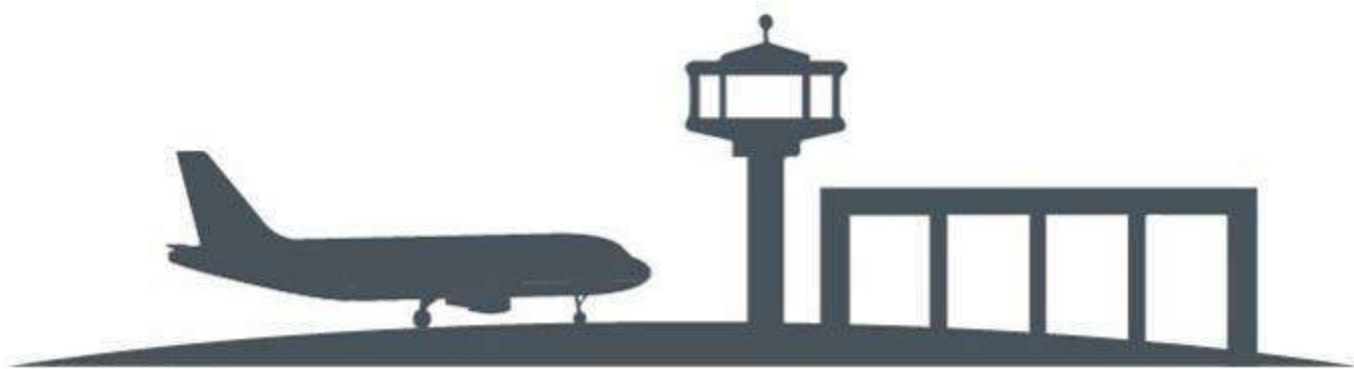


เอกสารแนบ 46
เอกสารสอบเทียบเครื่องมือวิเคราะห์



รายการใบรับรองสอบเทียบเครื่องมือหลักประจำห้องปฏิบัติการสำหรับวิเคราะห์คุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือสำหรับวิเคราะห์คุณภาพอากาศ									
1	Analytical Balance (Readability 0.1 mg)	ฝุ่นละอองรวม (TSP) ฝุ่นละอองขนาดไม่เกิน 10 ไมครอน	Mettler-Toledo	AB204-S / 1128312528	Mettler-Toledo (Thailand) Ltd.	TH2058-097-040722- ACC-TH	7 Apr 22	6 Apr 23	-
2	Analytical Balance (Readability 0.1 mg)	(PM-10)	Mettler-Toledo	AB204-S/FACT / B108115858	Mettler-Toledo (Thailand) Ltd.	TH2058-098-040722- ACC-TH	7 Apr 22	6 Apr 23	-
3	Analytical Balance (Readability 0.001 mg)	ฝุ่นละอองขนาดไม่เกิน 2.5 ไมครอน	Mettler-Toledo	XP6 / B322373893	Mettler-Toledo (Thailand) Ltd.	TH2058-099-040722- ACC-TH	7 Apr 22	6 Apr 23	-
4	Gas Chromatography / Mass Spectrometer (GC/MS)	สารอินทรีย์ระเหยง่าย	Agilent Technologies	System ID: CN1313001 7890 (GC.02.51)	Agilent Technologies (Thailand) Co.,Ltd.	Certificate of System Qualification GC-OQ+ GCMS-OQ	22 Apr 22	21 Apr 23	-

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

รายการใบรับรองสอบเทียบเครื่องมือหลักประจำห้องปฏิบัติการสำหรับวิเคราะห์คุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือสำหรับวิเคราะห์คุณภาพน้ำผิวดิน ตะกอนดิน และน้ำเสีย									
1	pH Meter	ความเป็นกรดและด่าง (pH)	Hanna Instrument	HI2211 / 8165345	National Food Institute, Ministry of Industry, Thailand	2202097-001	16 Mar 22	15 Mar 23	-
2	pH Meter		Mettler-Toledo	Seven Easy S20 / 123052512	National Food Institute, Ministry of Industry, Thailand	2202093-001-01	16 Mar 22	15 Mar 23	-
3	Turbidity Meter	ความขุ่น (Turbidity)	Oakton	T100IR / 1120501017	Technology Promotion Association (Thailand-Japan)	21CH1017	17 Aug 21	16 Aug 22	-
4	Conductivity Meter	ความนำไฟฟ้า (Conductivity)	SI Analytics	Lab955 / 16300356	SPC Calibration Center Co.,Ltd.	C24220084	22 Mar 22	21 Mar 23	-
5	BOD Incubator	บีโอดี(BOD)	Arco	UR-1320 / (UAE.WAO.006/2553)	Technology Promotion Association (Thailand-Japan)	22TM306	7 Apr 22	6 Apr 23	-
6	BOD Incubator		Arco	UC4-1320 / (UAE.WAO.015/2561)	Technology Promotion Association (Thailand-Japan)	22TM90	17 Feb 22	16 Feb 23	-
7	BOD Incubator		Arco	UC4-1320 / (UAE.WAO.018/2551)	Technology Promotion Association (Thailand-Japan)	21TM305	18 Apr 22	17 Apr 23	-
8	Analytical Balance (Readability 0.01 mg)	ของแข็งที่ละลายได้ทั้งหมด (TDS) ของแข็งแขวนลอย (SS)	Mettler-Toledo	XPE205 / B748054897	National Food Institute, Ministry of Industry, Thailand	TH2058-028-042722-ACC-T	31 Mar 22	30 Mar 23	-
9	Hot Air Oven		Memmert	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	22TM304	7 Apr 22	6 Apr 23	-
10	Analytical Balance (Repeatability 0.1 mg)	น้ำมันและไขมัน (Oil and Grease)	Mettler-Toledo	AB204-S/FACT / B108115858	National Food Institute, Ministry of Industry, Thailand	TH2058-098-040722-ACC-T	7 Apr 22	6 Apr 23	-

รายการใบรับรองสอบเทียบเครื่องมือหลักประจำห้องปฏิบัติการสำหรับวิเคราะห์คุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือสำหรับวิเคราะห์คุณภาพน้ำผิวดิน ตะกอนดิน และน้ำเสีย									
11	Atomic Absorption Spectrometer (AAS)	ตะกั่ว (Pb) โครเมียม (Cr) นิกเกิล (Ni)	Agilent Technologies	System ID:G8432A AA240FS / MY13160001	Thailand Institute Of Science And Technological Research (TISTR)	MTC.ACL. No. 486/65	3 Feb 22	2 Feb 23	-
12	Inductively Coupled Plasma (ICP)		Agilent Technologies	System ID:08434AA AA280FS / MY2114002	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	9 May 22	8 May 23	-
13	Incubator (Cooled Incubator)	เบคทีเรียกลุ่มโคลิฟอร์มทั้งหมด (TCB) เบคทีเรียกลุ่มฟีคอลโคลิฟอร์ม (FCB)	Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	22TM563	7 Apr 22	6 Apr 23	-
14	Incubator (Cooled Incubator)		Memmert	IF 75 / D.317.0305	Technology Promotion Association (Thailand-Japan)	22TM670	10 May 22	9 May 23	-
15	Water Bath		Memmert	WNE 14 / L414.1407	Technology Promotion Association (Thailand-Japan)	22TM565	18 Apr 22	17 Apr 23	-
16	Water Bath		Memmert	WNE 14 / L414.1410	Technology Promotion Association (Thailand-Japan)	22TM564	18 Apr 22	17 Apr 23	-
17	Auto Clave		ALP	CL-40L / 808763	Technology Promotion Association (Thailand-Japan)	22TM681	2 Jun 22	1 Jun 23	-
18	Digestor Unit	ทีเคเอ็น (TKN)	FOSS TECATOR	2520 / 91794469	FOSS South East Asia	2202361-001-01	29 Nov 21	28 Nov 22	-
19	Distillation Unit (Kjeldahl Method)		FOSS TECATOR	KT200 / 91790524	FOSS South East Asia	5874	30 Nov 21	29 Nov 22	-

รายการใบรับรองสอบเทียบเครื่องมือหลักประจำห้องปฏิบัติการสำหรับวิเคราะห์คุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
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Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.

Mettler-Toledo (Thailand) Ltd.
846/4 - 846/5 Laksila Rd., Bangna Tai Sub-District,
Bangna District, Bangkok 10260
+66 2723 6362
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

Company: United Analytical Engineering Consultant Co., Ltd.
Address: 3 Sai Udon Sub-41, Sukhewit Rd., Bang Chak
City: Phra Prachin Contact: Sunit Chokchai
Zip/Postal: 10260
State/Province: Bangkok
Order Number:

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: AD204-G Asset Number: UNZAR01000008
Serial No.: 112310228 Technical Model: N/A
Building: 2A Technical Serial No.: N/A
Floor: 2 Technical Asset No.: N/A
Room: Balance Room 2 (208)

Range	Max. Capacity	Readability (d)
1	220 g	0.001 g

Procedure

Calibration Certificate: EURAMET-9g-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: QP.W002/00
This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.
The device is both of the weighing instrument was adjusted before calibration with a 1 kg test weight.
In accordance with EURAMET-9g-18 (11/2015), the test loads were adjusted to reflect the specific use of the weighing device or to accommodate specific calibration needs.

	Temperature	Humidity
As Found	Start: 22.5 °C End: 24.4 °C Start: 56.1 % End: 65.2 %	

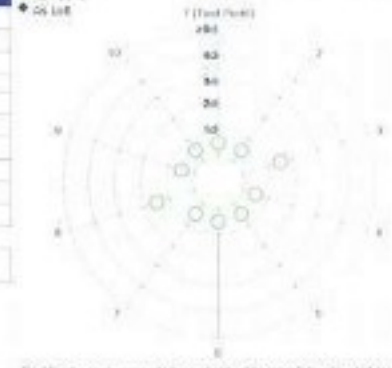
As Found Calibration Date: 07-Apr-2022 Calibration:
As Left Calibration Date: N/A
Issue Date: 08-Apr-2022 Approved Signatory:
☒ Kissanont Tassanontsakul
☐ Sunit Chokchai
☐ Suraphat Sunkate

เอกสารไม่ควบคุม

Measurement Results

Repeatability

Test Load: 100 g	As Found	As Left
1	99.9999 g	N/A
2	100.0000 g	N/A
3	99.9998 g	N/A
4	100.0000 g	N/A
5	99.9999 g	N/A
6	100.0000 g	N/A
7	99.9999 g	N/A
8	100.0001 g	N/A
9	99.9999 g	N/A
10	100.0000 g	N/A
Standard Deviation	0.0000 g	N/A



The "1d" in the graph represents the readability of the range interval in which the test was performed.
The results of this g test are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g	As Found	As Left
1	100.0000 g	N/A
2	99.9999 g	N/A
3	99.9998 g	N/A
4	100.0001 g	N/A
5	100.0001 g	N/A
Maximum Deviation	0.0002 g	N/A

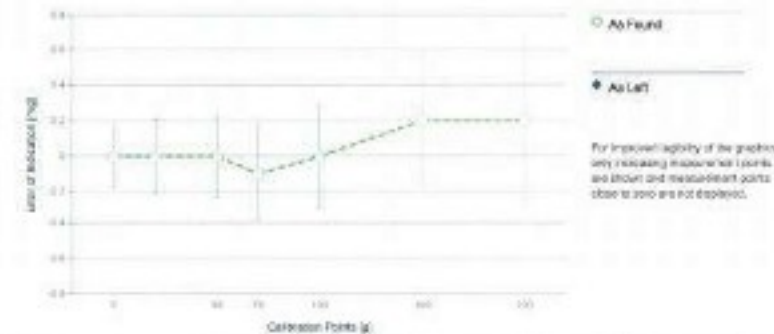


The "1d" in the graph represents the readability of the range interval in which the test was performed.

เอกสารไม่ควบคุม

Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.18 mg	2
2	0.0000 g	0.0000 g	0.0000 g	0.18 mg	2
3	1.0000 g	0.9999 g	-0.0001 g	0.18 mg	2
4	5.0000 g	5.0000 g	0.0000 g	0.18 mg	2
5	10.0000 g	10.0000 g	0.0000 g	0.28 mg	2
6	20.0000 g	20.0000 g	0.0000 g	0.28 mg	2
7	50.0000 g	50.0000 g	0.0000 g	0.47 mg	2
8	100.0001 g	100.0000 g	-0.0001 g	0.28 mg	2
9	150.0000 g	150.0000 g	0.0000 g	0.28 mg	2
10	180.0000 g	180.0000 g	0.0000 g	0.43 mg	2
11	200.0001 g	200.0000 g	-0.0001 g	0.45 mg	2



The uncertainty stated is the expanded uncertainty of calibration obtained by multiplying the standard combined uncertainty by the coverage factor k = 2, which has a larger than 2 according to EURAMET-9g-18. The value of the measurement lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML 62
Weight Set No.: W583 Date of Issue: 25-Feb-2022
Certificate Number: C33658-031 Calibration Due Date: 14-Aug-2023
Thermo Hygrometer
Equipment No.: 84181 Date of Issue: 14-Jun-2021
Certificate Number: 21H1228 Calibration Due Date: 01-Jun-2022

เอกสารไม่ควบคุม

Remarks

Equipment condition: Good
Next calibration according to customer's procedure
Calibration data not delete by calibration laboratory
Test weight by Filter pan: 1 g = 0.9999 g, 5 g = 0.9999 g, 5 g = 0.9999 g

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

เอกสารไม่ควบคุม

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the calculation of the uncertainty under consideration at the point of indication. This value R represents the relative standard deviation in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $3.0 \cdot 10^{-7} / K$
Temperature range on site for the evaluation of the measurement uncertainty in use: $3 K$

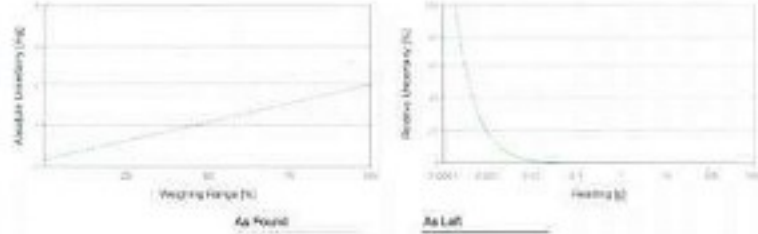
Uncertainty of Uncertainty Equation

Range	As Found	As Left
1 0.0001 g 220 g	$U = 0.15 \text{ mg} \pm 0.00017 \text{ mg/g}$ R	N/A

To optimize the stability of the instrument, besides of the zero load only increasing measurement points with a load of 95% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found	As Left
0.0220 g	0.10 mg 0.45%	N/A
0.2000 g	0.10 mg 0.05%	N/A
2.2000 g	0.21 mg 0.0095%	N/A
22.0000 g	0.57 mg 0.0026%	N/A
220.0000 g	2.0 mg 0.0009%	N/A



Mettler-Toledo (Thailand) Ltd.
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Bangna District, Bangkok 10260
+66 2123 0340
MT-TH-Service@mettler.com

Accuracy Calibration Certificate

Customer

Company: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Sukhvithej Suk 41, Sukhvithej Sub-District, Bangkok
City: Phra Nakhon Contact: Suan Chirakul
Zip / Postal: 10262
State / Province: Bangkok
Order Number: 2222222222

Weighing Device

Manufacturer: Mettler-Toledo Instrument Type: Weighing Instrument
Model: AD204-SFACT Asset Number: LMC-AR-0102550
Serial No.: B120110528 Terminal Model: N/A
Building: N/A Terminal Serial No.: N/A
Floor: 3 Terminal Asset No.: N/A
Room: Laboratory Room 4 (2023)

Range	Max. Capacity	Readability (g)
1	220 g	0.0001 g

Procedure

Calibration Outline: EURAMET-cg-16 v. 4.0 (11/2015)
Mettler-Toledo Work Instructions: OIM D 03

This calibration certificate contains measurements for As Found and As Left indications.
The sensitivity of the weighing instrument was adjusted before As Found and As Left calibrations with a test weight.
In accordance with EURAMET-cg-16 (11/2015), the test loads were selected to reflect the standard use of the weighing device or to accommodate special calibration conditions.

	Temperature		Humidity	
As Found	Start: 22.8 °C	End: 23.1 °C	Start: 50.0 %	End: 51.0 %
As Left	Start: 22.3 °C	End: 22.4 °C	Start: 49.2 %	End: 50.0 %

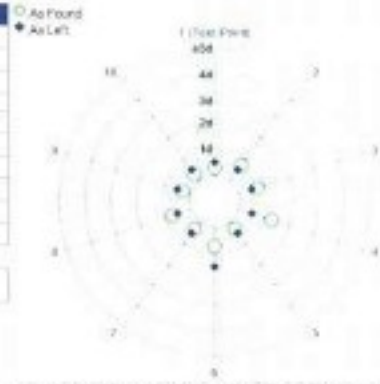
As Found Calibration Date: 07-Apr-2022 Calibration:
As Left Calibration Date: 07-Apr-2022 Approved Signature:
Issue Date: 08-Apr-2022
☒ Expansion Tissue attached
☐ Auto Analysis
☐ Successive Models

Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1 100.0005 g	100.0005 g	100.0005 g
2 100.0004 g	100.0004 g	100.0004 g
3 100.0004 g	100.0004 g	100.0004 g
4 100.0006 g	100.0006 g	100.0006 g
5 100.0005 g	100.0005 g	100.0005 g
6 100.0004 g	100.0004 g	100.0004 g
7 100.0005 g	100.0005 g	100.0005 g
8 100.0004 g	100.0004 g	100.0004 g
9 100.0005 g	100.0005 g	100.0005 g
10 100.0005 g	100.0005 g	100.0005 g
Standard Deviation	0.0007 g	0.0007 g

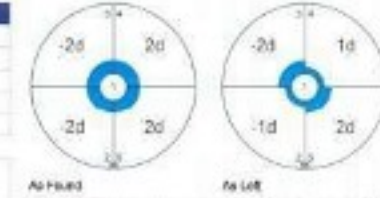


The '10' in the graph represents the readability of the weighing instrument in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1 100.0005 g	100.0005 g	100.0005 g
2 100.0003 g	100.0003 g	100.0003 g
3 100.0003 g	100.0003 g	100.0003 g
4 100.0007 g	100.0007 g	100.0007 g
5 100.0007 g	100.0007 g	100.0007 g
Maximum Deviation	0.0002 g	0.0002 g

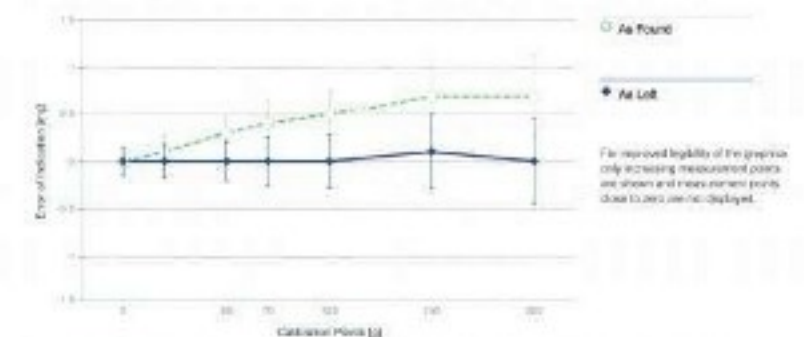


The '10' in the graph represents the readability of the weighing instrument in which the test was performed.

Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.15 mg	2
2	0.1000 g	0.1001 g	0.0001 g	0.16 mg	2
3	1.0000 g	0.9999 g	-0.0001 g	0.16 mg	2
4	5.0000 g	5.0000 g	0.0000 g	0.16 mg	2
5	10.0000 g	10.0001 g	0.0001 g	0.17 mg	2
6	20.0000 g	20.0001 g	0.0001 g	0.18 mg	2
7	50.0000 g	50.0002 g	0.0002 g	0.18 mg	2
8	70.0001 g	70.0005 g	0.0004 g	0.26 mg	2
9	100.0000 g	100.0005 g	0.0005 g	0.27 mg	2
10	150.0000 g	150.0007 g	0.0007 g	0.28 mg	2
11	200.0001 g	200.0008 g	0.0007 g	0.44 mg	2

As Left	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.16 mg	2
2	0.1000 g	0.1000 g	0.0000 g	0.16 mg	2
3	1.0000 g	0.9999 g	-0.0001 g	0.17 mg	2
4	5.0000 g	5.0000 g	0.0000 g	0.17 mg	2
5	10.0000 g	10.0003 g	0.0003 g	0.17 mg	2
6	20.0000 g	20.0003 g	0.0003 g	0.18 mg	2
7	50.0000 g	50.0003 g	0.0003 g	0.21 mg	2
8	70.0001 g	70.0001 g	0.0000 g	0.26 mg	2
9	100.0000 g	100.0004 g	0.0004 g	0.28 mg	2
10	150.0000 g	150.0001 g	0.0001 g	0.28 mg	2
11	200.0001 g	200.0001 g	0.0000 g	0.45 mg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to EURAMET-cg-16. The value of the measured lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for initial signal testing are traceable to national or international standards. The weights were selected and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.	W500	Date of Issue	20-Feb-2022
Certificate Number	C036301031	Calibration Due Date	14-Apr-2023
Thermo Hygrometer			
Relevant No.	81181	Date of Issue	15-Jul-2021
Certificate Number	21111208	Calibration Due Date	01-Jun-2022

Remarks

FACT adjustment functionality activated
Value of the built-in weight adjusted
Equipment condition: Good
Next calibration according to customer's procedure
Calibration data not decide by calibration laboratory
Total weight by P1000 scale: 1 g = 1.0000 g, 3 g = 3.0000 g, 5 g = 5.0000 g

End of Accredited Section

This information below and any attachments to this calibration certificate are not part of the accredited calibration.

Mettler Toledo (Thailand) Ltd.
846/4 - 846/5 Laksalee Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10710
+66 2720 5482
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

Company:	United Analytical Engineering Consultant Co., Ltd.		
Address:	3/101 Udoni Sub-RT, Sukhewit Rd., Bang Chak		
City:	Phra Khanong	Contact:	Sevit Chutarak
Zip / Postal:	10260		
State / Province:	Bangkok		
Order Number:			

Weighing Device

Manufacturer:	Mettler Toledo	Instrument Type:	Weighing Instrument
Model:	AP5	Asset Number:	UNC AR 0150550
Serial No.:	9022572683	Terminal Model:	PAT
Building:	5th	Terminal Serial No.:	8022773680
Floor:	2	Terminal Asset No.:	N/A
Room:	distance from 4 (LAK)		

Range	Max. Capacity	Resolution (g)
1	0.1 g	0.000001 g

Procedure

Calibration Guidelines: EURAMET cg-16 v. 4.6 (1/2015)
METTLER TOLEDO Work Instruction: CPW303/20
This calibration certificate contains measurements for As Found and As Left calibrations.
The sensitivity/span of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight.
In accordance with EURAMET cg-16 (1/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature		Humidity	
As Found	Start: 22.7 °C	End: 22.9 °C	Start: 54.2 %	End: 55.8 %
As Left	Start: 22.6 °C	End: 22.9 °C	Start: 52.9 %	End: 56.8 %

As Found Calibration Date:	27-Apr-2022	Calibrator:	
As Left Calibration Date:	27-Apr-2022	Approved Signature:	
Issue Date:	28-Apr-2022		

☒ Kasetorn Tanasachakul
☐ Sank Jiraporn
☐ Pavechit Eakwila

Measurement Uncertainty of the Weighing Instrument in Use

related to the expanded uncertainty with $k=2$ is used. This formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the relative indication in the unit of measure of the force.

Temperature coefficient for the evaluation of the measurement uncertainty is: $2.5 \times 10^{-6} / K$
Temperature range on site for the evaluation of the measurement uncertainty is: $2 K$

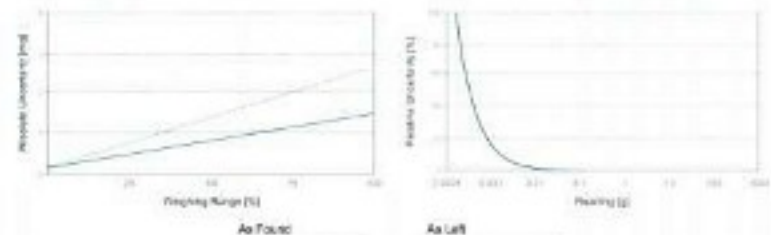
Uncertainty Classification

Range	As Found	As Left
1: 0.0001 g, 0.25 g	$u_1 = 0.16 \text{ mg} \pm 0.011 \text{ mg/g} \cdot R$	$u_1 = 0.16 \text{ mg} \pm 0.0050 \text{ mg/g} \cdot R$

To optimize the stability of the measurement, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear expansion.

Absolute and Relative Measurement Uncertainty in Use for Various Test Indicators (Examples)

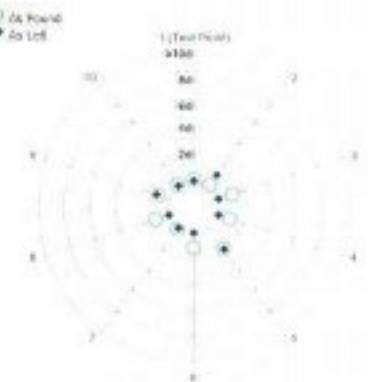
Test Indicator	As Found	As Left
6.5223 g	6.16 mg, 8.73%	6.16 mg, 9.73%
6.3001 g	6.16 mg, 0.074%	6.16 mg, 0.074%
3.3000 g	6.16 mg, 0.0004%	6.17 mg, 0.0019%
20.000 g	6.40 mg, 0.0318%	6.20 mg, 0.0312%
220.000 g	2.6 mg, 0.0012%	1.5 mg, 0.0006%



Measurement Results

Repeatability

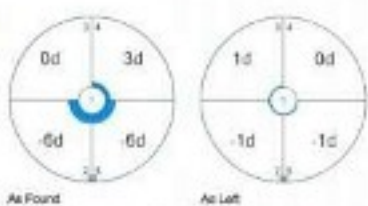
Test Load: 2 g	As Found	As Left
1	2.00000 g	2.00000 g
2	2.00000 g	2.00000 g
3	2.00000 g	2.00000 g
4	2.00000 g	2.00000 g
5	2.00000 g	2.00000 g
6	2.00000 g	2.00000 g
7	2.00000 g	2.00000 g
8	2.00000 g	2.00000 g
9	2.00000 g	2.00000 g
10	2.00000 g	2.00000 g
11	2.00000 g	2.00000 g
12	2.00000 g	2.00000 g
Standard Deviation	0.000000 g	0.000000 g



The "12" in the graph represents the repeatability of the range interval in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 2 g	Position	As Found	As Left
1	0d	2.00000 g	2.00000 g
2	3d	2.00000 g	2.00000 g
3	6d	2.00000 g	2.00000 g
4	9d	2.00000 g	2.00000 g
5	12d	2.00000 g	2.00000 g
Maximum Deviation		0.000000 g	0.000000 g



The "12" in the graph represents the repeatability of the range interval in which the test was performed.

Error of Indication

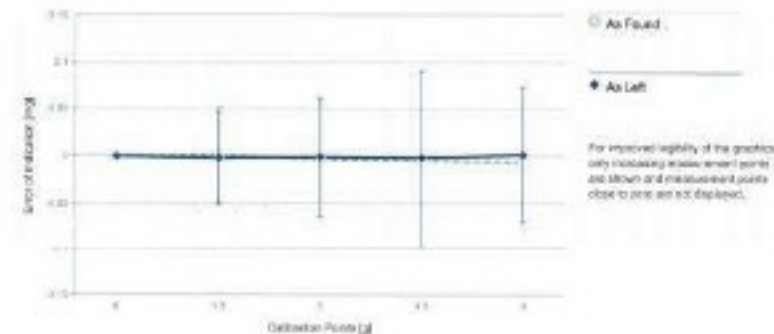
As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1*	0.00000 g	0.00000 g	0.00000 g	0.004 mg	2
2	0.01000 g	0.01000 g	0.00001 g	0.007 mg	2
3*	0.05000 g	0.05000 g	-0.00003 g	0.011 mg	2
4*	0.10000 g	0.10000 g	0.00000 g	0.015 mg	2
5	0.15000 g	0.15001 g	-0.00001 g	0.020 mg	2
6	0.17500 g	0.17501 g	-0.00001 g	0.024 mg	2
7	0.20000 g	0.20000 g	0.00000 g	0.028 mg	2
8	1.00000 g	1.00000 g	0.00000 g	0.040 mg	2
9	3.00000 g	3.00000 g	-0.00004 g	0.060 mg	2
10	4.00000 g	4.00000 g	-0.00005 g	0.084 mg	2
11	6.00000 g	6.00000 g	-0.00006 g	0.102 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1*	0.00000 g	0.00000 g	0.00000 g	0.004 mg	2
2	0.01000 g	0.01000 g	0.00001 g	0.007 mg	2
3*	0.05000 g	0.05000 g	0.00000 g	0.011 mg	2
4*	0.10000 g	0.10000 g	0.00000 g	0.015 mg	2
5	0.15000 g	0.15001 g	-0.00001 g	0.020 mg	2
6	0.17500 g	0.17501 g	-0.00001 g	0.024 mg	2
7	0.20000 g	0.20000 g	0.00000 g	0.028 mg	2
8	1.00000 g	1.00000 g	-0.00000 g	0.040 mg	2
9	3.00000 g	3.00000 g	-0.00000 g	0.060 mg	2
10	4.00000 g	4.00000 g	-0.00000 g	0.084 mg	2
11	6.00000 g	6.00000 g	0.00000 g	0.102 mg	2

The calculated uncertainty was replaced by the GUM (Guidelines for the Expression of Uncertainty in Measurement) value because the calculated uncertainty was smaller than the GUM value.



The uncertainty stated is the expanded uncertainty by multiplying the standard combined uncertainty by the coverage factor $k=2$, which can be larger than 2 according to EURAMET cg-15. The value of the measured lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Measurement Uncertainty of the Weighing Instrument in Use

Below is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of mass of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.0 \cdot 10^{-7} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: $\pm 3 K$

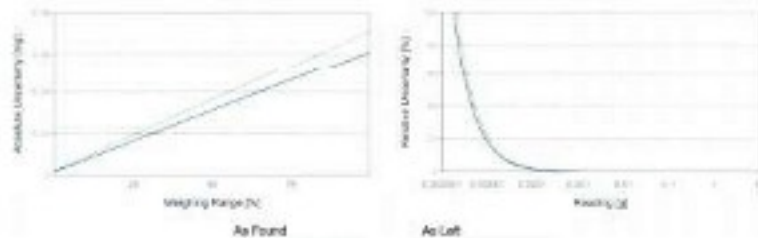
Uncertainty of Uncertainty Equation

Range	As Found	As Left
1	0.00001 g	0.1 g
	$U_1 = 0.0021 \text{ mg} + 0.0130 \text{ mg/g} \cdot R$	$U_1 = 0.0018 \text{ mg} + 0.0046 \text{ mg/g} \cdot R$

To optimize the stability of the indication, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger was taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
0.00010 g	0.0021 mg	0.005%	0.0018 mg	0.005%
0.00100 g	0.0022 mg	0.006%	0.0019 mg	0.006%
0.01000 g	0.0025 mg	0.0048%	0.0024 mg	0.0030%
0.10000 g	0.0030 mg	0.0015%	0.0027 mg	0.0013%
1.00000 g	0.0037 mg	0.0012%	0.0031 mg	0.0010%



Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: DIML 02

Weight Set No.	W896	Date of Issue:	23-Feb-2022
Certificate Number:	0208581831	Calibration Due Date:	14-Aug-2023
Theme Hydrostatic			
Calibration No.:	01/01	Date of Issue:	14-Jun-2021
Certificate Number:	21011235	Calibration Due Date:	01-Jun-2023

Remarks

- FACT adjusters functionality activated
- Value of the built-in weight adjusted
- Equipment condition: Good
- Next calibration according to customer's procedure
- Calibration data not delete by calibration laboratory
- Test weight by their: $0.050005 \text{ g} \pm 0.00004 \text{ g}$, $0.100012 \text{ g} \pm 0.00011 \text{ g}$

End of Accredited Section

The information below and any addenda to this calibration certificate are not part of the accredited calibration.

