

คุณภาพตะกอนจากระบบบำบัดน้ำเสีย

บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง

คอนซัลแตนท์ จำกัด

ANALYSIS REPORT

CUSTOMER NAME : 304 INDUSTRIAL PARK 7 PROJECT OF 304 INDUSTRIAL PARK 7 CO., LTD.
ADDRESS : 106 MOO 7, THATOOM, SRIMAHAPHOTE, PRACHINBURI 25140.
CONTACT INFORMATION : TEL : 08 5835 2343 e-mail : pasawee_n@mibholding.com
SAMPLING SOURCE : SLUDGE จากระบบบำบัดน้ำเสีย (ETP2)
SAMPLE TYPE : SLUDGE **RECEIVED DATE** : MAY 15, 2024
SAMPLING DATE : MAY 14, 2024 **ANALYTICAL DATE** : MAY 15-17, 2024
SAMPLING TIME : 09:41 HOUR **ISSUE DATE** : JUNE 13, 2024
SAMPLING METHOD : GRAB **REPORT NO.** : 2024-U050728
SAMPLING BY : MR KRIDSANAPONG NAMTHIP **WORK NO.** : 2023-009004
ANALYZED BY : MISS JINTASUPA PLIANSRI **ANALYSIS NO.** : T24AK176-0001

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT
			SLUDGE จากระบบบำบัดน้ำเสีย (ETP2) T24AK176-0001
pH (1:1)	-	ELECTROMETRIC METHOD (US EPA 2004: 9045D)	7.0 (25°C)
SAMPLE CONDITION			GREY SLUDGE

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SAMPLE TYPE : SLUDGE **RECEIVED DATE** : MAY 15, 2024
SAMPLING DATE : MAY 14, 2024 **ANALYTICAL DATE** : MAY 15 - JUNE 10, 2024
SAMPLING TIME : 09:41 HOUR **ISSUE DATE** : JUNE 13, 2024
SAMPLING METHOD : GRAB **REPORT NO.** : 2024-U050722
SAMPLING BY : MR KRIDSANAPONG NAMTHIP **WORK NO.** : 2023-009004
ANALYZED BY : MISS APHORN ONKONG **ANALYSIS NO.** : T24AK176-0001

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			SLUDGE	
			จากระบบบำบัดน้ำเสีย (ETP2) T24AK176-0001	
TOTAL THRESHOLD LIMIT CONCENTRATION (TTLIC)				
ARSENIC (As)	mg/kg (wet weight)	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996:3050B AND 1992: 7061A)	0.349	< 500
BARIUM (Ba)	mg/kg (wet weight)	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996: 3050B AND 2018: 6010D)	30.0	< 10,000
CADMIUM (Cd)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996: 3050B AND 2007: 7000B)	ND	< 100
HEXAVALENT CHROMIUM (Cr ⁶⁺)	mg/kg (wet weight)	ALKALINE DIGESTION AND COLOURIMETRIC METHOD (U.S.EPA 1996: 3060A AND 1992: 7196A)	ND	< 500
COPPER (Cu)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996: 3050B AND 2007: 7000B)	178	< 2,500
LEAD (Pb)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996: 3050B AND 2007: 7000B)	6.85	< 1,000
MERCURY (Hg)	mg/kg (wet weight)	ACID DIGESTION AND COLD VAPOUR AAS METHOD (U.S. EPA 2007: 7471B)	ND	< 20
NICKEL (Ni)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996:3050 B AND 2007:7000 B)	12.5	< 2,000
SELENIUM (Se)	mg/kg (wet weight)	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996: 3050B AND 1994: 7742)	ND	< 100
SILVER (Ag)	mg/kg (wet weight)	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996: 3050B AND 2018: 6010D)	ND	< 500

Piyapat S.

(MRS PIYAPAT SUTTAMANUTWONG)

LABORATORY SUPERVISOR

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			SLUDGE จากระบบบำบัดน้ำเสีย (ETP2) T24AK176-0001	
ZINC (Zn)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996: 3050B AND 2007: 7000B)	146	< 5,000
CHROMIUM (Cr)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996: 3050B AND 2007: 7000B)	15.6	< 2,500
MANGANESE (Mn)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996: 3050B AND 2007: 7000B)	52.1	-
SAMPLE CONDITION			GREY SLUDGE	

REGULATORY STANDARD : MANAGEMENT OF SOLID WASTE OR UNUSABLE MATERIAL, NOTIFICATION OF THE MINISTRY OF (B.E.2566), APPENDIX 2, ITEM 5.1.


ND : NON-DETECTABLE (CADMIUM < 0.300 mg/kg, HEXAVALENT CHROMIUM < 0.600 mg/kg, MERCURY < 0.100 mg/kg, SELENIUM < 0.100 mg/kg, SILVER < 0.250 mg/kg).

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SAMPLE TYPE : SLUDGE
SAMPLING DATE : MAY 14, 2024
SAMPLING TIME : 09:41 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : MR KRIDSANAPONG NAMTHIP
ANALYZED BY : MISS APHORN ONKONG

RECEIVED DATE : MAY 15, 2024
ANALYTICAL DATE : MAY 15-31, 2024
ISSUE DATE : JUNE 13, 2024
REPORT NO. : 2024-U050723
WORK NO. : 2023-009004
ANALYSIS NO. : T24AK176-0002

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			SLUDGE	
			จากระบบบำบัดน้ำเสีย (ETP2) T24AK176-0002	
SOLUBLE THRESHOLD LIMIT CONCENTRATION (STLC)				
ARSENIC	mg/L As	WASTE EXTRACTION TEST AND HYDRIDE GENERATION AAS METHOD	0.0033	< 5.0
BARIUM	mg/L Ba	WASTE EXTRACTION TEST, NITRIC ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD	1.52	< 100
CADMIUM	mg/L Cd	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	ND	< 1.0
HEXAVALENT CHROMIUM	mg/L Cr ⁶⁺	WASTE EXTRACTION TEST AND COLOURIMETRIC METHOD	ND	< 5
COPPER	mg/L Cu	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	0.007	< 25
LEAD	mg/L Pb	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	ND	< 5.0
MERCURY	mg/L Hg	WASTE EXTRACTION TEST AND COLD VAPOUR AAS METHOD	0.0099	< 0.2
NICKEL	mg/L Ni	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	0.322	< 20
SELENIUM	mg/L Se	WASTE EXTRACTION TEST AND HYDRIDE GENERATION AAS METHOD	ND	< 1.0
SILVER	mg/L Ag	WASTE EXTRACTION TEST, NITRIC ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD	ND	< 5


 (MR BHUCHONK PANICHLERTUMPI)
 LABORATORY SUPERVISOR

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			SLUDGE จากระบบบำบัดน้ำเสีย (ETP2) T24AK176-0002	
ZINC	mg/L Zn	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	0.688	< 250
CHROMIUM	mg/L Cr	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	0.674	< 5
MANGANESE	mg/L Mn	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	4.25	-
SAMPLE CONDITION			GREY SLUDGE	

REGULATORY STANDARD : MANAGEMENT OF SOLID WASTE OR UNUSABLE MATERIAL, NOTIFICATION OF THE MINISTRY OF (B.E.2566), APPENDIX 2, ITEM 5.2.


ND : NON-DETECTABLE (CADMIUM < 0.006 mg/L, HEXAVALENT CHROMIUM < 0.006 mg/L, LEAD < 0.031 mg/L, SELENIUM < 0.0005 mg/L, SILVER < 0.005 mg/L).

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CONTACT INFORMATION : TEL : 08 5835 2343 e-mail : pasawee_n@mibholding.com
SAMPLING SOURCE : SLUDGE จากระบบบำบัดน้ำเสีย (ETP2A)
SAMPLE TYPE : SLUDGE
SAMPLING DATE : MAY 14, 2024
SAMPLING TIME : 09:48 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : MR KRIDSANAPONG NAMTHIP
ANALYZED BY : MISS JINTASUPA PLIANSRI

RECEIVED DATE : MAY 15, 2024
ANALYTICAL DATE : MAY 15-17, 2024
ISSUE DATE : JUNE 13, 2024
REPORT NO. : 2024-U050730
WORK NO. : 2023-009004
ANALYSIS NO. : T24AK176-0003

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT
			SLUDGE จากระบบบำบัดน้ำเสีย (ETP2A) T24AK176-0003
pH (1:1)	-	ELECTROMETRIC METHOD (US EPA 2004: 9045D)	6.6 (25°C)
SAMPLE CONDITION			GREY SLUDGE


(MR BHUCHONK PANICHLERTUMPI)
LABORATORY SUPERVISOR


(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

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SAMPLING SOURCE : SLUDGE จากระบบบำบัดน้ำเสีย (ETP2A)
SAMPLE TYPE : SLUDGE **RECEIVED DATE** : MAY 15, 2024
SAMPLING DATE : MAY 14, 2024 **ANALYTICAL DATE** : MAY 15 - JUNE 10, 2024
SAMPLING TIME : 09:48 HOUR **ISSUE DATE** : JUNE 13, 2024
SAMPLING METHOD : GRAB **REPORT NO.** : 2024-U050725
SAMPLING BY : MR KRIDSANAPONG NAMTHIP **WORK NO.** : 2023-009004
ANALYZED BY : MISS APHORN ONKONG **ANALYSIS NO.** : T24AK176-0003

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			SLUDGE จากระบบบำบัดน้ำเสีย (ETP2A) T24AK176-0003	
TOTAL THRESHOLD LIMIT CONCENTRATION (TTLIC)				
ARSENIC (As)	mg/kg (wet weight)	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996:3050B AND 1992: 7061A)	0.287	< 500
BARIUM (Ba)	mg/kg (wet weight)	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996: 3050B AND 2018: 6010D)	27.6	< 10,000
CADMIUM (Cd)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996: 3050B AND 2007: 7000B)	ND	< 100
HEXAVALENT CHROMIUM (Cr ⁶⁺)	mg/kg (wet weight)	ALKALINE DIGESTION AND COLOURIMETRIC METHOD (U.S.EPA 1996: 3060A AND 1992: 7196A)	ND	< 500
COPPER (Cu)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996: 3050B AND 2007: 7000B)	190	< 2,500
LEAD (Pb)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996: 3050B AND 2007: 7000B)	5.61	< 1,000
MERCURY (Hg)	mg/kg (wet weight)	ACID DIGESTION AND COLD VAPOUR AAS METHOD (U.S. EPA 2007: 7471B)	ND	< 20
NICKEL (Ni)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996:3050 B AND 2007:7000 B)	14.8	< 2,000
SELENIUM (Se)	mg/kg (wet weight)	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996: 3050B AND 1994: 7742)	ND	< 100
SILVER (Ag)	mg/kg (wet weight)	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996: 3050B AND 2018: 6010D)	ND	< 500

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			SLUDGE จากระบบบำบัดน้ำเสีย (ETP2A) T24AK176-0003	
ZINC (Zn)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996: 3050B AND 2007: 7000B)	170	< 5,000
CHROMIUM (Cr)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996: 3050B AND 2007: 7000B)	19.1	< 2,500
MANGANESE (Mn)	mg/kg (wet weight)	ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD (U.S.EPA 1996: 3050B AND 2007: 7000B)	54.8	-
SAMPLE CONDITION			GREY SLUDGE	

REGULATORY STANDARD : MANAGEMENT OF SOLID WASTE OR UNUSABLE MATERIAL, NOTIFICATION OF THE MINISTRY OF (B.E.2566),
 APPENDIX 2, ITEM 5.1.
 ND : NON-DETECTABLE (CADMIUM < 0.300 mg/kg, HEXAVALENT CHROMIUM < 0.600 mg/kg, MERCURY < 0.100 mg/kg,
 SELENIUM < 0.100 mg/kg, SILVER < 0.250 mg/kg).

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SAMPLING TIME : 09:48 HOUR **ISSUE DATE** : JUNE 13, 2024
SAMPLING METHOD : GRAB **REPORT NO.** : 2024-U050726
SAMPLING BY : MR KRIDSANAPONG NAMTHIP **WORK NO.** : 2023-009004
ANALYZED BY : MISS APHORN ONKONG **ANALYSIS NO.** : T24AK176-0004

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			SLUDGE จากระบบบำบัดน้ำเสีย (ETP2A) T24AK176-0004	
SOLUBLE THRESHOLD LIMIT CONCENTRATION (STLC)				
ARSENIC	mg/L As	WASTE EXTRACTION TEST AND HYDRIDE GENERATION AAS METHOD	0.0025	< 5.0
BARIUM	mg/L Ba	WASTE EXTRACTION TEST, NITRIC ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD	1.39	< 100
CADMIUM	mg/L Cd	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	ND	< 1.0
HEXAVALENT CHROMIUM	mg/L Cr ⁶⁺	WASTE EXTRACTION TEST AND COLOURIMETRIC METHOD	ND	< 5
COPPER	mg/L Cu	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	0.007	< 25
LEAD	mg/L Pb	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	ND	< 5.0
MERCURY	mg/L Hg	WASTE EXTRACTION TEST AND COLD VAPOUR AAS METHOD	ND	< 0.2
NICKEL	mg/L Ni	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	0.347	< 20
SELENIUM	mg/L Se	WASTE EXTRACTION TEST AND HYDRIDE GENERATION AAS METHOD	ND	< 1.0
SILVER	mg/L Ag	WASTE EXTRACTION TEST, NITRIC ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD	ND	< 5

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			SLUDGE จากระบบบำบัดน้ำเสีย (ETP2A) T24AK176-0004	
ZINC	mg/L Zn	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	0.437	< 250
CHROMIUM	mg/L Cr	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	0.930	< 5
MANGANESE	mg/L Mn	WASTE EXTRACTION TEST, NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD	4.49	-
SAMPLE CONDITION			GREY SLUDGE	

REGULATORY STANDARD : MANAGEMENT OF SOLID WASTE OR UNUSABLE MATERIAL, NOTIFICATION OF THE MINISTRY OF (B.E.2566), APPENDIX 2, ITEM 5.2.
 ND : NON-DETECTABLE (CADMIUM < 0.006 mg/L, HEXAVALENT CHROMIUM < 0.006 mg/L, LEAD < 0.031 mg/L, MERCURY < 0.0005 mg/L, SELENIUM < 0.0005 mg/L, SILVER < 0.005 mg/L).

