt)	230	231



Probe Installation Details :

Dimension of Chamber :

a = 10 cm	D = 0.50 m
b = 10 cm	W = 0.64 m
c = 10 cm	H = 0.80 m
	Capacity = 0.26 m³

Position :	Ref. Std. ID No.:
1	18-18RTD-01
2	18-18RTD-02
3	18-18RTD-03
4	18-18RTD-04
5	18-18RTD-05
6	18-18RTD-10
7	18-18RTD-07
8	22-18RTD-08
9 (ref.)	18-18RTD-09

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เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-0461OC-7
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 23TM729
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
22.0	22.0	22.0	0.058	0.11	0.19	2
44.0	44.0	44.0	0.066	0.50	0.87	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
22.0	22.009	22.038	21.971	22.005	22.004	22.009	21.941	21.959	22.022	0.30
44.0	44.393	44.447	44.029	44.204	43.899	43.895	43.637	43.923	44.085	0.30

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 temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state 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 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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM1079
Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNB 14
Serial No. : L407.0756
ID No. : UAE.MIC.024/2550
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 10 July 2023
Calibration Date : 10 July 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon
Approved by :
() Pomthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 20 July 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2307-0087OC-6
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 23TM1079
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			Position					
			1	2	3	4	5 (ref.)	
44.5	45.0	45.0	44.428	44.374	44.397	44.378	44.387	0.15
45.0	45.5	45.5	44.933	44.878	44.902	44.877	44.902	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
44.5	0.084	0.040	2
45.0	0.19	0.076	2

Average* : The average of 30 values in each position.

Uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

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.

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 %.

-000-

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2307-0087OC-6
Procedure Used :-

Cert. No.: 23TM1079
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 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	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY59003411	22LM165	TPA	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.

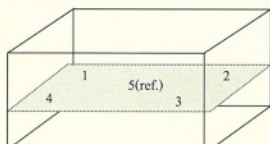
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration : (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	
Beginning of Calibration	25	57	222
Finished of Calibration	25	58	223



Front

Position :	Ref. Std. ID No.:
1	4804539-001
2	4804539-002
3	4804539-003
4	4804539-004
5(ref.)	4804539-005

เอกสารไม่ควบคุม



Certificate of Calibration

Equipment : Balance
Model : PX623
Serial No. (or ID.): C236754745 (UAE.MIC.055/2565)
Manufacturer : Ohaus
Condition : In condition

Certificate No.: C01234158
Issued Date : 08 December 2023
Job No.: WO-00011251
Page : 1 of 3

Customer : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,
Phrakhanong District, Bangkok, THAILAND 10260

Environment Condition : Temperature 25 °C ± 0.5 °C
Humidity 54 %RH ± 1.7 %RH

Calibration Place : United Analyst and Engineering Consultant Co., Ltd. (301 Microbiology Room)
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,
Phrakhanong District, Bangkok, THAILAND 10260

Calibration By : Mr. Adisai Maknoi
Calibration Date : 07 December 2023

The Method used : In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability : This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02222534

(Mr. Adisai Maknoi)
Person in charge

(Mr. Rungrod Jenkitrakulchai)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

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

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

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2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
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CAL-FM-C01-14: 12 Sep 2022

Calibration Results:

Before Adjustment

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

			Nominal Test Value	200	(g)
Reference Points (g)					
A	B	C	D	E	
-	0.000	-0.003	0.000	0.001	

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




Nominal test value (g)	Standard Deviation
50	0.0006
500	0.0008

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

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.0000	1.000	0.000	0.0013	2.10
5	5.0001	5.000	0.000	0.0013	2.10
10	10.0001	10.001	0.001	0.0013	2.10
20	20.0000	20.000	0.000	0.0013	2.09
50	50.0001	50.000	0.000	0.0013	2.09
100	100.0001	100.001	0.001	0.0013	2.09
200	200.0004	200.002	0.002	0.0014	2.07
300	300.0005	300.002	0.002	0.0015	2.05
400	400.0006	400.004	0.003	0.0016	2.03
500	500.0006	500.008	0.007	0.0019	2.02
600	600.0007	600.009	0.008	0.0021	2.01

After Adjustment

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

			Nominal Test Value	200	(g)
Reference Points (g)					
A	B	C	D	E	
-	0.001	-0.002	-0.002	0.001	