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Agilent GreenLab Compliance Services

Certificate of System Qualification

GC-DQ

System ID:	CN10113001
Organization Name:	United Analyst and Engineering Consultant
Organization Location:	3 Soi Udomsak 41 Sukhumvit Road, Bangkok, Phraekhong, Bangkok 10260

Date:	April 22, 2022 2:32:15 PM
EQP Name:	Agilent/Recommended
EQP Revision:	GC-DQ-01
Overall Qualification Status:	Pass

System Inspection and Basic Safety and Operation

Name:	7890
Setpoint Status:	Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressures Decay

Name:	7890
Front:	SSL
Setpoint Status:	Pass
Pressure:	25.0 psi
Pressure Change:	-0.1 psi
Agilent Recommended:	>= -2.0 and <= 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name:	7890
Front:	SSL

Setpoint Status: **Pass**

Setpoint: **25.0** psi Actual: **25.0** psi

Flow Type: **Makeup**

Setpoint: **50.0** mL/min Measured Flow: **50.2** mL/min

Accuracy: **0.0** psi

Agilent Recommended: **<= 1.2**

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: **7890**

Back **PPD+**

Setpoint Status: **Pass**

Flow Type: **Front**

Setpoint: **50.0** mL/min Measured Flow: **50.2** mL/min

Accuracy: **0.2** mL/min

Agilent Recommended: **<= 15.0** % setpoint (**6.0** mL/min)

Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: **Pass**

Flow Type: **Front**

Setpoint: **50.0** mL/min Measured Flow: **50.1** mL/min

Accuracy: **0.1** mL/min

Agilent Recommended: **<= 15.0** % setpoint (**6.0** mL/min)

Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Date: **April 22, 2022 2:32:15 PM**

System ID: **CH12113001**

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Setpoint Status: **Pass**

Flow Type: **Makeup**

Setpoint: **50.0** mL/min Measured Flow: **50.2** mL/min

Accuracy: **0.2** mL/min

Agilent Recommended: **<= 15.0** % setpoint (**6.0** mL/min)

Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name: **7890**

Front **FID**

Setpoint Status: **Pass**

Flow Type: **Front**

Setpoint: **50.0** mL/min Measured Flow: **50.2** mL/min

Accuracy: **0.2** mL/min

Agilent Recommended: **<= 15.0** % setpoint (**6.0** mL/min)

Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: **Pass**

Flow Type: **Front**

Setpoint: **50.0** mL/min Measured Flow: **50.2** mL/min

Accuracy: **0.2** mL/min

Agilent Recommended: **<= 15.0** % setpoint (**6.0** mL/min)

Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Date: **April 22, 2022 2:32:15 PM**

System ID: **CH12113001**

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Setpoint Status: **Pass**

Flow Type: **Makeup**

Setpoint: **25.0** mL/min Measured Flow: **24.9** mL/min

Accuracy: **0.1** mL/min

Agilent Recommended: **<= 10.0** % setpoint (**2.5** mL/min)

Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: **7890**

Setpoint Status: **Pass**

Zone: **Over**

Setpoint/Measured: **250.0** **250.5** °C

Accuracy: **0.5** °C

Agilent Recommended: **<= 1.0** % setpoint in K (**-5.0** °C)

<= 1.0 % setpoint in K (**5.0** °C)

Setpoint Status: **Pass**

Zone: **Over**

Setpoint/Measured: **100.0** **100.4** °C

Accuracy: **0.4** °C

Agilent Recommended: **<= 1.0** % setpoint in K (**-3.7** °C)

<= 1.0 % setpoint in K (**3.7** °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: **7890**

Date: **April 22, 2022 2:32:15 PM**

System ID: **CH12113001**

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Setpoint Status: **Pass**

Setpoint/Average: **100.0** **100.4333** °C

Stability: **0.1** °C

Agilent Recommended: **<= 0.5**

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination: **Front** **SSL** **/ Back** **PPD+**

Injection Tower

Name: **7890A**

Setpoint Status: **Completed**

Injection Volume on Column: **1.0** µL

Mode: **P-Mode**

Overall Scouting Run Status

Completed

Notes and Drift

Tested Combination: **Front** **SSL** **/ Back** **PPD+**

Name: **7890**

Setpoint Status: **Pass**

Mode: **P-Mode**

Base Signal: **12.2** **150** pA

Agilent Recommended: **<= 2.00** **<= 1.50**

Status: **Pass** **Pass**

Date: **April 22, 2022 2:32:15 PM**

System ID: **CH12113001**

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Overall Noise and Drift Test Status

Pass

Injection Description

Tested Combination1	Front	SSL	/ Back	FID+
Name:	7893A			

Setpoint Status: Pass

Injection Volume on Column: 1.0 μ L

Mode:

Area RSD: 2.53 % Retention Time RSD: 0.02 %

Agilent Recommended: \leq 3.00 \leq 1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination1	Front	SSL	/ Back	FID+
Name:	Injection Tower			

Mode: P-Mode

Setpoint Status: Pass

Signal to Noise: 11529

Agilent Recommended: \geq 2400

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2	Front	SSL	/ Front	FID
Name:	Injection Tower			

7893A

Date: April 22, 2022 2:33:10 PM

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Setpoint Status: Completed

Injection Volume on Column: 1.0 μ L

Overall Scouting Run Status

Complete

Noise and Drift

Tested Combination2	Front	SSL	/ Front	FID
Name:	7890			

Setpoint Status: Pass

Base Signal: 21.3 μ AASTM Noise: μ A0.07 μ A/HzAgilent Recommended: \leq 0.10 \leq 2.50

Status: Pass

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2	Front	SSL	/ Front	FID
Name:	7893A			

Setpoint Status: Pass

Injection Volume on Column: 1.0 μ L

Area RSD: 0.00 % Retention Time RSD: 0.04 %

Agilent Recommended: \leq 3.00 \leq 1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

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System ID: CN13113301

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Tested Combination2	Front	SSL	/ Front	FID
Name:	Injection Tower			

7890

Setpoint Status: Pass

Signal to Noise: 521845

Agilent Recommended: \geq 300000

Overall Signal to Noise Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	CN13113301
Manufacturer	Agilent Technologies
Name	7890
Raw Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Inlet	Front
Detector	Back
LTM Included?	No

Tested Combination2

Injection Technique	Injection Tower
Inlet	Front
Detector	Front
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7893A
Model Number	04513A
Serial Number	CN13096014
Firmware Revision	A.10.00
Usage	Sample Injection
Location	Front
Syringe Volume (μ L)	50

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System ID: CN13113301

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Sampler 2

Manufacturer	Agilent Technologies
Type	Trey
Model	7800A
Model Number	04514A
Serial Number	CN13200166
Firmware Revision	A.12.16
Val Handler	Not installed

Manifold 1

Manufacturer	Agilent Technologies
Name	7860
Model Number	00440B
Serial Number	CN13113001
Firmware Revision	R.02.03.2
Owner Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	7860
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Date: April 22, 2022 2:02:15 PM
System ID: CN13113001

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Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	FID+
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Rack
Makeup Gas	Nitrogen
Flow Filter Tweed	IP-Mode

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Electronic Signature

Purpose

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Logged On User Name:	surekshat.tarak@mn.agilent.com
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System ID: CN13113001

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เอกสารไม่ควบคุม

User Name: surekshat.tarak
Password: 1497094213184186

System ID: CN13113001
Print Date: April 22, 2022 2:03:48 PM

CN13113001 Transaction Log

Time	Transaction Date	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 9:34:28 AM	Start	Session Created	Session	None
April 22, 2022 9:34:25 AM	Start	Configuration	Session	None
April 22, 2022 9:34:25 AM	Start	Entered	Logging	User is logging in and does not require an external code
April 22, 2022 9:34:25 AM	Start	Exp. setup	Session	EPC checks for primary flow path - PM-4 Flow path Pressure/Flow/Out/Configured smol: 0.1904 61.51 exp: ECP File Name: [Ex 61-51 exp], ECP Name: [Agilent Recommended]
April 22, 2022 9:34:34 AM	End	Configuration	Session	None
April 22, 2022 9:35:00 AM	Start	Qualification	Session	QS
April 22, 2022 9:35:00 AM	Start	Execution	System Inspection and Basic Safety and Operation - 100% - Qualitative Test - No reports associated	None
April 22, 2022 9:35:21 AM	End	Execution	System Inspection and Basic Safety and Operation - 100% - Qualitative Test - No reports associated	Run Count: 1
April 22, 2022 9:35:21 AM	End	Execution	Valve Pressure Primary - Front SM - Pressure Controlled Inlet - 0.25.0 psi (-), min - 0.0 psi and max 0.0 psi	None
April 22, 2022 9:35:21 AM	End	Execution	Inlet Pressure Setup - Front SSL - Pressure Controlled Inlet - 5.25.0 psi (-), min - 0.0 psi and max 0.0 psi	Run Count: 1
April 22, 2022 9:35:21 AM	Start	Execution	Inlet Pressure Secondary - Front SM - Pressure Controlled Inlet - 0.25.0 psi (-), min - 0.0 psi	None

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Date: April 22, 2022 2:02:16 PM
System ID: CN13113001

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เอกสารไม่ควบคุม

User Name: samgpradit.kong

Hardware: LAPTOP-CQ294Q286

System ID: CM12113001

Print Date: April 22, 2022 2:32:18 PM

CM12113001 Transaction Log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 9:28:28 AM	End	Execution	Int Pressure Accuracy - Front ISO - Pressure Controlled Inlet ISO - Flow: 1.0 L/min 1.2 psi	Run Count: 1
April 22, 2022 9:30:42 AM	Start	Execution	Detector Flow Accuracy - Back PTD - Type: Full - 3.000 ISO - Flow: 1.0 L/min 10.0% output	None
April 22, 2022 9:30:51 AM	Auto	Data	Detector Flow Accuracy - Back PTD - Type: Full - 3.000 ISO - Flow: 1.0 L/min 10.0% output	Manual Data Entry
April 22, 2022 9:30:55 AM	End	Execution	Detector Flow Accuracy - Back PTD - Type: Full - 3.000 ISO - Flow: 1.0 L/min 10.0% output	Run Count: 1
April 22, 2022 9:30:57 AM	Start	Execution	Detector Flow Accuracy - Back PTD - Type: Output - 5 ISO - Flow: 1.0 L/min 10.0% output	None
April 22, 2022 9:30:59 AM	Auto	Data	Detector Flow Accuracy - Back PTD - Type: Output - 5 ISO - Flow: 1.0 L/min 10.0% output	Manual Data Entry
April 22, 2022 9:31:03 AM	End	Execution	Detector Flow Accuracy - Back PTD - Type: Output - 5 ISO - Flow: 1.0 L/min 10.0% output	Run Count: 1
April 22, 2022 9:31:05 AM	Start	Execution	Detector Flow Accuracy - Back PTD - Type: Makeup - 0 ISO - Flow: 1.0 L/min 10.0% output	None
April 22, 2022 9:31:09 AM	Start	Execution	Detector Flow Accuracy - Back PTD - Type: Makeup - 0 ISO - Flow: 1.0 L/min 10.0% output	None

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System ID: CM12113001

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User Name: samgpradit.kong		System ID: CM12113001		
Hardware: LAPTOP-CQ294Q286		Print Date: April 22, 2022 2:32:18 PM		
CM12113001 Transaction Log				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 9:31:25 AM	Auto	Data	Detector Flow Accuracy - Back PTD - Type: Full - 3.000 ISO - Flow: 1.0 L/min	Manual Data Entry
April 22, 2022 9:31:40 AM	End	Execution	Detector Flow Accuracy - Back PTD - Type: Full - 3.000 ISO - Flow: 1.0 L/min	Run Count: 1
April 22, 2022 9:44:30 AM	Start	Execution	Signal to Noise - Injection Flow: 1.0 L/min	None
April 22, 2022 10:30:32 AM	Start	Execution	Signal to Noise - Injection Flow: 1.0 L/min	None
April 22, 2022 10:30:37 AM	Start	Execution	Signal to Noise - Injection Flow: 1.0 L/min	None
April 22, 2022 10:30:39 AM	Auto	Data	Detector Flow Accuracy - Front PTD - Type: Full - 3.000 ISO - Flow: 1.0 L/min	Manual Data Entry
April 22, 2022 10:30:41 AM	End	Execution	Detector Flow Accuracy - Front PTD - Type: Full - 3.000 ISO - Flow: 1.0 L/min	Run Count: 1
April 22, 2022 10:30:43 AM	Start	Execution	Detector Flow Accuracy - Front PTD - Type: Full - 3.000 ISO - Flow: 1.0 L/min	None
April 22, 2022 10:30:45 AM	Auto	Data	Detector Flow Accuracy - Front PTD - Type: Full - 3.000 ISO - Flow: 1.0 L/min	Manual Data Entry
April 22, 2022 10:30:47 AM	End	Execution	Detector Flow Accuracy - Front PTD - Type: Full - 3.000 ISO - Flow: 1.0 L/min	Run Count: 1

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System ID: CM12113001

เอกสารไม่ควบคุม

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User Name: samgpradit.kong

Hardware: LAPTOP-CQ294Q286

System ID: CM12113001

Print Date: April 22, 2022 2:32:18 PM

CM12113001 Transaction Log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 10:11:25 AM	Start	Execution	Detector Flow Accuracy - Front	None
			PTD - Type: Full - 3.000	
			ISO - Flow: 1.0 L/min	
April 22, 2022 10:11:40 AM	Auto	Data	Detector Flow Accuracy - Front	Manual Data Entry
			PTD - Type: Full - 3.000	
			ISO - Flow: 1.0 L/min	
April 22, 2022 10:11:49 AM	End	Execution	Detector Flow Accuracy - Front	Run Count: 1
			PTD - Type: Full - 3.000	
			ISO - Flow: 1.0 L/min	
April 22, 2022 10:11:52 AM	Start	Execution	GC Oven Temperature	None
			Accuracy - TMR - Temperature	
			Over - 5: 230.0°C - L: -1.0	
			AND - 1.0% - 1.0% - 1.0%	
April 22, 2022 10:12:15 AM	Auto	Data	GC Oven Temperature	Manual Data Entry
			Accuracy - TMR - Temperature	
			Over - 5: 230.0°C - L: -1.0	
			AND - 1.0% - 1.0% - 1.0%	
April 22, 2022 10:12:18 AM	End	Execution	GC Oven Temperature	Run Count: 1
			Accuracy - TMR - Temperature	
			Over - 5: 230.0°C - L: -1.0	
			AND - 1.0% - 1.0% - 1.0%	
April 22, 2022 10:12:20 AM	Start	Execution	GC Oven Temperature	None
			Accuracy - TMR - Temperature	
			Over - 5: 230.0°C - L: -1.0	
			AND - 1.0% - 1.0% - 1.0%	
April 22, 2022 10:12:43 AM	Auto	Data	GC Oven Temperature	Manual Data Entry
			Accuracy - TMR - Temperature	
			Over - 5: 230.0°C - L: -1.0	
			AND - 1.0% - 1.0% - 1.0%	
April 22, 2022 10:12:46 AM	End	Execution	GC Oven Temperature	Run Count: 1
			Accuracy - TMR - Temperature	
			Over - 5: 230.0°C - L: -1.0	
			AND - 1.0% - 1.0% - 1.0%	

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Date: April 22, 2022 2:32:18 PM
System ID: CM12113001

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User Name: samgpradit.kong Hardware: LAPTOP-CQ294Q286			System ID: CM12113001 Print Date: April 22, 2022 2:32:18 PM	
CM12113001 Transaction Log				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 10:12:48 AM	Start	Execution	GC Oven Temperature Stability	None
			Accuracy - TMR - Temperature	
			Over - 5: 230.0°C - L: -1.0	
April 22, 2022 10:13:00 AM	Auto	Data	GC Oven Temperature Stability	Manual Data Entry
			Accuracy - TMR - Temperature	
			Over - 5: 230.0°C - L: -1.0	
April 22, 2022 10:13:03 AM	End	Execution	GC Oven Temperature Stability	Run Count: 1
			Accuracy - TMR - Temperature	
			Over - 5: 230.0°C - L: -1.0	
April 22, 2022 10:13:05 AM	Start	Execution	GC Scouting Run - Injection	None
			Flow: 1.0 L/min, Back PFD: -	
			Part of System Preparation, No	
			Info associated	
April 22, 2022 10:14:11 AM	Auto	Data	GC Scouting Run - Injection	Manual Data Entry
			Flow: 1.0 L/min, Back PFD: -	
			Part of System Preparation, No	
			Info associated	
April 22, 2022 10:14:13 AM	End	Execution	GC Scouting Run - Injection	Run Count: 1
			Flow: 1.0 L/min, Back PFD: -	
			Part of System Preparation, No	
			Info associated	
April 22, 2022 10:14:15 AM	Start	Execution	Flow and Cell - Back PFD: -	None
			Detector FPD: F-Mode - L	
			Mass: - 2.00 150 pA - L	
			DRF: - 1.50 150 pA/Hz	
April 22, 2022 10:14:17 AM	Auto	Data	Flow and Cell - Back PFD: -	Manual Data Entry
			Detector FPD: F-Mode - L	
			Mass: - 2.00 150 pA - L	
			DRF: - 1.50 150 pA/Hz	
April 22, 2022 10:14:19 AM	End	Execution	Flow and Cell - Back PFD: -	Run Count: 1
			Detector FPD: F-Mode - L	
			Mass: - 2.00 150 pA - L	
			DRF: - 1.50 150 pA/Hz	

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Date: April 22, 2022 2:32:18 PM
System ID: CM12113001

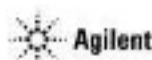
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Agilent CrossLab Start Up Services Agilent 7890 Gas Chromatograph Preventive Maintenance Checklist

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

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



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Introduction

Customer Information

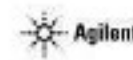
- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the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

Important Customer Web Links

- For more information about Agilent Technologies services, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- The Agilent Community is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- To access Agilent University, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful Agilent Resource Center web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>.
- Need technical support, FAQs, supplies? – visit our **Support Home page** <http://www.agilent.com/county/support>.
- Videos about specific preparation requirements for your instrument can be found by searching the Agilent YouTube channel at <https://www.youtube.com/user/agilent>.
- 7890B Manuals are also available on Agilent.com:
 - Safety**
https://www.agilent.com/cs/library/usermanuals/public/7890B_Safety.pdf
 - Installation and First Startup**
https://www.agilent.com/cs/library/usermanuals/public/7890B_Installation.pdf
 - Operation Manual**
https://www.agilent.com/cs/library/usermanuals/public/7890B_Operation.pdf
 - Maintaining Your GC**
https://www.agilent.com/cs/library/usermanuals/public/7890B_200124_207890B_Maintaining%20Guide.pdf

Revision: 2.01, issued: September 15, 2021
Agilent Document Number: D0013618
DE number: 44166-759722222
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Service Engineer's Responsibilities

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

Additional Instruction Notes

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



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System Information

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

Instrument System Name and ID	Q7890B	0113119001
Instrument System Site and Location	VAE	Instrument room

Unit System Component Product Numbers	List the Serial Numbers of each Component
1. Q7890B	CN13113001
2. G4513A	CN13262018
3. G4514A	CN13200169
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Preparation

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



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Preventive Maintenance Procedure

Clean and inspect GC

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

Inlet and detector consumable replacement

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

Zero Sensors and Leak test

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

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ALS Maintenance

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

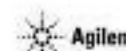
Restore Instrument

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

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

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Signature Page

Service Review

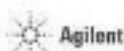
- ☐ Attach available reports/printouts of all tests to this documentation.
- ✓ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ✓ Update actual instrument maintenance counters as appropriate.
- ✓ Affix the O&A sticker to the system or instrument logbook based on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

7890 GC Test Results Table

Detector Signal Outputs	Before PM Service	After PM Service
Front detector output	N/A	21.6
Back detector output	N/A	12.4
ALX detector output	N/A	N/A
Pressure decay test	Expected test result	Actual test result
Front inlet pressure decay test	Pass	Pass
Back inlet pressure decay test	Pass	N/A

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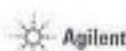
7890 Parts List Table

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

Part description	Part number	Product or model# where used	Quantity consumed
SSL Capillary Inlet OMA kit, 0.18-inch	5188-6197	7890A/B	1
SSL Capillary Inlet PM kit, split	5188-6496	7890A/B	1
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Low Pressure Drop Split Liner - with Glass Wool	5190-2295	7890A/B	N/A
PP Inlet PM kit	5188-6498	7890A/B	N/A
Split vent trap PM kit, single cartridge (for MMI, PTV & VI)	5188-6190	7890A/B	N/A
MMI Cleaning Kit	03510-60820	7890A/B	N/A
PTV Septumless Head Rebuild Kit	5182-4747	7890A/B	N/A
PTV Septumless Head Teflon Guide	5182-4748	7890A/B	N/A
Ignitor (fits new and old assemblies with O-ring)	110031-00000	7890A/B	1
FID Collector Rebuild/Cleaning Kit	61531-67000	7890A/B	N/A
Standard .011-inch FID Jet for capillary FID base	61531-60560	7890A/B	1
High Temperature .018-inch FID Jet for capillary FID base	61531-60520	7890A/B	N/A
Standard .018-inch FID Jet for packed column with packed FID base	18710-20119	7890A/B	N/A
Standard .011-inch FID Jet for capillary column with packed/adjustable FID base	19244-80510	7890A/B	N/A
High Temperature .018-inch FID Jet for capillary column with packed/adjustable FID base	19244-80520	7890A/B	N/A
NPD Jet, universal fit, .011-inch ID	61534-80560	7890A/B	N/A
NPD Jet, universal fit, .011-inch ID - Extended fit	61534-80550	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	7890A/B	N/A
**FID Collector Replacement Kit, if needed	61531-67001	7890A/B	N/A

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Service Engineer Comments

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

Service Completion

Service request number 600496548 Date service completed 22 April 2022
 Agilent signature [Signature] Customer signature [Signature]
 Total number of pages in this document: 9 pages

Revision: 3.01, Issued: September 15, 2021
 Agilent Document Number: D0013018
 DC number: 44166.7097222222
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EQP Name: AgilentRecommended
 Service Type: GC
 Company Name: United Analyst And Engineering Consultant Co., Ltd.
 Customer Name/Title: Tom Somporn Niyathum / Laboratory Manager
 EQP Filename: GC0201.eeq
 EQP Release Date: November 2020
 Print Date: November 2, 2020 6:00:29 PM

AgilentRecommended

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November 2, 2020 6:00:29 PM

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Scope and Purpose

Overview

The Equipment Qualification Plan (EQP) documents the activity program that is performed during the qualification services for the applicable systems. A complete description of the test specifications is provided for the supported services, including setpoints and acceptance criteria (or limits) for each test. The test specification section of this document is created directly from the EQP file name listed on the cover. This document is an abstraction of the EQP file used to perform the service and is generated directly from the workstation Agilent Equipment Qualification Plan (eEQP) Editor. The purpose of this document is to allow the user to review and record approval of the EQP that guides the delivery of compliance services provided by the Agilent Automated Compliance Engine.

CD5 Software Pre-requisite for Hardware Qualifications

(Applies to hardware qualifications only) Agilent recommends that the customer data system (CD5) software used during the qualification has been qualified within the qualification period specified by the customer's software qualification SOP.

Statement of Intent

Unless otherwise requested, the qualification is delivered according to the standard test program described in the AgilentRecommended EQP. Agilent defines variances as changes to the default recommended values (as stated in the AgilentRecommended EQP) that lie within a user-defined range. These changes are considered to be within the intended use range of the system under test.

Customizations are values that (a) subject the system to limits that exceed the typical operational range or (b) additional tests that are not considered part of the core program required for completion of the selected service. Because custom setpoints and limits may exceed the operational envelope of the equipment, Agilent reserves the right to warrant performance only to the closest variance within. The user is notified of this situation at EQP setup time and the qualification report (EQR) will reflect this situation.

A set of ink signature fields, as determined by the creator of this document, can be included at the end of this document. All fields should be completed on a single set of fields, whether by an operator using a pen through any signature fields that are not to be used. This is an optional process that allows a paper record of sign-off by the appropriate reviewers where a hybrid (electronic/ink) signature SOP is followed. If this document will be saved electronically and digitally signed in a document management system, it should be generated without ink signature fields. The customer must sign the EQP review documents and return an electronic copy to Agilent prior to qualification delivery. The delivery of the services is done according to the terms and conditions stated in the corresponding service exhibit. It is recommended that after approval, this EQP be archived with the electronic EQP file.

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Injection Carry Over

Description: Low carry over from a previous injection is critical for accuracy of quantitative and reliability of qualitative analysis. For method development, the engineering precision contributes to carry over performance, as this is a pure EQ test for these samples.

For liquid samples, carry over performance is contingent on many variable factors independent of the engineering condition of the EQ system. Many different sample wash programs are available that can eliminate carry over. These are user selectable and may be application specific. The condition of the injection syringe is the only controllable engineering factor. The injection syringe is typically replaced for new during PM before EQ. Therefore, the carry over test for liquid samples is offered only as an optional extra test in a random occurrence PDP.

Procedure: The blank injection after the six repeat injections of the precision test is evaluated for carry over, and the result is expressed as a percentage.

Updated: November 2019

www.agilent.com/chem/qualification

Information, descriptions and specifications in this publication are subject to change without notice.

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Published in USA

เอกสารไม่ควบคุม**Report and Delivery Options**

(For hybridized system types only) If different options are chosen for the primary and supported system types, the primary system options are used for both technique in the EQR.

- Show chromatograms
- Show header and footer on cover
 - Include requested test logs
- Include transaction logs

Selected Signature Options

Since EQP is not signed

- Reporting variance is allowed in the EQP

เอกสารไม่ควบคุม**Customer Approval**

Name: นิต วัฒนวัฒน นิลทิพย์
Title: Laboratory Manager
Date: Feb 2, 2021
Signature: [Signature]

Name: _____
Title: _____
Date: _____
Signature: _____

Name: _____
Title: _____
Date: _____
Signature: _____

Name: _____
Title: _____
Date: _____
Signature: _____

เอกสารไม่ควบคุม**Legal Notice**

Agilent CrossLab Compliance and its primary components (ACE software tool, procedures, test design, metrology tools, chemical reference standards, and sponsor training materials) have been designed, tested, validated, and released for commercial use following Agilent's Life-Cycle Development Quality Assurance methodology.

Agilent CrossLab Group R&D VP and Dir. of Technology: Neil Cook, Santa Clara, California USA.
Agilent CrossLab Group Quality Manager: Jairo Hector, Santa Clara, California USA.

Agilent CrossLab Compliance is endorsed by Dr. Ludwig Huber on behalf of labcompliance.com

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Protocol Details

Protocol Revision Used for this Document:

GC.02.51

Protocol Revision Release Date:

November 2020

(NOTE: This Revision History is NOT edited or updated directly for changes to all other documents in revision.)

Agilent Recommended

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November 5, 2020 6:00:00 PM

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Agilent CrossLab Compliance

Qualification Type:	GC-CQ
System ID:	CN13113001
EQP Name:	AgilentRecommended
EQP Revision:	GC.02.51
EQP Publish Date:	November 2020
Date:	April 22, 2022 2:33:46 PM
Report Type:	Report
Org. Name:	United Analyst and Engineering Consultan
Org. Location:	3 Soi Udomsuk 41 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10200

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Test Summary

Purpose

This section includes a status for each scheduled test and the overall qualification. For each test that is run, (1) the status is automatically determined based on pre-defined limits, and (2) the total number of times the test was run is displayed. For detailed results and specifications for a test, refer to the test results in this EQR.

Details

Test	Status	Runs
System Inspection and Basic Safety and Operation - 7890	Pass	1
Inlet Pressure Decay - Front SSL	Pass	1
Inlet Pressure Accuracy - Front SSL	Pass	1
Detector Flow Accuracy - Back FPD+	Pass	1
Detector Flow Accuracy - Front FID	Pass	1
Oven Oven Temperature Accuracy - 7890	Pass	1
GC Oven Temperature Stability - 7890	Pass	1
GC Scouting Run - Injection Tower, Front SSL, Back FPD+	Pass	1
Noise and Drift - Back FPD+	Pass	1
Injection Precision - Injection Tower, Front SSL, Back FPD+	Pass	1
Signal to Noise - Injection Tower, Front SSL, Back FPD+	Pass	1
GC Scouting Run - Injection Tower, Front SSL, Front FID	Pass	1
Noise and Drift - Front FID	Pass	1
Injection Precision - Injection Tower, Front SSL, Front FID	Pass	1
Signal to Noise - Injection Tower, Front SSL, Front FID	Pass	1

Overall Qualification Status

Pass

Date: April 22, 2022 2:35:49 PM
System ID: CN13113001

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Service Details

Purpose

This section includes local contact and delivery details for this service.

General Information	
Service Order No./Request	6204903548
EQP Name	Agilent/Recommended
EQP Revision	GC 02.01
Report Type	Report
Organization Details	
Name	United Analyst and Engineering Consultan
Location	3 Soi Udonrak 41 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10200
Local Contact Details	
Name	K. Nantaporn Teibongyay
Job Title	Chemist
Qualification Location	Instrument Room/Lab
Operator Details	
Name	Seengutai Tanak
Job Title	Field Service Engineer
Data Acquisition Details	
Acquisition Software Name	ChemStation
Acquisition Software Revision	C.01.10 Update 03
Customer Data System (CDS)	GC-OpenLAB CDS

Date: April 22, 2022 2:35:49 PM
System ID: CN13113001

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Instrument Details

Purpose

This section describes the as-found system configuration.

Manuals

System

System ID	CN13113001
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Inlet	Front
Detector	Back
LTM Included?	No

Tested Combination2

Injection Technique	Injection Tower
Inlet	Front
Detector	Front
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7890A
Model Number	G4515A
Serial Number	CN131300118
Firmware Revision	A.10.05
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Tray
Name	7893A
Model Number	G4514A
Serial Number	CN13290169
Firmware Revision	A.10.15
Val Holder	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440B
Serial Number	CN13113001
Firmware Revision	B.02.03.2
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Front
Manufacturer	Agilent Technologies
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	7890
Type	FPD
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Date: April 22, 2022 2:35:49 PM
System ID: CN13113001

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Detector 2

Manufacturer:	Agilent Technologies
Name:	7690
Type:	FPD+
Adapter:	Capillary
Control Type:	Electronic Pressure Control (EPC)
Location:	Back
Makeup Gas:	Nitrogen
First Filter Tested:	P-Mode

Calculation Formulas

Purpose

This section includes calculation formulas for all available tests. Depending upon which tests are scheduled, all or some apply to your qualification.

$$\begin{aligned} \text{Accuracy} &= (X_{\text{ref}} - X_{\text{meas}}) & \text{Absolute Accuracy} &= (X_{\text{ref}} - X_{\text{meas}}) & \text{Average} &= \text{mean value of } n \text{ observations} = \frac{1}{n} \sum_{i=1}^n X_i \\ X_{\text{ref}} &= \text{Mean value} & X_{\text{meas}} &= \text{Mean value} & X_i &= \text{Value, } i^{\text{th}} \text{ observation} \\ X_{\text{ref}} &= \text{Setpoint} & X_{\text{meas}} &= \text{Setpoint} & n &= \text{Total number of observations} \\ \text{[N-Carry Over]} &= \frac{X_i}{V_i} \times 100 & \text{Correlation (r)} &= \frac{1}{\sqrt{\Delta X \Delta Y}} \times \left(n \sum_{i=1}^n X_i Y_i - \sum_{i=1}^n X_i \sum_{i=1}^n Y_i \right) \\ X_i &= \text{Response of blank injection} & \Delta X &= n \sum_{i=1}^n X_i^2 - \left(\sum_{i=1}^n X_i \right)^2 \\ X_i &= \text{Response of final standard injection} & \Delta Y &= n \sum_{i=1}^n Y_i^2 - \left(\sum_{i=1}^n Y_i \right)^2 \\ \text{[Drift]} &= \text{slope of the regression} = \frac{1}{\Delta X} \left(n \sum_{i=1}^n X_i Y_i - \sum_{i=1}^n X_i \sum_{i=1}^n Y_i \right) & n &= \text{Number of data points} \\ \Delta X &= n \sum_{i=1}^n X_i^2 - \left(\sum_{i=1}^n X_i \right)^2 & X_i &= \text{Time, } i^{\text{th}} \text{ observation} \\ & & Y_i &= \text{Response, } i^{\text{th}} \text{ observation} \\ \text{[NTM Noise]} &= \frac{\sum_{i=1}^n X_{\text{noise},i}}{n} & \text{[rms Noise]} &= \sqrt{\frac{\sum_{i=1}^n (E_i - \bar{E})^2}{(n-1)}} & \text{[N/A Signal Noise]} &= n \times SD \\ X_{\text{noise},i} &= \text{Peak to peak noise in segment } n & E_i &= \text{Individual voltage readings} & \text{[Response Error]} &= \frac{Y}{X} \\ n &= \text{Number of segments} & \bar{E} &= \text{Average of } n \text{ measurements} & X &= \text{Amount} \\ & & & & Y &= \text{Response} \\ \text{Parts Per Million (ppm)} &= \frac{(M_r - M_t)}{M_t} \times 1,000,000 & \text{[Stability]} &= |Y_{\text{min}} - Y_{\text{max}}| \\ M_r &= \text{Reported mass} & Y_{\text{min}} &= \text{Minimum value} \\ M_t &= \text{Theoretical mass} & Y_{\text{max}} &= \text{Maximum value} \\ \text{Standard Deviation (SD)} &= \sqrt{\frac{1}{(n-1)} \sum_{i=1}^n (X_i - \bar{X})^2} & \text{Relative Standard Deviation (RSD)} &= \frac{SD}{\bar{X}_n} \times 100 \\ X_i &= \text{Value, } i^{\text{th}} \text{ observation} & SD &= \text{Standard deviation} \\ \bar{X}_n &= \text{Mean value in } n \text{ observations} & \bar{X}_n &= \text{Mean value of observations} \\ n &= \text{Total number of observations} & & & & \end{aligned}$$

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NOTE: For many tests performed by the Automated Compliance Engine, multi-step calculations are employed to reduce the raw data to a report-ready form. These calculations retain the full precision of each intermediate result as the algorithm progresses through the required reduction. Where intermediates or raw data is displayed, these results must be rounded or truncated to provide the proper display values. Attempting to calculate the final value based on these display-modified intermediates can result in a small difference in the final result. These intermediates, where presented, are simply used to show algorithmic processes through the calculation and not intended to act as a means of algorithmic validation. Beginning with GC.01.B3, results are rounded to use the same number of decimal places as defined in the limit, which must be less than or equal to the resolution provided by the measuring equipment.