(MR BHUCHONK PANICHLERTUMPI)
 LABORATORY SUPERVISOR

เอกสารแนบ ง
เอกสารสอบเทียบเครื่องมือ

บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง
คอนซัลแตนท์ จำกัด

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Atomic Absorption Spectrometer	IRON	Agilent Technologies	AA240FS / MY13160001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	24 Jan 24	23 Jan 25
2	Mercury Analyzer	MERCURY	NIC. Japan	RA-4500 / 17780278	Coax Group Corporation Ltd.	Preventive Maintenance Report	11 Jul 23	10 Jul 24
3	Inductively Coupled Plasma- Optical Emission Spectrometer(ICP-OES)	ALUMINIUM	Agilent Technologies, USA	5110 VDV(G8015AA) / MY803001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	13 Nov 23	12 Nov 24
4	UV-VIS Spectrophotometer	AMMONIA-NITROGEN	Hitachi	U-1900 / 2021-064	DQE Services Co.,Ltd.	SP24-008	16 Jan 24	15 Jan 25
5	UV-VIS Spectrophotometer	NITRATE NITROGEN	Hitachi	U-2900 / 21E22-009	DQE Services Co.,Ltd.	SP24-001	4 Jan 24	3 Jan 25
6	Turbidity Meter (Portable)	TURBIDITY (NTU)	Oakton Instruments(China)	T100IR / 1120501017	Technology Promotion Association (Thailand-Japan)	23CH1148	15 Sep 23	13 Sep 24

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Atomic Absorption Spectrometer	COPPER IRON	Agilent Technologies	AA240FS / MY13160001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	24 Jan 24	23 Jan 25
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XSR205DU / C210685394	National Food Institute,Ministry of Industry, Thailand	2402283-002-01	2 Apr 24	1 Apr 25
3	Continuous Flow Analyzer(CFA)	CYANIDE	Skalar Analytical B.V., the Netherlands	San++5000-02 / 182688	DKSH (Thailand) Ltd.	Service Report/Test Report WO-00018067	20 Feb 24	19 Feb 25
4	Mercury Analyzer	MERCURY	NIC. Japan	RA-4500 / 17780278	Coax Group Corporation Ltd.	Preventive Maintenance Report	11 Jul 23	10 Jul 24
5	Hot Air Oven	TOTAL DISSOLVED SOLIDS	Memmert	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	24TM589	1 Apr 24	31 Mar 25
6	UV-VIS Spectrophotometer	FLUORIDE NITRATE SULPHATE	Hitachi	U-2900 / 21E22-009	DQE Services Co.,Ltd.	SP24-001	4 Jan 24	3 Jan 25
7	Turbidity Meter (Portable)	TURBIDITY (NTU)	Oakton Instruments(China)	T100IR / 1120501017	Technology Promotion Association (Thailand-Japan)	23CH1148	15 Sep 23	13 Sep 24

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Atomic Absorption Spectrometer	ARSENIC CADMIUM CHROMIUM COPPER LEAD MANGANESE MERCURY NICKEL SELENIUM ZINC	Agilent Technologies	AA240FS / MY13160001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	24 Jan 24	23 Jan 25
2	Inductively Coupled Plasma- Optical Emission Spectrometer(ICP-OES)	BARIUM SILVER	Agilent Technologies, USA	5110 VDV(G8015AA) / MY803001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	13 Nov 23	12 Nov 24

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.



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

Certificate of Calibration

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 Sirdhean
Approved by :
() Saithip Meangmai
(✓) Warakorn Lernagatrakul
() 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.

เอกสารไม่ควบคุม

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 %.

-o0o-

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a 1179917



Agilent 55 240 280 Series Atomic Absorption Spectroscopy Systems

Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical systems 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 installation.

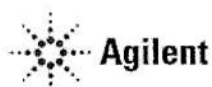
Note: While non-current production AA instrument and or accessory models are not covered specifically in this document it can be used as a basic reference.

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

Introduction

Customer Information

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



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Instrument Preventive Maintenance Checklist

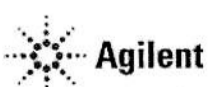
Important Customer Web Links

- For more information about Agilent Technologies services, please visit our website using the following URL: <http://www.agilent.com/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.
- Confirm the ability of the instrument to deliver continued safe operation as established via the Agilent AA safe operation flow chart. (Refer directly to the AA 55/240/280 Preventive Maintenance Scope of Work to make this decision.)
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

This information is subject to change without notice.



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Instrument Maintenance

System Information

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

Instrument System Name and ID	
Instrument System Site and Location	UNITED ANALYST AND ENGINEERING consultant. / 2nd Lab FI

List System Component Product Numbers	List the Serial Numbers of each Component
1. G 8432 A	117 1316 0001
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

Preparation, Safe operation and Initial performance checks

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Preventive Maintenance Procedures

FLAME SYSTEM section

- ☐ Section not applicable

Electronic components

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

Mechanical components

- ☒ Check the burner adjuster controls for complete and free movement. If the burner adjuster needs lubrication, use Molykote 321 or mineral-based molybdenum disulphide grease.
☒ Run SVD tests to exercise all motor drives over the full range of their travel:
☒ Monochromator drive
☒ Slit drive
☒ Lamp selector
☐ ABA N/A

Optics components

- ☒ Check that external optical surfaces are clean – Clean or replace as required.
☒ Use SVD and perform **Mono Wavelength Correction**.
☒ Use SVD and perform **Slit Calibration**.
☒ Use SVD and perform **Grating Squareness Diagnostic**.
☒ Use SVD and perform **Zero Order Offset/Mono Correction**.
☒ Use SVD and perform **Wavelength Repeatability**.
☒ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.
☒ Check that the signal energy of the D2 and HC lamps track properly. Advise customer if their D2 lamp is showing emission degradation due to age.

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Sample Introduction and Atomization

- ☒ Inspect the burner interlock plate to ensure that the interlock pin is secure and correct for the burner type.
☒ Clean the burner slot with a clean white card.
☒ Check the uniformity of the slot width.
☒ Clean the burner if required.
☒ Change the burner o-ring.
☒ Clean the nebulizer, spray chamber and liquid trap.
☒ Change all o-rings and seals in the nebulizer, nebulizer block and spray chamber.
☒ Check that the pressure relief bung releases readily.
☒ Change o-rings on the fuel and oxidant delivery bars
☒ Leave the liquid trap EMPTY and verify the flame will not ignite in this state.
☒ Refill liquid trap and check that overflow drains freely into the drain/waste tube.
☒ Check the drain/waste tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel
☒ Check and clean the igniter electrode

Gas handling components and safety interlocks

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

Analytical performance for Flame systems

- ☒ Ignite a flame.
☒ Check that you can adjust the nebulizer uptake rate from 4 to 6.5 mL per minute.
☒ Optimize the instrument ready to perform Cu sensitivity test.
☒ Create a manual method to perform a Basic Cu ABS test - "Final Performance Testing"
☒ Run a PM completed sensitivity test for a 5 ppm copper sample and record the results in the AA PM Performance test results and measurements table.

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FURNACE SYSTEM section

- ☒ Section not applicable

Electronic components

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

Mechanical components

- ☐ Run SVD tests to exercise all motor drives over the full range of their travel:
☐ Monochromator drive
☐ Slit drive
☐ Lamp selector

Optics components

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

Gas handling, water system and workhead component checks

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

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- ☐ Tube
- ☐ Electrodes
- ☐ Shroud

- ☐ Check and clean the end windows on the workhead.
- ☐ Check safety interlock operation.

Analytical performance for Furnace systems

- ☐ Optimize the instrument ready to perform Cu sensitivity test.
- ☐ Run the sensitivity test for a 25 ppb copper sample and record the results in the results table.

PSD autosampler accessory for Furnace systems

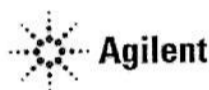
- ☒ Section NOT Applicable
- ☐ Check condition of the PSD capillary – replace if necessary
- ☐ Check condition and operation of PSD syringe – ensure it does not have air locks and bubbles.
- ☐ Change PSD rinse bottle o-ring.
- ☐ Check and clean the rinse vessel.
- ☐ Check the drain tube for good drainage.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

Sample introduction pump system (SIPS) accessory

- ☒ Section NOT Applicable
- ☐ Re-torque screws securing the hubs, presser arms and pump rotors.
- ☐ Adjust each roller so that it rotates freely.
- ☐ Wipe clean the pump rotor rollers and pump bands with a dry clean cloth.
- ☐ Ensure that the presser arms and the surfaces near the pump are free from dirt and spills.
- ☐ Remove the pump module rear cover and check for the incursion of liquids and any signs of corrosion.
- ☐ Re-torque the nuts that fasten the motor mounting plates to the chassis.
- ☐ Check clips securing the diluents holder and replace if necessary.
- ☐ Disconnect, clean T-piece, and reassemble the tubing using the following steps.

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- ☐ Remove the T-piece by disconnecting the pump tubes, the pump bands and all other tubing.
- ☐ Place the T-piece in an ultrasonic bath containing strong detergent 1-5% Decon 30 or similar, for approximately 5-10 minutes.
- ☐ Wash the T-piece under a tap with a strong flow of water.
- ☐ Rinse with distilled water through all of the inlets in the reverse direction to normal sample flow.
- ☐ Reassemble.

Sample preparation system (SPS 4) accessory

- ☒ Section NOT Applicable

The Agilent SPS 4 autosampler is designed to need minimal maintenance.

The following maintenance requirements are suggested to maintain the performance of the autosampler.

- ☐ Cleaning the spill tray, rack location mat, end frames and chassis accessories with a damp soft cloth and diluted mild detergent.
- ☐ Cleaning the autosampler cover panels with domestic window cleaner.
- ☐ Checking the X- axis and Z- axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes..
- ☐ Check the X- axis, Theta- axis and Z- axis FFC cables for cracks, incorrect positioning, damaged edge or damaged connectors.

NOTE: The autosampler requires no extra lubrication throughout its lifetime.

For further details refer to the SPS 4 service manual G8410-90050.

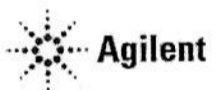
Sample preparation system (SPS 3) accessory

- ☒ Section NOT Applicable

- ☐ Check the x-axis and z-axis timing belts – Replace if there is are any cracks, splits or color deterioration and belt tension.
- ☐ Check belt tensions - adjust if required
- ☐ Check the lubrication pad for single x-axis shaft. If pad is dry or customer has observed any vibration or erratic movements of the x-axis carriage, add 1 mL of Dow Corning 200 ® Fluid, 200 CS into the well.
- ☐ Check the auto-sampler ability to find tube positions - Calibrate if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

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Vapor generation accessory VGA (hydride generator)

- ☒ Section NOT Applicable
- ☐ Inspect VGA gas supply hose.
- ☐ Inspect/replace VGA pump tubing.
- ☐ Check low gas pressure interlock setting– adjust if required.
- ☐ Check precision orifice gas flow setting – adjust if required.
- ☐ Check gas regulator pressure to 46 psi (325 kPa) – adjust if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

UltrAA lamp accessory (external)

- ☒ Section NOT Applicable
- ☐ Check the condition of the power cable.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

Restore System

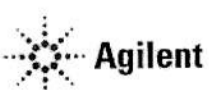
- ☒ If you have altered the customer's instrumentation during the course of PM, restore to the original status to allow the customer to conduct their normal activities (e.g., reload the customer's method.)

Guidance

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

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Signature Page

Service Review

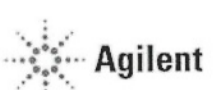
- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the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

Test Results

Test Description		
Flame optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	44 %
Flame performance test with 5 ppm copper sample		
Air /acetylene, mixing paddle removed	Abs value > 0.5	0.7401 Abs
Air /acetylene, mixing paddle installed. 10 replicates	%RSD < 1.0	0.5 % RSD
Deuterium furnace optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	N/A
Deuterium furnace performance test with 25 ppb copper sample (324.8 nm)		
Precision %RSD	≤ 4.0%	N/A
Abs value	≥ 0.15	N/A
Zeeman furnace analytical performance: 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0%	N/A
Abs value	≥ 0.10	N/A
MSR%	≥70 %	N/A

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AA consumable and parts list table

Part Description		Product/Model # where used	PM supplied or Consumable	Instrument-Type
Test Solution – Cu 5ppm solution	6610030100	50 55 140 240 280	PM supplied	Common
Test Solution - Blank solution	5190-7001	50 55 140 240 280	PM supplied	Common
Copper, 1000 ug/ml, 100ml	5190-8279	50 55 140 240 280	*	Common
Kit, Mk 7 O-rings, aqueous, complete set	9910093400	50 55 140 240 280	PM supplied	Flame
Organic Kit	9910093500	50 55 140 240 280	PM supplied	Flame
Wire Nebulizer Cleaning	9910024700	50 55 140 240 280	consumable	Flame
Tubing-Capillary Std Nebs	9910024800	50 55 140 240 280	consumable	Flame
Capillary Tube Hivac Neb (3) (organics only)	9910044000	50 55 140 240 280	consumable	Flame
Glass impact beads (5/pk)	9910025700	50 55 140 240 280	consumable	Flame
Teflon impact beads (5/pk): (organics only)	9910053300	50 55 140 240 280	consumable	Flame
Burner cleaning strip (100/pk)	9910053900	50 55 140 240 280	consumable	Flame
Window UV silica – round (right side)	2010082600	50 55 140 240 280	PM supplied	Common
Window UV silica – rectangular (left side)	2010082500	50 55 140 240 280	PM supplied	Common
Pad adhesive window (round)	4910012700	50 55 140 240 280	PM supplied	Common
Pad adhesive window (rectangular)	4910012800	50 55 140 240 280	PM supplied	Common
Electrode kit (1 pr) (D2)	6310003400	GTA120	PM supplied	Furnace
Shroud (D2)	6310003100	GTA120	PM supplied	Furnace
Zeeman electrode kit (1 pr)	6310003500	GTA120	PM supplied	Furnace
Zeeman shroud	6310003600	GTA120	PM supplied	Furnace
O-ring PSD rinse bottle	6910025900	PSD120	PM supplied	Furnace

* For engineers who only service AA instruments 5190-8279 can be used as a cheaper alternative for 6610030100.

Items classified as PM supplied in the above table are included in the standard PM
Those classified as consumable should be provided by the customer or charged to the customer if supplied by the Agilent service engineer.