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

Nominal test value (g)	Standard Deviation
50	0.0006
500	0.0008

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

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.0000	1.000	0.000	0.0013	2.10
5	5.0001	5.000	0.000	0.0013	2.10
10	10.0001	10.000	0.000	0.0013	2.10
20	20.0000	20.000	0.000	0.0013	2.10
50	50.0001	50.000	0.000	0.0013	2.10
100	100.0001	100.000	0.000	0.0014	2.09
200	200.0004	200.000	0.000	0.0014	2.07
300	300.0005	300.001	0.001	0.0015	2.05
400	400.0006	400.002	0.001	0.0017	2.04
500	500.0006	500.001	0.000	0.0019	2.02
600	600.0007	600.002	0.001	0.0021	2.01

The End of Certificate

Statements of conformity:

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

The error of indication 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, UKAS Lab14. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

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

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

Rungrod

(Mr. Rungrod Jenkitrakulchai)

Authorized signatory

Statements of conformity:

Before Adjustment

Readability: 0.001 g

Nominal Value (g)	Error of indication (g)	Guard band (w) (g)	Tolerance (\pm) (g)	Conformity
1	0.000	0.0013	0.002	Pass
5	0.000	0.0013	0.010	Pass
10	0.001	0.0013	0.020	Pass
20	0.000	0.0013	0.040	Pass
50	0.000	0.0013	0.100	Pass
100	0.001	0.0013	0.200	Pass
200	0.002	0.0014	0.400	Pass
300	0.002	0.0015	0.600	Pass
400	0.003	0.0016	0.800	Pass
500	0.007	0.0019	1.000	Pass
600	0.008	0.0021	1.200	Pass

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

Statements of conformity:

After Adjustment

Readability: 0.001 g

Nominal Value g	Error of indication g	Guard band (w) g	Tolerance (±) g	Conformity
1	0.000	0.0013	0.002	Pass
5	0.000	0.0013	0.010	Pass
10	0.000	0.0013	0.020	Pass
20	0.000	0.0013	0.040	Pass
50	0.000	0.0013	0.100	Pass
100	0.000	0.0014	0.200	Pass
200	0.000	0.0014	0.400	Pass
300	0.001	0.0015	0.600	Pass
400	0.001	0.0017	0.800	Pass
500	0.000	0.0019	1.000	Pass
600	0.001	0.0021	1.200	Pass

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

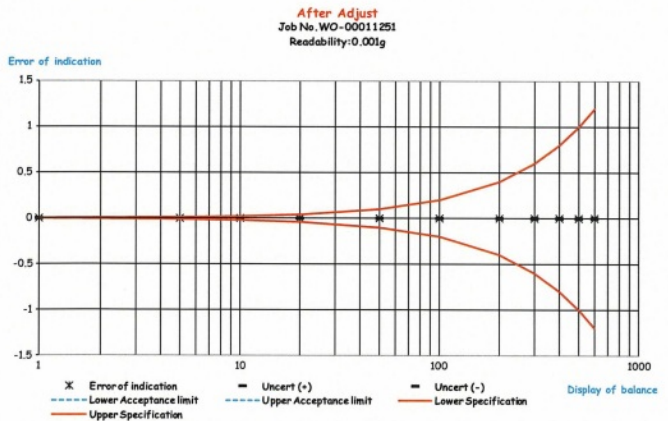
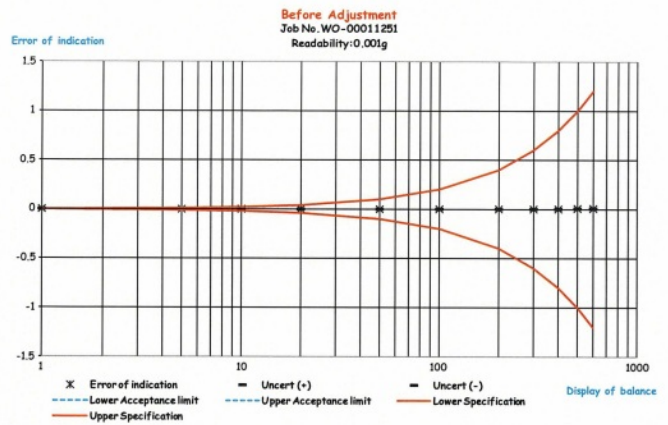
The End of Statements of conformity

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เอกสารไม่ควบคุม

CAL-FM-C01-14: 12 Sep 2022



เอกสารไม่ควบคุม

ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: WO-00011251

ชนิดเครื่องมือ: Balance

รุ่น: PX623

หมายเลขเครื่อง: C236754745

ตรวจสอบ (วัน)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
07 Dec 2023			07 Dec 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระดกกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตอบสนองของไม่กด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานเชิง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและภายใน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Mr. Adisai Maknoi

Service Engineer

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