Protocol Details

Purpose

This section lists the revisions for all test units used in this report. For complete test-specific and high-level change details, refer to the Revision History document.

Test Revision	Test
GC.02.B1	Detector Flow Accuracy
GC.02.B1	GC Oven Temperature Accuracy
GC.02.B1	GC Oven Temperature Stability
GC.02.B3	GC Scouting Run
GC.02.B4	Injection Precision
GC.02.B5	Inlet Pressure Accuracy
GC.02.B5	Inlet Pressure Decay
GC.02.B5	Noise and Drift
GC.02.B5	Signal to Noise
GC.02.B5	Random Injection and Basic Safety and Operations

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System Inspection and Basic Safety and Operation

Purpose

This test verifies that the GC is correctly installed and connected.

Configuration Details

Name: 7890

Setpoint

Results	Observed Result	Expected Result	Status
Is the system in good operating condition (no physical damage)?	Yes	Yes	Pass
Are there apparent instrumental or environmental safety concerns?	No	No	Pass
Are required gases present and of appropriate pressures?	Yes	Yes	Pass
Is there continuity between the GC chassis and the ground pin?	Yes	Yes	Pass
Does the power-cycled GC complete the self test without errors (a "not ready" status is considered to be without errors)?	Yes	Yes	Pass
Does the system reject operator entry of over setpoint of 100°C?	Yes	Yes	Pass
Does a (hydrogen) safety shutdown start in approximately 4 - 10 minutes?	Yes	Yes	Pass

Setpoint Status: Pass Run: 1

Overall System Inspection and Basic Safety and Operation Test Status

Pass

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Inlet Pressure Decay

Purpose

This test demonstrates the pressure integrity of the GC inlet (with a valve controlled injection system, if applicable) and all flows controlled by the GC inlet pressure(s).

Configuration Details

Name: 7890
Front SSL

Setpoint	Pressure:	25.0	psi
Measurements			
Initial Pressure:	25.1	psi	
Final Pressure:	25.0	psi	

Results

Pressure Change: -0.1 psi 15 minutes
Agilent Recommended: >= -2.0 psi <= 0.5

Setpoint Status: Pass Run: 1

Overall Inlet Pressure Decay Test Status

Pass

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Inlet Pressure Accuracy

Purpose

This test uses a digital calibrated manometer to demonstrate the ability of the system to provide accurate pressure to the head of the column. Accuracy is calculated as the absolute difference between the measured pressure and setpoint.

Configuration Details

Name: 7890
Front SSL

Setpoint	Inlet Pressure:	25.0	psi
----------	-----------------	------	-----

Measurements

Reading: 25.0 psi

Results

Accuracy: 0.0 psi
Agilent Recommended: <= 1.2

Setpoint Status: Pass Run: 1

Overall Inlet Pressure Accuracy Test Status

Pass

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Detector Flow Accuracy

Purpose

Detector flow accuracy is determined by measuring the flows with a calibrated mass flowmeter and comparing them to the test setpoints and the values displayed by the GC (if applicable).

Configuration Details

Name: 7890
Back FPD+

Setpoint	Flow Type:	Fuel	50.0	mL/min
----------	------------	------	------	--------

Measurements and Results

Time: 10:05
Flow: 50.2 mL/min
Accuracy: 0.2 mL/min
Agilent Recommended: <= 10.0 % setpoint (5.0 mL/min)
Unit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: Pass Run: 1

Setpoint	Flow Type:	Oxidant	60.0	mL/min
----------	------------	---------	------	--------

Measurements and Results

Time: 10:10
Flow: 60.1 mL/min
Accuracy: 0.1 mL/min
Agilent Recommended: <= 10.0 % setpoint (6.0 mL/min)
Unit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: Pass Run: 1

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Setpoint	Flow Type:	Makeup	60.0	mL/min
	Purge Effect:		20	% setpoint
	Adjusted Flow Setpoint:		72.00	mL/min

Measurements and Results

Time	Flow			
10:20	64.0	mL/min		
Accuracy:		7.2	mL/min	
Agilent Recommended:	<=	10.0	% setpoint	(7.2 mL/min)

Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: **Pass** Run: 1

Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Purpose

Detector flow accuracy is determined by measuring the flows with a calibrated mass flowmeter and comparing them to the test setpoints and the values displayed by the GC (if applicable).

Configuration Details

Name: 7890
Front: FID

Setpoint	Flow Type:	Fuel	30.0	mL/min
----------	------------	------	------	--------

Measurements and Results

Time	Flow			
10:20	30.2	mL/min		
Accuracy:		0.2	mL/min	
Agilent Recommended:	<=	10.0	% setpoint	(3.0 mL/min)

Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: **Pass** Run: 1

Setpoint	Flow Type:	Oxidizer	400.0	mL/min
----------	------------	----------	-------	--------

Measurements and Results

Time	Flow			
10:30	398.2	mL/min		
Accuracy:		1.8	mL/min	
Agilent Recommended:	<=	10.0	% setpoint	(40.0 mL/min)

Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: **Pass** Run: 1

Setpoint	Flow Type:	Makeup	25.0	mL/min
----------	------------	--------	------	--------

Measurements and Results

Time	Flow			
10:40	24.0	mL/min		
Accuracy:		0.1	mL/min	
Agilent Recommended:	<=	10.0	% setpoint	(2.5 mL/min)

Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: **Pass** Run: 1

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Purpose

This test uses a calibrated digital thermometer to determine the accuracy of the GC oven. Accuracy is calculated as the absolute difference between the measured temperature and setpoint.

Configuration Details

Name: 7890
Setpoint: 200.0 °C
Zone: Oven

Measurements and Results

Probe: A single probe is used for this service.

Time	Temperature			
10:35	202.6	°C		
Accuracy:		0.0	°C	
Agilent Recommended:	>=	-1.0	% setpoint in K	(-0.0 °C)
	<=	1.0	% setpoint in K	(0.0 °C)

Setpoint Status: **Pass** Run: 1

Setpoint	Temperature:	100.0	°C
	Zone:	Oven	

Measurements and Results

Probe: A single probe is used for this service.

Time	Temperature			
10:42	100.4	°C		
Accuracy:		0.4	°C	
Agilent Recommended:	>=	-1.0	% setpoint in K	(-0.7 °C)
	<=	1.0	% setpoint in K	(0.7 °C)

Setpoint Status: **Pass** Run: 1

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Purpose

This test uses a calibrated digital thermometer to determine the stability of the oven temperature. Stability is expressed as the delta between the highest and lowest measured temperatures.

Configuration Details

Name: 7890

Setpoint: Temperature: 100.0 °C
Zone: Oven

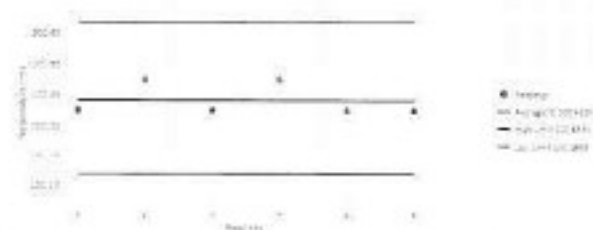
Measurements

Probe: A single probe is used for this service.

Time	Temperature	Average	100.4333 °C
1. 10.42	100.4 °C	High	100.6 °C
2. 10.44	100.5	Low	100.4 °C
3. 10.46	100.4	Stability:	0.1 °C
4. 10.48	100.5	Agilent Recommended:	not > 0.5
5. 10.50	100.4		
6. 10.52	100.4		

Setpoint Status: Pass Run: 1

GC Oven Temperature Stability graph (Temperature range: 100.000 °C to 100.500 °C)



Overall GC Oven Temperature Stability Test Status

Pass

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Scouting Run

Purpose

This test is used to determine the chromatogram for presence of expected peaks, sufficient run time, and proper integration events prior to the start of the qualification runs.

Sequence

The sequence has one line to perform a single injection of the evaluation standard.

Evaluation standard, 1 injection

Configuration Details

Tested Combination: Front SBL / Back FPD+
Injection Tower
Name: 7895ASetpoint: Injection Volume on Column: 1.0 µL
Mode: P-Mode

Conditions

Y-Axis Unit: 100 pA

Configuration

Sample: PPD Std KL 5188-0953
Evaluated Compound: Methylphenidone
Evaluation Standard Concentration: 0.0 mg/mL (From Stock Solution of Analyte)

Measurements

Does the run include sufficient flat baseline for the S/N test? Yes
Noise start time for Signal to Noise (minutes): 7
Run time for Signal to Noise (minutes): 10
Run time for tests not requiring extra noise interval (minutes): 1

Setpoint Status: Completed Run: 1

Data Audit Log

Host name: LAPTOP-CQ35NDM/
Original Data Path: F:\
Analyzed Data Path: E:\VACE
C:\Program Files\Agilent\CrossLab\compliance\tools\CN13113001\Tools\GC-Scout 0.0.0\PPDStd\Run1Acquisition operation: Saving initial Task
Acquisition method: OQ2022_FPD.M
Data file analyzed for this test: PPD_5C001.D
Acquisition Date: 21-Apr-22, 15:25:48

Integration Parameters:

Type of Integration: Injection
Integration Count: 1

Optional Values:

Baseline Correction Mode: Advanced
Initial Slope Sensitivity: 10
Initial Peak Width: 0.01
Initial Area Reject: 0
Initial Height Reject: 100

Timed Event Table:

Integration Type	Time	Time
Integration	0.0	5
Integration	0.5	7

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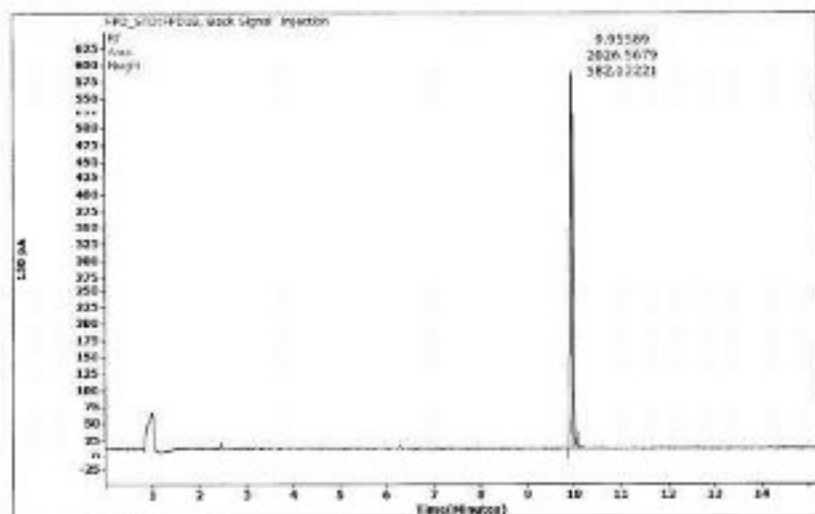
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Overall Scouting Run Status

Completed

(Completed is expressed as Pass in the Test Summary section.)

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Noise and Drift

Purpose

This test determines the noise and drift of the detector signal. The base signal is recorded at the beginning of the test. Noise is calculated as the average peak-to-peak noise in a number of signal segments, and drift is calculated as the slope of the linear regression for the signal.

Sequence

Line 1: Blank run, 1 injection

Configuration Details

Tested Combination	Front	SSL	/ Back	FPD+
Name:	7830			

Sequence	Mode	P-Mode
Base Signal	12.2	100 pA

Base signal is not evaluated and for recording purposes only.

Conditions

Noise Evaluation Start Time	0.0	min
Noise Evaluation Duration	20.0	min
Sample	Blank run	
Oven Temperature	100.0	°C

Configuration

Y-Axis Unit: 100 pA

Results

ASTM Noise	Drift
DU	DUW
1.88	0.02

Agilent Recommended:	< 2.00	< 1.50
Status:	Pass	Pass

After data is generated, test report results under test runs are associated for the FPD+ used for test data.

Sequence Status: Pass

Run: 1

Data Audit Log

Host name: LAPTOP-QG38N6MV

Original Data Path: P3.

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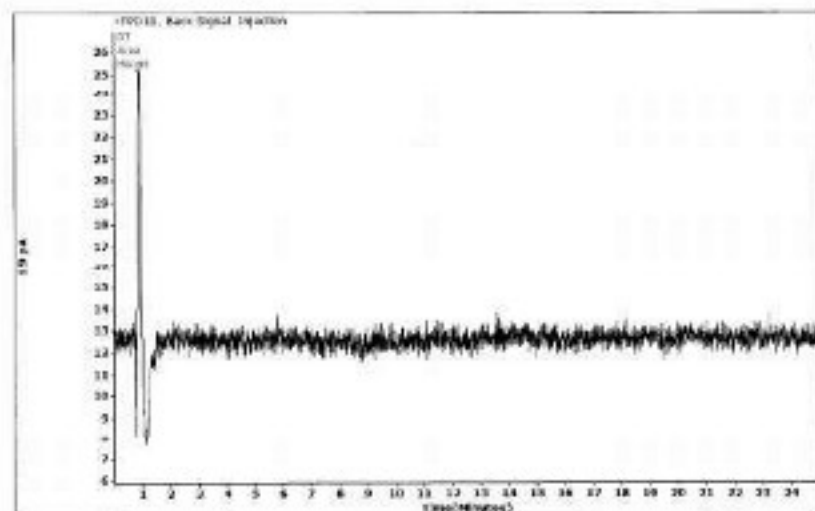
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Analyzed Data Path:

E:\ACE
2.33\Agilent_ACE\Sessions\awing\test\run\CN13113001\test\run\0_0_0_1\PreviousRun\run1

Acquisition operator: Saengchai Tanak
Acquisition method: QG2522_FPD_NO.M
Data file analyzed for this test: FPD_NO001.D
Acquisition Date: 21-Apr-22, 15:45:32
Noise Type: ASTM
Noise Value: 1.57997
Noise start time: 0.0
Noise duration: 20.0
Drift Value: 0.01010



Overall Noise and Drift Test Status

Pass

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Injection Precision

Purpose

This test uses a fivefold standard to determine injection precision. The mean, standard deviation, and % RSD of six standard injections are calculated.

Sequence

This sequence has two or eight lines depending upon whether you inject 7 lines from the same vial or use 7 separate vials.

Evaluation standard: 1 injection (system equilibration)

Evaluation standard: 1 injection (6 of these)

Sample blank: 1 injection (applies only if carry over is run immediately after precision)

Configuration Details

Tested Combination	Front	SSL	/ Back	FPD+
Name:	Injection Tower			
	7823A			

Sequence	Injection Volume on Column	1.0	0.1
Mode:	P-Mode		

Conditions

Y-Axis Unit: 100 pA

Configuration

Sample	FPD Std Kit, 5188-5993
Evaluated Compound	Methoxyacetone
Evaluation Standard Concentration	2.5 mg/L (from Certificate of Analysis)

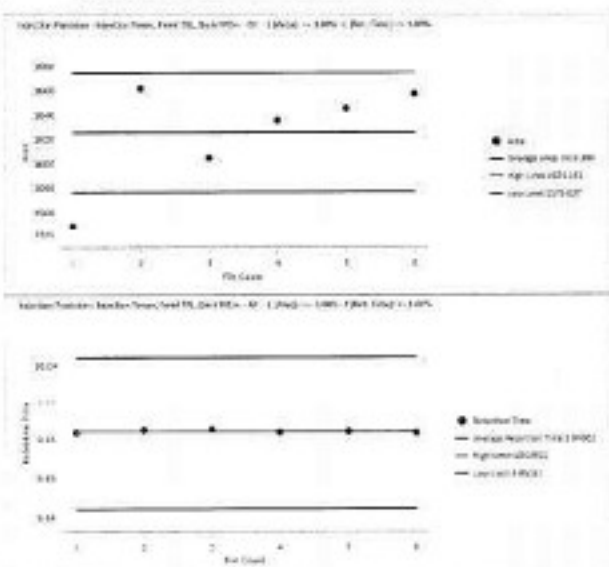
Measurements	Area	Retention Time
	1548.489	0.04945 minutes
	1601.572	0.04107
	1674.590	0.05201
	1635.334	0.04840
	1645.240	0.04975
	1657.232	0.04756

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Result:	Area	1625.589	DU's	Retention Time	9.56902	minutes
Average:		42.76543	DU's		0.00164	minutes
STD Deviation:		2.64	%		0.22	%
Score:		< 3.00			1.30	
Agilent Recommended:		Pass			Pass	
Status:						
Setpoint Status:	Pass			Rank:	1	



Data Audit Log

Host name: LAPTOP-QG35KQWU
 Original Data Path: FA
 Analyzed Data Path: ENACE
 2:53Agilent_ACESession\swingulha\raw\ON1313001\OGTest0Gdp_0_0Gdp_0_0_1PreviousRun1
 Run1

Date: April 22, 2022 2:30:48 PM
 System ID: ON1313001

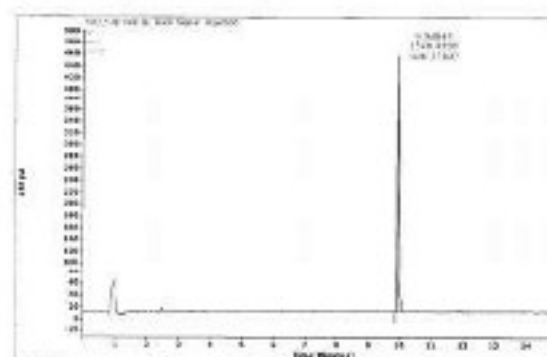
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Acquisition operator: Swingulha Tansk
 Acquisition method: OG2022_FPD.M
 Data file analyzed for this test: FPD_Pre001-000F.D
 Acquisition Date: 21-Apr-22, 17:13:26

Integration Parameters:

Type of Integration: Injection
 Integration Count: 1
 Options/Notes:
 Baseline Correction Mode: Advanced
 Initial Slope Sensitivity: 10
 Initial Peak Width: 0.01
 Initial Area Reject: 0
 Initial Height Reject: 100
 Timed Event Table:
 Integration Type: Manual
 Integration: Off
 Integration: On

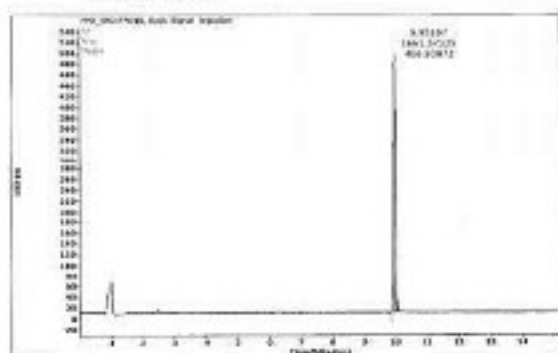


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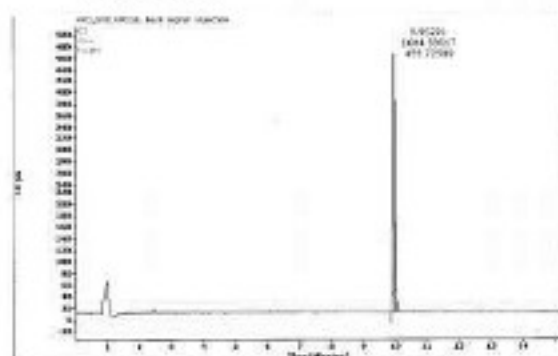
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Acquisition operator: Swingulha Tansk
 Acquisition method: OG2022_FPD.M
 Data file analyzed for this test: FPD_Pre001-000F.D
 Acquisition Date: 21-Apr-22, 17:49:53



Acquisition operator: Swingulha Tansk
 Acquisition method: OG2022_FPD.M
 Data file analyzed for this test: FPD_Pre001-000F.D
 Acquisition Date: 21-Apr-22, 17:49:53



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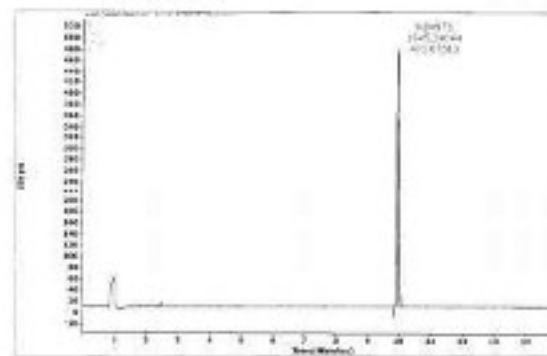
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Acquisition operator: Swingulha Tansk
 Acquisition method: OG2022_FPD.M
 Data file analyzed for this test: FPD_Pre001-010F.D
 Acquisition Date: 21-Apr-22, 18:08:04



Acquisition operator: Swingulha Tansk
 Acquisition method: OG2022_FPD.M
 Data file analyzed for this test: FPD_Pre001-010F.D
 Acquisition Date: 21-Apr-22, 18:28:17

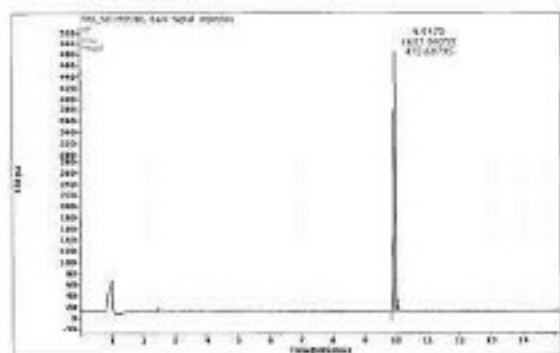


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Acquisition operator: Saengulal Tank
 Acquisition method: GC2022_FPD.M
 Data file analyzed for this test: FPD_F0001-011F.D
 Acquisition Date: 22-Apr-22, 18:04:00



Overall Injection Precision Test Status

Pass

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Signal to Noise

Purpose

This test uses a traceable standard to determine signal to noise.

Requirements

Line 1: Evaluation standard, 1 injection

Configuration Details

Tested Combination	Front	SSL	/ Back	FPD+
Name:	Injection Tower			
	7890			

Setup	Mode	P-Mode

Conditions

Injection Volume on Column:	1.0	μL
Noise Evaluation Start Time/Duration:	7	min. / 1.0 min.

Configuration

n-size unit:	100 pA
Sample:	FPD Std Kit, 5188-6003
Evaluated Compound:	Methylparathion
Evaluation Standard Concentration:	2.5 mg/L (Certificate of Analysis)

Measurements

Noise (Type/Value):	AGTM	/ 1.12583	DU
Retention Time of Evaluated Peak:	8.06541	minutes	
Peak Height (Unconnected/Connected):	12891.75	DU	/ 12891.75 DU

(Computed for integration and differences between nominal and reported concentration; analog data is corrected for the applied signal reduction (range attenuation).)

Results

Signal to Noise:	11529
Agilent Recommended:	>= 2400

ACE uses unit-coded values in its calculations; only the final result is rounded. Therefore, for high signal-to-noise ratios (high peaks/low noise), ACE calculations may appear to differ slightly from your manual calculations using the reported height and noise.

Setup Status: Pass

Rank: 1

Data Audit Log

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Host name: LAPTOP-G2S8X0MV
 Original Data Path: F:\
 Analyzed Data Path: E:\ACE
 2.33\Agilent_ACE\session\saengulal tank\CN13113001\test\GC2022_FPD.M_0_0_0_0_19\PreviousRun1

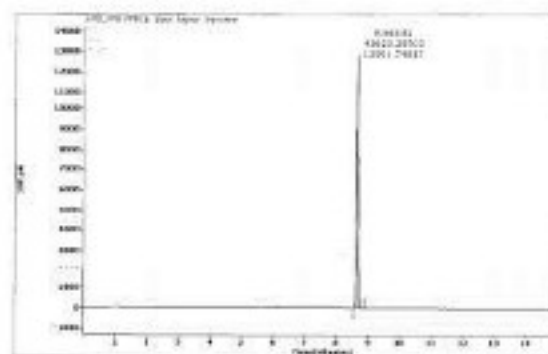
Acquisition operator: Saengulal Tank
 Acquisition method: GC2022_FPD.M
 Data file analyzed for this test: FPD.D
 Acquisition Date: 22-Apr-22, 09:27:10

Integration Parameters:

Type of Integration:	Injection
Integration Count:	0
Optional Values:	
Baseline Correction Mode:	Advanced
Initial Slope Sensitivity:	10
Initial Peak Width:	0.01
Initial Area Reject:	0
Initial Height Reject:	1000

Timed Event Table:

Integration Type	Feature	Time
Integration	OFF	0
Integration	ON	7



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Date: April 22, 2022 2:33:46 PM
 System ID: CN13113001

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เอกสารไม่ควบคุม

Noise and Drift

Purpose

This test determines the noise and drift of the detector signal. The base signal is recorded at the beginning of the test, noise is calculated as the average peak-to-peak noise in a number of signal segments, and drift is calculated as the slope of the linear regression for the signal.

Sequence

Line 1: Blank run, 1 injection

Configuration Details

Tested Combination?	Event	ISL	1. Point	FID
Name:	7893A			
Setpoint	Base Signal	21.3	pA	

Base signal is not evaluated and for recording purposes only.

Conditions

Noise Evaluation Start Time: 3.0 min
Noise Evaluation Duration: 20.0 min
Sample: Blank run
Oven Temperature: 200.0 °C

Configuration

Y-Axis Unit	pA	
Measure	ASTM Noise	Peak
	pA	pA/mV
	0.07	0.65
Agilent Recommended:	Yes 0.10	Yes 2.50
Status:	Pass	Pass

After data is processed, test-specification limits on this form are recalculated for the COS used to collect data.

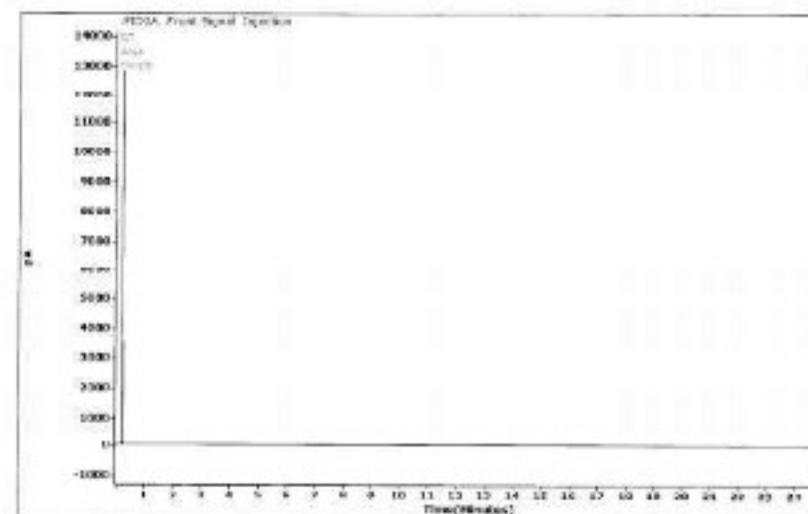
Setpoint Status:	Pass	Run: 1
Date And Log		
Host name:	LAPTOP-CQ35NDWV	
Original Data Path:	F:\	

Date: April 22, 2022 2:25:16 PM
System ID: CN13113001

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เอกสารไม่ควบคุม

Analyzed Data Path:	E:\ACE 2.53\Agilent_ACE\Session\saengulha.tanik\CN13113001\COITests\Glob_1_9\Glob_1_9_1\PreviousRun1
Acquisition operator:	Saengulha Tanik
Acquisition method:	UNIMV2_FID_RUN.M
Data File analyzed for this test:	FID_7893A.D
Acquisition Date:	22-Apr-22 12:40:27
Noise Type:	ASTM
Noise Value:	0.07260
Noise start time:	3.0
Noise duration:	20.0
Drift Value:	0.00138



Overall Noise and Drift Test Status

Pass

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เอกสารไม่ควบคุม

Injection Precision

Purpose

This test uses a testable standard to determine injection precision. The mean, standard deviation, and % RSD of six standard injections are calculated.

Sequence

The sequence has two or eight lines depending upon whether you inject 7 times from the same vial or use 7 separate vials.

Evaluation standard, 1 injection (system equilibration)
Evaluation standard, 1 injection (6 of these)
Sample blank, 1 injection (applies only if carry over is run immediately after precision)

Configuration Details

Tested Combination?	Event	ISL	1. Point	FID
Name:	Injection Tower			
	7893A			

Setpoint	Injection Volume on COLUMN	5.0	µL
----------	----------------------------	-----	----

Conditions

Y-Axis Unit: pA

Configuration

Sample: FID MCL Std 92, 5100-5372
Evaluated Compound: Sample Peak
Injection Standard Measurement(s): 100 % (from Certified and Analytical)

Measurements	Area	Retention Time
	24434.40 pA's	0.22030 minutes
	24473.53	0.22514
	24509.20	0.23094
	24248.07	0.22541
	24468.46	0.26040
	24425.07	0.22509

Date: April 22, 2022 2:25:40 PM
System ID: CN13113001

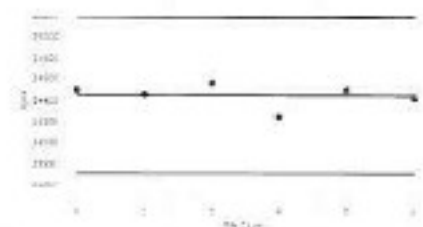
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เอกสารไม่ควบคุม

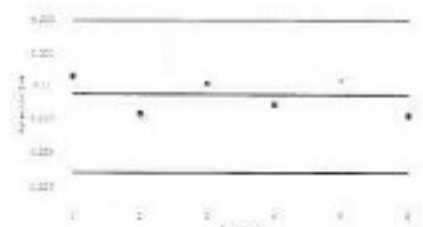
Results	Area	Retention Time
Average	24446.50 pA's	0.22970 minutes
STD DEVIATION:	107.4110 pA's	0.00065 minutes
RSD:	0.44 %	0.28 %
Agilent Recommended:	<= 3.00	<= 1.00
Status:	Pass	Pass

Setpoint Status: Pass Run: 1

Injection Precision Test Data: Peak Area (pA) vs. Retention Time (min) for 6 injections.