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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

Service r

Agilent s

Total nu

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SVD Results Report



Report ID: 1	Diagnostic Start Time: 1/24/2024 9:41:23 AM	Diagnostic End Time: 1/24/2024 10:10:55 AM
Customer:	Service Engineer: Worawit T.	
Address:	Contact Details:	

Instrument Configuration

Configuration:

Serial Number: MY13160001	Turret Type: Automatic
Instrument Model: Varian AA140/240/280	Number Of Lamps: 4
Flame Instrument: True	Mono Type: Automatic
Furnace Instrument: True	Gasbox Type: 'Y' Gas Box
Zeeman Present: False	Auto Burner Adjuster: False
Internal Zeeman: False	Mains Frequency: 50
Internal UltrAA: False	Firmware Version: 2.11
Optics Type: Double Beam	Photomultiplier Type: Normal(900nm)
D2 BG Correction Fitted: True	PWB Version: 45
Boot Block Version: 1.09	

EEPROM Data:

Instrument Run Hours: 62609.832	D2 Run Hours: 49136.000
Zero Wavelength Offset: 30.148	D2 Serial Number: not set !
Mono Correction: 0.765	D2 Install Date: 1/1/1970
Flame Hours: 29802.416	D2 Original Intensity: 1.000
	D2 Last Intensity: 475.000

Frequency:

Averaging Period: 30.0	
Datapoint Count: 20	
Upper Limit: 51.00	Highest Measured Frequency: 50.00
Average Frequency: 50.00	
Lower Limit: 49.00	Lowest Measured Frequency: 50.00
Result: Passed	

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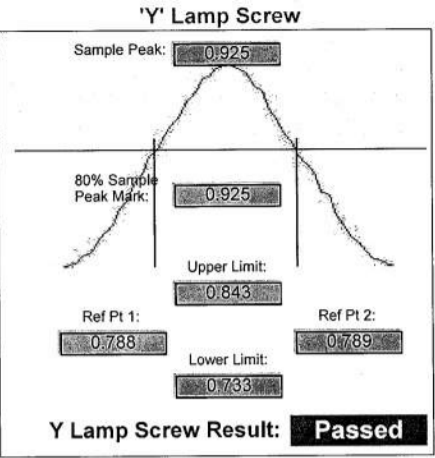
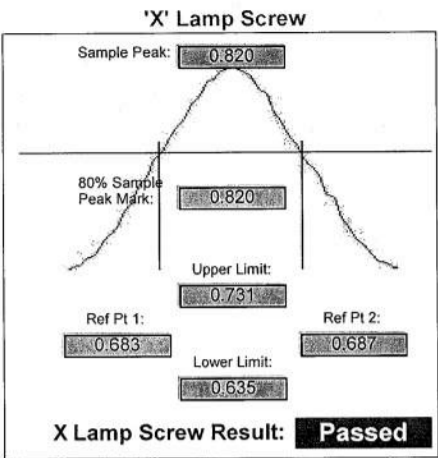
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Optics

Beam Balance:

Lamp Type: Copper
Lamp Socket Used: 3

Peak Selected: 324.80
Lamp Alignment: Performed



Grating Squareness:

Lamp Element(s): Copper
Lamp Turret Position: 3
Lamp Current(mA): 4.00
Slit Width(nm): 0.5
1st Order Wavelength(nm): 324.80
Lamp Alignment: Performed

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.10	0.00	0.10	Passed
First Order	324.45	324.75	325.15	Passed
Second Order	649.23	649.52	649.97	Passed

Mechanical

Wavelength Drive:

Passed

Slit Drive:

Passed

Turret Drive:

Passed

Auto Burner Adjuster Drive:

Untested

Miscellaneous

Signal Processing Linearity:

Calculate Mode: New Calc Mode

	Lower Limit	Actual	Upper Limit	Result:
S0	114	261	297	Passed
S1	156	165	191	Passed
S2	271	296	332	Passed
S3	474	507	579	Passed
S4	825	918	1008	Passed
S5	1435	1528	1754	Passed
S6	2498	2769	3053	Passed
S7	4347	4752	5313	Passed

Interlocks:

Burner Fitted: Working
N2O Burner Fitted: Untested
Flame Shield Closed: Working
Gas Control Fitted: Untested
Pressure Release Bung Fitted: Working
Liquid Trap Fitted: Working
Flame Detect: Working
GCU Active: Working
Oxidant Pressure: Working
Oxidant Changeover: Untested
Ignition: Working

Wavelength Repeatability:

Lamp Used: Copper
Peak Used(nm): 324.750
Connected to Socket: 3
Lamp Current(mA): 4
Slit Width(nm): 0.2
Slit Height: Normal

Lamp Alignment: Performed

Lower Limit(nm) 324.768 324.888 Upper Limit(nm)

(Approach from Zero Order) (Approach from end)
Sample 1: 324.828 Sample 2: 324.828
Sample 3: 324.828 Sample 4: 324.823
Sample 5: 324.823 Sample 6: 324.823
Sample 7: 324.823 Sample 8: 324.823
Sample 9: 324.823 Sample 10: 324.823

Mean: 324.825 Standard Deviation: 0.002

Result: Passed

Auto Lamp Recognition:

Lamp 1: Uncoded Lamp/Not Connected
Lamp 2: 87 - Silver/Cadmium/Lead/Zinc(UltraA) (Ag/CLamp 6: INot Supported
Lamp 3: 14 - Copper (Cu)
Lamp 4: Uncoded Lamp/Not Connected
Lamp 5: Not Supported
Lamp 7: Not Supported
Lamp 8: Not Supported

Result: Passed

GTA Temperature Monitoring:

Not Performed

Notes:

PM 24 Jan 2024

Signatures:

[Redacted Signature Area]

Sequential by time report

1/24/2024 11:46 AM

SpectrAA

Analyst

Date Started

Worksheet

Comment

Methods

Computer name

Serial Number:

1/24/2024 11:39 AM GMT: 1/24/2024 4:39 AM

Cu 5 PPM Sense check

Cu

DESKTOP-R9UIFRS

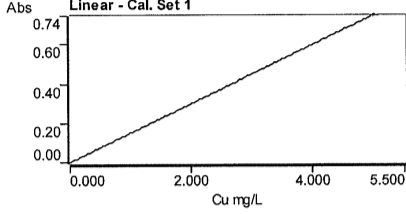
MY13160001

Method: Cu (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs
CAL ZERO	0.000	55.0	0.0003
	Readings		
	0.0002	0.0002	0.0004
			1/24/2024
STANDARD 1	5.000	1.7	0.7419
	Readings		
	0.7274	0.7515	0.7468
			1/24/2024

Abs

Linear - Cal. Set 1



Curve Fit

Characteristic Conc

r

Calculated Conc

Residuals

= Linear

= 0.028 mg/L

= 1.0000

= 0.000 5.000

= 0.000 0.000

Abs = 0.14833 x C + 0.00026

Sample 001	4.988	0.7	0.7401
	Readings		
	0.7454	0.7399	0.7349
			1/24/2024

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Sequential by time report

1/24/2024 11:50 AM

SpectrAA

Analyst

Date Started

Worksheet

Comment

Methods

Computer name

Serial Number:

1/24/2024 11:47 AM GMT: 1/24/2024 4:47 AM

Cu 5 PPM Precision

Cu

DESKTOP-R9UIFRS

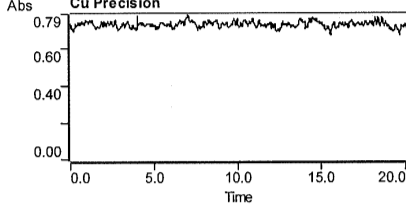
MY13160001

Method: Cu (Flame)

Sample ID	Exp Abs	%RSD	Mean Abs
Cu Precision	0.723	0.5	0.7232
	Readings		
	0.7221	0.7195	0.7226
			0.7283
			0.7278
			0.7260
	0.7201	0.7213	0.7266
			0.7174
			1/24/2024

Abs

Cu Precision



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UNITED ANALYST AND ENGINEERING CONSULTANT COMPANY Ltd.

Automatic Mercury Analyzer

Model RA-4500

Preventive Maintenance Report

Serial No.	13700070
Soft version	
ROM version	
Date	
PM by	
Approved by	



Coax Group Corporation Ltd.

1131/62,64,325-331 Nakornchaisri road,

Kwang ThanonNakornchaisri, Dusit, Bangkok 10300 Thailand

Tel. 02-2435263, 02-6682436 Fax. 02-2437386

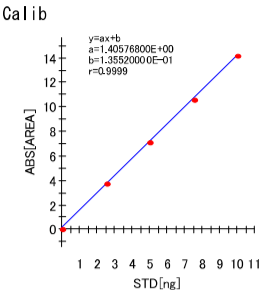
เอกสารไม่ควบคุม

Inspection result

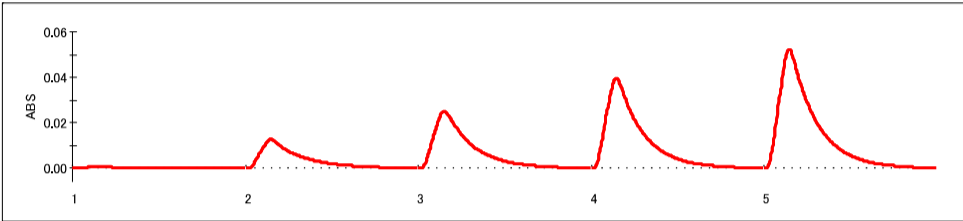
ITEM	STANDARD	RESULT	JUDGE
1. Self Check	1.1 Heating	PASS	OK
	1.2 Cooling	PASS	OK
	1.3 Leak	PASS	OK
	1.4 Optical system	PASS	OK
	1.5 Drift	PASS	OK
2. Analytical curve inspection(AREA)	2.1 No Pretreatment (Low Conc.)	Correlation coefficient (r) ≥ 0.9990	1.0000 OK
3. Repeatability(AREA)	3.1 No Pretreatment 100ppb, n=5	1. 99.12 ppb 2. 101.48 ppb 3. 101.24 ppb 4. 102.34 ppb 5. 101.92 ppb C.V. ≤ 5%	1.23% OK
4. Blank	Below 1.0 (AREA)	0.2062	OK

เอกสารไม่ควบคุม

Title : Preventive Maintenance RA-4500 sn:17780278
Date : 7/11/2023
Name : Coax Group
Memo : Calibration Curve 0-10ng



STD	No.	STD [ppb]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	Dev [%]	Note
	1	100.000	0.000	5.000	5.000	0.000	0.0859	-0.0353	-	
	2	100.000	0.025	5.000	5.000	2.500	3.7687	2.5845	3.4	
	3	100.000	0.050	5.000	5.000	5.000	7.1028	4.9562	0.9	
	4	100.000	0.075	5.000	5.000	7.500	10.6441	7.4753	0.3	
	5	100.000	0.100	5.000	5.000	10.000	14.2203	10.0193	0.2	



SMP	No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Note
	1	hg 100 ppb	0.050	5.000	5.000	7.1027	4.9561	99.122	
	2	hg 100 ppb	0.050	5.000	5.000	7.2687	5.0742	101.484	
	3	hg 100 ppb	0.050	5.000	5.000	7.2514	5.0619	101.238	
	4	hg 100 ppb	0.050	5.000	5.000	7.3285	5.1168	102.336	
	5	hg 100 ppb	0.050	5.000	5.000	7.2996	5.0962	101.924	

Statistics	No.	NAME	TRY	AV [ug/L]	SD [ug/L]	Cv [%]
	1	hg 100 ppb	5	101.2208	1.246264	1.23

เอกสารไม่ควบคุม

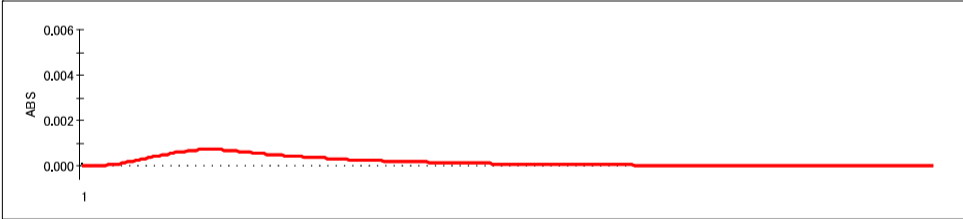


เอกสารไม่ควบคุม



Title : Preventive Maintenance RA-4500 sn:17780278
Date : 7/11/2023
Name : Coax Group
Memo : Blank

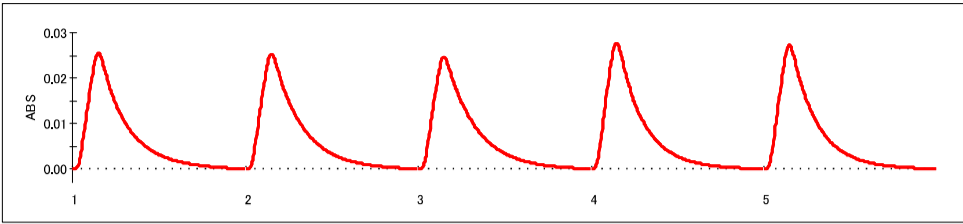
SMP	No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Note
	1	Blank				0.2062	0.0503		



เอกสารไม่ควบคุม



เอกสารไม่ควบคุม



Self Check

Heat check:PASS!! (24.9degC[05:00] -> 28.9degC[02:31])
Sensor check:PASS!! (78- 18= 60)
Leak check:PASS!! (0.17L/min)
Sig/Ref check:PASS!! (Sig:3.73V, Ref:3.94V)
Drift check:PASS!! (-0.0027882 - -0.0032876 = 0.0004993)



REPORT OF CALIBRATION

Certificate No. : SP24-001

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °CRelative 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	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

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 : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021



REPORT OF CALIBRATION

Certificate No. : SP24-001

Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.575	0.0030	0.0031	2.00
	1.0484	1.045	0.0034	0.0029	2.00
	2.1876	2.192	-0.0044	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.558	0.0015	0.0034	2.00
	1.0239	1.023	0.0009	0.0035	2.00
	2.1230	2.125	-0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.520	0.0030	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.975	0.0003	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.516	0.0021	0.0031	2.00
	1.0002	0.997	0.0032	0.0033	2.00
	1.9973	1.993	0.0043	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.550	0.0017	0.0030	2.00
	1.0803	1.079	0.0013	0.0030	2.00
	2.0373	2.032	0.0053	0.0080	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.558	0.0011	0.0031	2.00
	1.0518	1.050	0.0018	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021



REPORT OF CALIBRATION

Certificate No. : SP24-001

Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7469	0.743	0.0039	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.862	0.0054	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.289	0.0029	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.641	0.0020	0.0055	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021



REPORT OF CALIBRATION

Certificate No. : SP24-001

Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.72	241.2	0.52	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.4	0.41	0.18	2.00
334.06	333.8	0.26	0.18	2.00
360.93	360.6	0.33	0.18	2.00
418.59	418.4	0.19	0.18	2.00
445.94	445.8	0.14	0.18	2.00
453.66	453.4	0.26	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.4	0.19	0.18	2.00
637.98	638.0	-0.02	0.18	2.00
431.38	431.2	0.18	0.18	2.00
472.50	472.5	0.00	0.18	2.00
513.47	513.4	0.07	0.18	2.00
528.88	528.9	-0.02	0.18	2.00
573.17	573.4	-0.23	0.18	2.00
585.35	585.2	0.15	0.20	2.00
684.40	684.4	0.00	0.18	2.00
740.72	741.0	-0.28	0.20	2.00
748.55	748.8	-0.25	0.18	2.00
807.03	807.1	-0.07	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 -

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQEServices

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-TISI-TIS 17025
CALIBRATION 0404

CERTIFICATE OF CALIBRATION

Certificate No. : SP24-008Page 1 of 5

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

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Banchak, 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 : 16 January 2024

Calibration Date : 16 January 2024

Issue Date : 19 January 2024

Calibration

Approved by :
(M)

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.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQEServices

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-TISI-TIS 17025
CALIBRATION 0404

REPORT OF CALIBRATION

Certificate No. : SP24-008Page 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	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

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.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQEServices

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32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
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NSC-TISI-TIS 17025
CALIBRATION 0404

REPORT OF CALIBRATION

Certificate No. : SP24-008Page 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
	0.5780	0.575	0.0030	0.0031	2.00
	1.0484	1.046	0.0024	0.0029	2.00
	2.1876	2.186	0.0016	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.558	0.0015	0.0034	2.00
	1.0239	1.024	-0.0001	0.0035	2.00
	2.1230	2.121	0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.520	0.0030	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.975	0.0003	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.516	0.0021	0.0031	2.00
	1.0002	0.999	0.0012	0.0033	2.00
	1.9973	1.994	0.0033	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.550	0.0017	0.0030	2.00
	1.0803	1.080	0.0003	0.0030	2.00
	2.0373	2.032	0.0053	0.0080	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.558	0.0011	0.0031	2.00
	1.0518	1.051	0.0008	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

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NSC-TISI-TIS 17025
CALIBRATION 0404

REPORT OF CALIBRATION

Certificate No. : SP24-008Page 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
	0.7469	0.748	-0.0011	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.865	0.0024	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.293	-0.0011	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.641	0.0020	0.0055	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

REPORT OF CALIBRATION

Certificate No. : SP24-008

Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.54	241.1	0.44	0.18	2.00
279.40	278.9	0.50	0.18	2.00
288.70	288.0	0.70	0.18	2.00
334.22	333.8	0.42	0.18	2.00
361.26	360.8	0.46	0.18	2.00
418.48	418.2	0.28	0.18	2.00
446.70	446.0	0.70	0.18	2.00
453.20	453.1	0.10	0.18	2.00
460.06	459.6	0.46	0.18	2.00
536.90	536.4	0.50	0.18	2.00
637.94	637.6	0.34	0.18	2.00
440.74	440.1	0.64	0.18	2.00
472.22	472.0	0.22	0.18	2.00
513.70	513.5	0.20	0.18	2.00
528.72	528.2	0.52	0.18	2.00
574.60	574.3	0.30	0.18	2.00
585.48	585.0	0.48	0.20	2.00
684.63	684.2	0.43	0.18	2.00
740.27	740.0	0.27	0.20	2.00
748.28	747.8	0.48	0.18	2.00
807.16	806.8	0.36	0.18	2.00
879.70	879.2	0.50	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 -

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021



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

Certificate of Calibration

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 Sirithean
Approved by :
() Saithip Meangmai
(✓) Warakorn Lernagatrakul
() 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.

เอกสารไม่ควบคุม

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 %.

-o0o-

เอกสารไม่ควบคุม

a 1179917



Cert. No.: 24TM589
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UF 55
Serial No. : B212.0411
ID No. : UAE.WAO.005/2556
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 : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity :
Calibrated by :
Approved by :
() Ponpan Paipim
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 5 April 2024

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

A 0065065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Procedure Used :-

Cert. No.: 24TM589
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 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.

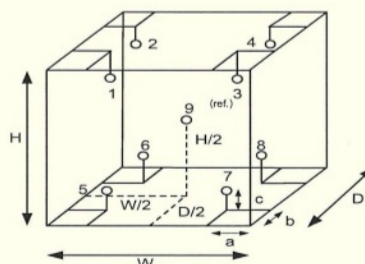
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humid. (%)	47	48
AC Supply (Volt)	221	220



Probe Installation Details :		Dimension of Chamber :	
a =	5.0 cm	D =	0.50 m
b =	5.0 cm	W =	0.80 m
c =	5.0 cm	H =	0.75 m
		Capacity =	0.30 m ³

Ref. Std. ID No.: @ Calibration Point		
Position :	(120 to 180) °C	(104) °C
1	21-18TC-01	22-18RTD-2/1
2	21-18TC-02	18RTD-2/2
3	21-18TC-03	18RTD-2/3
4	21-18TC-04	18RTD-2/4
5	21-18TC-05	18RTD-2/5
6	21-18TC-06	18RTD-2/6
7	21-18TC-07	18RTD-2/7
8	21-18TC-08	18RTD-2/8
9 (ref.)	21-18TC-09	18RTD-2/9

เอกสารไม่ควบคุม

a 1209739



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM589
Page : 3 of 3

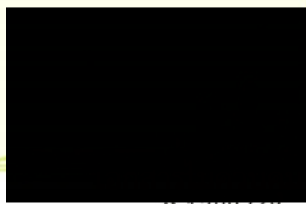
Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.464	103.847	104.226	104.232	104.106	103.691	104.275	104.127	104.013	0.42
120.0	120.486	120.089	120.635	120.596	119.531	119.644	120.364	120.144	120.158	1.1
180.0	180.574	179.769	180.285	180.870	179.594	179.790	180.287	179.961	179.802	1.1

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured 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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ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565

Order No.: 2402283

Operation No.: 2402283-002

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by

(M

Manager, Div

Date of Issue: 9 April 2024

Responsible for

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

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



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Capacity: 220 g

Date of Calibration: 2 April 2024 Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, 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	M2304053S	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH 016/23	Quality Reborn	QR24-0343	9 February 2025

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:

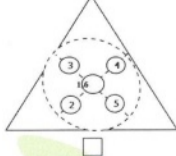
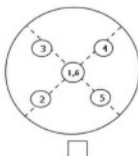
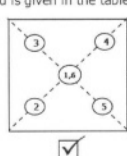
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000042
80	0.000052
100	0.000048
200	0.000048

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 (g)	2 (g)	3 (g)	4 (g)	5 (g)	6 (g)	(Maximum Difference) (g)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

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

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



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Capacity: 220 g

Date of Calibration: 2 April 2024 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unload	0.000000	0.00000	0.00000	0.0000086	2.00
0.001	0.001003	0.00101	-0.00001	0.0000089	2.00
0.005	0.005003	0.00500	0.00000	0.0000092	2.00
0.01	0.010003	0.01000	0.00000	0.0000089	2.00
0.05	0.049996	0.05000	0.00000	0.0000096	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50001	0.00001	0.000014	2.00
1	1.000003	1.00002	-0.00002	0.000016	2.00
2	2.000023	2.00001	0.00001	0.000017	2.00
5	5.000017	5.00002	0.00000	0.000020	2.00
10	10.000009	10.00000	0.00001	0.000026	2.00
20	20.000031	20.00000	0.00003	0.000037	2.00
30	30.000040	30.00001	0.00003	0.000050	2.00
50	50.000028	50.00002	0.00001	0.000068	2.00
80	80.000068	80.00002	0.00005	0.00011	2.00

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

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Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
90	90.00010	90.0001	0.0000	0.00015	2.00
100	100.00006	100.0001	0.0000	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00016	2.00
120	120.00009	120.0000	0.0001	0.00017	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0002	0.0000	0.00028	2.00

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

----- End -----

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

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Agilent 55 240 280 Series Atomic Absorption Spectroscopy Systems

Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical systems to 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 installation.

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

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

Introduction

Customer Information

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

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Instrument Preventive Maintenance Checklist

Important Customer Web Links

- For more information about Agilent Technologies services, please visit our website using the following URL: <http://www.agilent.com/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>

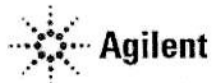
Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Confirm the ability of the instrument to deliver continued safe operation as established via the Agilent AA safe operation flow chart. (Refer directly to the AA 55/240/280 Preventive Maintenance Scope of Work to make this decision.)
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

This information is subject to change without notice.

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Instrument Preventive Maintenance Checklist

Instrument Maintenance

System Information

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

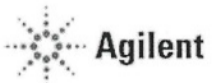
Instrument System Name and ID	
Instrument System Site and Location	UNITED ANALYST AND ENGINEERING consultant. / 2nd Lab FI

List System Component Product Numbers	List the Serial Numbers of each Component
1. G 8432 A	17 1316 0001
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

Preparation, Safe operation and Initial performance checks

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Preventive Maintenance Procedures

FLAME SYSTEM section

☐ Section not applicable

Electronic components

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

Mechanical components

- ☒ Check the burner adjuster controls for complete and free movement. If the burner adjuster needs lubrication, use Molykote 321 or mineral-based molybdenum disulphide grease.
- ☒ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☒ Monochromator drive
 - ☒ Slit drive
 - ☒ Lamp selector
 - ☐ ABA *N/A*

Optics components

- ☒ Check that external optical surfaces are clean – Clean or replace as required.
- ☒ Use SVD and perform *Mono Wavelength Correction*.
- ☒ Use SVD and perform *Slit Calibration*.
- ☒ Use SVD and perform *Grating Squareness Diagnostic*.
- ☒ Use SVD and perform *Zero Order Offset/Mono Correction*.
- ☒ Use SVD and perform *Wavelength Repeatability*.
- ☒ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.
- ☒ Check that the signal energy of the D2 and HC lamps track properly. Advise customer if their D2 lamp is showing emission degradation due to age.

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Sample Introduction and Atomization

- ☒ Inspect the burner interlock plate to ensure that the interlock pin is secure and correct for the burner type.
- ☒ Clean the burner slot with a clean white card.
- ☒ Check the uniformity of the slot width.
- ☒ Clean the burner if required.
- ☒ Change the burner o-ring.
- ☒ Clean the nebulizer, spray chamber and liquid trap.
- ☒ Change all o-rings and seals in the nebulizer, nebulizer block and spray chamber.
- ☒ Check that the pressure relief bung releases readily.
- ☒ Change o-rings on the fuel and oxidant delivery barbs
- ☒ Leave the liquid trap EMPTY and verify the flame will not ignite in this state.
- ☒ Refill liquid trap and check that overflow drains freely into the drain/waste tube.
- ☒ Check the drain/waste tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel
- ☒ Check and clean the igniter electrode

Gas handling components and safety interlocks

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

Analytical performance for Flame systems

- ☒ Ignite a flame.
- ☒ Check that you can adjust the nebulizer uptake rate from 4 to 6.5 mL per minute.
- ☒ Optimize the instrument ready to perform Cu sensitivity test.
- ☒ Create a manual method to perform a Basic Cu ABS test - "Final Performance Testing "
- ☒ Run a PM completed sensitivity test for a 5 ppm copper sample and record the results in the AA PM Performance test results and measurements table.

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FURNACE SYSTEM section

☒ Section not applicable

Electronic components

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

Mechanical components

- ☐ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☐ Monochromator drive
 - ☐ Slit drive
 - ☐ Lamp selector

Optics components

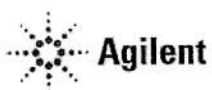
- ☐ Check that external optical surfaces are clean – Clean or replace as required.
- ☐ Use SVD and perform *Mono Wavelength Correction*.
- ☐ Use SVD and perform *Slit Calibration*.
- ☐ Use SVD and perform *Grating Squareness Diagnostic*.
- ☐ Use SVD and perform *Zero Order Offset/Mono Correction*.
-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

Gas handling, water system and workhead component checks

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

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- ☐ Tube
- ☐ Electrodes
- ☐ Shroud

- ☐ Check and clean the end windows on the workhead.
- ☐ Check safety interlock operation.

Analytical performance for Furnace systems

- ☐ Optimize the instrument ready to perform Cu sensitivity test.
- ☐ Run the sensitivity test for a 25 ppb copper sample and record the results in the results table.

PSD autosampler accessory for Furnace systems

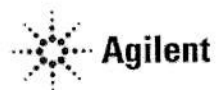
- ☒ Section NOT Applicable
- ☐ Check condition of the PSD capillary – replace if necessary
- ☐ Check condition and operation of PSD syringe – ensure it does not have air locks and bubbles.
- ☐ Change PSD rinse bottle o-ring.
- ☐ Check and clean the rinse vessel.
- ☐ Check the drain tube for good drainage.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

Sample introduction pump system (SIPS) accessory

- ☒ Section NOT Applicable
- ☐ Re-torque screws securing the hubs, presser arms and pump rotors.
- ☐ Adjust each roller so that it rotates freely.
- ☐ Wipe clean the pump rotor rollers and pump bands with a dry clean cloth.
- ☐ Ensure that the presser arms and the surfaces near the pump are free from dirt and spills.
- ☐ Remove the pump module rear cover and check for the incursion of liquids and any signs of corrosion.
- ☐ Re-torque the nuts that fasten the motor mounting plates to the chassis.
- ☐ Check clips securing the diluents holder and replace if necessary.
- ☐ Disconnect, clean T-piece, and reassemble the tubing using the following steps.

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- ☐ Remove the T-piece by disconnecting the pump tubes, the pump bands and all other tubing.
- ☐ Place the T-piece in an ultrasonic bath containing strong detergent 1-5% Decon 30 or similar, for approximately 5-10 minutes.
- ☐ Wash the T-piece under a tap with a strong flow of water.
- ☐ Rinse with distilled water through all of the inlets in the reverse direction to normal sample flow.
- ☐ Reassemble.

Sample preparation system (SPS 4) accessory

- ☒ Section NOT Applicable

The Agilent SPS 4 autosampler is designed to need minimal maintenance.

The following maintenance requirements are suggested to maintain the performance of the autosampler.

- ☐ Cleaning the spill tray, rack location mat, end frames and chassis accessories with a damp soft cloth and diluted mild detergent.
- ☐ Cleaning the autosampler cover panels with domestic window cleaner.
- ☐ Checking the X- axis and Z- axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes..
- ☐ Check the X- axis, Theta- axis and Z- axis FFC cables for cracks, incorrect positioning, damaged edge or damaged connectors.

NOTE: The autosampler requires no extra lubrication throughout its lifetime.

For further details refer to the SPS 4 service manual G8410-90050.

Sample preparation system (SPS 3) accessory

- ☒ Section NOT Applicable

- ☐ Check the x-axis and z-axis timing belts – Replace if there is are any cracks, splits or color deterioration and belt tension.
- ☐ Check belt tensions - adjust if required
- ☐ Check the lubrication pad for single x-axis shaft. If pad is dry or customer has observed any vibration or erratic movements of the x-axis carriage, add 1 mL of Dow Corning 200 ® Fluid, 200 CS into the well.
- ☐ Check the auto-sampler ability to find tube positions - Calibrate if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

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Vapor generation accessory VGA (hydride generator)

- ☒ Section NOT Applicable

- ☐ Inspect VGA gas supply hose.
- ☐ Inspect/replace VGA pump tubing.
- ☐ Check low gas pressure interlock setting– adjust if required.
- ☐ Check precision orifice gas flow setting – adjust if required.
- ☐ Check gas regulator pressure to 46 psi (325 kPa) – adjust if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

UltrAA lamp accessory (external)

- ☒ Section NOT Applicable

- ☐ Check the condition of the power cable.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

Restore System

- ☒ If you have altered the customer's instrumentation during the course of PM, restore to the original status to allow the customer to conduct their normal activities (e.g., reload the customer's method.)