Injection Precision Test Data: Peak Area (pA) vs. Retention Time (min) for 6 injections.



Host name:	LAPTOP-CQ35NDWV
Original Data Path:	F:\
Analyzed Data Path:	E:\ACE 2.53\Agilent_ACE\Session\saengulha.tanik\CN13113001\COITests\Glob_1_9\Glob_1_9_1\PreviousRun1

Date: April 22, 2022 2:25:40 PM
System ID: CN13113001

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Acquisition operator: Saenguthai Tanti
 Acquisition method: Q02022_FID.M
 Data file analyzed for this test: FID_Pre01-004F.D
 Acquisition Date: 22-Apr-22, 11:45:00

Integration Parameters:

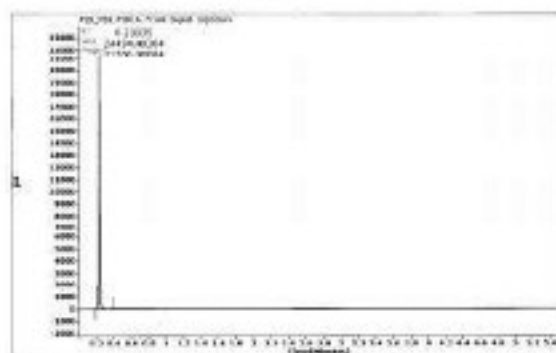
Type of integration: Injection
 Integration Count: 0

Optional Values:

Baseline Correction Mode: Advanced
 Initial Slope Sensitivity: 10
 Initial Peak Width: 0.01
 Initial Area Reject: 0
 Initial Height Reject: 100

Time Event Table:

Integration type	Value	Time
Integration	OFF	0
Integration	ON	0.15
Integration	OFF	0.5



Date: April 22, 2022 2:30:48 PM
 System ID: CN13113001

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Acquisition operator: Saenguthai Tanti
 Acquisition method: Q02022_FID.M
 Data file analyzed for this test: FID_Pre01-005F.D
 Acquisition Date: 22-Apr-22, 12:22:00



Acquisition operator: Saenguthai Tanti
 Acquisition method: Q02022_FID.M
 Data file analyzed for this test: FID_Pre01-006F.D
 Acquisition Date: 22-Apr-22, 13:28:29



Date: April 22, 2022 2:33:48 PM
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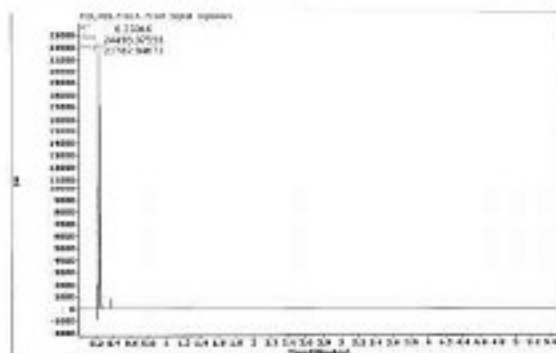
เอกสารไม่ควบคุม

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Acquisition operator: Saenguthai Tanti
 Acquisition method: Q02022_FID.M
 Data file analyzed for this test: FID_Pre01-007F.D
 Acquisition Date: 22-Apr-22, 13:54:40



Acquisition operator: Saenguthai Tanti
 Acquisition method: Q02022_FID.M
 Data file analyzed for this test: FID_Pre01-008F.D
 Acquisition Date: 22-Apr-22, 13:41:25



Date: April 22, 2022 2:33:48 PM
 System ID: CN13113001

เอกสารไม่ควบคุม

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Acquisition operator: Saenguthai Tanti
 Acquisition method: Q02022_FID.M
 Data file analyzed for this test: FID_Pre01-009F.D
 Acquisition Date: 22-Apr-22, 13:47:54



Overall Injection Precision Test Status

Pass

Date: April 22, 2022 2:33:48 PM
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เอกสารไม่ควบคุม

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Signal to Noise

Purpose

This test uses a traceable standard to determine signal to noise.

Sequence:

Line 1: Evaluation standard, 1 injection

Configuration Details

Tested Configuration: Front SSI / Front FID

Name: 7890

Setup

Conditions

Injection Volume on Column: 1.0 μ L
 Noise Evaluation Start Time/Duration: 4 min / 1.0 min

Configuration

Y-Axis Unit: pA
 Sample: FID MDL Std Kit, 5188-6372
 Evaluated Compound: Sample Peak
 Evaluation Standard Concentration: 100 % (Certificate of Analysis)

Measurements

Noise (Type/Value): ASTM / 0.04191 pA
 Retention Time of Evaluated Peak: 6.22540 minutes
 Peak Height (Uncorrected/Corrected): 21559.22 pA / 21529.22 pA
 (Corrected for attenuation and difference between nominal and reported concentration; analog data is corrected for the applied signal reduction [wavelength/attenuation].)

Results

Signal to Noise: 521845
 Agilent Recommended: >= 300000

Agilent uses unrounded values in its calculations; only the final result is rounded. Therefore, for high signal-to-noise ratios (high peak above noise), Agilent calculations may appear to differ slightly from your manual calculations using the reported height and noise.

Setup Status: Pass Run: 1

Data Audit Log

Date: April 22, 2022 2:30:48 PM
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เอกสารไม่ควบคุม

Host name: LAPTOP-QQSGK0NV

Original Data Path: F:\

Analyzed Data Path: E:\ACE
 2.55\Agilent_ACE\Sessions\Seanguthai tank\CN13113001\QQSGK0NV_1_0\6084_1_0_1\PreviousRun
 000001

Date: April 22, 2022 2:30:48 PM
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เอกสารไม่ควบคุม

Acquisition operation: Seanguthai Tank

Acquisition method: QQSGK_FID.M

Data file analyzed for this test: FID_SN-012F.D

Acquisition Date: 22-Apr-22, 14:07:24

Integration Parameters:

Type of Integration: Injection

Integration Count: 0

Optional Values:

Baseline Correction Mode: Advanced

Initial Slope Sensitivity: 10

Initial Peak Width: 0.05

Initial Area Reject: 0

Initial Height Reject: 100

Tuned Event Table:

Integration Type	Value	Time
Integration	OFF	0
Integration	ON	0.15
Integration	OFF	0.5

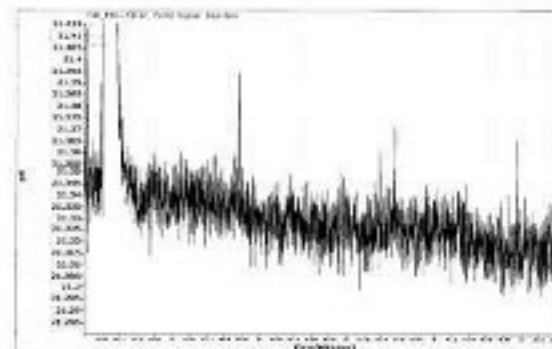


Acquisition operation: Seanguthai Tank

Acquisition method: QQSGK_FID.M

Data file analyzed for this test: FID_SN-012F.D

Acquisition Date: 22-Apr-22, 14:07:24



Overall Signal to Noise Test Status:

Pass

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เอกสารไม่ควบคุม

Declaration of Change Control

This document is under change control. Revision history is maintained and printed on each document. Access to the master documents is limited to process owners. Documents receive periodic review and cannot be assigned an overgreen status. The qualification performed according to this document refers only to the hardware/software configuration in place at the time of the qualification. Agilent Technologies recommends that instrument configuration change management procedures be in place in order to maintain the validation process. Any changes to the analytical or computer hardware or software must be clearly specified. A change management system provides a means for determining the degree of requalification required according to the extent of the changes made. All details of the changes must be thoroughly recorded and documented, together with details of completed tests and their results. Note: Hardware/software configuration management is the customer's responsibility.

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เอกสารไม่ควบคุม

Attachments

Training requirements note: The delivery engineer attached an ACE technique-specific training certificate to the Equipment Qualification Report (EQR). Obtaining ACE technique-specific certification includes pre-requisite training for Data Integrity, General Compliance topics (GMP, GLP, ALCOA, etc.), instrument hardware and software components, and the ACE technique itself. The one certificate encompasses all pre-requisite training and is shown below for the Agilent Laboratory Management System (LMS), Qualitest Factors.

Location	Category	Document Name	Page
EQR	General	ACE Self Qualification Certificate	54
EQR	General	Operator's training certificate and qualifications	55
EQR	General	Operator's training certificate and qualifications	56
EQR	General	Operator's training certificate and qualifications	57
EQR	General	Operator's training certificate and qualifications	58
EQR	General	Operator's training certificate and qualifications	59
EQR	Tool	Certificate of Calibration Gas Flowmeter	60
EQR	Tool	Certificate of Calibration Manometer	64
EQR	Tool	Certificate of Calibration Thermometer	68
EQR	Tool	Certificate of Calibration Thermometer Probe	74
EQR	Tool	Certificate of Calibration Thermometer Probe	78
EQR	Material	Certificate of Analysis FID MCL std kit, 5188-5772	82
EQR	Material	Certificate of Analysis FPD std kit, 5188-5963	83
FPO	General	Procedure of System Qualification	87
EQR	General	Certificate of System Qualification	88
EQR	General	Certificate of System Qualification	87
EQR	General	Certificate of System Qualification	86
EQR	General	Certificate of System Qualification	89
EQR	General	Certificate of System Qualification	90
EQR	General	Certificate of System Qualification	91

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General

Document Name: ACE Self Qualification Certificate

**Agilent Technologies**

Agilent Compliance Engine Self Qualification

Date: April 18, 2021 11:09:23 AM
File: Self Qual - 04/18/2021
Method: Manual
ACE v. 1.0

Individual self-qualification results for each specific technique installed are also available upon request. They provide additional details as the general report from the console summary and are structured by the actual algorithms challenged during the process. There is no correlation or relationship between algorithms and QC program tests because some algorithms are used by several tests and some multiple whole hardware components of the qualified systems.

Technique Type	Tests Completed	Result
Acoustic Adaptation	3	Confirms
Capillary Electrophoresis	16	Confirms
Densitometer	6	Confirms
Gas Chromatography - GCMS	17	Confirms
Gas Permeation Chromatography	8	Confirms
Gas Chromatography	20	Confirms
Extinction Spectroscopy	3	Confirms
ICP-MS	6	Confirms
Infrared Spectroscopy	7	Confirms
Liquid Chromatography	17	Confirms
Liquid Chromatography - LCMS	8	Confirms
Microfluidics	16	Confirms
Sample Preparation - Gas Chromatography	9	Confirms
Sample Preparation - Liquid Chromatography	8	Confirms
Supercritical Fluid Chromatography	16	Confirms
Sulfuric	6	Confirms
UV-Vis Spectrophotometer	15	Confirms

Overall Qualification Status
Confirms

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เอกสารไม่ควบคุม

General

Document Name: Operator's training certificate and qualifications

**Agilent Technologies**

Certificate of Completion

Location Name: Sengphet Seng Tanak

Title Of Course: AN-CE-55 (1-033)-ACE 3.3X User Update Training

Completion Date: July 9, 2022

Certified By: Thomas

Extension of Service

All Service and Support training certificates have the following specific standards:

A certificate for training and support training is only valid while employed by Agilent Technologies or while making use of Agilent-authorized service provider through which the service engineer has ongoing access to Agilent's Field Skills, Service Tools, internal technical updates, system training, course documentation, technical support, course pack, and public updates. Completion of training hours, without being employed by Agilent Technologies, does not qualify as intended in sales records, service or otherwise Agilent products.

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เอกสารไม่ควบคุม

General

Document Name: Operator's training certificate and qualifications

 <h2 style="text-align: center;">Certificate of Completion</h2>	
Learner Name:	Songpakde Tunk
Title Of Course:	AN-CSE-OC-1-022-A: Advanced GC Detector Application and Troubleshooting Lab
Completion Date:	November 25, 2014
Certified By (Company):	Learning at Agilent
<p>All Service and Support training certificates have the following specific limitations:</p> <p>A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent authorized service provider, through which the service employee has ongoing access to Agilent's Field Alert Service Portal, internal technical updates, update training, current documentation, technical support, current parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual as a safety specialist, service or technical Agilent product.</p>	

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เอกสารไม่ควบคุม

General

Document Name: Operator's training certificate and qualifications

 <h2 style="text-align: center;">Certificate of Completion</h2>	
Learner Name:	Songpakde Tunk
Title Of Course:	AN-ASPC/CSE-OC-1-003-M: T800/T80 GC and GC GC Standard Chemistry DUT Service
Completion Date:	November 25, 2014
Certified By (Company):	Learning at Agilent
<p>All Service and Support training certificates have the following specific limitations:</p> <p>A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent authorized service provider, through which the service employee has ongoing access to Agilent's Field Alert Service Portal, internal technical updates, update training, current documentation, technical support, current parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual as a safety specialist, service or technical Agilent product.</p>	

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เอกสารไม่ควบคุม

General

Document Name: Operator's training certificate and qualifications

 <h2 style="text-align: center;">Certificate of Completion</h2>	
Learner Name:	Songpakde Song Tunk
Title Of Course:	AN-FSE-SDB-1-009-A: OpenLab CDS v3.5 Workstation Update
Completion Date:	February 18, 2015
Certified By (Company):	Learning at Agilent
<p>All Service and Support training certificates have the following specific limitations:</p> <p>A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent authorized service provider, through which the service employee has ongoing access to Agilent's Field Alert Service Portal, internal technical updates, update training, current documentation, technical support, current parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual as a safety specialist, service or technical Agilent product.</p>	

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System ID: CN13113001

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เอกสารไม่ควบคุม

General

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 <h2 style="text-align: center;">Certificate of Completion</h2>	
Learner Name:	Songpakde Song Tunk
Title Of Course:	AN-ASPC/CSE-OC-1-003-M: T800/T80 GC and GC GC Standard Chemistry DUT Service
Completion Date:	November 25, 2014
Certified By (Company):	Learning at Agilent
<p>All Service and Support training certificates have the following specific limitations:</p> <p>A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent authorized service provider, through which the service employee has ongoing access to Agilent's Field Alert Service Portal, internal technical updates, update training, current documentation, technical support, current parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual as a safety specialist, service or technical Agilent product.</p>	

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เอกสารไม่ควบคุม

Tools

Document Name: Certificate of Calibration Manometer

ISOLAB
Excellence in Calibration

CERTIFICATE OF CALIBRATION
No: CS212469
Date of Issue: 02nd June 2021
Issued by ISOLAB (SINGAPORE) PTE LTD

Requested by: Agilent Technologies (Thailand) Ltd
1 Chulalongkorn Building, 224 Chulalongkorn Road, Bangkok 10330 Thailand

Lab Order No: 21070
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (55 ± 10) % Relative Humidity
Page: 1 of 2

Description:
Instrument: Digital Manometer
Brand: Digimer
Model: 2021P
Serial No: 500281209
Calibration Range: 0 to 1000 gPa
Media Used: Oil
Calibration Start Date: 29th May 2021
Calibration End Date: 29th May 2021
Next Due Date: 30th May 2022

Isolab (S) Pte Ltd and its personnel are in compliance with ISO/IEC 17025:2017 The Quality System provides it in accordance with the Quality Standard ISO 9001.

Method of Calibration:
The Digital Manometer has been calibrated at ISOLAB's laboratory under the ambient conditions stated above according to a formal calibration procedure: S-CY-001-01. The Digital Manometer was calibrated by comparison with reference standards. The reference standard(s) used are traceable to national measurement standards maintained at National Metrology Centre (NMC-Singapore).

The following reference standards were used during the calibration:

S/N	Reference Instrument / Instrument	Local Identifier	CAL Reference	Last Calibration Due Date
1	Reference Instrument	MTS000046	PL000018	09 th March 2022

Calibrated By: 
Pradeep
Calibration Officer

Approved By: 
Pradeep A. Jagdeo
Approved Signature

* The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council.
The user may not reproduce or disseminate this report without prior written approval of ISOLAB.

ISOLAB (S) Pte Ltd is a registered company in Singapore.
1, Joo Koon Circle, Singapore 630001 Tel: +65 6346 4711 Fax: +65 6346 0021
Website: www.isolab.com.sg Email: service@isolab.com.sg

Date: April 22, 2022 2:35:48 PM
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เอกสารไม่ควบคุม

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Document Name: Certificate of Calibration Manometer

Notes

- This certificate is prepared based upon the item(s) submitted, the Service required and the conditions under which the Service are performed. This certificate is not intended to be representative of similar or equivalent services as similar or equivalent items and items not suitable and endorsement by ISOLAB of the item or the ISOLAB in anyway "guarantee" the later performance of the item. The user should determine the suitability of this instrument for its intended use.
- Unless otherwise requested, a report shall contain only technical results. Analysis and interpretation of the results and professional opinion and recommendations expressed thereupon, if required shall be clearly indicated and additional fee paid by the Client.
- This certificate may not be reproduced other than in full except with prior written approval of ISOLAB.
- Additional copies of this certificate are available to the Client at additional fee. The third party user cannot copy or use this certificate from ISOLAB, unless the Client has authorized ISOLAB to do so.
- ISOLAB shall under no circumstances be liable to the Client or its agents or representatives, in contract, including negligence or breach of statutory duty or otherwise for any direct or indirect loss or damage suffered by the Client, its agents or representatives from any error or whether connected with the Service provided by ISOLAB herein.

Date: April 22, 2022 2:35:48 PM
System ID: CN13113001

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Document Name: Certificate of Calibration Manometer

CERTIFICATE OF CALIBRATION
No: CS212469
Date of Issue: 02nd June 2021
Digital Manometer
Serial No: 500281209

Per: 21070
Calibration Start Date: 29th May 2021
Calibration End Date: 29th May 2021

Results of Calibration:
The results of the calibration are shown in the table below. The expanded uncertainty of the measurement are at a level of confidence of approximately 95% with a coverage factor "k" as mentioned below.

Calibration Results (As Found)


Applied Pressure (gPa)	DUT Indicated Value (gPa)	Correction (gPa)	Uncertainty (gPa)	k-Factor
0.0	0.0	0.0	0.5	0.5
15.0	15.1	-0.1	0.1	1.04
100.0	99.9	0.1	0.1	1.04
15.0	15.1	-0.1	0.1	1.04
0.0	0.0	0.0	0.5	0.5

Calibration Results (As Left)

Applied Pressure (gPa)	DUT Indicated Value (gPa)	Correction (gPa)	Uncertainty (gPa)	k-Factor
0.0	0.0	0.0	0.5	0.5
15.0	15.1	-0.1	0.1	1.04
100.0	99.9	0.1	0.1	1.04
15.0	15.1	-0.1	0.1	1.04
0.0	0.0	0.0	0.5	0.5

* Customer's measurement tolerance is 0.1 gPa at all points.
* The accuracy of the instrument was found to be within 0.1% of measurement range.
* The measurement results have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council.

Remarks:
1. No Adjustment/Repair was made during calibration.
2. Although there was no adjustment, note made in the DUT response indicated to reflect "As Found" and "As Left" results on ISO/IEC 17025:2017.

Calibrated By: 
Pradeep
Calibration Officer

Date: April 22, 2022 2:35:48 PM
System ID: CN13113001

เอกสารไม่ควบคุม

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Document Name: Certificate of Calibration Manometer


Pradeep
Calibration Officer

Date: April 22, 2022 2:35:48 PM
System ID: CN13113001

เอกสารไม่ควบคุม

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Tools

Document Name: Certificate of Calibration Thermometer



ISOLAB
 Excellence in Calibration

CERTIFICATE OF CALIBRATION
 No : CS212471
 Date of Issue: 09th June 2021
 Issued By: ISOLAB (SINGAPORE) PTE LTD

Requested by: Agilent Technologies (Thailand) Ltd
 17 Cha Uthong Building, 227 Uthit 1st Rd
 101 Rama IV Road, Samsat Building,
 Bangkok 10260 Thailand.

Alt Order No: 210074
 Calibration Temperature: (23 ± 2) °C
 Relative Humidity: (35 ± 10) % Relative Humidity
 Page: 1 of 3

Description:
 Instrument: Digital Thermometer
 Brand: Fluke
 Model: 54 II B
 Serial No: 448102495
 Calibration Point: (5 to 25) °C (g) Type K Standard for Channel 1 & 2
 Calibration Start Date: 27th May 2021
 Calibration End Date: 09th June 2021
 Next Due Date: 09th June 2022

ISOLAB (S) Pte Ltd and its process are in compliance with ISO/IEC 17025:2017. The Quality System process is in accordance with the Quality Standard ISO 9001.

Method of Calibration:
 The Digital Thermometer has been calibrated at ISOLAB's laboratory with means to show ambient conditions also in accordance to the calibration standard GTS-402.8.4. The Digital Thermometer was calibrated in comparison with below mentioned reference standards. The reference standards are traceable to national measurement standards maintained at National Metrology Centre (NMC-Singapore). The calibration was performed in accordance of the International Temperature Scale of 1990 (ITS-90).

The following reference standards were used during the calibration:

SN	Reference Instrument / Equipment	Serial Number	CAL. Expiry Date	Next Calibration Due Date
1	Reference Calibrator	113000	14/09/2021	09 th March 2022
2	Reference Thermocouple Type K	796110	11/01/2021	09 th March 2022

Calibrated By: 
 Supon Uthairat
 Calibration Officer

Approved By: 
 Shashik Sripattana
 Approved Signatory

*The results reported herein have been performed in accordance with the rules of accreditation under the Singapore Accreditation Council.
 This certificate may not be reproduced or used in full except with prior written approval of ISOLAB.

ISOLAB (Singapore) Pte Ltd
 1, 200 North Canal Singapore 080001 Tel: (65) 6336 4100 Fax: (65) 6336 5004
 Website: www.isolab.com.sg Email: iso@isolab.com.sg





 Date: April 22, 2022 2:33:46 PM
 System ID: CN13113001

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เอกสารไม่ควบคุม

Document Name: Certificate of Calibration Thermometer

Note


- This certificate is prepared based upon the item(s) selected, the Service required and the conditions under which the Service are performed. This certificate is not intended to be representative of similar or equivalent Service on similar or equivalent item and does not warrant or endorsement by ISOLAB of the item or that ISOLAB is assuring "goodness" the item performance of the item. The user should determine the reliability of the information for his business use.
- Unless otherwise requested, a report shall contain only technical results. Analysis and interpretation of the results and professional opinion and recommendations expressed thereupon, if required shall be clearly indicated and additional fee paid by the Client.
- This certificate may not be reproduced other than in full except with prior written approval of ISOLAB.
- Additional copies of this certificate are available to the Client at additional fee. No third party can obtain a copy of this certificate from ISOLAB, unless the user and permission from ISOLAB in writing to do so.
- ISOLAB shall under no circumstances be liable to the Client or its agents or representatives, in contract, including negligence or breach of statutory duty or otherwise for any direct or indirect loss or damage suffered by the Client, its agents or representatives however arising or whether connected with the Service provided by ISOLAB herein.

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 System ID: CN13113001

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เอกสารไม่ควบคุม

Document Name: Certificate of Calibration Thermometer



ISOLAB
 Excellence in Calibration

CERTIFICATE OF CALIBRATION
 No : CS212471
 Date of Issue: 09th June 2021
 Digital Thermometer
 Serial No: 448102495

Page: 1 of 3
 Calibration Start Date: 27th May 2021
 Calibration End Date: 09th June 2021

Results of Calibration:
 The results of the calibration are shown in the below table. The expanded uncertainty of the measurement are at a level of confidence of approximately 95% with a coverage factor "k" as mentioned below.

Channel 1 Measurement (As Per Set)

Applied Voltage (mV)	Equivalent Temperature (°C)	Average DUT Indicated Value (°C)	Correction (°C)	Uncertainty (°C)	k-Factor
3.800	0.0	0.0	0.0	0.2	2.00
4.990	10.0	10.0	0.0	0.2	2.00
13.400	25.0	25.0	0.0	0.2	2.00
14.200	28.0	28.0	0.1	0.2	2.00

Channel 1 Measurement (As Left)

Applied Voltage (mV)	Equivalent Temperature (°C)	Average DUT Indicated Value (°C)	Correction (°C)	Uncertainty (°C)	k-Factor
3.800	0.0	0.0	0.0	0.2	2.00
4.990	10.0	10.0	0.0	0.2	2.00
13.400	25.0	25.0	0.0	0.2	2.00
14.200	28.0	28.0	0.1	0.2	2.00

*The user should determine the reliability of the information for his business use.
 *The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council.

Remarks:

- No Adjustment/Offset were made during calibration.
- Although there was no adjustment, the results of the DUT, as shown in the table "As Per Set" and "As Left" results in calibration certificate.

Supon Uthairat
 Calibration Officer

 Date: April 22, 2022 2:33:46 PM
 System ID: CN13113001

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เอกสารไม่ควบคุม

Document Name: Certificate of Calibration Thermometer

Note

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- Additional copies of this certificate are available to the Client at additional fee. No third party can obtain a copy of this certificate from ISOLAB, unless the user and permission from ISOLAB in writing to do so.
- ISOLAB shall under no circumstances be liable to the Client or its agents or representatives, in contract, including negligence or breach of statutory duty or otherwise for any direct or indirect loss or damage suffered by the Client, its agents or representatives however arising or whether connected with the Service provided by ISOLAB herein.

 Date: April 22, 2022 2:33:46 PM
 System ID: CN13113001

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เอกสารไม่ควบคุม

Document Name: Certificate of Calibration Thermometer Probe

CERTIFICATE OF CALIBRATION

No: CS212477

Date of Issue: 5th June 2021

Type K Thermocouple Wire Sensor

Serial No: 4410509A5901K-P1

Page: 1 of 2
Calibration Start Date: 27th May 2021
Calibration End Date: 6th June 2021

Results of Calibration

The results of the calibration are shown in the below table. The expanded uncertainty of the measurement is at a level of confidence of approximately 95% with a coverage factor "k" as indicated below.

Calibration Results (As Found)

Actual Temperature (°C)	UUT Average Value (°C)	Correction (°C)	Uncertainty (°C)	k-Factor
0.0	0.5	-0.5	0.4	2.00
100.0	101.4	-1.4	0.4	2.00
230.0	231.2	-1.2	0.5	2.00

Calibration Results (As Left)

Actual Temperature (°C)	UUT Average Value (°C)	Correction (°C)	Uncertainty (°C)	k-Factor
0.0	-0.4	0.4	0.4	2.00
100.0	101.4	-1.4	0.4	2.00
230.0	231.2	-1.2	0.5	2.00


Expanded Uncertainty: 0.4°C at 0.0°C, 0.5°C at 230.0°C

* The user should document the suitability of the measurement for its intended use.

** The results reported herein have been performed in accordance with the scope of accreditation under the Singapore Accreditation Council.

Remarks:

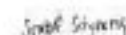
1. No Adjustment/Offset was made during calibration.
2. Although there was an adjustment was made in the UUT, customer indicated to reflect "As Found" and "As Left" results on calibration certificate.


Supan Laha
Calibration Officer
Date: April 22, 2022 2:33:46 PM
System ID: CN13113001

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Document Name: Certificate of Calibration Thermometer Probe


Supan Laha
4/26/2021
Date: April 22, 2022 2:33:46 PM
System ID: CN13113001

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Tools

Document Name: Certificate of Calibration Thermometer Probe

CERTIFICATE OF CALIBRATION

No: CS212477

Date of Issue: 6th June 2021

Issued By: ISOLAB (SINGAPORE) PTE LTD

Requester: Agilent Technologies (Thailand) Ltd
1100 Rama IV Road (Silom Building),
Bangkok 10500 Thailand.Job Order No: 211071
Ambient Temperature: (22 ± 2) °C
Relative Humidity: (45 ± 10) % Relative Humidity
Page: 1 of 2

Description:

Item name: Type K Module Probe

Brand: N/A

Model: TCE-CAS-450G Probe

Serial No: 4410509A5901K-P1

Manufacturer: Agilent Technologies

Calibration Range: 0 to 230 °C

Calibration Start Date: 27th May 2021Calibration End Date: 6th June 2021Next Due Date: 6th June 2022


Isolab (S) Pte Ltd and its practices are in compliance with ISO/IEC 17025:2017. The Quality System practice is in compliance with the Quality Standard ISO 9001.

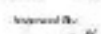
Worked of Calibration

The Type K Module Probe has been calibrated at ISOLAB's laboratory under the relevant conditions stated above according to in-house calibration procedure STCP-004-B5. The Type K Module Probe was calibrated by comparison with a Reference Sensor in constant temperature bath. The Reference Sensor and Reference bath were calibrated by National Metrology Institute of Singapore (NIM) and National Physical Laboratory (NPL), Singapore, National Physical Laboratory (NPL), UKAS and National Physical Laboratory (NPL). The calibration was performed in terms of the International Temperature Scale of 1990 (ITS-90).

The following reference standards were used during the calibration:

SN	Reference Standard / Equipment	Serial Number	CAL Certificate	Next Calibration Due Date
1	Reference Sensor	210111	CER011-S	24 th September 2021
2	Reference Sensor	210111	CER011-S	24 th September 2021
3	Reference Sensor	210111	CER011-S	24 th September 2021
4	Reference Sensor	210111	CER011-S	24 th September 2021
5	Reference Sensor	210111	CER011-S	24 th September 2021
6	Reference Sensor	210111	CER011-S	24 th September 2021
7	Reference Thermocouple Type K, Class 1	210111	CER011-S	24 th September 2021


Supan Laha
Calibration Officer


Supan Laha
Approved Signature
* The results reported herein have been performed in accordance with the scope of accreditation under the Singapore Accreditation Council.
The certificate may not be reproduced other than in full except with prior written approval of ISOLAB.ISOLAB (Singapore) Pte Ltd
2, 100, River Valley Road, Singapore 100029. Tel: +65 6336 6111 Fax: +65 6336 6111
www.isolab.com.sg Email: sales@isolab.com.sgDate: April 22, 2022 2:33:46 PM
System ID: CN13113001

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Document Name: Certificate of Calibration Thermometer Probe

Note

1. This certificate is prepared based upon the item(s) submitted, the Service requested and the conditions under which the device was performed. This certificate is not intended to be representative of similar or equivalent Service on similar or equivalent items and does not constitute an endorsement by ISOLAB of the item or that ISOLAB is saying "guarantee" the later performance of the item. The user should determine the suitability of this instrument for its intended use.
2. Unless otherwise requested, a report shall contain only technical results. Analysis and interpretation of the results and professional opinion and recommendations expressed thereupon, if required shall be clearly indicated and additional fee paid by the Client.
3. This certificate may not be reproduced other than in full except with prior written approval of ISOLAB.
4. Additional copies of this certificate are available to the Client at additional fee. No third party can obtain a copy of this certificate from ISOLAB, unless the Client has authorized ISOLAB in writing to do so.
5. ISOLAB shall render no representation be liable to the Client or its agents or representatives, in contract, including negligence or breach of statutory duty or otherwise for any direct or indirect loss or damage suffered by the Client, its agents or representatives, however arising or whether connected with the services provided by ISOLAB herein.

Date: April 22, 2022 2:33:46 PM
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Document Name:

Certificate of Calibration Thermometer Probe

CERTIFICATE OF CALIBRATION

No : CS212177

Date of Issue: 07th June 2021

Type: K Sheath Probe

Serial No: 440504/PWS/0201N-P1

Page: 1 of 2
 Calibration Start Date: 15th May 2021
 Calibration End Date: 07th June 2021

Results of Calibration

The results of the calibration are shown in the below table. The expanded uncertainty of the measurement is at a level of confidence of approximately 95% with a coverage factor "k" as mentioned below.