Guidance

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

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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 this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.

Test Results

Test Description		
Flame optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	44 %
Flame performance test with 5 ppm copper sample		
Air /acetylene, mixing paddle removed	Abs value > 0.5	0.7401 A
Air /acetylene, mixing paddle installed. 10 replicates	%RSD < 1.0	0.5 % RSD
Deuterium furnace optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	N/A
Deuterium furnace performance test with 25 ppb copper sample (324.8 nm)		
Precision %RSD	≤ 4.0%	N/A
Abs value	≥ 0.15	N/A
Zeeman furnace analytical performance: 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0%	N/A
Abs value	≥ 0.10	N/A
MSR%	≥70 %	N/A

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AA consumable and parts list table

Part Description		Product/Model # where used	PM supplied or Consumable	Instrument-Type
Test Solution – Cu 5ppm solution	6610030100	50 55 140 240 280	PM supplied	Common
Test Solution - Blank solution	5190-7001	50 55 140 240 280	PM supplied	Common
Copper, 1000 ug/ml, 100ml	5190-8279	50 55 140 240 280	*	Common
Kit, Mk 7 O-rings, aqueous, complete set	9910093400	50 55 140 240 280	PM supplied	Flame
Organic Kit	9910093500	50 55 140 240 280	PM supplied	Flame
Wire Nebulizer Cleaning	9910024700	50 55 140 240 280	consumable	Flame
Tubing-Capillary Std Nebs	9910024800	50 55 140 240 280	consumable	Flame
Capillary Tube Hivac Neb (3) (organics only)	9910044000	50 55 140 240 280	consumable	Flame
Glass impact beads (5/pk)	9910025700	50 55 140 240 280	consumable	Flame
Teflon impact beads (5/pk): (organics only)	9910053300	50 55 140 240 280	consumable	Flame
Burner cleaning strip (100/pk)	9910053900	50 55 140 240 280	consumable	Flame
Window UV silica – round (right side)	2010082600	50 55 140 240 280	PM supplied	Common
Window UV silica – rectangular (left side)	2010082500	50 55 140 240 280	PM supplied	Common
Pad adhesive window (round)	4910012700	50 55 140 240 280	PM supplied	Common
Pad adhesive window (rectangular)	4910012800	50 55 140 240 280	PM supplied	Common
Electrode kit (1 pr) (D2)	6310003400	GTA120	PM supplied	Furnace
Shroud (D2)	6310003100	GTA120	PM supplied	Furnace
Zeeman electrode kit (1 pr)	6310003500	GTA120	PM supplied	Furnace
Zeeman shroud	6310003600	GTA120	PM supplied	Furnace
O-ring PSD rinse bottle	6910025900	PSD120	PM supplied	Furnace

* For engineers who only service AA instruments 5190-8279 can be used as a cheaper alternative for 6610030100.

Items classified as PM supplied in the above table are included in the standard PM

Those classified as consumable should be provided by the customer or charged to the customer if supplied by the Agilent service engineer.

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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.

Report ID: 1	Diagnostic Start Time: 1/24/2024 9:41:23 AM	Diagnostic End Time: 1/24/2024 10:10:55 AM
Customer:	Service Engineer: Worawit T.	
Address:	Contact Details:	

Instrument Configuration

Configuration:

Serial Number: MY13160001	Turret Type: Automatic
Instrument Model: Varian AA140/240/280	Number Of Lamps: 4
Flame Instrument: True	Mono Type: Automatic
Furnace Instrument: True	Gasbox Type: 'Y' Gas Box
Zeeman Present: False	Auto Burner Adjuster: False
Internal Zeeman: False	Mains Frequency: 50
Internal UltrAA: False	Firmware Version: 2.11
Optics Type: Double Beam	Photomultiplier Type: Normal(900nm)
D2 BG Correction Fitted: True	PWB Version: 45
Boot Block Version: 1.09	

EEPROM Data:

Instrument Run Hours: 62609.832	D2 Run Hours: 49136.000
Zero Wavelength Offset: 30.148	D2 Serial Number: not set !
Mono Correction: 0.765	D2 Install Date: 1/1/1970
Flame Hours: 29802.416	D2 Original Intensity: 1.000
	D2 Last Intensity: 475.000

Frequency:

Averaging Period: 30.0		
Datapoint Count: 20		
Upper Limit: 51.00	Average Frequency: 50.00	Highest Measured Frequency: 50.00
Lower Limit: 49.00		Lowest Measured Frequency: 50.00

Result: **Passed**

Revision: 10.00, Issued: November 2021

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Report Generated At: 1/24/2024 10:11:18 AM

1

SVD Results Report SVD

เอกสารไม่ควบคุม

Power Supply:

Averaging Period: 30.0
Datapoint Count: 20

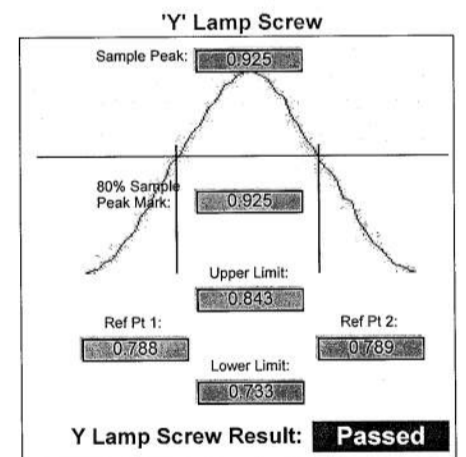
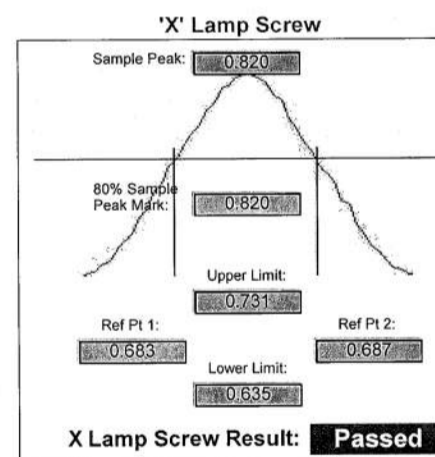
	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00 V Rail	10.80	12.19	13.20	Passed
-12.00 V Rail	-13.20	-11.90	-10.80	Passed
5.00 V Rail	4.50	5.05	5.50	Passed
310.00 V Rail	279.00	320.00	341.00	Passed

Optics

Beam Balance:

Lamp Type: Copper
Lamp Socket Used: 3

Peak Selected: 324.80
Lamp Alignment: **Performed**



Grating Squareness:

Lamp Element(s): Copper
Lamp Turret Position: 3
Lamp Current(mA): 4.00
Slit Width(nm): 0.5
1st Order Wavelength(nm): 324.80
Lamp Alignment: **Performed**

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.10	0.00	0.10	Passed
First Order	324.45	324.75	325.15	Passed
Second Order	649.23	649.52	649.97	Passed

Wavelength Repeatability:

Lamp Used: Copper		Lamp Current(mA): 4	
Peak Used(nm): 324.750		Slit Width(nm): 0.2	
Connected to Socket: 3		Slit Height: Normal	
Lamp Alignment: <div>Performed</div>			
Lower Limit(nm)	324.768	324.888	Upper Limit(nm)
(Approach from Zero Order)		(Approach from end)	
Sample 1:	324.828	Sample 2:	324.828
Sample 3:	324.828	Sample 4:	324.823
Sample 5:	324.823	Sample 6:	324.823
Sample 7:	324.823	Sample 8:	324.823
Sample 9:	324.823	Sample 10:	324.823
Mean: 324.825		Standard Deviation: 0.002	
Result: <div>Passed</div>			

Auto Lamp Recognition:

Lamp 1: Uncoded Lamp/Not Connected	Lamp 5: Not Supported
Lamp 2: 87 - Silver/Cadmium/Lead/Zinc(UltrAA) (Ag/CLamp 6: INot Supported	
Lamp 3: 14 - Copper (Cu)	Lamp 7: Not Supported
Lamp 4: Uncoded Lamp/Not Connected	Lamp 8: Not Supported
Result: Passed	

GTA Temperature Monitoring:

Not Performed

Notes:

PM 24 Jan 2024

Signatures:

Mechanical

Wavelength Drive:	Passed
Slit Drive:	Passed
Turret Drive:	Passed
Auto Burner Adjuster Drive:	Untested

Miscellaneous

Signal Processing Linearity:				
Calculate Mode: New Calc Mode				
	Lower Limit	Actual	Upper Limit	Result:
S0	114	261	297	Passed
S1	156	165	191	Passed
S2	271	296	332	Passed
S3	474	507	579	Passed
S4	825	918	1008	Passed
S5	1435	1528	1754	Passed
S6	2498	2769	3053	Passed
S7	4347	4752	5313	Passed

Interlocks:

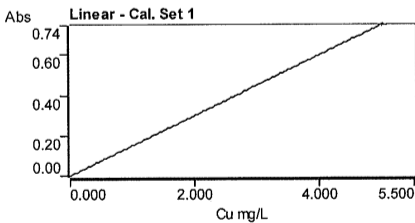
Burner Fitted:	Working	Flame Detect:	Working
N2O Burner Fitted:	Untested	GCU Active:	Working
Flame Shield Closed:	Working	Oxidant Pressure:	Working
Gas Control Fitted:	Untested	Oxidant Changeover:	Untested
Pressure Release Bung Fitted:	Working	Ignition:	Working
Liquid Trap Fitted:	Working		

Sequential by time report 1/24/2024 11:46 AM SpectrAA
Page 1 of 1

Analyst
Date Started 1/24/2024 11:39 AM GMT: 1/24/2024 4:39 AM
Worksheet Cu 5 PPM Sense check
Comment
Methods Cu
Computer name DESKTOP-R9UIFRS
Serial Number: MY13160001

Method: Cu (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs
CAL ZERO	0.000	55.0	0.0003
Readings			
	0.0002	0.0002	0.0004 1/24/2024
STANDARD 1	5.000	1.7	0.7419
Readings			
	0.7274	0.7515	0.7468 1/24/2024



Curve Fit = Linear
Characteristic Conc = 0.028 mg/L
r = 1.0000
Calculated Conc = 0.000 5.000
Residuals = 0.000 0.000

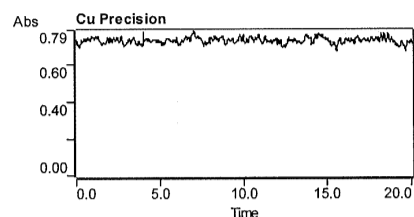
Abs = 0.14833 x C + 0.00026

Sample 001	4.988	0.7	0.7401
Readings			
	0.7454	0.7399	0.7349 1/24/2024

Analyst	
Date Started	1/24/2024 11:47 AM GMT: 1/24/2024 4:47 AM
Worksheet	Cu 5 PPM Precision
Comment	
Methods	Cu
Computer name	DESKTOP-R9UIFRS
Serial Number:	MY 13160001

Method: Cu (Flame)

Sample ID	Exp Abs	%RSD	Mean Abs			
Cu Precision	0.723	0.5	0.7232			
	Readings					
	0.7221	0.7195	0.7226	0.7283	0.7278	0.7260
	0.7201	0.7213	0.7266	0.7174	1/24/2024	



UNITED ANALYST AND ENGINEERING CONSULTANT COMPANY Ltd.

Automatic Mercury Analyzer

Model RA-4500

Preventive Maintenance Report

Serial No. : 17780278

Soft version : Ver 2.0.7

ROM version : Ver 2.0.1

Date

PM by

Approved by



Coax Group Corporation Ltd.

1131/62,64,325-331 Nakornchaisri road,

Kwang ThanonNakornchaisri, Dusit, Bangkok 10300 Thailand

Tel. 02-2435263, 02-6682436 Fax. 02-2437386

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Inspection result

ITEM		STANDARD	RESULT	JUDGE
1. Self Check	1.1 Heating		PASS	OK
	1.2 Cooling		PASS	OK
	1.3 Leak		PASS	OK
	1.4 Optical system		PASS	OK
	1.5 Drift		PASS	OK

2. Analytical curve inspection (AREA)

2.1	No Pretreatment (Low Conc.)	Correlation coefficient	1.0000	OK
		(r) ≥ 0.9990		

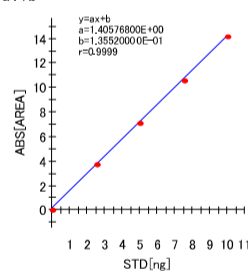
3. Repeatability(AREA)

3.1	No Pretreatment	100ppb, n=5	1.	99.12	ppb
			2.	101.48	ppb
			3.	101.24	ppb
			4.	102.34	ppb
			5.	101.92	ppb
				C.V. \leq 5%	1.23% OK

4. Blank	Below 1.0 (AREA)	0.2062	OK
----------	------------------	--------	----

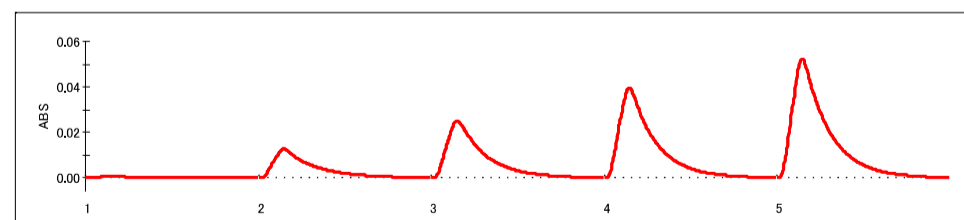
Title : Preventive Maintenance RA-4500 sn:17780278
Date : 7/11/2023
Name : Coax Group
Memo : Calibration Curve 0-10ng

Calib



STD

STD									
No.	STD [ppb]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	Dev [%]	Note
1	100.000	0.000	5.000	5.000	0.000	0.0859	-0.0353	-	
2	100.000	0.025	5.000	5.000	2.500	3.7687	2.5845	3.4	
3	100.000	0.050	5.000	5.000	5.000	7.1028	4.9562	0.9	
4	100.000	0.075	5.000	5.000	7.500	10.6441	7.4753	0.3	
5	100.000	0.100	5.000	5.000	10.000	14.2203	10.0193	0.2	



SMP

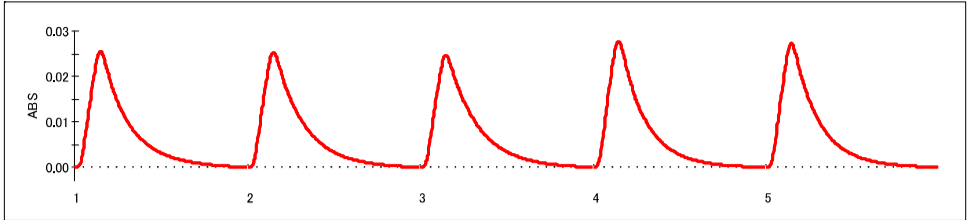
No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Note
1	hg 100 ppb	0.050	5.000	5.000	7.1027	4.9561	99.122	
2	hg 100 ppb	0.050	5.000	5.000	7.2687	5.0742	101.484	
3	hg 100 ppb	0.050	5.000	5.000	7.2514	5.0619	101.238	
4	hg 100 ppb	0.050	5.000	5.000	7.3285	5.1168	102.336	
5	hg 100 ppb	0.050	5.000	5.000	7.2996	5.0962	101.924	

Statistics

Statistics					
No.	NAME	TRY	AV [ug/L]	SD [ug/L]	Cv [%]
1	hg 100 ppb	5	101.2208	1.246264	1.23

เอกสารไม่ควบคุม

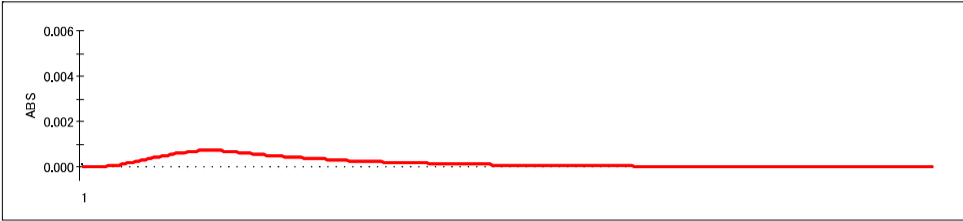




Self Check
Heat check:PASS!! (24.9degC[05:00] -> 28.9degC[02:31])
Sensor check:PASS!! (78- 18= 60)
Leak check:PASS!! (0.17L/min)
Sig/Ref check:PASS!! (Sig:3.73V, Ref:3.94V)
Drift check:PASS!! (-0.0027882 - -0.0032876 = 0.0004993)

Title : Preventive Maintenance RA-4500 sn:17780278
Date : 7/11/2023
Name : Coax Group
Memo : Blank

SMP								
No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Note
1	Blank				0.2062	0.0503		



Technology



Service Report

TO	FOR

WORK ORDER INFORMATION			
Top-Level		Order Type	Preventive Maintenance
Installed Product ID	IB-00105024	Billing Type	Paid
Product	SKALAR SAN++ Classic 2SAN59000	PO No.	SSPR2400629
Serial No.	182688	Warranty No.	
		Contract No.	

PRODUCTS SERVICED		
Installed Product Id	Serial Number	Product

PROBLEM DESCRIPTION	
PM 1/1	

Line Number	Engineer	Start Date And Time	End Date And Time	Billable Labor Hour	Billable Travel Hour	Travel KM
WL-00071161	Yongyuth Chanphong	02/20/2024 8:53 AM	02/20/2024 6:07 PM	9.23333		
WL-00092966	Ronnarit Dechnawarat	02/20/2024 8:53 AM	02/20/2024 6:07 PM	9.23333		
Total				18.46666	0	0

Technology



Line Number	Work Description
WL-00071161	ทำ PM เรียบร้อย
WL-00092966	ทำ PM เรียบร้อย

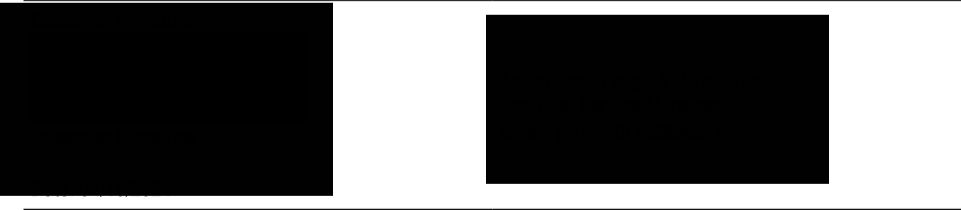
PARTS CONSUMED		
Part No	Part Description	Quantity

EXPENSES			
Part No	Expense Type	Description	Line Quantity

RECOMMENDED PARTS
แนะนำอะไหล่ที่ต้องสั่งซื้อเพิ่มเติมมีดังนี้ , อะไหล่ พารามิเตอร์ Ammonia จำนวน 2 รายการ (9220, 3026) , อะไหล่ พารามิเตอร์ Phenol และ Cyanide จำนวน 6 รายการ (5454, 3028, 3031, 3034, 3036, 3150)

REMARKS

Travel Time Disclaimer:
Please note that the travel time in this report only includes time taken to reach the installed equipment location. It does not include our engineer's return travel time.





Job No. WO-00018067

Test Report

Customers	United Analyst and Engineering Consultant Co., Ltd.		
Equipment	Continuous Flow Analyzer	Manufacturer	SKALAR
Controller Mdel	SA5000	Auto Sample Model	SA1052
Controller Serial No.	182688	Auto Sample Serial No.	181729
Date of test	20-Feb-2024	Period	12 Month
Environment temperature	24.7 °C	Humidity	62.2 %RH

Results

Instrument Checked							
Item	Characteristic	Before		After		Remark	
1	Visual inspect	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail		
2	Power supply (210 - 240 VAC)	220	VAC	220	VAC		
3	Computer	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail		
4	Program	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail		
5	Auto sampler	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail		
6	Module holder						
	- Motor pump	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail		
	- Pump tube	<input type="checkbox"/> Pass	<input checked="" type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	*	
	- Air-injection	<input type="checkbox"/> Pass	<input checked="" type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	*	
	- Chemistry manifolds, Switching valve, Coil, Membrane	<input type="checkbox"/> Pass	<input checked="" type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	*** ,	
7	Detector						
	- Filter	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail		
	- Flow cell	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail		
	- Lamp	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail		
8	Interface	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail		
9	Rinsing valves	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A
10	Temperature / Reactor	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A
11	Flame photometer	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A
12	UPS / Stabilizer	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A

Warning and Error Checked			
Item	Event	Before	After
13	Error list	<div><input checked="" type="checkbox"/> None</div> <div><input type="checkbox"/> Appear : _____</div>	<div><input checked="" type="checkbox"/> None</div> <div><input type="checkbox"/> Appear : _____</div>



Check with Standard

Item	Characteristic	Before			After			Remark
14	Base Line Test	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input type="checkbox"/> N/A	
15	Detector Signal Test	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input type="checkbox"/> N/A	

Summary of checked

- ☒ The instrument can work normally and efficiently. (เครื่องมือวัดสามารถทำงานได้ปกติและมีประสิทธิภาพ)
- ☐ The instrument can work but it's requiring to maintenance. (เครื่องมือวัดสามารถทำงานได้แต่ต้องบำรุงรักษา)
- ☐ The instrument could not work it's requiring to repair. (เครื่องมือวัดไม่สามารถทำงานได้แต่ต้องการซ่อมบำรุง)

Remark :

* Pump tube และ Air tube เริ่มเสื่อมสภาพ ได้เปลี่ยนอะไหล่ทั้งหมดแล้วตามระยะเวลาใช้งาน
** อะไหล่ 9220 (Manifold T ,StSt needle) ขาดไม่สามารถซ่อมได้ และได้เปลี่ยนมาใช้ 5216 ทดแทนชั่วคราว
*** อะไหล่ 5454 (Nipple polyethylene N5) เสีย ได้ทำการเปลี่ยนใหม่แล้ว

หมายเหตุ แนะนำอะไหล่ที่ควรสั่งเพิ่มเติมดังนี้
1. อะไหล่ พารามิเตอร์ Ammonia จำนวน 2 รายการ (9220, 3026)
2. อะไหล่ พารามิเตอร์ Phenol และ Cyanide จำนวน 6 รายการ (5454, 3028, 3031, 3034, 3036, 3150)

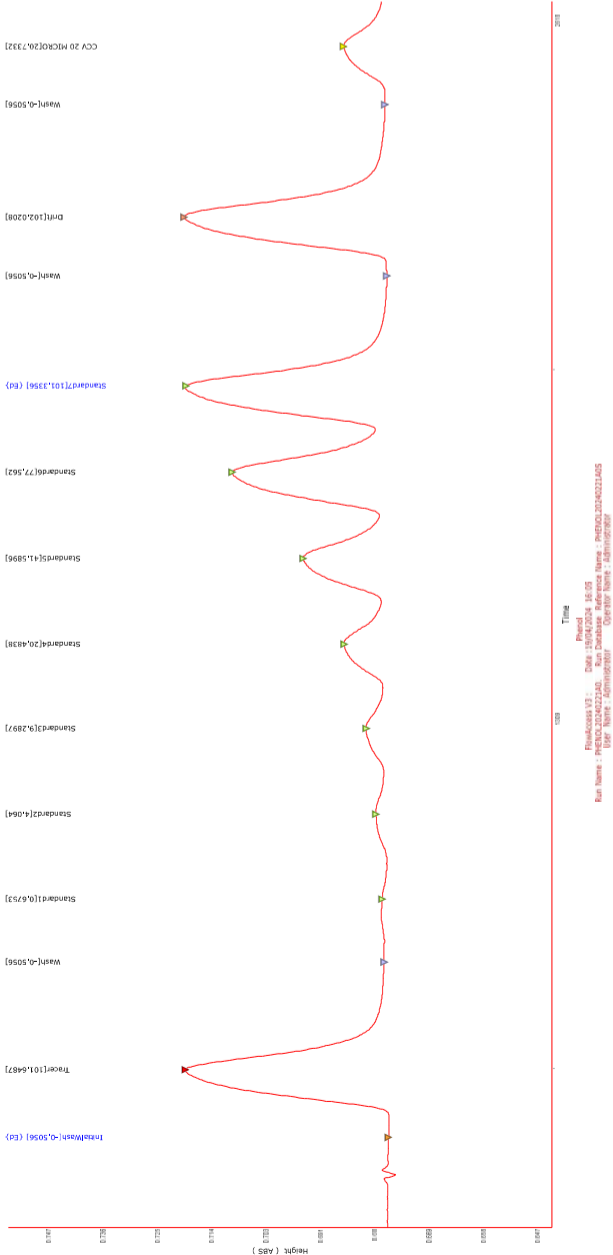
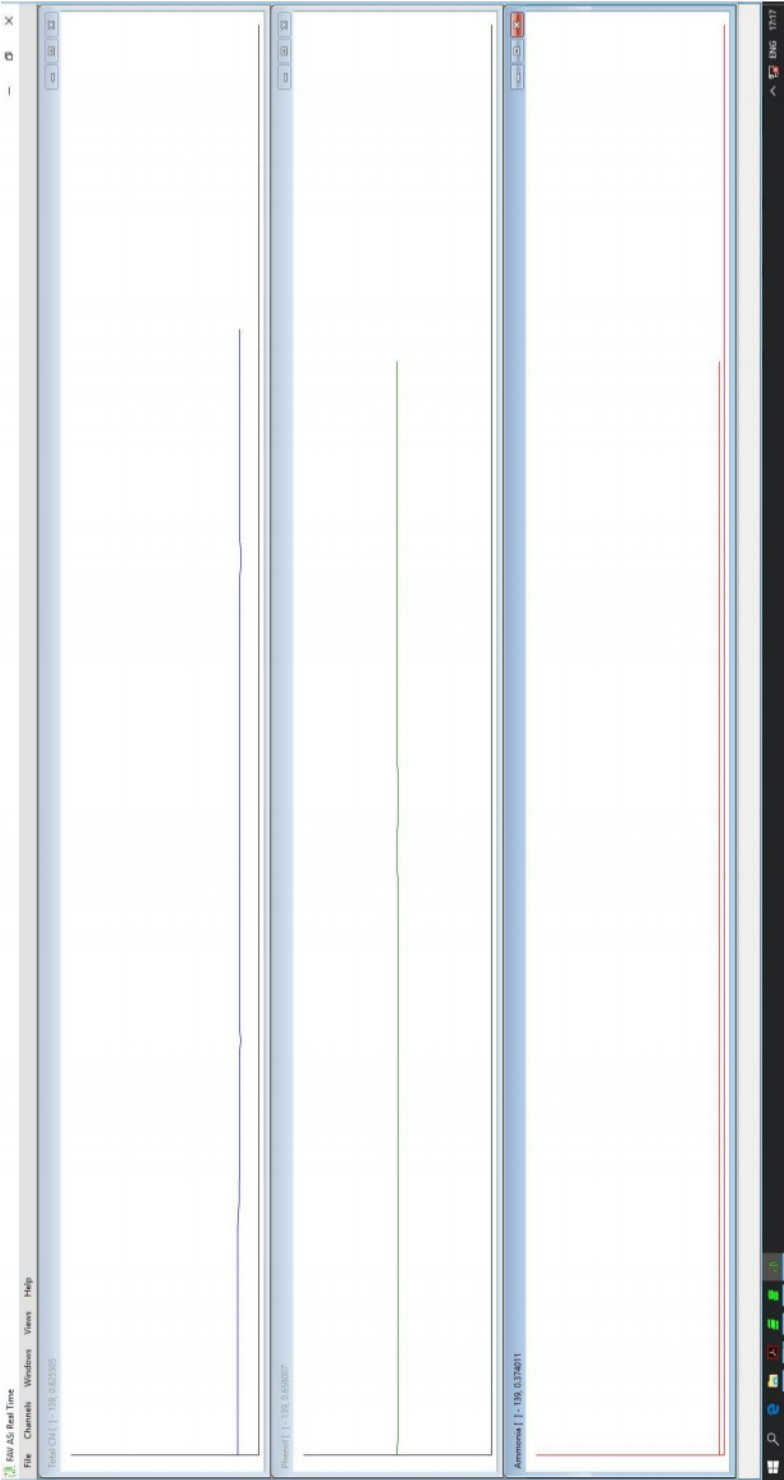
Standard Equipment Used		
Equipment	Equipment I.D.	
Digital multi meter	S/N 57600592	Due date : 8-Jul-2024
Thermo hygrometer	S/N 39520444	Due date : 27-Dec-2024