Calibration Results (As Fixed)

Actual Temperature (°C)	DOF	Correction (°C)	Uncertainty (°C)	k-Factor
0.0	9.5	-4.3	0.5	1.08
100.0	99.9	0.1	0.5	1.08
200.0	200.9	-0.9	1.0	1.08
300.0	300.7	-0.7	1.0	1.08

Calibration Results (As Load)

Actual Temperature (°C)	DOF	Correction (°C)	Uncertainty (°C)	k-Factor
0.0	9.5	-4.3	0.5	1.08
100.0	99.9	0.1	0.5	1.08
200.0	200.9	-0.9	1.0	1.08
300.0	300.7	-0.7	1.0	1.08

* Manufacturer's tolerance is $\pm 0.1^\circ\text{C}$ at 200°C and $\pm 0.2^\circ\text{C}$ at 300°C .

* The user should document the uncertainty of this instrument for its intended use.

* The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Standard Order Contract.

Remarks

1. No adjustment was made during calibration.
2. Although there was no adjustment made on the UUT, customer submitted to confirm "As Fixed" and "As Load" results in calibration certificate.


 Supra Datta
 Calibration Officer

Date: April 22, 2022 2:53:46 PM
 System ID: CN12113001

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Document Name:

Certificate of Calibration Thermometer Probe

Date: April 22, 2022 2:53:46 PM
 System ID: CN12113001

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Material:

Document Name:

CERTIFICATE OF ANALYSIS FID MDL STD 01, 0180-0072



Certificate of Analysis

FID MDL Sample

Agilent Part Number: 5180-0072

Sample Lot Number: W0001121

This certificate relates only to the material tested with an Agilent instrument with an ISO 9001 registered quality system, and the accuracy of the results is not guaranteed for use on other instruments. For critical data for risk assessment, determine your own.

Concentrations
 n-hexadecane 2.26 mg/L (± 0.2%)
 n-heptadecane 2.27 mg/L (± 0.2%)
 n-octadecane 22.7 mg/L (± 0.2%)
 Internal standard 22.8 mg/L (± 0.2%)

1. Internal standard is a mixture of n-alkanes with carbon numbers 19 to 27. It is used to correct for differences in detector response and to compensate for differences in sample size and injection volume.

Purity:
 n-hexadecane 99.9%
 n-heptadecane 99.9%
 n-octadecane 99.9%
 Internal standard 99.9%

Typical Analytical Spectrum on 1.5m x 0.25mm i.d.

1.5m x 0.25mm i.d. Chromatogram - n-hexadecane, n-heptadecane and n-octadecane in hexane



Date of release: 20 April 2021
 Date of expiration: 31 May 2024


 Supra Datta
 Calibration Officer

Date: April 22, 2022 2:53:46 PM
 System ID: CN12113001

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Material:

Document Name:

Certificate of Analysis FPD std 01, 0180-0083



Certificate of Analysis

Flame Photometric Detector Check Out Sample (40)

Agilent Part Number: 5180-0083

Sample Lot Number: W0001121

This certificate relates only to the material tested with an Agilent instrument with an ISO 9001 registered quality system, and the accuracy of the results is not guaranteed for use on other instruments. For critical data for risk assessment, determine your own.

Concentrations: n-hexadecane 2.26 mg/L (± 0.2%)

Internal standard: 22.8 mg/L (± 0.2%)

Purity: n-hexadecane 99.9%

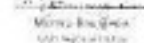
Internal standard 99.9%

Typical Analytical Spectrum on 1.5m x 0.25mm i.d.

1.5m x 0.25mm i.d. Chromatogram - n-hexadecane in hexane



Date of release: 20 April 2021
 Date of expiration: 31 May 2024


 Supra Datta
 Calibration Officer

Date: April 22, 2022 2:53:46 PM
 System ID: CN12113001

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General

Document Name: Certificate of System Qualification

Agilent Technologies

Agilent Compliance Engine Self Qualification

Date: April 22, 2022 10:22:13 PM

Device Details: 4013113001 Platform Revision: J.FRM 3.11

Test	Process Revision	Result
System Inspection and Basic Safety and Operation - 7890	QC 02.00	Conforms
Inlet Pressure Decay - Front PTV	QC 02.00	Conforms
Inlet Pressure Accuracy - Front PTV	QC 02.00	Conforms
Inlet Pressure Decay - Back On Column	QC 02.00	Conforms
Inlet Pressure Accuracy - Back On Column	QC 02.00	Conforms
Detector Flow Accuracy - Front FID	QC 02.00	Conforms
Detector Flow Accuracy - Back TCD	QC 02.00	Conforms
Headspace Leak - TMSA with Tray (Sample 1)	QC 02.00	Conforms
Headspace-Modet Zones Temperature Accuracy - TMSA with Tray (Sample 1)	QC 02.00	Conforms
GC Oven Temperature Recovery - 7890	QC 02.00	Conforms
GC Oven Temperature Stability - 7890	QC 02.00	Conforms
GC Inlet Temperature Accuracy - Front PTV, Front FID	QC 02.00	Conforms
Heads and Ovens - Front FID	QC 02.00	Conforms
Signal to Noise - TMSA with Tray Headspace, Front PTV, Front FID	QC 02.00	Conforms
Response Linearity FID - Liquid Injection, Front PTV, Front FID	QC 02.00	Conforms
GC Flowing Run - Manual Injection, Back On Column, Back PTV	QC 02.00	Conforms
Heads and Ovens - Back TCD	QC 02.00	Conforms
Signal to Noise - Manual Injection, Back On Column, Back TCD	QC 02.00	Conforms
LTM Data Operation - 7890, Column 1	QC 02.00	Conforms
LTM Oven Temperature Accuracy - 7890, Column 1	QC 02.00	Conforms

Overall Qualification Status: Conforms

Date: April 22, 2022 10:22:13 PM
System ID: CN13113001

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เอกสารไม่ควบคุม

Document Name:

Certificate of System Qualification

LTM Oven Temperature Stability - 7890, Column 1	QC 02.00	Conforms
LTM Oven Temperature Ramp - 7890, Column 1	QC 02.00	Conforms
Injection Precision - LTM using TMSA with Tray Headspace, Front PTV, Front FID	QC 02.00	Conforms
Injection Carry Over - LTM using TMSA with Tray Headspace, Front PTV, Front FID	QC 02.00	Conforms
GC Oven Temperature Accuracy - 7890	QC 02.00	Conforms
GC Inlet Temperature Accuracy - Front PTV	QC 02.00	Conforms
GC Detector Temperature Accuracy - Front FID	QC 02.00	Conforms
GC TWC Temperature Accuracy - Back On Column	QC 02.00	Conforms
GC Detector Temperature Accuracy - Back TCD	QC 02.00	Conforms

Overall Qualification Status: Conforms

Date: April 22, 2022 10:22:13 PM
System ID: CN13113001

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General

Document Name: Certificate of System Qualification

Agilent Technologies

Agilent Compliance Engine Self Qualification

Date: April 22, 2022 12:02:14 PM

Device Details: 4013113001 Platform Revision: ACS 3.11

Test	Process Revision	Result
Preparation - Agilent ChemStation	SW 30.00	Conforms
Security Data Access - ChemStation	SW 30.00	Conforms
Reporting and Calculation Algorithm Test - ChemStation	SW 30.00	Conforms
Reporting and Calculation Report - ChemStation	SW 30.00	Conforms
Communication - Instrument 1	SW 30.00	Conforms
CheckUp - Agilent ChemStation	SW 30.00	Conforms

Overall Qualification Status: Conforms

Date: April 22, 2022 12:02:14 PM
System ID: CN13113001

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General

Document Name:

Certificate of System Qualification

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General

Document Name: Certificate of System Qualification

Software Verification Report																			
Date:	Thursday, April 22, 2022	Time:	1:29:56 PM (UTC-07:00)																
Host Name:	CDLAB-01	Product Name:	Agilent OpenLab																
Windows User Name:	Administrator	Build Number:	1.0.0																
Build Type:	Release	Additional Packages:	None																
<p>Summary:</p> <p>Overall Evaluation of Software Check: PASS</p> <p>File Report Summary:</p> <p>No missing files or invalid file hashes.</p> <p>SQL File Report Summary:</p> <p>No missing or invalid SQL files.</p> <p>File Registration Report Summary:</p> <p>No registration errors.</p> <p>Registry Report Summary:</p> <p>No invalid registry entries.</p>																			
<p>Details:</p> <table border="1"> <thead> <tr> <th>ID</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>Agilent OpenLab CDS Checksums (1.0.0)</td> </tr> <tr> <td>02</td> <td>Agilent OpenLab Data Provider for Classification (1.0.0)</td> </tr> <tr> <td>03</td> <td>Agilent OpenLab CDS Checksums (1.0.0)</td> </tr> <tr> <td>04</td> <td>Agilent OpenLab Control Panel Checksums (1.0.0)</td> </tr> <tr> <td>05</td> <td>Agilent OpenLab CDS Checksums (1.0.0)</td> </tr> <tr> <td>06</td> <td>Agilent OpenLab CDS Checksums (1.0.0)</td> </tr> <tr> <td>07</td> <td>Agilent OpenLab CDS Checksums (1.0.0)</td> </tr> </tbody> </table>				ID	Description	01	Agilent OpenLab CDS Checksums (1.0.0)	02	Agilent OpenLab Data Provider for Classification (1.0.0)	03	Agilent OpenLab CDS Checksums (1.0.0)	04	Agilent OpenLab Control Panel Checksums (1.0.0)	05	Agilent OpenLab CDS Checksums (1.0.0)	06	Agilent OpenLab CDS Checksums (1.0.0)	07	Agilent OpenLab CDS Checksums (1.0.0)
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Date: April 22, 2022 2:30:46 PM
System ID: CN12113001

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General

Document Name: Certificate of System Qualification

Software Verification Report																			
Date:	Thursday, April 22, 2022	Time:	1:29:56 PM (UTC-07:00)																
Host Name:	CDLAB-01	Product Name:	Agilent OpenLab CDS Checksums																
Windows User Name:	Administrator	Build Number:	1.0.0																
Build Type:	Release	Additional Packages:	None																
<p>Summary:</p> <p>Overall Evaluation of Software Check: PASS</p> <p>File Report Summary:</p> <p>No missing files or invalid file hashes.</p> <p>SQL File Report Summary:</p> <p>No missing or invalid SQL files.</p> <p>File Registration Report Summary:</p> <p>No registration errors.</p> <p>Registry Report Summary:</p> <p>No invalid registry entries.</p>																			
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Date: April 22, 2022 2:30:46 PM
System ID: CN12113001

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General

Document Name: Certificate of System Qualification

Software Verification Report							
Date:	Thursday, April 22, 2022	Time:	1:29:56 PM (UTC-07:00)				
Host Name:	CDLAB-01	Product Name:	Agilent OpenLab CDS Checksums				
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001	Agilent OpenLab CDS Checksums (1.0.0)						

Date: April 22, 2022 2:30:46 PM
System ID: CN12113001

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General

Document Name: Certificate of System Qualification

Software Verification Report									
Date:	Thursday, April 22, 2022	Time:	1:29:56 PM (UTC-07:00)						
Host Name:	CDLAB-01	Product Name:	Agilent OpenLab CDS Checksums						
Windows User Name:	Administrator	Build Number:	1.0.0						
Build Type:	Release	Additional Packages:	None						
<p>Summary:</p> <p>Overall Evaluation of Software Check: PASS</p> <p>File Report Summary:</p> <p>No missing files or invalid file hashes.</p> <p>SQL File Report Summary:</p> <p>No missing or invalid SQL files.</p> <p>File Registration Report Summary:</p> <p>No registration errors.</p> <p>Registry Report Summary:</p> <p>No invalid registry entries.</p>									
<p>Details:</p> <table border="1"> <thead> <tr> <th>ID</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>011</td> <td>Agilent OpenLab CDS Checksums (1.0.0)</td> </tr> <tr> <td>012</td> <td>Agilent OpenLab CDS Checksums (1.0.0)</td> </tr> </tbody> </table>				ID	Description	011	Agilent OpenLab CDS Checksums (1.0.0)	012	Agilent OpenLab CDS Checksums (1.0.0)
ID	Description								
011	Agilent OpenLab CDS Checksums (1.0.0)								
012	Agilent OpenLab CDS Checksums (1.0.0)								

Date: April 22, 2022 2:30:46 PM
System ID: CN12113001

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Agilent Technologies Materials GC/MS

This section lists details for a set of Agilent materials required for all qualifications. If several part numbers are listed for an item, only the one(s) that apply to the tested configuration are used.

Retention Gap

For SS/TCO, H9/SS/PO, H9/VW/PO tests: for SS/PO tests correct Response Linearity.

Part No. 12091-60520(E) or equivalent
(12091-60521 (Interim 9000 OC))

Capillary Column:

HPL-5 30 µm x 0.32 mm x 0.25 µm for H11 Heptadecyl Levityl, all other intermediate combinations.

Part No.	10091J-413(E) or equivalent
	10091J-413-INT or equivalent (Interio 9000 90)

Capillary Column (BID)

DB: 1.30 m x 0.32 mm x 1.0 μ m; for SCD

Part No. 123-1005 or equivalent

Capillary Column (8Q, TQ, Q-TOF)

49-1845 30 in x 0.35 mm x 0.25 mm; for SQ, TD, and D-TDF tests

Part No.	160915-433(E) or equivalent (5075 and below)
	160915-433(U) or equivalent (5975 and up, TQ, and Q-TOP)

Capillary Column Ion Trap

2.87 450.20 m, 0.25 mm, 0.25 mm, 4x10m Trap Net

Part No.	CP6644 or equivalent
----------	----------------------

Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Full Name of Signer:	Seemgeethal Tarak
Logged On User Name:	seemgeethal.tarak@nrcn.apjilnet.com
Signature Creation Date:	April 22, 2022
Reason for Signature:	Executed protocol and published this original version of document

Regulatory ☐ and/or ☐

This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared for our use in accordance with applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Verification depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory occasion.

Waverley

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Sheet Name: testreportblank
Worksheet: LAMP1010101010101

System ID: CN151281
Print Date: April 22, 2022 9:25:55 AM

CN151281 Transaction Log:

Date	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 9:24:28 AM	Auth	Session Created	Session	None
April 22, 2022 9:24:28 AM	Start	Configuration	Session	None
April 22, 2022 9:24:28 AM	Auth	Entername	Loading	User is Nonpending and does not require an unlock code
April 22, 2022 9:24:41 AM	Auth	Exp Locked	Session	COP details for primary equipment only: File path: ProcessPath\Kits\Config\151281-04-20-21 and BOP File Name: 04-20-21 and COP Name: 04-20-21 and 04-20-21
April 22, 2022 9:24:54 AM	Start	Configuration	Session	None
April 22, 2022 9:25:00 AM	Start	Qualification	Session	OK
April 22, 2022 9:25:00 AM	Start	Execution	System Inspection and Basic Safety and Operation - T800 - Qualitative Test - No setpoints assembled	None
April 22, 2022 9:25:21 AM	Start	Execution	System Inspection and Basic Safety and Operation - T800 - Qualitative Test - No setpoints assembled	Run Count: 1
APRIL 22, 2022 9:25:21 AM	Start	Execution	High Pressure Decay - T800 - Pressure Controlled Inlet - 2. 20.0 psi - 1. 14 - 2.0 psi and in 0.0 psi	None
April 22, 2022 9:25:32 AM	Start	Execution	High Pressure Decay - T800 - Pressure Controlled Inlet - 2. 20.0 psi - 1. 14 - 2.0 psi and in 0.0 psi	Run Count: 1
April 22, 2022 9:25:35 AM	Start	Execution	High Pressure Decay - T800 - Pressure Controlled Inlet - 2. 20.0 psi - 1. 14 - 2.0 psi and in 0.0 psi	None

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Time	Transmission State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 9:25:29 AM	End	Execution	Int Pressure Accuracy - Front SQL - Pressure Control Test (0.250 psi - 1.000 psi)	Run Count: 1
April 22, 2022 9:34:42 AM	Start	Execution	Detect Flow Accuracy - Back FPC - Type: Fail - 5.000 min - L - 10.0% output	None
April 22, 2022 9:35:07 AM	Start	Start	Int Pressure Accuracy - Back TPO - Type: Fail - 0.000 min - L - 10.0% output	Manual Warning
April 22, 2022 9:36:08 AM	End	Execution	Break Flow Accuracy - Back FPC - Type: Pass - 0.000 min - L - 10.0% output	Run Count: 1
April 22, 2022 9:36:09 AM	Start	Execution	Detect Flow Accuracy - Back TPO - Type: Detect - 5.000 min - L - 10.0% output	None
April 22, 2022 9:36:25 AM	Alert	Alert	Detect Flow Accuracy - Back FPC - Type: Detect - 5.000 min - L - 10.0% output	Manual Data Entry
April 22, 2022 9:38:22 AM	End	Execution	Detect Flow Accuracy - Back FPC - Type: Detect - 0.000 min - L - 10.0% output	Run Count: 1
April 22, 2022 9:55:30 AM	Start	Execution	Detect Flow Accuracy - Back TPO - Type: Status - 0.000 min - L - 10.0% output	None
April 22, 2022 9:57:08 AM	Start	Execution	Control Flow Accuracy - Back TPO - Type: Monitor - 0.000 min - L - 10.0% output	None

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User Name: saangulha.1248 Hardware: LAPTOP-CQ258D8N			System ID: CM1270001 Print Date: April 22, 2022 2:22:45 PM	
CM1270001 Transaction Log				
Date	Transaction Date	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 8:27:23 AM	Auto	Data	Detector Flow Accuracy - Back FID - Type: Makeup - S: 800 mL/min - L: +/- 10.0% adjust	Manual Data Entry
April 22, 2022 8:27:40 AM	Auto	Execution	Detector Flow Accuracy - Back FID - Type: Makeup - S: 800 mL/min - L: +/- 10.0% adjust	Run Count: 1
April 22, 2022 8:44:18 AM	Start	Execution	Signal to Valve - Injection Tower, Front SSI, Back FID - Detector FID - L: +/- 240	None
April 22, 2022 10:10:30 AM	Start	Execution	Signal to Valve - Injection Tower, Front SSI, Back FID - Detector FID - L: +/- 240	None
April 22, 2022 10:17:10 AM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Peak - S: 20.0 mL/min - L: +/- 10.0% adjust	None
April 22, 2022 10:18:00 AM	Auto	Data	Detector Flow Accuracy - Front FID - Type: Peak - S: 20.0 mL/min - L: +/- 10.0% adjust	Manual Data Entry
April 22, 2022 10:18:30 AM	Auto	Execution	Detector Flow Accuracy - Front FID - Type: Peak - S: 20.0 mL/min - L: +/- 10.0% adjust	Run Count: 1
April 22, 2022 10:19:30 AM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Detector - S: 400.0 mL/min - L: +/- 10.0% adjust	None
April 22, 2022 10:19:40 AM	Auto	Data	Detector Flow Accuracy - Front FID - Type: Detector - S: 400.0 mL/min - L: +/- 10.0% adjust	Manual Data Entry
April 22, 2022 10:19:50 AM	Auto	Execution	Detector Flow Accuracy - Front FID - Type: Detector - S: 400.0 mL/min - L: +/- 10.0% adjust	Run Count: 1

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User Name: saangulha.1248 Hardware: LAPTOP-CQ258D8N		System ID: CM1270001 Print Date: April 22, 2022 2:22:45 PM		
CM1270001 Transaction Log				
Date	Transaction Date	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 10:11:20 AM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Makeup - S: 75.0 mL/min - L: +/- 10.0% adjust	None
April 22, 2022 10:11:40 AM	Auto	Data	Detector Flow Accuracy - Front FID - Type: Makeup - S: 75.0 mL/min - L: +/- 10.0% adjust	Manual Data Entry
April 22, 2022 10:11:40 AM	Auto	Execution	Detector Flow Accuracy - Front FID - Type: Makeup - S: 75.0 mL/min - L: +/- 10.0% adjust	Run Count: 1
April 22, 2022 10:11:50 AM	Start	Execution	GC Oven Temperature Accuracy - 700 - Temperature - Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0% adjust in K	None
April 22, 2022 10:12:10 AM	Auto	Data	GC Oven Temperature Accuracy - 700 - Temperature - Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0% adjust in K	Manual Data Entry
April 22, 2022 10:12:10 AM	Auto	Execution	GC Oven Temperature Accuracy - 700 - Temperature - Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0% adjust in K	Run Count: 1
April 22, 2022 10:12:30 AM	Start	Execution	GC Oven Temperature Accuracy - 700 - Temperature - Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0% adjust in K	None
April 22, 2022 10:12:40 AM	Auto	Data	GC Oven Temperature Accuracy - 700 - Temperature - Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0% adjust in K	Manual Data Entry
April 22, 2022 10:12:40 AM	Auto	Execution	GC Oven Temperature Accuracy - 700 - Temperature - Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0% adjust in K	Run Count: 1

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Date: April 22, 2022 2:22:45 PM
System ID: CM1270001

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Date: April 22, 2022 2:22:45 PM
System ID: CM1270001

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User Name: saangulha.1248 Hardware: LAPTOP-CQ258D8N		System ID: CM1270001 Print Date: April 22, 2022 2:22:45 PM		
CM1270001 Transaction Log				
Date	Transaction Date	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 10:12:10 AM	Start	Execution	GC Oven Temperature Stability - 700 - Temperature - Oven - S: 100.0°C - L: +/- 0.5°C	None
April 22, 2022 10:13:40 AM	Auto	Data	GC Oven Temperature Stability - 700 - Temperature - Oven - S: 100.0°C - L: +/- 0.5°C	Manual Data Entry
April 22, 2022 10:13:40 AM	Auto	Execution	GC Oven Temperature Stability - 700 - Temperature - Oven - S: 100.0°C - L: +/- 0.5°C	Run Count: 1
April 22, 2022 10:13:40 AM	Start	Execution	GC Heating Rate - Injection Tower, Front SSI, Back FID - Part of System Preparation - No data associated	None
April 22, 2022 10:14:10 AM	Auto	Data	GC Heating Rate - Injection Tower, Front SSI, Back FID - Part of System Preparation - No data associated	Data File Path: F:\VPO_PeakID-DIFF-DIFF-8
April 22, 2022 10:14:30 AM	Auto	Execution	GC Heating Rate - Injection Tower, Front SSI, Back FID - Part of System Preparation - No data associated	Run Count: 1
April 22, 2022 10:14:30 AM	Start	Execution	Injection and Split - Back FID - Detector FID - P-Make - L: (Peak) +/- 2.00 (SD) - L: (Peak) +/- 1.50 (SD) adjust	None
April 22, 2022 10:15:00 AM	Auto	Data	Injection and Split - Back FID - Detector FID - P-Make - L: (Peak) +/- 2.00 (SD) - L: (Peak) +/- 1.50 (SD) adjust	Data File Path: F:\VPO_PeakID-DIFF-DIFF-8
April 22, 2022 10:15:10 AM	Auto	Execution	Injection and Split - Back FID - Detector FID - P-Make - L: (Peak) +/- 2.00 (SD) - L: (Peak) +/- 1.50 (SD) adjust	Run Count: 1

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User Name: saangulha.1248 Hardware: LAPTOP-CQ258D8N			System ID: CM1270001 Print Date: April 22, 2022 2:22:45 PM	
CM1270001 Transaction Log				
Date	Transaction Date	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 10:15:00 AM	Start	Execution	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L: (Area) +/- 3.00% - L: (Area) +/- 1.00%	None
April 22, 2022 10:15:10 AM	Start	Execution	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L: (Area) +/- 3.00% - L: (Area) +/- 1.00%	None
April 22, 2022 10:16:00 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L: (Area) +/- 3.00% - L: (Area) +/- 1.00%	Data File Path: F:\VPO_PeakID-DIFF-DIFF-8 36.4s
April 22, 2022 10:16:00 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L: (Area) +/- 3.00% - L: (Area) +/- 1.00%	Data File Path: F:\VPO_PeakID-DIFF-DIFF-8 36.4s
April 22, 2022 10:16:00 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L: (Area) +/- 3.00% - L: (Area) +/- 1.00%	Data File Path: F:\VPO_PeakID-DIFF-DIFF-8 36.4s
April 22, 2022 10:16:00 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L: (Area) +/- 3.00% - L: (Area) +/- 1.00%	Data File Path: F:\VPO_PeakID-DIFF-DIFF-8 36.4s
April 22, 2022 10:16:00 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L: (Area) +/- 3.00% - L: (Area) +/- 1.00%	Data File Path: F:\VPO_PeakID-DIFF-DIFF-8 36.4s
April 22, 2022 10:16:00 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L: (Area) +/- 3.00% - L: (Area) +/- 1.00%	Data File Path: F:\VPO_PeakID-DIFF-DIFF-8 36.4s

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Date: April 22, 2022 2:22:45 PM
System ID: CM1270001

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Date: April 22, 2022 2:22:45 PM
System ID: CM1270001

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User Name: saangpattana.sak
Hardware: LAPTOP-CG54Q8V7

System ID: CN13113001
Print Date: April 22, 2022 2:33:58 PM

CN13113001 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 1:14:33 AM	End	Execution	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Run Count: 1
April 22, 2022 1:18:33 AM	Start	Execution	Signal to Valve - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	None
April 22, 2022 1:18:45 AM	Auto	Data	Signal to Valve - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: F:\GC_Data\2022-04-22\1845 AM
April 22, 2022 1:20:30 AM	End	Execution	Signal to Valve - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Run Count: 1
April 22, 2022 1:20:30 AM	Start	Execution	GC Sampling Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No data associated	None
April 22, 2022 1:21:30 PM	Auto	Acquisition	Session	None
April 22, 2022 1:21:30 PM	Auto	Session/Validation	Session	None
April 22, 2022 1:21:30 PM	Start	Qualification	Session	QC
April 22, 2022 1:21:30 PM	Start	Execution	GC Sampling Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No data associated	None
April 22, 2022 1:28:30 PM	Auto	Data	GC Sampling Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No data associated	Data File Path: F:\GC_Data\2022-04-22\1283 PM
April 22, 2022 1:28:30 PM	End	Execution	GC Sampling Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No data associated	Run Count: 1

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User Name: saangpattana.sak
Hardware: LAPTOP-CG54Q8V7

System ID: CN13113001
Print Date: April 22, 2022 2:33:58 PM

CN13113001 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 1:58:30 PM	Start	Execution	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	None
April 22, 2022 1:58:45 PM	Auto	Data	Signal to Valve - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: F:\GC_Data\2022-04-22\1584 PM
April 22, 2022 1:59:00 PM	End	Execution	Signal to Valve - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Run Count: 1
April 22, 2022 1:59:00 PM	Start	Execution	GC Sampling Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No data associated	None
April 22, 2022 2:00:18 PM	Auto	Data	GC Sampling Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No data associated	Data File Path: F:\GC_Data\2022-04-22\2001 PM
April 22, 2022 2:00:18 PM	Auto	Data	GC Sampling Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No data associated	Data File Path: F:\GC_Data\2022-04-22\2001 PM
April 22, 2022 2:00:18 PM	Auto	Session	Session	None
April 22, 2022 2:00:18 PM	Auto	Session/Validation	Session	None
April 22, 2022 2:00:18 PM	Start	Qualification	Session	QC
April 22, 2022 2:00:18 PM	Start	Execution	GC Sampling Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No data associated	None
April 22, 2022 2:00:18 PM	Auto	Data	GC Sampling Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No data associated	Data File Path: F:\GC_Data\2022-04-22\2001 PM

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Date: April 22, 2022 2:33:46 PM
System ID: CN13113001

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Date: April 22, 2022 2:33:46 PM
System ID: CN13113001

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User Name: saangpattana.sak
Hardware: LAPTOP-CG54Q8V7

System ID: CN13113001
Print Date: April 22, 2022 2:33:58 PM

CN13113001 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 2:08:18 PM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: F:\GC_Data\2022-04-22\2081 PM
April 22, 2022 2:08:18 PM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: F:\GC_Data\2022-04-22\2081 PM
April 22, 2022 2:08:40 PM	End	Execution	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Run Count: 1
April 22, 2022 2:09:45 PM	Auto	Execution	Signal to Valve - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	None
April 22, 2022 2:15:38 PM	Auto	Data	Signal to Valve - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: F:\GC_Data\2022-04-22\2153 PM
April 22, 2022 2:16:35 PM	End	Execution	Signal to Valve - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Run Count: 1
April 22, 2022 2:16:35 PM	End	Qualification	Session	QC
April 22, 2022 2:16:35 PM	Start	Reporting	Session	None
April 22, 2022 2:22:42 PM	Auto	Reporting	Session	Report Generated: Certificate

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User Name: saangpattana.sak
Hardware: LAPTOP-CG54Q8V7

System ID: CN13113001
Print Date: April 22, 2022 2:33:58 PM

CN13113001 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 2:32:21 PM	Auto	Reporting	Session	Report Generated: Certificate PDF Name: CN13113001_20220422_Cat Report Type: User Name: saangpattana.sak@agilent.com Full Name of User: Saangpattana Sak Reason for signature: Issued and published this report version at 04/22/2022
April 22, 2022 2:32:50 PM	Auto	Reporting	Session	Report Generated: Report

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Date: April 22, 2022 2:33:46 PM
System ID: CN13113001

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Date: April 22, 2022 2:33:46 PM
System ID: CN13113001

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Calibration Certificate

Certificate No.: 226287-401-41
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Uthongk 41, Sukhumvit Road,
Bangchuck, Prathumwan, Bangkok 10500

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Equipment: pH Meter
Manufacturer: HANNA INSTRUMENTS
Model: HI 3211
Serial No.: 08185345
ID No.: UWE.WAT.284.2556
Order No.: 226287
Operation No.: 226287/001
Date of Receipt: 11 March 2022
Date of Calibration: 16 March 2022

Calibrated by: Mr. Manee Sansak Specialist
Approved by: (Mr. Phengsat Tsungrit)
Manager, Division of Calibration Laboratory
Date of Issue: 21 March 2022
Responsible for the Test/and Management Time

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

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P-CF-012 Revision: 00 Date: 14-12-61

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เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 226287-401-41
Equipment: pH Meter
Manufacturer: HANNA INSTRUMENTS
Model: HI 3211
Serial No.: 08185345
ID No.: UWE.WAT.284.2556

Date of Calibration: 16 March 2022
Page 2 of 5

Calibration Results:
1. Calibration of pH Meter (Manual Temperature Compensation at 25.0°C)

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (mV)	Coverage Factor (k=1)
		mV	pH		
0	904.17	414	6.80	0.03	2.08
2	205.271	204.1	6.80	0.03	2.08
4	114.144	114.1	6.80	0.03	2.08
6	58.128	58.2	6.80	0.03	2.08
7	0.081	0.1	7.80	0.03	2.08
8	-80.959	-80.1	8.80	0.03	2.08
9	-177.433	-177.3	9.80	0.03	2.08
10	-265.812	-265.8	10.80	0.03	2.08
11	-416.119	-416	11.80	0.03	2.08

2. Calibration of pH Meter with Electrode (Manual Temperature Compensation at 25.0°C)

Equipment:	pH Electrode	Type:	Combined Electrode
Manufacturer:	METTLER TOLEDO	Model:	IN422
Serial No.:	1142632	S/N:	HA

Performance of Electrode system (Three-Point Calibration at pH4, pH7 and pH10)

Certified Value (pH ±0.01)	Average Indicator Reading		Relative Slope (%)	Uncertainty (pH)	Coverage Factor (k=1)
	pH	mV			
4.008	4.01	183.4	88.5	0.0071	2.08
6.865	6.87	12.5	-	0.0074	2.08
10.015	10.01	-171.5	88.1	0.0092	2.08
6.863	6.88	9.2	-	0.0092	2.08

เอกสารไม่ควบคุม

P-CF-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 226287-401-41
Equipment: pH Meter
Manufacturer: HANNA INSTRUMENTS
Model: HI 3211
Serial No.: 08185345
ID No.: UWE.WAT.284.2556

Date of Calibration: 16 March 2022
Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute.
Environment Condition: Ambient Temperature: (23.6 ± 0.5) °C Relative Humidity: (36.5 ± 0.5) %
Condition of Equipment: Good Condition

Condition of B & Results of Calibration:

1. Calibration Method: In house method: W/CEM22 based on direct measurement by using standard voltage calibration and certified reference materials (CRM).

2. Reference Standards / Certified Reference Materials:

Reference	Batch No.	Manufacturer	Certificate No.	Expiry Date
1.1 DC Voltage Calibrator	2708007	Fluke	901-217-0087	31 June 2022
2.2 Digital Thermometer	2708007	Fluke	CC-640984-01	30 October 2021
3.3 Thermo-Hygro Water	89445874-08548	PONPE	Q421-2781	15 November 2022

Certified Reference Material	Lot. No.	Manufacturer	Set No.	Expiry Date
2.4 pH buffer 4.00 (Primary pH buffer Solution)	780012	QPAchem	PH2KLS	21 November 2023
2.5 pH buffer 6.86 (Primary pH buffer Solution)	780013	QPAchem	PH2TLLS	21 November 2023
2.6 pH buffer 10.01 (Primary pH buffer Solution)	780015	QPAchem	PH2BLLS	21 November 2022
2.7 pH buffer 7.60 (Standard pH buffer Solution)	776048	QPAchem	PH13TLLS	8 November 2022

3. This calibration is traceable to The International System of Units (SI) as follows:

3.1 Instrument No.2.1	Uncalibrated	NIST 780-105-17025 Laboratory Accreditation of Calibration No.3075
3.2 Instrument No.2.2	Uncalibrated	NIST 780-105-17025 Laboratory Accreditation of Calibration No.3001
3.3 Instrument No.2.3	Uncalibrated	NIST 780-105-17025 Laboratory Accreditation of Calibration No.3039

4.4 Certified Reference Material No. 2.3 to 2.8: traceable to Primary measurement method based on using calibrated thermodynamic, calorimetric, and refractometric and a laboratory calibration preparation and certified by QPAchem Ltd is accredited to ISO 17025 and ISO/IEC 17025.

5.5 Certified Reference Material No. 2.7: traceable to BAM Ref No.7 Lot# 30.04.2022, BAM Ref No.9 Lot# 28.05.2020, BAM Ref No.8 Lot# 30.04.2020, BAM Ref No.10 Lot# 26.05.2020. The standard solution preparation and certified by QPAchem Ltd is accredited to ISO 17025 and ISO/IEC 17025.

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

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

P-CF-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 220201-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C Model: H2211
Serial No.: 8005345 ID No.: UAE-WAT-0042555
Manufacturer: HANNA INSTRUMENTS
Date of Calibration: 18 March 2022 Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature: (20.0 ± 1.0) °C
Relative Humidity: (50 ± 4) %

Condition of this results of Calibration:

1. Calibration Method:
 - In house method: WTR-005 by comparison with standard thermometer.
 - The Calibration is determined by comparing with a known temperature from a standard reference thermometer.
 - The temperature scale in use at this laboratory is the International Temperature scale of 1990 (ITS-90).

2. Reference Standard Instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANNA THERMOMETER	1020	2118191	PSL-T 080164	24 Jun-22	TSTR
Robur Radiance Thermometer (RRT)	002 HV	877002			

Support equipment: Low Temperature Bath (SOCAL-6), Model: Europa-6 Plus Basic, SN: 3116922

3. This certificate is traceable to International System of Units (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.
6. Condition of Calibrated Item: ☒ Good
7. Result of Calibration: ☒ Without adjustment ☐ After adjustment

FCS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 220201-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C Model: H2211
Serial No.: 8005345 ID No.: UAE-WAT-0042555
Manufacturer: HANNA INSTRUMENTS
Date of Calibration: 18 March 2022 Page 5 of 5

Calibration point: 15.0, 20.0 and 25.0 °C

Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 180 mm.
- Description of probe model: NA GN: NA
- Information of probe: Material: pH: pH type: length: 150 (cm)
- Sheath material: Stainless Steel

UUC* Read-kg (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.0	15.031	-0.0	0.309
20.0	20.032	-0.0	0.309
25.0	25.032	-0.0	0.309

NA: - UUC: Unit Under Calibration

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

----- End -----

FCS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 220203-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsak 41, Sukhumvit Road,
Bangchak, Phrahanong, Bangkok 10250

Page 1 of 5

Equipment: pH Meter
Manufacturer: METTLER TOLEDO
Model: SevenEasy pH
Serial No.: 1330305212
ID No.: UAE-WAT-0032893
Order No.: 220203
Operation No.: 220203-001
Date of Receipt: 11 March 2022
Date of Calibration: 18 March 2022

Calibrated by: Mr. Nadek Sornchai Specialist
Approved by: (Mr. Phengchai Tsarj) Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 21 March 2022

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

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

FCS-009 Revision: 00 Date: 04-12-60

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 220203-001-01
Equipment: pH Meter
Resolution: 0.01 pH ± 1 mV
Manufacturer: METTLER TOLEDO
Model: SevenEasy pH
Serial No.: 1330305212
ID No.: UAE-WAT-0032893
Date of Calibration: 18 March 2022 Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature: (20.0 ± 1.0) °C Relative Humidity: (49.5 ± 5) %
Condition of Equipment: Good Condition
Condition of this Results of Calibration:

1. Calibration Method: In house method: W-00-002 based on direct measurement by using standard voltage cell and certified reference material (CRM).

2. Reference Standards / Certified Reference Material

Label/Code	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Cell	270007	Fluke	SLC-01F-0007	24 June 2022
2.2 Digital Thermometer	270007	Fluke	00448596-01	30 October 2022
2.3 Titrated Hydrochloric Acid	WAL-01814-00000	WAL-01814	0001-0181	15 November 2022

Certified Reference Material	Lot No.	Manufacturer	Batch	Expiry Date
2.4 pH buffer 4.00 (Primary pH buffer solution)	70011	CPAQUANT	PH011.05	21 November 2022
2.5 pH buffer 7.00 (Primary pH buffer solution)	70011	CPAQUANT	PH011.05	21 November 2022
2.6 pH buffer 10.01 (Primary pH buffer solution)	70011	CPAQUANT	PH011.05	21 November 2022
2.7 pH buffer 7.00 (Standard pH buffer solution)	70011	CPAQUANT	PH011.05	5 November 2022

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

- 3.1 Instruments No. 2.1: through NISO-T04-T0-17025 Laboratory Accreditation of Calibration No. 0075
- 3.2 Instruments No. 2.2: through NISO-T04-T0-17025 Laboratory Accreditation of Calibration No. 0081
- 3.3 Instruments No. 2.3: through NISO-T04-T0-17025 Laboratory Accreditation of Calibration No. 0082

- 3.4 pH buffer 4.00 (Primary pH buffer solution): through NISO-T04-T0-17025 Laboratory Accreditation of Calibration No. 0075
- 3.5 pH buffer 7.00 (Primary pH buffer solution): through NISO-T04-T0-17025 Laboratory Accreditation of Calibration No. 0081
- 3.6 pH buffer 10.01 (Primary pH buffer solution): through NISO-T04-T0-17025 Laboratory Accreditation of Calibration No. 0082

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.

FCS-012 Revision: 00 Date: 04-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 25005-001-01
Equipment: pH Meter
Manufacturer: METTLER TOLEDO
Model: SevenEasy pH
Serial No.: 123052512
ID No.: UAE-WAT-0562583
Resolution: 0.01 pH ± 1 µV
Model: SevenEasy pH
Type: Bench top

Date of Calibration: 16 March 2022 Page 3 of 3

Calibration Results:

1. Calibration of pH Meter (Visual Temperature Compensation at 25 °C)

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (mV)	Coverage Factor (k=1)
		mV	pH		
0	-414.117	414	0.90	0.06	0.06
2	235.071	236	2.90	0.06	0.06
4	177.402	175	4.90	0.06	0.06
6	59.453	59	6.90	0.06	0.06
7	-2.081	0	7.90	0.06	0.06
8	-89.789	-90	8.90	0.06	0.06
10	-377.465	-377	10.90	0.06	0.06
12	-695.812	-696	12.90	0.06	0.06
M	-414.112	-414	15.00	0.06	0.06

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

Equipment: pH Electrode
Manufacturer: METTLER TOLEDO
Model: COMBIO 3000
Serial No.: 840340
ID No.: N/A

Performance of Electrode system (Three-Point Calibration at pH 4.017 and pH 7.00)

Certified Value (pH ± 0.01)	Average Indicator Reading		Relative Slope (%)	Sensitivity (mV/pH)	Coverage Factor (k=1)
	mV	pH			
4.008	4.31	172	98.1	0.0071	0.00
6.008	5.37	6	-	0.0074	0.00
10.005	10.81	-176	97.8	0.0090	0.00
8.993	8.98	-3	-	0.0092	0.00

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 25005-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C
Model: SevenEasy pH
Serial No.: 123052512
ID No.: UAE-WAT-0562583
Manufacturer: METTLER TOLEDO

Date of Calibration: 16 March 2022 Page 4 of 5

Location: Overlook Calibration Laboratory, National Food Institute

Environment Condition:
 Ambient Temperature : (22 ± 1.0) °C
 Relative Humidity : (30 ± 4) %

Condition of this results of Calibration:

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

2. Reference Standard Instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANNAH THERMISTOR	160	2115761	PSLT 08164	24-Jun-22	TETR
Platinum Resistance Thermometer (PRT)	842A	67222			

Support Equipment : Low Temperature Bath (SOCAL-4), Model: Euro-6 Plus Series, SN: 311802

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

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 25005-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C
Model: SevenEasy pH
Serial No.: 123052512
ID No.: UAE-WAT-0562583
Manufacturer: METTLER TOLEDO

Date of Calibration: 16 March 2022 Page 5 of 5

Calibration point: 15.0, 25.0 and 35.0 °C

Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.
- Description of probe, model : N/A SN : N/A
- Dimension of probe : Diameter 3.5 mm, Length 125 mm.
- Sheath material : Stainless Steel

UUC Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.2	15.001	-0.2	0.069
25.2	25.002	-0.2	0.069
35.2	35.002	-0.2	0.069

Note : UUC = Unit Under Calibration

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CALIBRATION AND TESTING EQUIPMENT SERVICES
 534 INTANAYARN ROAD SOI 10, SIANGKHAM, SIANGKHAM BANGKOK 10500
 TEL: 0-2717-5808-34 FAX: 0-2717-8484

Certificate of Calibration

Cert.No.: 21CH1017
Page: 1 of 2

Equipment: Turbidity Meter
Manufacturer: Odon
Model: T100RE
Serial No.: 1120501017
ID. No.: UAE-WAT-0562583
Condition As-Received: Used Item
Received Date: 09 August 2021
Calibration Date: 17 August 2021
Reference: 2108-0201WSC-1
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
 3 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10250

Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 20) %
Calibration Procedure: In-house method : GPCH11 based on direct measurement by using Foreman standard solution

Calibrated by: Waleek Sirithoon
Approved by: 
 Appointed Signatory
 { } Malee Butkrus
 { } Saichit Meangmai
 { } Wanworn Lemgagrakul

Issue Date: 23 August 2021
 The Uncertainties are for a confidence probability of approximately 95%.
 This certificate may not be reproduced without the full, original and complete without approval of the head of Calibration and Testing Equipment Services.

เอกสารไม่ควบคุม

A 0007434



Cert.No. : 21CH1017
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-Hygrometer	1103329	130EC010	21H1462	27 June 2022
2) Electronic Balance	1120143764	140RC004	20MM595	27 Sep 2021

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

Material	Manufacturer	Lot No.	Assay
1) Hexamethylenetetramine	HIMEDIA	0000343342	99.5%
2) Hydrazine Sulfate	HIMEDIA	0000332928	99.2%

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	0.0062	2.00
20	20.2	0.39	2.00
100	101	0.72	2.00
400	403	1.5	2.00
800	803	2.1	2.13

Remark : - UUC* = Unit Under Calibration
- NTU = Nephelometric Turbidity units

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

-000-

Value

เอกสารไม่ควบคุม
1066935



Certificate of Calibration

Equipment:	CONDUCTIVITY METER	Certificate No.:	C24220084
Model:	Lab955	Issued Date:	22 March 2022
Serial No. (or ID.):	16300358	Job No.:	KSPR2203267
Manufacturer:	SI Analytics	Page:	1 of 2
Electrode Serial No.	16075087	Model:	LF413T
Condition:	In Condition	Brand:	SI Analytics

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

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

Calibration Place: Environment Laboratory, SPC RT Co., Ltd.
1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd.,
Bangkok, Prakanong, Bangkok 10260 Thailand

Calibration By: Mr. Wasen Nuchnabee
Calibration Date: 22 March 2022
The Method used: In house method, SPCC-WM-48, base on ASTM D 1125-14 and D 5391-14
Traceability: This certificate is traceable to the SI Units maintained by CRM of NIST (SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 794135, 794136, 772624

(Mr. Wasen Nuchnabee)

SPC
RT Co., Ltd.

(Mr. Dumrong Boonsopon)

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

SPC RT Co., Ltd.
SPC RT Co., Ltd.
1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd., Bangkok, Prakanong, Bangkok 10260 Thailand
Tel: 0 200-4000 Ext. 5000-5009 Fax: 0 200-4004 E-mail: info@spcrt.com Website: www.spcrt.com

เอกสารไม่ควบคุม
SPCC-FM-C24-36: 23 Nov 2020

Certificate No.: C24220084 Page: 2 of 2

Calibration Results:

Before Adjustment

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor (k)	Uncertainty (±)
25.000 µS/cm	25.9 µS/cm	-0.900 µS/cm	2.00	0.22 µS/cm
1413.0 µS/cm	1444 µS/cm	-31.0 µS/cm	2.00	8.9 µS/cm
111.3 mS/cm	107.9 mS/cm	3.40 mS/cm	2.00	0.66 mS/cm

After Adjustment : at 1413 µS/cm

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor (k)	Uncertainty (±)
25.000 µS/cm	25.0 µS/cm	0.000 µS/cm	2.00	0.22 µS/cm
1413.0 µS/cm	1413 µS/cm	0.0 µS/cm	2.00	8.9 µS/cm
111.3 mS/cm	107.2 mS/cm	4.10 mS/cm	2.00	0.66 mS/cm

The End of Certificate

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบตรวจ: KSPR2203267

ชนิดเครื่องวัด: CONDUCTIVITY METER รุ่น: Lab955 หมายเลขเครื่อง: 16300358

ตรวจสอบ (ปี)	ตรวจสอบ (วัน)	ผลการตรวจสอบ	หมายเหตุ
22 Mar 2022	22 Mar 2022	ผ่าน	
วันที่	วันที่	วันที่	วันที่
General			
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3. สวิตช์ เปิด - ปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>
Spectrophotometer			
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	6. แบตเตอรี่สำรอง (Battery Backup) >= 2.5 VDC	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	7. ควบคุมความยาวคลื่น (Wavelength Control)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	8. การควบคุมความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9. แหล่งกำเนิดแสง (แสง < 2,000 nm)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11. ช่องใส่หลอดตัวอย่าง (Carousel Module)	<input checked="" type="checkbox"/>
pH Meter and Conductivity Meter			
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14. ฝาปิดป้องกัน Electrode (Dust Protection Hood)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	15. ฐานยึดอิเล็กโทรด (Stand)	<input checked="" type="checkbox"/>
Turbidimeter			
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	16. ค่าความขุ่นตัวอย่าง (No Sample)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	17. การทำความสะอาดของเซลล์ (>= 2.5 ไมครอน 3.0)	<input checked="" type="checkbox"/>
Autotitrator titrator			
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	18. สภาพ Piston Burdles	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	19. Function Rinsing and Dosing	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	20. ระบบจ่ายยาและอุปกรณ์ประกอบ	<input checked="" type="checkbox"/>

หมายเหตุ: Electrode ใช้งานอยู่ที่ 24.9 °C ใน Control Waterbath ที่ 25.0 ± 0.1 °C

Mr. Wasen Nuchnabee
Service Engineer

เอกสารไม่ควบคุม
SPCC-FM-R31-02: 23 Nov 2020

SPC RT Co., Ltd.
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1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd., Bangkok, Prakanong, Bangkok 10260 Thailand
Tel: 0 200-4000 Ext. 5000-5009 Fax: 0 200-4004 E-mail: info@spcrt.com Website: www.spcrt.com

เอกสารไม่ควบคุม
SPCC-FM-C24-36: 23 Nov 2020

SPC RT Co., Ltd.
SPC RT Co., Ltd.
1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd., Bangkok, Prakanong, Bangkok 10260 Thailand
Tel: 0 200-4000 Ext. 5000-5009 Fax: 0 200-4004 E-mail: info@spcrt.com Website: www.spcrt.com



Cert. No.: 22TM305
Page: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : ARCO
Model : UR-1320
Serial No. : -
ID No. : UAEWAO.0092553
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Set Udomsuk 41, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 7 April 2022
Calibration Date : 7 April 2022
Ambient Temperature : $(25 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Man Patisanpongpaloon

Approved by :
Approved Signatory

() Ponthipon Tamsukol
(x) Man Patisanpongpaloon
() Suwit Injai

Issue Date : 18 April 2022

The Uncertainty are for a confidence probability of approximately 95%

This certificate may not be reproduced without the written consent of the provider.
Approval of the Board of Corporate Services & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม

A 0040247



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2204-00150C-3
Procedure Used :-

Cert. No.: 22TM306
Page: 2 of 3

Calibration were conducted using calibration procedure CP-0102 according to direct measurement method with Data Acquisition which connected with Temperature Controller (PLC).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY41021843	22LM4	10 Jan 2023

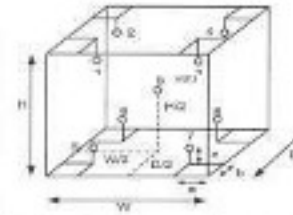
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :		Dimension of Chamber :	
a =	10 cm	D =	0.62 m
b =	10 cm	W =	1.2 m
c =	10 cm	H =	1.2 m
		Capacity =	0.89 m ³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	27
REL.Humid. (%)	59	57
AC Supply (Volt)	221	220

Position :	Ref. Std. ID No.:
1	18-04RTD-01
2	18-04RTD-02
3	18-04RTD-03
4	18-04RTD-04
5	18-04RTD-05
6	18-04RTD-06
7	18-04RTD-07
8	18-04RTD-08
9 (ref.)	18-04RTD-09

เอกสารไม่ควบคุม

a 1104312



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2204-00150C-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 22TM308
Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor K
20.0	20.0	19.9	0.33	0.63	1.4	0.50	2

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 of any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern in homogeneity within the observation volume 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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เอกสารไม่ควบคุม

a 1104311



Cert. No.: 22TM309
Page: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : Arco
Model : UC4-1320
Serial No. : 19URC48013201
ID No. : UAEWAO.0152561
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Set Udomsuk 41, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 17 February 2022
Calibration Date : 17 February 2022
Ambient Temperature : $(25 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Kundrit Promrat

Approved by :
Approved Signatory

() Ponthipon Tamsukol
(x) Kundrit Promrat
() Suwit Injai

Issue Date : 22 February 2022

The Uncertainty are for a confidence probability of approximately 95%

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Approval of the Board of Corporate Services & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม

A 0038099



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2202-04450C-1
 Procedure Used :-

Cert. No.: 22TM90
 Page: 2 of 3

Calibration were conducted using calibration procedure CP-0102 according to direct measurement method with Data Acquisition which incorporated with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1.) Data Acquisition	34970A	MY44035217	21LM30	23 Dec 2022

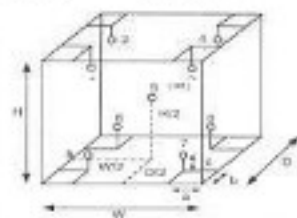
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

a = 10 cm
 b = 10 cm
 c = 10 cm

Dimension of Chamber :

D = 0.62 m
 W = 1.2 m
 H = 1.2 m
 Capacity = 0.88 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	28
REL.Humid. (%)	68	75
AC Supply (Volt)	220	220

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

เอกสารไม่ควบคุม
 A 1096042



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2202-04450C-1
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Not Available

Cert. No.: 22TM90
 Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	19.5	19.4	0.30	0.58	1.0	0.35	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.154	20.013	20.358	19.959	19.634	19.781	19.817	19.624	19.622

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 temperature 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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เอกสารไม่ควบคุม
 A 1096041



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
 514 PATTANAKARN ROAD 901 HIRUNANG SUKOLANG BANGKOK 10150
 TEL 0-2717-338-31 FAX 0-2719-9482



Cert. No.: 22TM305
 Page: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
 Manufacturer : ARCO
 Model : UR-1320
 Serial No. : -
 ID No. : UAE.WAO.0182551
 Submitted by : United Analyst and Engineering Consultant Co., Ltd.
 9 And Unnarak 41 Sukhumvit Road
 Bangkok, Phrakhanong,
 Bangkok 10250
 Location : Lab Floor 2
 Received Order : 7 April 2022
 Calibration Date : 7 April 2022
 Ambient Temperature : (26 ± 10) °C
 Relative Humidity : (50 ± 30) %
 Calibrated by : Man Pattanapongpaiboon
 Approved by :
 Approved Signatory
 () Pongthipha Tamayakul
 () Meechai Suthikul
 () Suwit Injai
 Issue Date : 18 April 2022

The Uncertainties are for a confidence probability of approximately 95%

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 Approval of the Board of Corporate Services, Technology Calibration and Testing Services.

เอกสารไม่ควบคุม
 A 0040246



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2204-00150C-2
 Procedure Used :-

Cert. No.: 22TM305
 Page: 2 of 3

Calibration were conducted using calibration procedure CP-0102 according to direct measurement method with Data Acquisition which incorporated with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1.) Data Acquisition	34970A	MY41021843	22LM4	10 Jan 2023

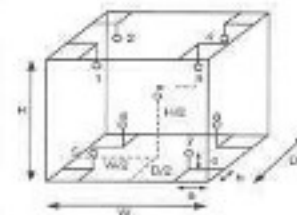
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

a = 10 cm
 b = 10 cm
 c = 10 cm

Dimension of Chamber :

D = 0.62 m
 W = 1.2 m
 H = 1.2 m
 Capacity = 0.88 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	27
REL.Humid. (%)	55	53
AC Supply (Volt)	222	221

Position :	Ref. Std. ID No.:
1	18-04RTD-01
2	18-04RTD-02
3	18-04RTD-03
4	18-04RTD-04
5	18-04RTD-05
6	18-04RTD-06
7	18-04RTD-07
8	18-04RTD-08
9 (ref.)	18-04RTD-09

เอกสารไม่ควบคุม
 A 1104314



Equipment : BCD Incubator
 Condition As-Received : Used Item
 Reference : Z204-0018DC-2
 Result of Calibration : (*) Without Adjustment
 Function of UUC* : Temperature Source
 Previous setting : Not Available

Cert. No.: 22TM305
 Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor
20.0	20.0	20.0	0.50	0.64	1.1	0.64	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.080	20.058	19.998	19.925	19.955	19.650	19.819	19.978	19.935

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 its close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under study, under the 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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เอกสารไม่ควบคุม
 a 1104313

Calibration Certificate ID
 TH0208-028-042725-ADD-TH

METTLER TOLEDO

Mettler-Toledo (Thailand) Ltd.
 8/814 - 8/815 Looeile Rd., Bangnae Tai Sub District
 Bangna District, Bangkok 10700
 +66 2723 0162
 mt-th.service.support@mt.com



Accuracy Calibration Certificate

Customer:

Company: United Analyst and Engineering Consultant Co., Ltd.
 Address: 3, 5th Udon Soi 41, Sukhumvit Rd., Bang Chak
 City: Phra Khanong
 Zip / Postal: 10260
 State / Province: Bangkok
 Order Number:

Weighing Device

Manufacturer: Mettler Toledo
 Model: XPR205
 Serial No.: 874505487
 Guiding: N/A
 Floor: 2
 room:
 Instrument Type: Weighing Instrument
 Asset Number: UAR-CAL-0340361
 Terminal Model: PELAT
 Terminal Serial No.: 874505487
 Terminal Asset No.: N/A

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

Procedure

Calibration Guideline: EURAMET cg-16/v.4.0 (11/2015)

METTLER TOLEDO Work Instruction: CRW02003

This calibration certificate contains measurements for As Found and As Left calibrations.

The serial number of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight. In accordance with EURAMET cg-16 (11/2015), the test loads were selected to reflect the specific use of the weighing device and to accommodate specific calibration conditions.

	Temperature		Humidity	
As Found	Start: 23.8 °C	End: 23.8 °C	Start: 43.6 %	End: 50.1 %
As Left	Start: 23.7 °C	End: 23.3 °C	Start: 50.1 %	End: 49.4 %

As Found Calibration Date: 31 Mar 2022
 As Left Calibration Date: 31 Mar 2022
 Issue Date: 31 Mar 2022

Calibration:

Approved Signature:

Brand Chanchan
☒ Pannakorn Tannachachakul
☐ Sam Janyam
☐ Surachai Sukade

Software Version: 1.20.0.286
 Report Version: 2.00.0
 Form Number: F-000

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Page: 1 of 3

เอกสารไม่ควบคุม

Calibration Certificate ID
 TH0208-028-042725-ADD-TH

METTLER TOLEDO Service

Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	99.99989 g	100.00002 g
2	99.99987 g	100.00001 g
3	99.99985 g	100.00002 g
4	99.99987 g	100.00001 g
5	99.99987 g	100.00001 g
6	99.99989 g	100.00002 g
7	99.99988 g	100.00003 g
8	99.99989 g	100.00004 g
9	99.99989 g	100.00002 g
10	99.99988 g	100.00001 g

Standard Deviation	0.00003 g	0.00001 g
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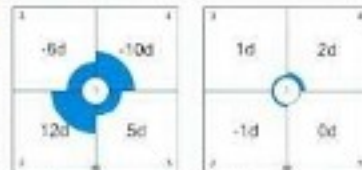
The '10' in the graph represents the readability of the weighing instrument to which the test was performed.
 The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	99.99989 g	100.00003 g
2	99.99989 g	100.00002 g
3	99.99989 g	100.00004 g
4	99.99989 g	100.00005 g
5	99.99991 g	100.00003 g

Maximum Deviation	0.00012 g	0.00003 g
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The '10' in the graph represents the readability of the weighing instrument to which the test was performed.

Calibration Certificate ID
 TH0208-028-042725-ADD-TH

METTLER TOLEDO Service

Error of Indication

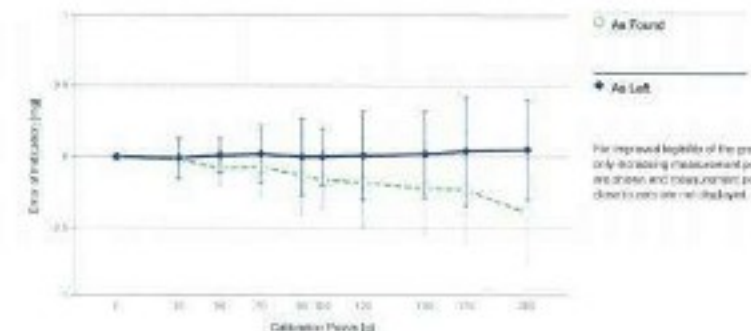
As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.024 mg	2
2	10.00001 g	9.99999 g	-0.00002 g	0.053 mg	2
3	20.00005 g	20.00003 g	-0.00002 g	0.14 mg	2
4	50.00001 g	49.99993 g	-0.00008 g	0.12 mg	2
5*	70.00005 g	69.99988 g	-0.00017 g	0.29 mg	2
6	80.00009 g	79.99989 g	-0.00020 g	0.25 mg	2
7	100.00000 g	100.00001 g	0.00001 g	0.04 mg	2
8*	120.00007 g	119.99989 g	-0.00018 g	0.31 mg	2
9	130.00005 g	129.99982 g	-0.00023 g	0.32 mg	2
10	170.00008 g	169.99989 g	-0.00019 g	0.40 mg	2
11	200.00000 g	199.99971 g	-0.00029 g	0.37 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.021 mg	2
2	10.00001 g	10.00000 g	-0.00001 g	0.062 mg	2
3	20.00005 g	20.00004 g	-0.00001 g	0.14 mg	2
4*	50.00001 g	50.00002 g	0.00001 g	0.10 mg	2
5*	70.00005 g	70.00007 g	0.00002 g	0.30 mg	2
6	80.00009 g	80.00009 g	0.00000 g	0.27 mg	2
7*	100.00000 g	100.00003 g	0.00003 g	0.20 mg	2
8*	120.00007 g	120.00005 g	-0.00002 g	0.31 mg	2
9*	130.00005 g	130.00001 g	-0.00004 g	0.41 mg	2
10	170.00008 g	170.00012 g	0.00004 g	0.36 mg	2
11*	200.00000 g	200.00015 g	0.00015 g	0.36 mg	2

The calculated uncertainty was replaced by the GUM (Combined and Measurement Capabilities) value because the calculated uncertainty was smaller than the GUM value.



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k = 2, which can be larger than 2 according to EURAMET cg-15. The value of the measured lies within the assigned range of values with a probability of at least approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Software Version: 1.20.0.286
 Report Version: 2.00.0
 Form Number: F-000

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Page: 3 of 3

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Software Version: 1.20.0.286
 Report Version: 2.00.0
 Form Number: F-000

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เอกสารไม่ควบคุม

Measurement Results

Results Summary

	Repeatability	Eccentricity	Error of Indication
As Found	✓	✓	✓
As Left	✓	✓	✓

✓ Passed
✗ Failed
✗ Safety Factor not met

Repeatability

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	0.00009 g		✓		✓
0.2%	0.00018 g		✓		✓
0.5%	0.00045 g	0.000012 g	✓	0.000010 g	✓
1%	0.00090 g		✓		✓
2%	0.00180 g		✓		✓
5%	0.00450 g		✓		✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

Eccentricity

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.00009 g		✓		✓
0.2%	0.00018 g		✓		✓
0.5%	0.00045 g	0.000012 g	✓	0.000010 g	✓
1%	0.00090 g		✓		✓
2%	0.00180 g		✓		✓
5%	0.00450 g		✓		✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

Error of Indication

As Found

Reference Value	Error	Control limits for various weighing tolerances					
		0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
30.00000 g	-0.00002 g	0.01500 g	0.03000 g	0.07500 g	0.15000 g	0.30000 g	0.75000 g
50.00000 g	-0.00003 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
70.00000 g	-0.00002 g	0.03500 g	0.07000 g	0.17500 g	0.35000 g	0.70000 g	1.75000 g
90.00000 g	-0.00013 g	0.04500 g	0.09000 g	0.22500 g	0.45000 g	0.90000 g	2.25000 g
130.00000 g	-0.00010 g	0.06000 g	0.12000 g	0.30000 g	0.60000 g	1.20000 g	3.00000 g
150.00000 g	-0.00010 g	0.07000 g	0.14000 g	0.35000 g	0.70000 g	1.40000 g	3.50000 g
150.00000 g	-0.00020 g	0.07000 g	0.14000 g	0.35000 g	0.70000 g	1.40000 g	3.50000 g
170.00000 g	-0.00020 g	0.08000 g	0.16000 g	0.40000 g	0.80000 g	1.60000 g	4.00000 g
200.00000 g	-0.00020 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g
Result		✓	✓	✓	✓	✓	✓

As Left

Reference Value	Error	Control limits for various weighing tolerances					
		0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
30.00000 g	-0.00001 g	0.01500 g	0.03000 g	0.07500 g	0.15000 g	0.30000 g	0.75000 g
50.00000 g	0.00001 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
70.00000 g	0.00002 g	0.03500 g	0.07000 g	0.17500 g	0.35000 g	0.70000 g	1.75000 g
90.00000 g	0.00003 g	0.04500 g	0.09000 g	0.22500 g	0.45000 g	0.90000 g	2.25000 g
130.00000 g	0.00003 g	0.06000 g	0.12000 g	0.30000 g	0.60000 g	1.20000 g	3.00000 g
150.00000 g	0.00003 g	0.07000 g	0.14000 g	0.35000 g	0.70000 g	1.40000 g	3.50000 g
150.00000 g	0.00003 g	0.07000 g	0.14000 g	0.35000 g	0.70000 g	1.40000 g	3.50000 g
170.00000 g	0.00004 g	0.08000 g	0.16000 g	0.40000 g	0.80000 g	1.60000 g	4.00000 g
200.00000 g	0.00005 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g
Result		✓	✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point can't be assessed.