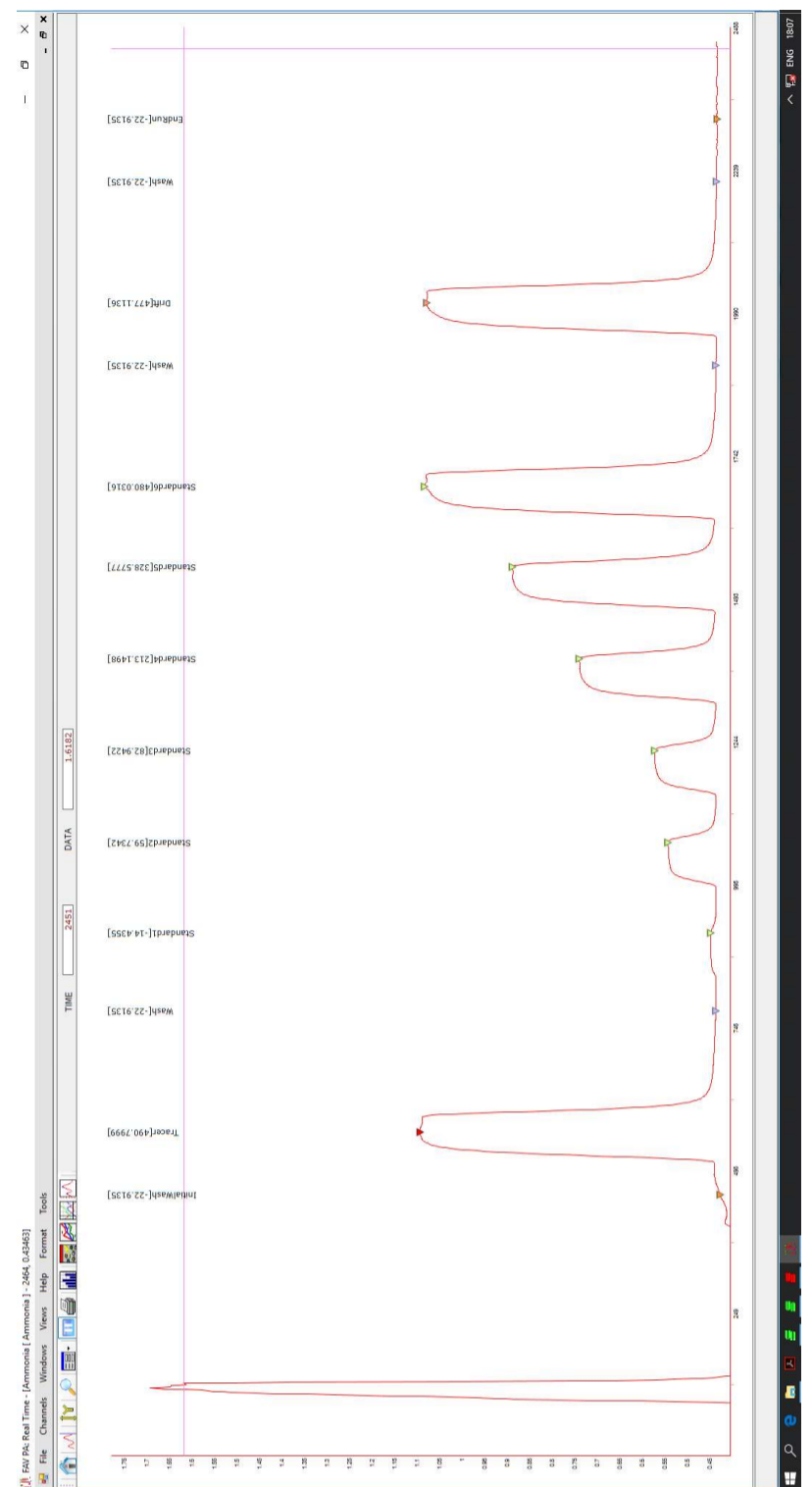
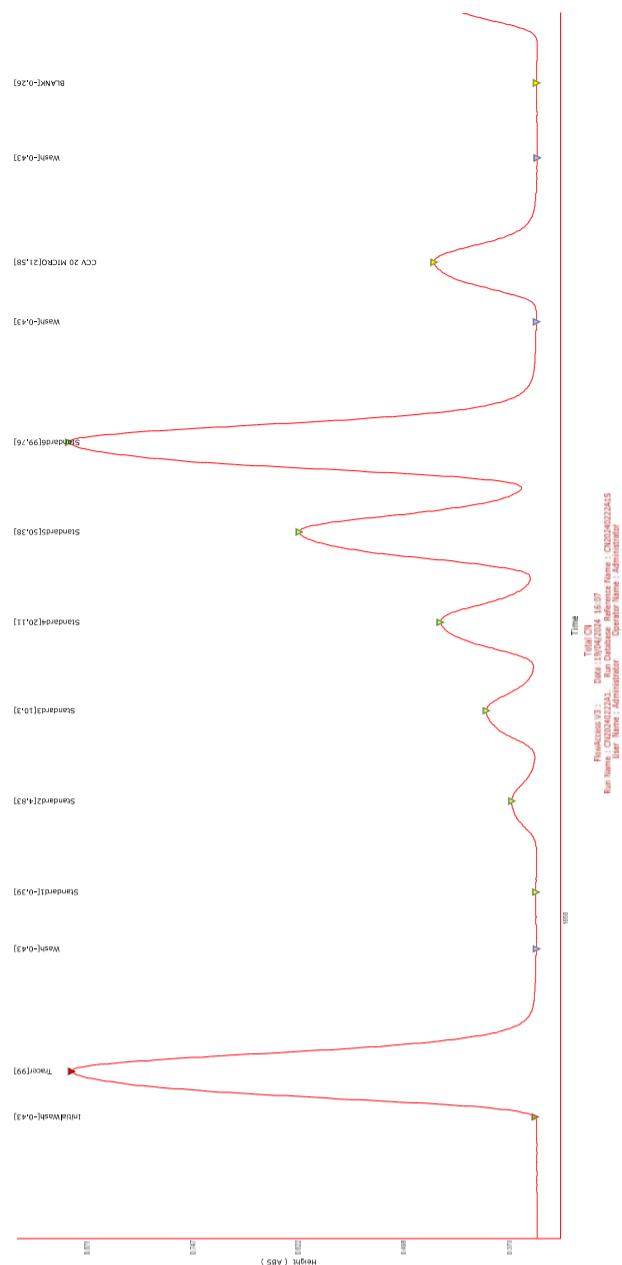
Test By :




Approved by :



Position :

Position :






<div><div>DQE</div><div>Services</div></div> <div>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</div>		<div><div>THAILAND NBS-TISI-TIS 17025 CALIBRATION 0404</div></div>
<div>CERTIFICATE OF CALIBRATION</div>		
<div>Certificate No. : SP24-001</div>	<div>Page 1 of 5</div>	
<div>Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)</div>		
<div>Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260</div>		
<div>Location of calibration : Laboratory 213</div>		
<div>Equipment : UV-Vis Spectrophotometer</div>		
<div>Manufacturer : Hitachi</div>		
<div>Model : U-2900</div>		
<div>Serial No. : 21E22-009</div>		
<div>ID No. : UAE.WAT.051/2564</div>		
<div>Received Date : 4 January 2024</div>		
<div>Calibration Date : 4 January 2024</div>		
<div>Issue Date : 5 January 2024</div>		
<div>Condition Instrument : Good</div>		
<div>Calibrated by</div>	<div></div>	<div>Approved by</div>
<div></div>		
<div>The calibration result is applied only to the above calibrated item and was found accurate as shown</div>		
<div>The measurement capability of the laboratory and its traceability to recognized national standards and national standards laboratory. This certificate may not be reproduced other than in full except with the</div>		

 DQE Services	<p style="text-align: center;">DQE Services Co.,Ltd.</p> <p style="text-align: center;">32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230</p> <p style="text-align: center;">Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com</p>																					
<h2 style="margin: 0;">REPORT OF CALIBRATION</h2>																						
Certificate No. : SP24-001	Page 2 of 5																					
<p>Environment Condition : Ambient Temperature 25 ± 5 °C</p> <p style="text-align: center;">Relative humidity 55 ± 20 %RH</p>																						
Calibration method : In-house method CP-01 Based on ASTM E275-08																						
Certified Reference Materials :																						
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Material</th> <th style="width: 25%;">Serial No.</th> <th style="width: 25%;">Certificate No.</th> <th style="width: 25%;">Due date</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Absorbance Standard set</td> <td style="text-align: center;">25760</td> <td style="text-align: center;">115663</td> <td style="text-align: center;">25 October 2025</td> </tr> <tr> <td style="text-align: center;">Absorbance Standard set</td> <td style="text-align: center;">25757</td> <td style="text-align: center;">115638</td> <td style="text-align: center;">25 October 2025</td> </tr> <tr> <td style="text-align: center;">Wavelength Standard set</td> <td style="text-align: center;">25806</td> <td style="text-align: center;">115657</td> <td style="text-align: center;">25 October 2025</td> </tr> <tr> <td style="text-align: center;">Wavelength Standard set</td> <td style="text-align: center;">25758</td> <td style="text-align: center;">115665</td> <td style="text-align: center;">25 October 2025</td> </tr> </tbody> </table>	Material	Serial No.	Certificate No.	Due date	Absorbance Standard set	25760	115663	25 October 2025	Absorbance Standard set	25757	115638	25 October 2025	Wavelength Standard set	25806	115657	25 October 2025	Wavelength Standard set	25758	115665	25 October 2025		
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Wavelength Standard set	25806	115657	25 October 2025																			
Wavelength Standard set	25758	115665	25 October 2025																			
<p>Traceability : This certification is traceable to the International System of Unit maintained at National -</p> <p style="text-align: center;">Institute of Standards and Technology (NIST) through Sarna Scientific Limited</p>																						
<p>Spectral Band Width of UUC : 1.5 nm.</p>																						
<p>Scan Speed of UUC : 200 nm/min</p>																						
<p>Scan Interval of UUC : 0.1 nm.</p>																						
<p>Resolution of UUC : Photometric 0.001 Abs.</p>																						
<p style="text-align: center;">Wavelength 0.1 nm.</p>																						

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NSC-TISI-TIS 17025
CALIBRATION 0404

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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
	0.5780	0.575	0.0030	0.0031	2.00
	1.0484	1.045	0.0034	0.0029	2.00
	2.1876	2.192	-0.0044	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.558	0.0015	0.0034	2.00
	1.0239	1.023	0.0009	0.0035	2.00
	2.1230	2.125	-0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.520	0.0030	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.975	0.0003	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.516	0.0021	0.0031	2.00
	1.0002	0.997	0.0032	0.0033	2.00
	1.9973	1.993	0.0043	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.550	0.0017	0.0030	2.00
	1.0803	1.079	0.0013	0.0030	2.00
	2.0373	2.032	0.0053	0.0080	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.558	0.0011	0.0031	2.00
	1.0518	1.050	0.0018	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

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NSC-TISI-TIS 17025
CALIBRATION 0404

REPORT OF CALIBRATION

Certificate No. : SP24-001Page 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
	0.7469	0.743	0.0039	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.862	0.0054	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.289	0.0029	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.641	0.0020	0.0055	2.00

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Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	241.2	0.52	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.4	0.41	0.18	2.00
334.06	333.8	0.26	0.18	2.00
360.93	360.6	0.33	0.18	2.00
418.59	418.4	0.19	0.18	2.00
445.94	445.8	0.14	0.18	2.00
453.66	453.4	0.26	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.4	0.19	0.18	2.00
637.98	638.0	-0.02	0.18	2.00
431.38	431.2	0.18	0.18	2.00
472.50	472.5	0.00	0.18	2.00
513.47	513.4	0.07	0.18	2.00
528.88	528.9	-0.02	0.18	2.00
573.17	573.4	-0.23	0.18	2.00
585.35	585.2	0.15	0.20	2.00
684.40	684.4	0.00	0.18	2.00
740.72	741.0	-0.28	0.20	2.00
748.55	748.8	-0.25	0.18	2.00
807.03	807.1	-0.07	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

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Agilent 55 240 280 Series Atomic Absorption Spectroscopy Systems

Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical systems to 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 installation.

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

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

Introduction

Customer Information

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

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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.
- Confirm the ability of the instrument to deliver continued safe operation as established via the Agilent AA safe operation flow chart. **(Refer directly to the AA 55/240/280 Preventive Maintenance Scope of Work to make this decision.)**
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

This information is subject to change without notice.

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Instrument Maintenance

System Information

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

Instrument System Name and ID	
Instrument System Site and Location	UNITED ANALYST AND ENGINEERING consultant. / 2nd Lab FI

List System Component Product Numbers	List the Serial Numbers of each Component
1. G 8432 A	117 1316 0001
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

Preparation, Safe operation and Initial performance checks

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Preventive Maintenance Procedures

FLAME SYSTEM section

☐ Section not applicable

Electronic components

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

Mechanical components

- ☒ Check the burner adjuster controls for complete and free movement. If the burner adjuster needs lubrication, use Molykote 321 or mineral-based molybdenum disulphide grease.
- ☒ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☒ Monochromator drive
 - ☒ Slit drive
 - ☒ Lamp selector
 - ☐ ABA N/A

Optics components

- ☒ Check that external optical surfaces are clean – Clean or replace as required.
- ☒ Use SVD and perform *Mono Wavelength Correction*.
- ☒ Use SVD and perform *Slit Calibration*.
- ☒ Use SVD and perform *Grating Squareness Diagnostic*.
- ☒ Use SVD and perform *Zero Order Offset/Mono Correction*.
- ☒ Use SVD and perform *Wavelength Repeatability*.
- ☒ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.
- ☒ Check that the signal energy of the D2 and HC lamps track properly. Advise customer if their D2 lamp is showing emission degradation due to age.

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Sample Introduction and Atomization

- ☒ Inspect the burner interlock plate to ensure that the interlock pin is secure and correct for the burner type.
- ☒ Clean the burner slot with a clean white card.
- ☒ Check the uniformity of the slot width.
- ☒ Clean the burner if required.
- ☒ Change the burner o-ring.
- ☒ Clean the nebulizer, spray chamber and liquid trap.
- ☒ Change all o-rings and seals in the nebulizer, nebulizer block and spray chamber.
- ☒ Check that the pressure relief bung releases readily.
- ☒ Change o-rings on the fuel and oxidant delivery bars
- ☒ Leave the liquid trap EMPTY and verify the flame will not ignite in this state.
- ☒ Refill liquid trap and check that overflow drains freely into the drain/waste tube.
- ☒ Check the drain/waste tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel
- ☒ Check and clean the igniter electrode

Gas handling components and safety interlocks

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

Analytical performance for Flame systems

- ☒ Ignite a flame.
- ☒ Check that you can adjust the nebulizer uptake rate from 4 to 6.5 mL per minute.
- ☒ Optimize the instrument ready to perform Cu sensitivity test.
- ☒ Create a manual method to perform a Basic Cu ABS test - "Final Performance Testing "
- ☒ Run a PM completed sensitivity test for a 5 ppm copper sample and record the results in the AA PM Performance test results and measurements table.

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FURNACE SYSTEM section

- ☒ Section not applicable

Electronic components

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

Mechanical components

- ☐ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☐ Monochromator drive
 - ☐ Slit drive
 - ☐ Lamp selector

Optics components

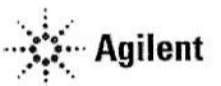
- ☐ Check that external optical surfaces are clean – Clean or replace as required.
- ☐ Use SVD and perform *Mono Wavelength Correction*.
- ☐ Use SVD and perform *Slit Calibration*.
- ☐ Use SVD and perform *Grating Squareness Diagnostic*.
- ☐ Use SVD and perform *Zero Order Offset/Mono Correction*.
-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

Gas handling, water system and workhead component checks

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

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- ☐ Tube
- ☐ Electrodes
- ☐ Shroud

- ☐ Check and clean the end windows on the workhead.
- ☐ Check safety interlock operation.