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES, EQUIPMENT CALIBRATION AND TESTING SERVICES
334/1 PATTANAKARN ROAD, SOI 10, SUKUMVIT 11, SUKUMVIT 11, BANGKOK 10250
TEL: 0-1771-3388-37 FAX: 0-2719-9884



Cert. No.: 22TM304
Page: 1 of 3

Certificate of Calibration

Equipment: Hot Air Oven
Manufacturer: Memmert
Model: UF 55
Serial No.: B212.0411
ID No.: UAE.WAO.006/2558
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
9-04/1 Udonnuek 41, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10250
Location: Lab Floor 2
Received Order: 7 April 2022
Calibration Date: 7 April 2022
Ambient Temperature: (26 ± 10) °C
Relative Humidity: (50 ± 30) %
Calibrated by: Man Pattanasongpaiboon
Approved by:
() Ponthipha Tiamyaku
(✓) Manee Sutnua
() Suwit Injai

Issue Date: 18 April 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the Issuing Calibration Laboratory: Equipment Calibration and Testing Services

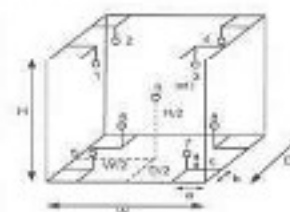


Equipment: Hot Air Oven
Condition As-Received: Used Item
Reference: 2204-00150C-1
Procedure Used: Calibration was conducted using calibration procedure CP-0102 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

Cert. No.: 22TM304
Page: 2 of 3

The temperature scale used was based on ITS-90.
Condition of this result of calibration
1. Reference standard instrument:
Instrument Model Serial No. Cert. No. Due Date
1) Data Acquisition 34970A MY41021843 22LMA 10 Jan 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.
Result of Calibration: () Without Adjustment
Function of UUC: Temperature Source
Fresh air setting: Close



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 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	26	26
REL.Humid. (%)	58	58
AC Supply (Volt)	221	224

Ref. Std. ID No.: @ Calibration Point (°C)		
Position	(128, 180)	(104)
1	21-04TC-01	18-04RTD-01
2	21-04TC-02	18-04RTD-02
3	21-04TC-03	18-04RTD-03
4	21-04TC-04	18-04RTD-04
5	21-04TC-05	18-04RTD-05
6	21-04TC-06	18-04RTD-06
7	21-04TC-07	18-04RTD-07
8	21-04TC-08	18-04RTD-08
9 (ref.)	21-04TC-09	18-04RTD-09



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2204-00150C-1
 Result of Calibration : [*] Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Closed

Cert. No.: 22TM304
 Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
104.0	104.0	104.0	0.040	0.67	0.80	0.42	2
120.0	120.0	120.0	0.11	0.82	1.1	1.1	2
180.0	180.0	180.0	0.12	1.4	2.0	1.1	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	104.403	104.220	104.517	104.474	103.778	103.859	104.292	104.357	104.319
120.0	120.183	119.878	120.238	120.355	119.478	119.455	120.046	120.173	120.199
180.0	180.602	179.929	180.855	180.797	179.012	179.044	180.043	180.355	180.340

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 %.

-00-

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 a 1104315

Calibration Certificate ID
 TH2024-008-846722-ACC-TH

METTLER TOLEDO

Mettler-Toledo (Thailand) Ltd.
 6401 - 6405 Laksale Rd., Bangna Tai Sub-District
 Bangna District, Bangkok 10260
 460 2133 0340
 MT-TH-Service@mettler.com



Accuracy Calibration Certificate

Customer

Company: United Analyst and Engineering Consultant Co., Ltd.
 Address: 3 Sukhvithee Suk 41, Sukhvithee Rd., Bang Chak
 City: Phra Prachin
 Zip / Postal: 10262
 State / Province: Bangkok
 Order Number:

Weighing Device

Manufacturer: Mettler Toledo
 Model: AG204-SFACT
 Serial No.: B108110858
 Building: 16A
 Floor: 3
 Name: Watanyu Poom 4 (2022)

Range	Max. Capacity	Readability (g)
1	220 g	0.0001 g

Procedure

Calibration Outline: EURAMET-cg-16 v. 4.0 (11/2015)
 METTLER TOLEDO Work Instructions: OIM D 003

This calibration certificate contains measurements for As Found and As Left calibrations.
 The sensitivity of the weighing instrument was adjusted before As Found and As Left calibrations with a 100 mg weight.
 In accordance with EURAMET-cg-16 (11/2015), the test loads were selected to reflect the standard use of the weighing device or to accommodate special calibration conditions.

	Temperature		Humidity	
As Found	Start: 22.8 °C	End: 22.1 °C	Start: 50.0 %	End: 51.0 %
As Left	Start: 22.3 °C	End: 22.4 °C	Start: 49.2 %	End: 50.0 %

As Found Calibration Date: 07-Apr-2022
 As Left Calibration Date: 07-Apr-2022
 Issue Date: 08-Apr-2022

Calibration:
 Approved Signature:
☒ Evaluation Table is attached
☐ Auto Analysis
☐ Supplier's Label

Software Version: 1.20.0.200
 Report Version: 2.02.15
 Form Number: F-002

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Calibration Certificate ID
 TH2024-008-846722-ACC-TH

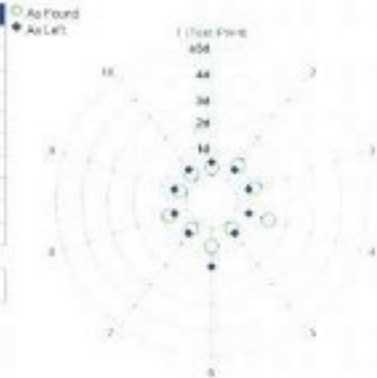
METTLER TOLEDO Service

Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0005 g	100.0005 g
2	100.0004 g	100.0006 g
3	100.0004 g	100.0008 g
4	100.0006 g	100.0006 g
5	100.0005 g	100.0008 g
6	100.0004 g	100.0008 g
7	100.0005 g	100.0006 g
8	100.0004 g	100.0006 g
9	100.0005 g	100.0006 g
10	100.0005 g	100.0006 g
Standard Deviation	0.00007 g	0.00007 g

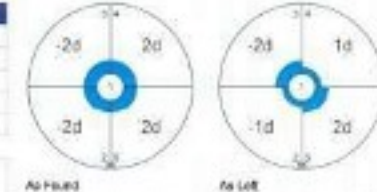


The "1P" in the graph represents the readability of the largest interval in which the test was performed.
 The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0005 g	100.0006 g
2	100.0003 g	99.9999 g
3	100.0000 g	99.9999 g
4	100.0007 g	100.0001 g
5	100.0007 g	100.0002 g
Maximum Deviation	0.0002 g	0.0002 g



The "1P" in the graph represents the readability of the largest interval in which the test was performed.

Calibration Certificate ID
 TH2024-008-846722-ACC-TH

METTLER TOLEDO Service

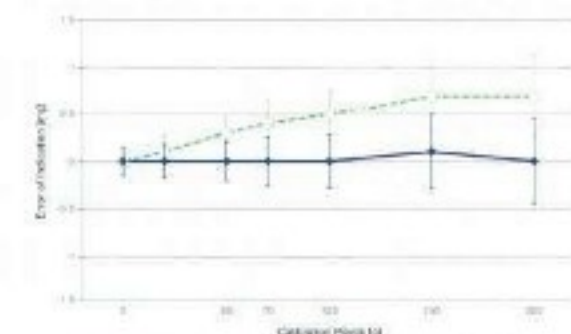
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.15 mg	2
2	0.1000 g	0.1001 g	0.0001 g	0.16 mg	2
3	1.0000 g	0.9999 g	-0.0001 g	0.16 mg	2
4	5.0000 g	5.0000 g	0.0000 g	0.16 mg	2
5	10.0000 g	10.0001 g	0.0001 g	0.17 mg	2
6	20.0000 g	20.0001 g	0.0001 g	0.18 mg	2
7	50.0000 g	50.0004 g	0.0004 g	0.45 mg	2
8	70.0001 g	70.0005 g	0.0004 g	0.38 mg	2
9	100.0000 g	100.0005 g	0.0005 g	0.27 mg	2
10	150.0000 g	150.0007 g	0.0007 g	0.38 mg	2
11	200.0001 g	200.0008 g	0.0007 g	0.44 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.16 mg	2
2	0.1000 g	0.1000 g	0.0000 g	0.16 mg	2
3	1.0000 g	0.9999 g	-0.0001 g	0.17 mg	2
4	5.0000 g	5.0000 g	0.0000 g	0.17 mg	2
5	10.0000 g	10.0003 g	0.0003 g	0.13 mg	2
6	20.0000 g	20.0003 g	0.0003 g	0.18 mg	2
7	50.0000 g	50.0003 g	0.0003 g	0.21 mg	2
8	70.0001 g	70.0001 g	0.0000 g	0.26 mg	2
9	100.0000 g	100.0000 g	0.0000 g	0.16 mg	2
10	150.0000 g	150.0001 g	0.0001 g	0.28 mg	2
11	200.0001 g	200.0001 g	0.0000 g	0.45 mg	2



For improved legibility of the graph only increasing measurement points are shown and mean values are shown due to zero reading displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to EURAMET-cg-16. The value of the measured lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Software Version: 1.20.0.200
 Report Version: 2.02.15
 Form Number: F-002

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Test Equipment

All weights used for initial signal testing are traceable to national or international standards. The weights were selected and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.: W500 Date of Issue: 20-Feb-2022
Certificate Number: C036301021 Calibration Due Date: 14-Apr-2023

Thermo Hygrometer

Equipment No.: 81181 Date of Issue: 15-Jun-2021
Certificate Number: 21H1208 Calibration Due Date: 01-Jun-2022

Remarks

FACT adjustment functionality activated
Value of the built-in weight adjusted
Equipment condition: Good
Next calibration according to manufacturer's procedure
Calibration data not decided by calibration laboratory
Total weight by P111 side : 1 g = 1.0000 g, 3 g = 3.0000 g, 5 g = 5.0000 g

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Based on the expanded uncertainty with $k=2$ in use, this formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the relative indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty is: $2.5 \times 10^{-6} / ^\circ\text{C}$
Temperature range on site for the evaluation of the measurement uncertainty is: 23°C

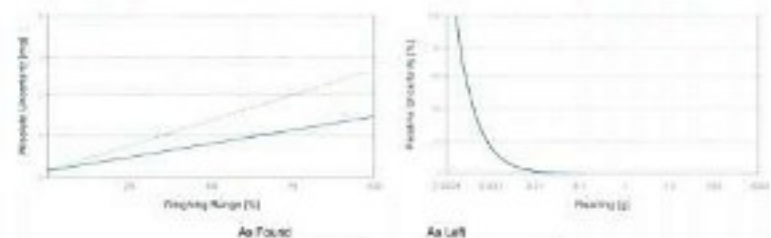
Uncertainty of Uncertainty Coefficient

Range	As Found	As Left
1 0.0001 g - 20 g	$u_i = 0.16 \text{ mg} + 0.0111 \text{ mg/g} \cdot R$	$u_i = 0.16 \text{ mg} + 0.0050 \text{ mg/g} \cdot R$

To optimize the stability of the measurement, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear expansion.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indicators (Examples)

Net Indicator	As Found	As Left
6.0220 g	6.10 mg	6.73%
6.3000 g	6.10 mg	0.074%
3.3000 g	6.10 mg	0.0064%
20.000 g	6.40 mg	0.0318%
220.000 g	2.6 mg	0.0112%



Request No. 25-65 / 0398

MTC, ACL No. 486 / 65

CALIBRATION CERTIFICATE

NOMENCLATURE : 1. Atomic Absorption Spectrophotometer "Agilent Technologies"

Model AA240FS, Serial No. MY13150001

2. Working standard solution "Inorganic Ventures"

Multi Analyte Custom Grade Solution, Lot No. P2-MEB675610

SUBMITTED BY : United Analyst and Engineering Consultant Co., Ltd.

3- Soi Udonis, 441, Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260

CALIBRATION PROCEDURE : 1. Performance Verification of Atomic Absorption Spectrophotometer
(M-500-02-30)

2. Estimation Uncertainty of Measurement in Analytical Chemistry (CP-313)

REFERENCE MATERIAL : Traceable to NIST "Agilent Technologies", "Certi-Bias"

Cadmium Lot No. 0106047046, Chromium Lot No. 0106315408, Copper Lot No. 0107090530, Iron Lot No. 0104897566,

Lead Lot No. 0106059473, Manganese Lot No. 7309228A, Nickel Lot No. 0104978040, Zinc Lot No. 0101922297

CALIBRATION RANGE : 0.02, 0.10, 0.30, 0.50, 0.70 mg/L at 228.8 nm Cd; 0.10, 0.30, 0.50, 0.70 mg/L at 357.9 nm Cr;
0.05, 0.10, 0.30, 0.50, 0.70 mg/L at 324.7 nm Cu; 0.10, 0.30, 0.50, 0.70, 1.00 mg/L at 248.3 nm Fe; 0.20, 0.50, 0.70, 1.00, 1.50 mg/L
at 214.7 nm Pb; 0.05, 0.10, 0.30, 0.50, 0.70 mg/L at 279.5 nm Mn; 0.10, 0.30, 0.50, 0.70, 1.00 mg/L at 285.2 nm Ni;
0.05, 0.10, 0.30, 0.50, 0.70 mg/L at 213.9 nm Zn

AMBIENT CONDITIONS : Temperature 22 °C, Relative humidity 60 %

The Atomic Absorption Spectrophotometer set has been calibrated against
Reference Material, traceable to National Institute of Standards and Technology (NIST) by The Analytical
Chemistry Laboratory. The results are attached herewith.

Calibrated by: (Mr. Daniel Silthongkum)

Approved by: (Mrs. Thippa-Pranee Fortune)
Director of Analytical Chemistry Laboratory
Ref. 2025265020400522001
Calibration Date : 3 February 2022

Request No. 25-65 / 0398

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MTC, ACL No. 486 / 65

CALIBRATION DATA

1. Noise Level in term of standard deviation

Element	Cd	Cr	Cu	Fe	Pb	Mn	Ni	Zn
Absorbance	-0.0004	0.0002	0.0007	0.0002	-0.0016	-0.0001	-0.0004	-0.0001
	0.0002	-0.0005	-0.0010	0.0007	0.0000	0.0005	0.0007	-0.0004
	-0.0002	0.0001	0.0008	0.0010	-0.0001	-0.0005	-0.0012	-0.0006
	0.0000	-0.0007	0.0007	0.0000	-0.0005	-0.0004	-0.0004	-0.0012
	0.0001	0.0004	0.0015	0.0014	-0.0001	-0.0001	0.0003	-0.0009
	0.0010	-0.0003	0.0009	-0.0012	0.0005	-0.0007	-0.0004	-0.0008
	0.0000	-0.0009	0.0019	-0.0002	-0.0010	0.0008	0.0007	-0.0003
	-0.0004	-0.0003	0.0015	0.0010	-0.0005	-0.0005	-0.0002	-0.0004
	0.0004	0.0008	0.0014	-0.0004	-0.0014	-0.0005	-0.0006	-0.0005
	-0.0006	-0.0013	0.0012	-0.0006	-0.0006	-0.0006	-0.0007	-0.0007
	0.0005	-0.0003	0.0014	-0.0004	-0.0006	-0.0003	0.0006	-0.0011
	-0.0007	-0.0014	0.0004	-0.0001	-0.0001	0.0000	0.0000	-0.0003
	0.0008	0.0004	0.0005	-0.0006	-0.0008	0.0000	-0.0005	-0.0009
	0.0011	0.0002	0.0005	0.0017	-0.0016	-0.0008	0.0004	-0.0005
	0.0002	0.0010	0.0014	-0.0002	-0.0010	-0.0010	0.0002	-0.0001
	0.0001	-0.0011	0.0011	-0.0003	-0.0011	-0.0005	-0.0003	-0.0012
	0.0000	-0.0015	0.0009	-0.0010	-0.0011	-0.0012	0.0000	-0.0014
	0.0015	-0.0012	0.0005	0.0002	-0.0007	-0.0001	0.0005	-0.0002
	0.0006	0.0014	0.0010	0.0002	-0.0005	0.0001	-0.0006	-0.0010
	0.0001	0.0003	0.0003	-0.0001	-0.0004	-0.0002	-0.0001	-0.0001
Average Absorbance	0.000	0.000	0.001	0.000	-0.001	0.000	0.000	-0.001
Standard Deviation	0.0005	0.0008	0.0004	0.0007	0.0005	0.0006	0.0005	0.0006

Continue : 2 / 5

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Request No. 25-65 / 0398

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MTC, ACL No. 486 / 65

2. Precision

Element	Conc. (mg/l)	Absorbance										Inv. Abs.	SD	NRSD
Cd	0.00	0.0071	0.0062	0.0065	0.0064	0.0070	0.0062	0.0070	0.0063	0.0062	0.0069	0.0067	0.0008	2.76
	0.30	0.0932	0.0939	0.0951	0.0957	0.0952	0.0950	0.0948	0.0956	0.0943	0.095	0.0945	0.0005	0.49
	0.70	0.2213	0.2180	0.2203	0.2208	0.2234	0.2213	0.2196	0.2219	0.2201	0.2194	0.221	0.0015	0.67
Cr	0.10	0.0096	0.0098	0.0097	0.0102	0.0106	0.0097	0.0098	0.0103	0.0093	0.010	0.0097	0.0004	3.83
	0.30	0.0309	0.0302	0.0300	0.0316	0.0306	0.0299	0.0319	0.0297	0.0311	0.0296	0.030	0.0007	2.20
	0.70	0.0659	0.0667	0.0664	0.0648	0.0656	0.0662	0.0658	0.0638	0.0668	0.0659	0.066	0.0011	1.70
Cu	0.05	0.0380	0.0375	0.0378	0.0375	0.0377	0.0381	0.0380	0.0375	0.0376	0.0376	0.0376	0.0003	3.26
	0.30	0.0417	0.0419	0.0412	0.0421	0.0424	0.0420	0.0423	0.0415	0.0418	0.0415	0.0415	0.0006	1.67
	0.70	0.0960	0.0945	0.0972	0.0957	0.0961	0.0958	0.0961	0.0963	0.0959	0.0972	0.096	0.0006	0.58
Fe	0.10	0.0090	0.0105	0.0078	0.0099	0.0091	0.0103	0.0096	0.0094	0.0093	0.0084	0.009	0.0007	8.11
	0.50	0.0462	0.0470	0.0464	0.0466	0.0467	0.0462	0.0467	0.0460	0.0463	0.0466	0.047	0.0005	0.67
	1.00	0.0867	0.0866	0.0910	0.0892	0.0897	0.0873	0.0892	0.0885	0.0889	0.0875	0.089	0.0014	1.44
Pb	0.20	0.0091	0.0095	0.0088	0.0087	0.0082	0.0094	0.0090	0.0087	0.0082	0.0090	0.009	0.0004	4.34
	0.70	0.0322	0.0321	0.0324	0.0318	0.0335	0.0326	0.0327	0.0315	0.0336	0.0321	0.032	0.0007	2.05
	1.50	0.0653	0.0645	0.0663	0.0664	0.0652	0.0671	0.0662	0.0666	0.0657	0.0648	0.066	0.0008	1.28
Mn	0.03	0.0032	0.0032	0.0037	0.0037	0.0035	0.0039	0.0035	0.0035	0.0034	0.0039	0.003	0.0007	7.33
	0.30	0.0616	0.0630	0.0632	0.0633	0.0634	0.0628	0.0660	0.0633	0.0640	0.0629	0.063	0.0007	1.08
	0.70	0.1396	0.1366	0.1386	0.1377	0.1380	0.1386	0.1396	0.1391	0.1374	0.1365	0.136	0.0009	0.67
Ni	0.10	0.0102	0.0092	0.0097	0.0105	0.0091	0.0105	0.0105	0.0095	0.0098	0.0102	0.010	0.0005	5.22
	0.50	0.0488	0.0489	0.0489	0.0490	0.0489	0.0490	0.0491	0.0491	0.0492	0.0495	0.049	0.0004	0.91
	1.00	0.0976	0.0979	0.0975	0.0982	0.0977	0.0973	0.0966	0.0962	0.0985	0.0982	0.098	0.0008	0.85
Zn	0.05	0.0340	0.0369	0.0341	0.0352	0.0357	0.0351	0.0344	0.0346	0.0349	0.0343	0.035	0.0005	1.49
	0.30	0.1669	0.1663	0.1628	0.1642	0.1657	0.1637	0.1659	0.1652	0.1654	0.1657	0.165	0.0012	0.72
	0.70	0.2426	0.2461	0.2443	0.2435	0.2442	0.2438	0.2437	0.2458	0.2435	0.2438	0.244	0.0013	0.37

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Request No. 25-65 / 0398

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MTC, ACL No. 486 / 65

3. Trueness

3.1 Reading on wavelength- Cadmium (Cd) at 228.8 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cd	0.02014	0.019	-0.001	5.19	± 0.004
	0.30050	0.291	-0.009	3.19	± 0.006
	0.70140	0.678	-0.023	3.34	± 0.012

3.2 Reading on wavelength- Chromium (Cr) at 357.9 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cr	0.1002	0.101	0.001	0.80	± 0.007
	0.3006	0.298	-0.003	0.86	± 0.012
	0.7014	0.685	-0.016	9.47	± 0.023

3.3 Reading on wavelength- Copper (Cu) at 934.7 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cu	0.0502	0.046	-0.004	8.37	± 0.004
	0.3012	0.295	-0.006	2.06	± 0.002
	0.7028	0.694	-0.009	1.25	± 0.021

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Amphoe Bang Chalong Samutprakan 10280, Thailand
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MTC, ACL No. 486 / 65

3.4 Reading on wavelength- Iron (Fe) at 248.3 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Fe	0.1005	0.106	0.006	5.68	± 0.008
	0.5015	0.522	0.021	4.19	± 0.017
	1.0030	0.995	-0.008	1.00	± 0.032

3.5 Reading on wavelength- Lead (Pb) at 217.0 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Pb	0.1588	0.197	0.038	2.41	± 0.014
	0.6158	0.722	0.106	1.72	± 0.022
	1.8910	1.663	-0.228	1.20	± 0.041

3.6 Reading on wavelength- Manganese (Mn) at 279.5 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Mn	0.04955	0.051	0.002	4.90	± 0.004
	0.29730	0.317	0.019	6.43	± 0.006
	0.69370	0.682	-0.012	1.69	± 0.012

Continue 5 / 5

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Request No. 25-65 / 0398

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MTC, ACL No. 486 / 65

3.7 Reading on wavelength- Nickel (Ni) at 232.0 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Ni	0.059	0.102	0.043	7.29	± 0.007
	0.425	0.489	0.064	1.51	± 0.010
	0.990	0.975	-0.015	1.52	± 0.020

3.8 Reading on wavelength- Zinc (Zn) at 213.9 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Zn	0.150	0.053	-0.097	6.47	± 0.012
	0.300	0.307	0.007	2.33	± 0.011
	0.700	0.660	-0.040	5.71	± 0.015

Remark : The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 (k = 2)
which gives a level of confidence of approximately 95%.

Calibrated by Dei Sthongkum
(Mr. Danai Srihongkum)

Approved by Dr. Thiraporn Juntavee Fortune
(Mrs. Thiraporn Juntavee Fortune)
Director of Analytical Chemistry Laboratory
Calibration date : 3 February 2022

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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/agilent/resources>
- 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 "Location not applicable" checkbox 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	240FS RRS
Instrument System Site and Location	United Analyst and Engineering Consultant

List System Component Product Numbers	List the Serial Numbers of each Component
1. G 2402 R	MY 13160001
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

Preparation, Safe operation and Initial performance checks

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- ☐ Agilent AA safe operation flow chart inspections (to determine if the PM can be performed).

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

- ☒ Discuss any specific issues with the customer before starting.
- ☐ For HF application systems, if standard sample introduction system was not installed, ask the customer to install it. **WIR**
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components, settings as defined by current Service Notes.
- ☒ Check for required firmware updates and verify with customers if they would like them installed.
- ☒ Use SVD to perform a Full Wavelength Scan for Cu HCL - "As found test_1"
- ☒ Perform a Blank PLS AAS test - "As found test_2"
- ☒ Print the Details page or screen captures of the test results and attach to the end of this checklist.

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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

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 Squariness 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 or-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 ignitor 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 Squariness 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
- ☐ Thread

- ☐ 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 intrusion 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 connections.

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

For further details refer to the SPS 4 service manual G0410-90030.

Sample preparation system (SPS 3) accessory

- ☒ Section NOT Applicable

- ☐ Check the x-axis and z-axis timing belts – Replace if there is 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 8 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 45 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. **WFA**

UltraAA lamp accessory (external)

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

Restore System

- ☐ If you have altered the customer's instrumentation during the course of PM, restore to the original status to allow the customer to conduct their normal activities (e.g., 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	Expected Test Result	Actual Test Result
Mercury vapor PM test results		
For copper at 374.8 nm, 4 mA, 0.5 nm slit width	< 25 %	42 %
Flame performance test with 5 ppm copper sample		
Air /acetylene, mixing paddle removed	Abs value < 0.5	0.5963
Air /acetylene, mixing paddle installed, 10 replicates	%RSD < 1.0	0.4
Deuterium furnace optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 25 %	
Deuterium furnace performance test with 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0%	--
Abs value	≥ 0.15	--
Zeeman furnace analytical performance: 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0%	--
Abs value	≥ 0.10	--
MSRR	≥ 70 %	--

As VGA-77 test Abs. 0.2 Abs 0.2156 Abs

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**AA consumable and parts list table**

Part Description	Part Number	Product/Model # where used	PM supplied or Consumable	Instrument Type
Test Solution – DuSapm solution	6610030100	50 55 140 240 280	PM supplied	Common
Test Solution – Blank solution	5150-7001	50 55 140 240 280	PM supplied	Common
Copper, 1000 ug/mL, 100mL	5150-8270	50 55 140 240 280	*	Common
K1, K1, 70 Rings, aqueous, complete set	9510060400	50 55 140 240 280	PM supplied	Flame
Organic Kit	9410060200	50 55 140 240 280	PM supplied	Flame
Wax Nebulizer Cleaning	9410024700	50 55 140 240 280	consumable	Flame
Tubing Capillary Std 4000	9010024800	50 55 140 240 280	consumable	Flame
Capillary Tube Head Neb G0 (organics only)	9910044000	50 55 140 240 280	consumable	Flame
Glass impact beads (5µm)	9510025200	50 55 140 240 280	consumable	Flame
Teflon impact beads (5µm) (organics only)	9810053300	50 55 140 240 280	consumable	Flame
Burner cleaning strip (100/20)	9510055000	50 55 140 240 280	consumable	Flame
Window UV silica – round (right side)	2010082500	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)	4910012300	50 55 140 240 280	PM supplied	Common
Pad adhesive window (rectangular)	4910012300	50 55 140 240 280	PM supplied	Common
Electrode kit (1 pt) (D2)	6210003000	G7A120	PM supplied	Furnace
Shroud (D2)	6210003000	G7A120	PM supplied	Furnace
Zeeman electrode kit (1 pt)	6210003000	G7A120	PM supplied	Furnace
Zeeman shroud	6210003000	G7A120	PM supplied	Furnace
Drying PSD rinse bottle	6210023900	PSD120	PM supplied	Furnace

* For engineers who only service AA instruments 2190-0279 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 service of the instrument, please explain here.

Service Completion

Service request number: 6004901032 Date service completed: 26 Jan 2022
 Agilent signature: Kanyakorn S. Customer signature: ChonHaporn A.
 Total number of pages in this document: 13

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SVD Results Report



Report ID: 28010022 8:52:25 AM 28/01/2022 8:52:25 AM

Customer: UME Service Engineer: Kanyakorn S.
 Address: Contact Details: 02637636391

Instrument Configuration

Configuration:

Serial Number: MY13100001 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 UltraAA: False Firmware Version: 2.11
 Optics Type: Double Beam Photomultiplier Type: Normal(920nm)
 D2 BG Correction Fitted: True PWB Version: 45
 Boot Block Version: 1.09

EEPROM Data:

Instrument Run Hours: 48958.664 D2 Run Hours: 38038.500
 Zero Wavelength Offset: 30.071 D2 Serial Number: not set
 Mono Correction: 0.755 D2 Install Date: 01/01/1970
 Flame Hours: 23819.188 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**

Report Generated At: 28/01/2022 8:52:25 AM



Power Supply:

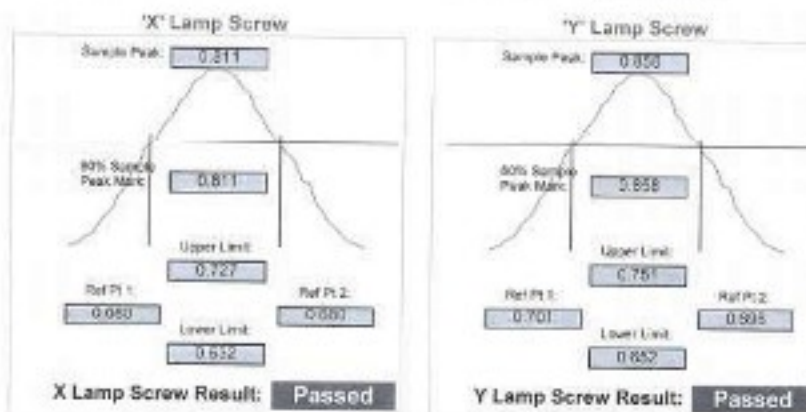
Averaging Period: 30.0
 Datapoint Count: 20

	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00 V Rail	10.80	12.20	13.20	Passed
-12.00 V Rail	-13.20	-11.90	-10.80	Passed
5.00 V Rail	4.00	5.01	5.50	Passed
310.00 V Rail	279.00	320.00	341.00	Passed

Optics

Beam Balance:

Lamp Type: Copper Peak Selected: 324.80
 Lamp Socket Used: 3 Lamp Alignment: **Performed**



Grating Squares:

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) 324.753 324.883 Upper Limit(nm)

(Approach from Zero Order)

(Approach from end)

Sample 1: 324.823

Sample 2: 324.823

Sample 3: 324.823

Sample 4: 324.819

Sample 5: 324.819

Sample 6: 324.819

Sample 7: 324.819

Sample 8: 324.819

Sample 9: 324.819

Sample 10: 324.819

Mean: 324.821

Standard Deviation: 0.002

Result: **Passed**

Mechanical

Wavelength Drive:

Passed

Slit Drive:

Passed

Turret Drive:

Passed

Auto Burner Adjuster Drive:

Untested

Miscellaneous

Signal Processing Linearity:

Calculate Mode: New Calc Mode

	Lower Limit	Actual	Upper Limit	Result:
S0	114	260	297	Passed
S1	158	164	191	Passed
S2	271	295	332	Passed
S3	474	500	578	Passed
S4	825	913	1008	Passed
S5	1435	1519	1754	Passed
S6	2495	2733	3003	Passed
S7	4347	4724	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		

Report Generated At: 28/01/2022 9:52:25 AM

4

SVD Result Report
เอกสารไม่ควบคุม

Report Generated At: 28/01/2022 9:52:26 AM

5

SVD Result Report
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Auto Lamp Recognition:

Lamp 1: 12 - Chromium (Cr)
Lamp 2: Uncoded Lamp/Not Connected
Lamp 3: 14 - Copper (Cu)
Lamp 4: 87 - Silver/Cadmium/Lead/Zinc(UltAA) (Ag/Cd/Lamp 8: Not Supported)

Lamp 5: Not Supported
Lamp 6: Not Supported
Lamp 7: Not Supported

Result: **Passed**

GTA Temperature Monitoring:

Not Performed

Notes:

Signatures:

Chingthana A. 28 Jan 2022
LAE Date

Kanyakorn S. 28 Jan 2022
Kanyakorn S. Date

Sequential by time report

28/01/2022 11:53 AM
Page 1 of 1

SpectrAA

Analyst:
Date Started: 28/01/2022 9:58 AM GMT: 28/01/2022 2:58 AM
Worksheet: RM23-01-2022 01-Genity test
Comment:
Methods: Cu
Computer name: H3A212
Serial Number: SN13160301

Method: Cu (Flame)

Sample ID	Exp Abs	%RSD	Mean Abs
Cu 5 ppm	0.520	0.4	0.5204
Readings			
0.5042	0.5002	0.4979	0.5006
0.5010	0.5004	0.4958	0.4998
			28/01/2022
			0.4985

Report Generated At: 28/01/2022 9:52:26 AM

6

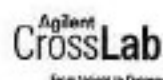
SVD Result Report
เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Analyst
Date Started 28/01/2022 11:04 AM GMT 28/01/2022 4:04 AM
Work sheet As Hydro
Comment
Method As
Computer name HDM212
Serial Number MY13190001

Method: As (Vapor)

Sample ID	Do Abs	%RSD	Mean Abs
As 10 cob	0.22	1.1	0.2166
Readings			
	0.2100	0.2171	0.2190
	0.2145	0.2125	
			28/01/2022



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" checkboxes 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	AR 280 F5 / 08434 AA
Instrument System Site and Location	UAE / 3 rd Fl. Laboratory

List System Component Product Numbers	List the Serial Numbers of each Component
1. 08434 AA (AA)	MY21140002
2. 08444 A (VOR T7)	11721160002
3. ETC 60	9A095968
4. 08445 A (CURVAA 60g)	MY21050002
5.	
6.	
7.	
8.	
9.	