Analytical performance for Furnace systems

- ☐ Optimize the instrument ready to perform Cu sensitivity test.
- ☐ Run the sensitivity test for a 25 ppb copper sample and record the results in the results table.

PSD autosampler accessory for Furnace systems

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

Sample introduction pump system (SIPS) accessory

- ☒ Section NOT Applicable
- ☐ Re-torque screws securing the hubs, presser arms and pump rotors.
- ☐ Adjust each roller so that it rotates freely.
- ☐ Wipe clean the pump rotor rollers and pump bands with a dry clean cloth.
- ☐ Ensure that the presser arms and the surfaces near the pump are free from dirt and spills.
- ☐ Remove the pump module rear cover and check for the incursion of liquids and any signs of corrosion.
- ☐ Re-torque the nuts that fasten the motor mounting plates to the chassis.
- ☐ Check clips securing the diluents holder and replace if necessary.
- ☐ Disconnect, clean T-piece, and reassemble the tubing using the following steps.

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- ☐ Remove the T-piece by disconnecting the pump tubes, the pump bands and all other tubing.
- ☐ Place the T-piece in an ultrasonic bath containing strong detergent 1-5% Decon 30 or similar, for approximately 5-10 minutes.
- ☐ Wash the T-piece under a tap with a strong flow of water.
- ☐ Rinse with distilled water through all of the inlets in the reverse direction to normal sample flow.
- ☐ Reassemble.

Sample preparation system (SPS 4) accessory

- ☒ Section NOT Applicable

The Agilent SPS 4 autosampler is designed to need minimal maintenance.

The following maintenance requirements are suggested to maintain the performance of the autosampler.

- ☐ Cleaning the spill tray, rack location mat, end frames and chassis accessories with a damp soft cloth and diluted mild detergent.
- ☐ Cleaning the autosampler cover panels with domestic window cleaner.
- ☐ Checking the X- axis and Z- axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes..
- ☐ Check the X- axis, Theta- axis and Z- axis FFC cables for cracks, incorrect positioning, damaged edge or damaged connectors.

NOTE: The autosampler requires no extra lubrication throughout its lifetime.

For further details refer to the SPS 4 service manual G8410-90050.

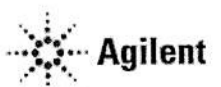
Sample preparation system (SPS 3) accessory

- ☒ Section NOT Applicable

- ☐ Check the x-axis and z-axis timing belts – Replace if there is are any cracks, splits or color deterioration and belt tension.
- ☐ Check belt tensions - adjust if required
- ☐ Check the lubrication pad for single x-axis shaft. If pad is dry or customer has observed any vibration or erratic movements of the x-axis carriage, add 1 mL of Dow Corning 200 ® Fluid, 200 CS into the well.
- ☐ Check the auto-sampler ability to find tube positions - Calibrate if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

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Vapor generation accessory VGA (hydride generator)

- ☒ Section NOT Applicable
- ☐ Inspect VGA gas supply hose.
- ☐ Inspect/replace VGA pump tubing.
- ☐ Check low gas pressure interlock setting– adjust if required.
- ☐ Check precision orifice gas flow setting – adjust if required.
- ☐ Check gas regulator pressure to 46 psi (325 kPa) – adjust if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

UltrAA lamp accessory (external)

- ☒ Section NOT Applicable
- ☐ Check the condition of the power cable.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

Restore System

- ☒ If you have altered the customer's instrumentation during the course of PM, restore to the original status to allow the customer to conduct their normal activities (e.g., reload the customer's method.)

Guidance

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

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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 this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.

Test Results

Test Description		
Flame optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	44 %
Flame performance test with 5 ppm copper sample		
Air /acetylene, mixing paddle removed	Abs value > 0.5	0.7401 A
Air /acetylene, mixing paddle installed. 10 replicates	%RSD < 1.0	0.5 % RSD
Deuterium furnace optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	N/A
Deuterium furnace performance test with 25 ppb copper sample (324.8 nm)		
Precision %RSD	≤ 4.0%	N/A
Abs value	≥ 0.15	N/A
Zeeman furnace analytical performance: 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0%	N/A
Abs value	≥ 0.10	N/A
MSR%	≥70 %	N/A

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AA consumable and parts list table

Part Description		Product/Model # where used	PM supplied or Consumable	Instrument-Type
Test Solution – Cu 5ppm solution	6610030100	50 55 140 240 280	PM supplied	Common
Test Solution - Blank solution	5190-7001	50 55 140 240 280	PM supplied	Common
Copper, 1000 ug/ml, 100ml	5190-8279	50 55 140 240 280	*	Common
Kit, Mk 7 O-rings, aqueous, complete set	9910093400	50 55 140 240 280	PM supplied	Flame
Organic Kit	9910093500	50 55 140 240 280	PM supplied	Flame
Wire Nebulizer Cleaning	9910024700	50 55 140 240 280	consumable	Flame
Tubing-Capillary Std Nebs	9910024800	50 55 140 240 280	consumable	Flame
Capillary Tube Hivac Neb (3) (organics only)	9910044000	50 55 140 240 280	consumable	Flame
Glass impact beads (5/pk)	9910025700	50 55 140 240 280	consumable	Flame
Teflon impact beads (5/pk): (organics only)	9910053300	50 55 140 240 280	consumable	Flame
Burner cleaning strip (100/pk)	9910053900	50 55 140 240 280	consumable	Flame
Window UV silica – round (right side)	2010082600	50 55 140 240 280	PM supplied	Common
Window UV silica – rectangular (left side)	2010082500	50 55 140 240 280	PM supplied	Common
Pad adhesive window (round)	4910012700	50 55 140 240 280	PM supplied	Common
Pad adhesive window (rectangular)	4910012800	50 55 140 240 280	PM supplied	Common
Electrode kit (1 pr) (D2)	6310003400	GTA120	PM supplied	Furnace
Shroud (D2)	6310003100	GTA120	PM supplied	Furnace
Zeeman electrode kit (1 pr)	6310003500	GTA120	PM supplied	Furnace
Zeeman shroud	6310003600	GTA120	PM supplied	Furnace
O-ring PSD rinse bottle	6910025900	PSD120	PM supplied	Furnace

* For engineers who only service AA instruments 5190-8279 can be used as a cheaper alternative for 6610030100.

Items classified as PM supplied in the above table are included in the standard PM

Those classified as consumable should be provided by the customer or charged to the customer if supplied by the Agilent service engineer.

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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

Agilent signature

Total number of pages

Revision: 10.00, Issued: November 2021

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เอกสารไม่ควบคุม

SVD Results Report



Report ID: 1Diagnostic Start Time: 1/24/2024 9:41:23 AMDiagnostic End Time: 1/24/2024 10:10:55 AM

Customer:Service Engineer: Worawit T.

Address:Contact Details:

Instrument Configuration

Configuration:

Serial Number: MY13160001Turret Type: Automatic

Instrument Model: Varian AA140/240/280Number Of Lamps: 4

Flame Instrument: TrueMono Type: Automatic

Furnace Instrument: TrueGasbox Type: 'Y' Gas Box

Zeeman Present: FalseAuto Burner Adjuster: False

Internal Zeeman: FalseMains Frequency: 50

Internal UltraAA: FalseFirmware Version: 2.11

Optics Type: Double BeamPhotomultiplier Type: Normal(900nm)

D2 BG Correction Fitted: TruePWB Version: 45

Boot Block Version: 1.09

EEPROM Data:

Instrument Run Hours: 62609.832D2 Run Hours: 49136.000

Zero Wavelength Offset: 30.148D2 Serial Number: not set !

Mono Correction: 0.765D2 Install Date: 1/1/1970

Flame Hours: 29802.416D2 Original Intensity: 1.000

D2 Last Intensity: 475.000

Frequency:

Averaging Period: 30.0
Datapoint Count: 20

Upper Limit: 51.00Highest Measured Frequency: 50.00

Average Frequency: 50.00

Lower Limit: 49.00Lowest Measured Frequency: 50.00

Result: **Passed**

Report Generated At: 1/24/2024 10:11:18 AM

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SVD Results Report

เอกสารไม่ควบคุม

Power Supply:

Averaging Period: 30.0
Datapoint Count: 20

	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00 V Rail	10.80	12.19	13.20	Passed
-12.00 V Rail	-13.20	-11.90	-10.80	Passed
5.00 V Rail	4.50	5.05	5.50	Passed
310.00 V Rail	279.00	320.00	341.00	Passed

Report Generated At: 1/24/2024 10:11:18 AM

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SVD Results Report

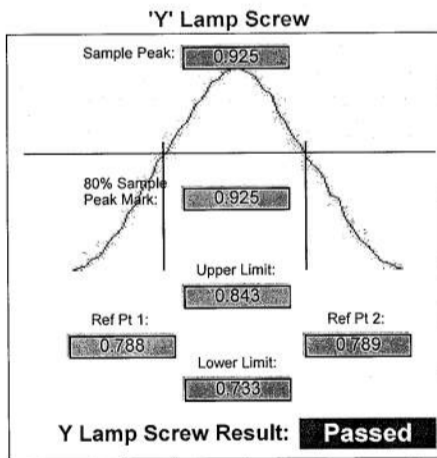
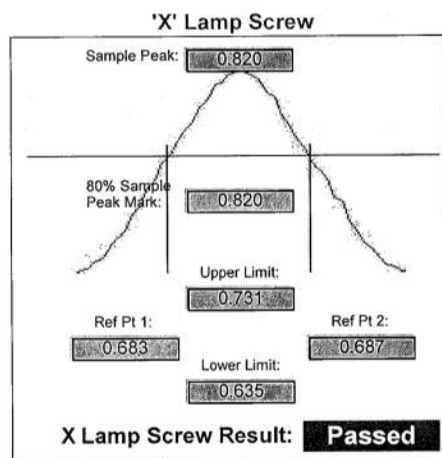
เอกสารไม่ควบคุม

Optics

Beam Balance:

Lamp Type: Copper
Lamp Socket Used: 3

Peak Selected: 324.80
Lamp Alignment: **Performed**



Grating Squareness:

Lamp Element(s): Copper
Lamp Turret Position: 3
Lamp Current(mA): 4.00
Slit Width(nm): 0.5
1st Order Wavelength(nm): 324.80
Lamp Alignment: **Performed**

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.10	0.00	0.10	Passed
First Order	324.45	324.75	325.15	Passed
Second Order	649.23	649.52	649.97	Passed

Wavelength Repeatability:

Lamp Used: Copper
Peak Used(nm): 324.750
Connected to Socket: 3
Lamp Current(mA): 4
Slit Width(nm): 0.2
Slit Height: Normal

Lamp Alignment: **Performed**

Lower Limit(nm) 324.768 324.888 Upper Limit(nm)

(Approach from Zero Order)

Sample 1: 324.828

Sample 3: 324.828

Sample 5: 324.823

Sample 7: 324.823

Sample 9: 324.823

Mean: 324.825

(Approach from end)

Sample 2: 324.828

Sample 4: 324.823

Sample 6: 324.823

Sample 8: 324.823

Sample 10: 324.823

Standard Deviation: 0.002

Result: **Passed**

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SVD Results Report

เอกสารไม่ควบคุม

Report Generated At: 1/24/2024 10:11:18 AM

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SVD Results Report

เอกสารไม่ควบคุม

Mechanical

Wavelength Drive:

Passed

Slit Drive:

Passed

Turret Drive:

Passed

Auto Burner Adjuster Drive:

Untested

Miscellaneous

Signal Processing Linearity:

Calculate Mode: New Calc Mode

	Lower Limit	Actual	Upper Limit	Result:
S0	114	261	297	Passed
S1	156	165	191	Passed
S2	271	296	332	Passed
S3	474	507	579	Passed
S4	825	918	1008	Passed
S5	1435	1528	1754	Passed
S6	2498	2769	3053	Passed
S7	4347	4752	5313	Passed

Interlocks:

Burner Fitted: Working

N2O Burner Fitted: Untested

Flame Shield Closed: Working

Gas Control Fitted: Untested

Pressure Release Bung Fitted: Working

Liquid Trap Fitted: Working

Flame Detect: Working

GCU Active: Working

Oxidant Pressure: Working

Oxidant Changeover: Untested

Ignition: Working

Auto Lamp Recognition:

Lamp 1: Uncoded Lamp/Not Connected

Lamp 2: 87 - Silver/Cadmium/Lead/Zinc(UltrAA) (Ag/CLamp 3: 14 - Copper (Cu)

Lamp 4: Uncoded Lamp/Not Connected

Lamp 5: Not Supported

Lamp 6: INot Supported

Lamp 7: Not Supported

Lamp 8: Not Supported

Result: Passed

GTA Temperature Monitoring:

Not Performed

Notes:

PM 24 Jan 2024

Signatures:

Sequential by time report

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SpectrAA

Analyst

Date Started 1/24/2024 11:39 AM GMT: 1/24/2024 4:39 AM

Worksheet Cu 5 PPM Sense check

Comment

Methods Cu

Computer name DESKTOP-R9UIFRS

Serial Number: MY13160001

Method: Cu (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs
CAL ZERO	0.000	55.0	0.0003
	Readings		
	0.0002	0.0002	0.0004
			1/24/2024
STANDARD 1	5.000	1.7	0.7419
	Readings		
	0.7274	0.7515	0.7468
			1/24/2024

Abs

Linear - Cal. Set 1

0.74

0.60

0.40

0.20

0.00

0.000

2.000

4.000

5.500

Cu mg/L

Curve Fit = Linear

Characteristic Conc = 0.028 mg/L

r = 1.0000

Calculated Conc = 0.000 5.000

Residuals = 0.000 0.000

Abs = 0.14833 x C + 0.00026

Sample 001	4.988	0.7	0.7401
	Readings		
	0.7454	0.7399	0.7349
			1/24/2024

Sequential by time report

1/24/2024 11:50 AM

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SpectrAA

Analyst

Date Started 1/24/2024 11:47 AM GMT: 1/24/2024 4:47 AM

Worksheet Cu 5 PPM Precision

Comment

Methods Cu

Computer name DESKTOP-R9UIFRS

Serial Number: MY13160001

Method: Cu (Flame)

Sample ID	Exp Abs	%RSD	Mean Abs
Cu Precision	0.723	0.5	0.7232
	Readings		
	0.7221	0.7195	0.7226
	0.7201	0.7213	0.7266
			0.7283
			0.7278
			0.7260
			1/24/2024

Abs

Cu Precision

0.79

0.60

0.40

0.00

0.0

5.0

10.0

15.0

20.0

Time