Preparation, Safe operation and Initial performance checks

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- ☒ Agilent AA safe operation flow chart inspection is (or determine if the PM can be performed remotely).

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

- ☒ Discuss any specific issues with the customer before starting.
- ☐ For HF application systems, if standard sample introduction system was not installed, ask the customer to install it.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☐ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components, settings as defined by current Service Notes
- ☒ Check for required firmware updates and verify with customers if they would like them installed.
- ☒ Use SVD to perform a Full Wavelength Scan for Cu HCL - "As found test_1"
- ☒ Perform a Basic Cu ABS test - "As found test_2"
- ☒ Print the Details page or screen captures of the test results and attach to the end of this checklist.

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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

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 HCL 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 HCL 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 HCL 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 surface near the pump are free from dirt and spills.
- ☐ Remove the pump module rear cover and check for the intrusion 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 2) accessory

- ☒ Section NOT Applicable

- ☐ Check the x-axis and z-axis timing belts – Replace if there are any cracks, splits or color deterioration and belt tension.
- ☐ Check belt tensions - adjust if required
- ☐ Check the lubrication pad for angle x-axis shafts. If pad is dry or squeaking free 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 VQA (Hydride generation)

- ☐ Section NOT Applicable
- ☒ Inspect VQA gas supply hose.
- ☒ Inspect/replace VQA 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 45 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/replace 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	Expected Test Result	Actual Test Result
Flame Atomic PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	38 %
Flame performance test with 5 ppm copper sample	(0.467 A) CC value:	
Air / acetylene, mixing paddle removed	Abs value > 0.3	0.6324 A
Air / acetylene, mixing paddle installed, 10 replicates	%RSD < 1.0	0.7 %
Deuterium furnace atomic PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	µA
Deuterium furnace performance test with 25 ppb copper sample (324.8 nm)		
Precision %RSD	≤ 4.0 %	µA
Abs value	≥ 0.15	µA
Zeeman furnace analytical performance: 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0 %	µA
Abs value	≥ 0.10	µA
%RSD	≤ 70 %	µA

Test 10 ppb Hg Sens = 0.1732 A (0.059) - 0.89 % R

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AA consumable and parts list table

Part Description	Part Number	Product/Model # where used	PM supplied or Consumable	Instrument Type
Test Solution - Cu Spinn solution	6610030100	50 55 140 240 280	PM supplied	Common
Test Solution - Blank solution	6190-3001	50 55 140 240 280	PM supplied	Common
Capex, 1000 mg (1000)	471005079	50 55 140 240 280		Common
Kit, Kit 7 O-rings, assembly, complete set	991003400	50 55 140 240 280	PM supplied	Flame
Organic Kit	991003350	50 55 140 240 280	PM supplied	Flame
Wick Net/Filter Cleaning	9910024700	50 55 140 240 280	consumable	Flame
Tubing Capillary Std Nebs	9910024800	50 55 140 240 280	consumable	Flame
Capillary Tube Hood Net (3) (organic only)	991004800	50 55 140 240 280	consumable	Flame
Glass Impact beads (50pk)	9910025700	50 55 140 240 280	consumable	Flame
Teflon Impact beads (50pk) (organic only)	9910032900	50 55 140 240 280	consumable	Flame
Burner cleaning amp (100pk)	991003900	50 55 140 240 280	consumable	Flame
Window UV glass - round (right side)	2010062600	50 55 140 240 280	PM supplied	Common
Window UV glass - rectangular (left side)	2010062500	50 55 140 240 280	PM supplied	Common
Pad asher/ke window (round)	4310012700	50 55 140 240 280	PM supplied	Common
Pad asher/ke window (rectangular)	4310012800	50 55 140 240 280	PM supplied	Common
Electrode kit (1 pr) (D2)	6310009400	GTA120	PM supplied	Furnace
Shroud (D2)	6310008100	GTA120	PM supplied	Furnace
Zeeman electrode kit (1 pr)	6310008500	GTA120	PM supplied	Furnace
Zeeman shroud	6310008600	GTA120	PM supplied	Furnace
Drying PSD rinse bottle	6410002500	RSD120	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 to the customer, please write in this box.

Service Completion

Service request number: 6004646805 Date service completed: 9 MAY 2022
 Agilent signature: Wansri T. Customer signature: Satida S.
 Total number of pages in this document: 98

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SVD Results Report



Report ID: 60000000000000000000	Diagnostic Start Time: 5/9/2022 9:53:00 AM	Diagnostic End Time: 5/9/2022 10:55:00 AM
Customer: Service Engineer: Wansri T.	Address: Contact Details:	

Instrument Configuration

Configuration:

Serial Number: Instrument Model: Varian AA1402402000
 Flame Instrument: True
 Furnace Instrument: True
 Zeeman Present: False
 Internal Zeeman: False
 Internal UltrAA: False
 Optics Type: Double Beam
 D2 BG Correction Fitted: True
 Boot Block Version: 1.0
 Turret type: Automatic
 Number Of Lamps: 8
 Mono Type: Automatic 0.333m
 Gasbox Type: Y Gas Box
 Auto Burner Adjuster: True
 Mains Frequency: 50
 Firmware Version: 2.12
 Photomultiplier Type: Normal(500nm)
 PWB Version: 181

EEPROM Data:

Instrument Run Hours: 1454.650
 Zero Wavelength Offset: 8.003
 Mono Correction: 0.205
 Flame Hours: 78.290
 D2 Run Hours: 496.600
 D2 Serial Number: not set
 D2 Install Date: 1/1/1970
 D2 Original Intensity: 1.000
 D2 Last Intensity: 1.000

Frequency:

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

Report Generated By: 60000000000000000000

Agilent Results Report SVD

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Power Supply:

Averaging Period: 30.0
 Datapoint Count: 20

	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00V Rail	10.80	11.99	12.20	Passed
-12.00V Rail	-10.20	-11.40	-10.80	Passed
5.00V Rail	4.50	5.10	5.50	Passed
310.00V Rail	270.00	318.00	341.00	Passed

Report Generated By: 60000000000000000000

Agilent Results Report SVD

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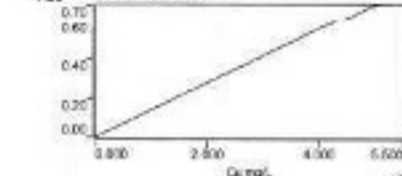
Analyst
Date Started 5/9/2022 11:27 AM CMT: 5/9/2022 4:27 AM
Worksheet
Comment
Method
Computer name DESKTOP-JGMA2FJP
Serial Number: MY21142002

Method: Cu (Flame)

Sample ID	Conc. mg/L	%RSD	Mean Abs
STANDARD 1	5.000	0.0	0.6945

Readings
0.0001 0.0000 0.0001 5/9/2022

Readings
0.0000 0.7019 0.6915 5/9/2022



Curve Fit = Linear
Characteristic Conc = 0.031 mg/L
r = 1.0000
Calculated Conc = 0.690 0.690
Residuals = 0.000 0.000

Abs = 0.1386 x C + 0.0004

Sample ID	Conc. mg/L	%RSD	Mean Abs
Sample 001	4.785	0.0	0.6624

Readings
0.0647 0.6940 0.6960 5/9/2022

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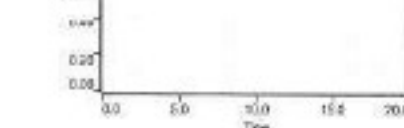
Analyst
Date Started 5/9/2022 11:50 AM CMT: 5/9/2022 4:50 AM
Worksheet
Comment
Method
Computer name DESKTOP-JGMA2FJP
Serial Number: MY21142002

Method: Cu (Flame)

Sample ID	Conc. mg/L	%RSD	Mean Abs
STANDARD 1	5.000	0.0	0.6945

Readings
0.0001 0.0000 0.0001 5/9/2022

Readings
0.0000 0.7019 0.6915 5/9/2022



Readings
0.0647 0.6940 0.6960 5/9/2022

Readings
0.0000 0.7019 0.6915 5/9/2022

Readings
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Readings
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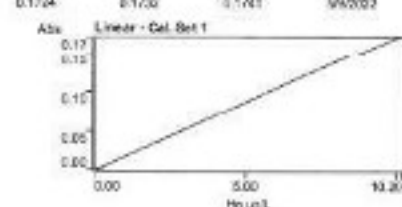
เอกสารไม่ควบคุม

Analyst
Date Started 5/9/2022 11:50 AM CMT: 5/9/2022 4:50 AM
Worksheet
Comment
Method
Computer name DESKTOP-JGMA2FJP
Serial Number: MY21142002

Method: Hg (Vapor)

Sample ID	Conc. ug/L	%RSD	Mean Abs
STANDARD 1	10.00	0.0	0.1732

Readings
0.0000 0.1732 0.1741 5/9/2022

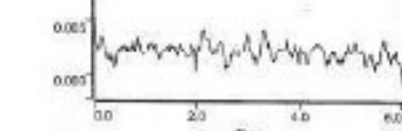


Curve Fit = Linear
Characteristic Conc = 0.25 ug/L
r = 1.0000
Calculated Conc = 0.00 10.00
Residuals = 0.00 0.00

Abs = 0.0173 x C + 0.0000

Sample ID	Conc. ug/L	%RSD	Mean Abs
Sample 001	0.00	0.0	0.0022

Readings
0.0024 0.0024 0.0019 5/9/2022



เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
504 PATTANAKARN ROAD SOI 14, SUKHUMVIT, SUKHUMVIT BANGKOK 10250
TEL: 0-2711-3000-27 FAX: 0-2114-9980



Cert. No.: 22TNG72
Page: 1 of 3

Certificate of Calibration

Equipment: Incubator
Manufacturer: Memmert
Model: IPP 260
Serial No.: V516.0086
ID No.: UAE.MC.0322559
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
6-04/1, Sukhumvit 11, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10260
Location: Microbiology Laboratory (302)
Received Order: 3 May 2022
Calibration Date: 5 May 2022
Ambient Temperature: (25 ± 10) °C
Relative Humidity: (50 ± 30) %
Calibrated by: Preecha Hahla
Approved by:
() Pongthipha Tamayakul
(✓) Meline Butkruas
() Suwit Injai

Issue Date: 11 May 2022

The Uncertainty are for a confidence probability of approximately 95%

This certificate is valid only if accompanied with the calibration report and the calibration certificate

Approved by the head of Corporate Services 3: Equipment Calibration and Testing Services

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2205-0003OC-3
Procedure Used :-

Cert. No.: 22TM672
Page: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44067817	21LM10	20 Jul 2022

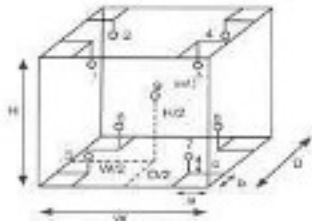
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

Dimension of Chamber :	
a = 5.0 cm	D = 0.50 m
b = 5.0 cm	W = 0.60 m
c = 5.0 cm	H = 0.60 m
	Capacity = 0.24 m ³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	23
REL.Humid. (%)	62	57
AC Supply (Volt)	221	221

Position :	Ref. Std. ID No.:
1	19-15RTD-01
2	19-15RTD-02
3	19-15RTD-03
4	19-15RTD-04
5	19-15RTD-05
6	21-15RTD-06
7	19-15RTD-07
8	19-15RTD-08
9 (ref.)	19-15RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2205-0003OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 22TM672
Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor
25.0	25.0	25.0	0.021	0.18	0.33	0.30	2
36.0	36.0	36.0	0.077	0.96	1.8	0.33	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
25.0	25.221	25.146	25.127	25.113	24.968	24.986	24.933	25.017	25.047
36.0	35.637	35.238	35.130	36.515	36.628	36.645	36.630	36.701	36.113

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

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

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

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and 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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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
35/4 PATTANAKARN ROAD, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-386527 FAX. 0-2719-5489



Cert. No.: 22TM670
Page: 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : Memmert
Model : IF 75
Serial No. : 0317.0305
ID No. : UAE.MIC.022/2561
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3, 6/1 Sukhumvit 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory (302)
Received Order : 3 May 2022
Calibration Date : 3 May 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Prescha Hahib

Approved by :

() Pongthip Tamayakul
() Malee Butkruea
() Suwit Injai

Issue Date : 10 May 2022

The Uncertainties are for a confidence probability of approximately 95%

This certificate may be reproduced after prior written approval with the prior written

Approval of the Issuer/Original Services () Equipment Calibration and Testing Services

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2205-0003OC-1
Procedure Used :-

Cert. No.: 22TM670
Page: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44067817	21LM10	20 Jul 2022

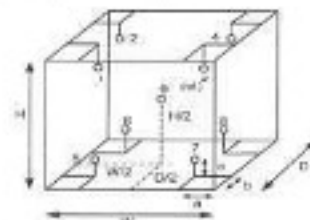
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :

Dimension of Chamber :	
a = 5.0 cm	D = 0.32 m
b = 5.0 cm	W = 0.42 m
c = 5.0 cm	H = 0.58 m
	Capacity = 0.075 m ³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	23	23
REL.Humid. (%)	59	59
AC Supply (Volt)	221	221

Position :	Ref. Std. ID No.:
1	19-15RTD-01
2	19-15RTD-02
3	19-15RTD-03
4	19-15RTD-04
5	19-15RTD-05
6	21-15RTD-06
7	19-15RTD-07
8	19-15RTD-08
9 (ref.)	19-15RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2205-00000C-1
 Result of Calibration : (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Close

Cert. No.: 22TM670
 Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
44.0	44.0	44.0	0.044	0.25	0.33	0.30	2

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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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
 104 PATTANAKARN ROAD SOI 15, SONGKRO, SOANG, BANGKOK 10110
 TEL. 0-2717-9006-27 FAX. 0-2719-9001



Cert. No.: 22TM565
 Page: 1 of 3

Certificate of Calibration

Equipment : Water Bath
 Manufacturer : Memmert
 Model : WNE 14
 Serial No. : 414 1407
 ID No. : UAE.MIC.0062558
 Submitted by : United Analyst and Engineering Consultant Co., Ltd.
 33 Sukhumvit 41, Sukhumvit Road,
 Bangkok, Phrakhanong,
 Bangkok 10260
 Location : Microbiology Laboratory
 Received Order : 7 April 2022
 Calibration Date : 7 April 2022
 Ambient Temperature : (26 ± 10) °C
 Relative Humidity : (50 ± 30) %
 Calibrated by : Prawat Sodavichit

Approved by : 
 Pongthipha Tamayakul
 Males Sutkrues
 Suwit Injai

Issue Date : 18 April 2022

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

This certificate may be reproduced without fee, except with the prior written approval of the head of Corporate Services & Equipment Calibration and Testing.

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Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2204-00160C-4
 Procedure Used :-

Cert. No.: 22TM565
 Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44087817	21LM10	29 Jul 2022

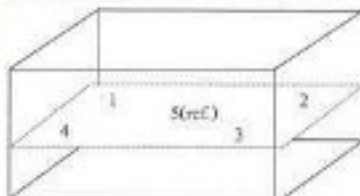
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	26	67	220
Finished of Calibration	26	65	220



Front

Position :	Ref. Std. ID No.:
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147



Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2204-00160C-4
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 22TM565
 Page: 3 of 3

Laboration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average standard reading (°C)				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.424	44.409	44.478	44.470	44.581

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.22	0.038	0.15	2

Average* : The average of 30 values in each position.
 Uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
 Stability : One-half of the greatest maximum difference of measured temperature at any one probe.
 UUC* : Unit Under Calibration
 Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Cert. No.: 22TM564
Page: 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L414,1410
ID No. : UAE.MIC.007/2558
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 7 April 2022
Calibration Date : 7 April 2022
Ambient Temperature : (28 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Prawat Sodasetchit
Approved by :
() Pongthipha Tameykeul
() Malee Bukrua
() Suwit Injai
Issue Date : 18 April 2022

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

This certificate may be reproduced after having full except with the prior written
Approval of the head of Corporate Services & Equipment Calibration and Testing Services

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Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2204-0018OC-5
Procedure Used :

Cert. No.: 22TM564
Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04- according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44067817	21LM10	20 Jul 2022

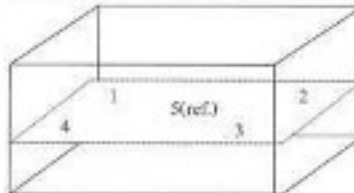
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply (Volt)
	(°C)	(%R.H.)	
Beginning of Calibration	28	60	220
Finished of Calibration	28	62	220



Front

Position :	Ref. Std. ID No.:
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2204-0018OC-5
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 22TM564
Page: 3 of 3

Calibration point (°C)	UUC Setting (°C)	UUC Reading (°C)	Average standard reading (°C)				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.498	44.530	44.542	44.635	44.501

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.16	0.068	0.15	2

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

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

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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เอกสารไม่ควบคุม



Cert. No.: 21TM425
Page: 1 of 3

Certificate of Calibration

Equipment : Autoclave
Manufacturer : ALP
Model : CL-40L
Serial No. : 802684
ID No. : UAE.MIC.014/2550
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong,
Bangkok 10260
Location : Air Analysis Unit
Received Order : 22 February 2021
Calibration Date : 23 February 2021
Ambient Temperature : (28 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Men Patanaspongpaiboon
Approved by :
() Pongthipha Tameykeul
() Malee Bukrua
() Suwit Injai
Issue Date : 3 March 2021

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

This certificate may be reproduced after having full except with the prior written
Approval of the head of Corporate Services & Equipment Calibration and Testing Services

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Equipment: Autoclave
Condition As-Received: Used Item
Reference: 2102-075100-1
Page: 2 of 3

Procedure Used :-
Calibration were conducted using in-house calibration procedure CP-QT00 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T

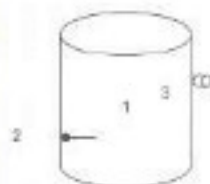
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-
Instrument Serial No. Cert. No. Traceable Due Date
1) Data Acquisition MY49023632 20LMB NIST, NIMT 20 Apr 2021
2. This certification is traceable to the SI unit.
3. This certificate is valid only to the item calibrated on date and place of calibration.
4. This result of calibration covers laboratory autoclave for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**
(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.
This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Remark: NIST : National Institute of Standards and Technology, The United State of America
NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (°) Without Adjustment
Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	26	61	222
Finished of Calibration	26	63	223

Position	Description	Ref. Std. Thermocouple
1 =	Center of chamber	19-16TC-05
2 =	Temperature sensor	19-16TC-03
3 =	Exhaust port	19-16TC-10

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a 1043935



Equipment: Autoclave
Condition As-Received: Used item
Reference: 2102-075100-1
Page: 3 of 3

Result of Calibration :- (°) Without Adjustment

Operating parameter Set : Temperature = 116 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
116	116	1	117.021	0.23	0.08	0.92	2
		2	117.111				
		3	117.212				

Operating parameter Set : Temperature = 122 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
122	122	1	122.813	0.15	0.12	1.10	2
		2	122.914				
		3	122.978				

Average* : The average of 30 values in each position.
Stability : One-half of the greatest maximum difference of measured temperature at any one probe.
UUC* : Unit Under Calibration
Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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เอกสารไม่ควบคุม
a 1043934

National Food Institute, Ministry of Industry, Thailand

2005 Soi 35, Arun Amarin Road, Bang Nakhon Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel : +66 (0) 2420 6999 Fax : +66 (0) 2420 6916 Website : www.nfi.go.th Email : nfi@nfi.go.th



Verification Certificate

Certificate No.: 2202361-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomauk 41, Sukhumvit Road,
Bangchack, Prakhong, Bangkok 10260

Page 1 of 4

Equipment: HEATING BLOCK DIGESTION
Manufacturer: FOSS
Model: 2520
Serial No.: 91794469
ID No.: UAE.WAS.011/2560
Order No.: 2202361
Operation No.: 2202361-001
Date of Receipt: 4 April 2022
Date of Calibration: 4-6 April 2022

Calibrated by Mr.Nuttapol Niyemchak
Specialist

Approved by
(Mr.Pheraphat Tuirat)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 11 April 2022

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.

เอกสารไม่ควบคุม

National Food Institute, Ministry of Industry, Thailand

2005 Soi 35, Arun Amarin Road, Bang Nakhon Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel : +66 (0) 2420 6999 Fax : +66 (0) 2420 6916 Website : www.nfi.go.th Email : nfi@nfi.go.th



Verification Report

Certificate No.: 2202361-001-01
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS

Date of Calibration: 4-6 April 2022

Page 2 of 4

Location: Laboratory Room, NATIONAL FOOD INSTITUTE
Environment Condition: Ambient Temperature (25 ± 3) °C
Relative Humidity (55 ± 15) %
Line Voltage (220 ± 10) Volt

Condition of this results of Calibration:

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

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	3H/5A/3H/5A	MY49023632	2202361-001-001	24-Apr-2022	N.F.I. Technical Center Laboratory
	Type R	19-16TC-03 / 19-16TC-05			

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

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

7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

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Verification Report

Certificate No.: 220201-021-01
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794499
Resolution: 1 °C ID No.: UAEWRS/011/2550
Manufacturer: FOSS
Date of Calibration: 4-6 April 2022 Page 3 of 4
Calibration point: 380 °C
Calibration result: Continued

Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	380	0.13	376.48	1.5
2	380	380	0.12	376.58	1.5
3	380	380	0.12	376.51	1.5
4	380	380	0.14	376.70	1.5
5	380	380	0.18	376.81	1.5
6	380	380	0.12	377.23	1.5
7	380	380	0.12	377.37	1.5
8	380	380	0.13	376.68	1.5
9	380	380	0.14	376.72	1.5
10	380	380	0.18	378.97	1.5
11	380	380	0.15	378.79	1.5
12	380	380	0.11	377.14	1.5
13	380	380	0.19	379.65	1.5
14	380	380	0.16	379.31	1.5
15	380	380	0.18	378.66	1.5
16	380	380	0.15	379.18	1.5
17	380	380	0.23	377.39	1.5
18	380	380	0.11	377.71	1.5
19	380	380	0.22	376.64	1.5
20	380	380	0.16	378.56	1.5

Note:

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

FCS-012 Revision: 00 Date: 31-12-01

เอกสารไม่ควบคุม

Verification Report

Certificate No.: 220201-021-01
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794499
Resolution: 1 °C ID No.: UAEWRS/011/2550
Manufacturer: FOSS
Date of Calibration: 4-6 April 2022 Page 4 of 4
Calibration point: 380 °C
Calibration result: Continued

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



Note:

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

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

FCS-012 Revision: 00 Date: 31-12-01

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FOSS

Customer Service Report

Date: 30/4/21
Customer: UAE
Instrument: KT 200
Report No: 5874
Address: 91794499
Serial: 91794499
Room: Travel To Customer
Start: 8.00
Finish: 14.00
Labour: 14.00
Travel From Customer: 15.00

Application	Special	Standard
Normal	Factory 24h	Installation
Distributor	PMA (1) handling	Control
Internal	Warranty	Repair
Digital Service	Sales Support	Remote

PO/Quote Number: 00000000

PMA Type: FossCare Pro Contract No: 00000000

Details of Work / Test	Condition / Status
- Check instrument	Pass
- UUC* PM KIT KT 200	Pass
- UUC* Safety Valve	Pass
- UUC* Rubber segment	Pass
- UUC* Seal	Pass
- UUC* Heating element	Pass
- UUC* New panel PCB	Pass
- UUC* Safety desc pass complete	Pass
- Clean & lubricant	Pass
- Check Temperature	Pass
- Check Volume 20ml set 20ml	Pass

Instrument ready for use: OK Not OK

Part No.	Batch	Description	Qty
10000001	10.05.2021	Foss PM KIT KT 200	1
10000002	10.05.2021	Safety Valve	1
10000003	10.05.2021	Rubber segment	1
10000004	10.05.2021	Seal	1
10000005	10.05.2021	Heating element	1
10000006	10.05.2021	New panel PCB	1
10000007	10.05.2021	Safety desc complete	1

I confirm this report is accurate and complete

Signed PMA: [Signature] Signed Customer: [Signature]
Name: [Name] Name: [Name]

Would you be willing to participate in a brief survey in order to tell us how we performed?

FOSS

Preventive Maintenance Protocol

FossCare™

Instrument	Geher™ 2100	Customer: UAE
Recommended PM interval (whichever occurs first between interval and no. of samples analysed)	12 months	No. of samples analysed (if applicable):
Preventive maintenance kit (PMK)	10000005	S/N 91794499

Introduction

A maintenance protocol provides systematic and functional means of maintaining a specific instrument type. The recommended PM interval depends on the operational conditions and is based on our extensive experience and knowledge of manufacturing and maintaining analytical instruments.

Apart from sample throughput, the environmental conditions also need to be considered. A demanding environment, such as high ambient temperature, humidity, dirtiness etc can measurably shorten component lifetime and also the maintenance and component replacement intervals.

NOTE:

The content of this protocol is subject to change over time. In order to safeguard that you obtain the correct parts, please make sure to indicate serial no and date of installation when contacting your FOSS representative.

Dedicated Analytical Solutions

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Web: www.foss.se

Customer Support: 1801 4172 / Rev. 3

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เอกสารไม่ควบคุม

Maintenance Procedure

Exchange of Parts and Cleaning

Step	Action	Part	P/N	OK
1	Replace	Adapter for dig. tube 250 ml	1000 0056	<input type="checkbox"/>
2	Replace	Non return valve	1000 3538	<input type="checkbox"/>
3	replace valves in alkali pump	valve kit oxygen/water pump	1545 0264	<input type="checkbox"/>
4	Replace steam tubing	Silicone tubing 8/12 mm	1582 0006	<input type="checkbox"/>
5	Replace alkali tubing	Tubing reinforced for alkali	1582 0011	<input type="checkbox"/>
6	Replace water tubing	Tubing PVC 8/11 mm	1582 0004	<input type="checkbox"/>
7	Cleaning	Steam generator		<input type="checkbox"/>
8	Cleaning	Splash head		<input type="checkbox"/>

Check and Adjustments

Step	Action	Module	Measured	Limits	OK
1	Check alkali volume, 10 ml/stroke	Alkali pump		At 50 ml -0/+3 ml	<input checked="" type="checkbox"/>
2	Check distillation volume			100 – 150 ml/4 min	<input checked="" type="checkbox"/>
3	Check, from panel switches				<input checked="" type="checkbox"/>
4	Check cables and electrical connections				<input checked="" type="checkbox"/>
5	Check level pins in steam generator				<input checked="" type="checkbox"/>
6	Check safety door switch				<input checked="" type="checkbox"/>

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental,Inc.	TE-5025A 3383	Tisch Environmental,Inc.	27072020	27 Jul 20	26 Jul 22	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	21P445	9 Feb 21	8 Feb 22	-
3	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	22P803	12 Mar 22	11 Mar 23	-
4	Flow Meter	Particular Matter (PM _{2.5})	Mesa Labs	DeltaCal DC1 160491	Innovative Instrument Co.,Ltd.	21-AFM-096	31 Aug 21	30 Aug 22	-
5	Mass Flow Meter	VOCs	Alicat Scientific, Inc.	MB-5SCCM-D/5M 71015	Miracle International Technology Co.,Ltd.	AD2110-274-0002	1 Nov 21	31 Oct 22	-
6	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5}) VOCs	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	21P2499	21 Jul 21	20 Jul 22	-
7	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5}) VOCs	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	22H771	5 Apr 22	4 Apr 23	-
8	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo	42C 42C-0508011076	UAE Consultant Co.,Ltd.	2110/2021	21 Oct 21	20 Oct 22	-
9	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	CC159599 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01QC	30 Jul 19	30 Jul 22	-
10	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1180540068	UAE Consultant Co.,Ltd.	14102021	14 Oct 21	13 Oct 22	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
11	Standard Gases (Mixture)	Carbon Monoxide	Airgas	CC159599 2015PSIG	Airgas an Air Liquide company	160-401526192-1	30 Jul 19	30 Jul 22	-
12	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 PDXEGXF7	UAE Consultant Co.,Ltd.	05062021	5 Jun 21	4 Jun 22	-
13	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-
14	Wind Speed/Wind Direction	WS/WD	LSI LASTEM	E-LOG305 19040308	Thai Meteorological Department	385/21	16 Aug 21	15 Aug 22	-
15	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM12891	Calibration Laboratory Co.Ltd	Q210884903	14 Sep 21	13 Sep 22	-
16	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	01dB	CAL31 84065	Innovative Instrument Co.,Ltd.	21-ACT-264	20 Jul 21	19 Jul 22	-
17	Sound Level Meter	$L_{Aeq\ 24\ hours}$ $L_{Aeq\ 1\ hour}$ L_{Amax} L_{A90} L_{Adn}	Rion, Japan	NL-42 00408979	Sithiporn Associates Co., Ltd.	ACL22067	25 Jan 22	24 Jan 23	-

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	YSI	pH100A JC03354	Technology Promotion Association (Thailand-Japan)	22CH60	13 Jan 22	12 Jan 23	-
2	DO Meter	DO	YSI	Pro 20i 18H110495	Technology Promotion Association (Thailand-Japan)	21TW184	2 Sep 21	1 Sep 22	-
3	Conductivity Meter	Conductivity	YSI	Pro30 18C105225	Technology Promotion Association (Thailand-Japan)	21CH1470	21 Oct 21	20 Oct 22	-



Cert.No.: 22CH60
Page: 1 of 3

Certificate of Calibration

Equipment: pH Meter
Manufacturer: EcoSense
Model: pH100A
Serial No.: J009351
ID No.: UAS.EFM.063.05826MM.pH.0362
Condition As-Received: Used Item
Received Date: 12 January 2022
Calibration Date: 13 January 2022
Reference: 2201-0360VSC-1
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
256 Udomsak 41, Suburml Road, Bangkok,
Phraekong, Bangkok, 10260
Ambient Temperature: (25 ± 2) °C
Relative Humidity: (50 ± 10) %
Calibration Procedure: In-house method
- CP-DRS by direct measurement with accurate voltage calibrator and check measurement with certified reference material (CRM)
- CP-DRS by comparison with standard thermocouple

Calibrated by: Watsorn Longpradul

Approved by:
Approved Signatory

☒ Watsorn Longpradul
☐ Sathip Mesingm
☐ Watsorn Longpradul

Issue Date: 17 January 2022

The uncertainties are for a confidence probability of approximately 95%

The calibration was performed in accordance with the requirements of the ISO 17025:2017 standard, and the results are traceable to the International System of Units (SI).

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Cert.No.: 22CH60
Page: 2 of 3

Condition of this calibration result

- Reference Standard Equipment
1. Document Process Calibrator: Serial No. 5400049, ID No. 1000018, S/N. 1E2832, Exp. Date 5 Aug 2022
2. Ref. Standard Thermometer: Serial No. 1980054, ID No. 1000044, S/N. 1H1201, Exp. Date 6 Oct 2022
This certification is traceable to the International System of Units (SI) maintained at:
- Traceable to National Institute of Metrology (Thailand), NIMT
- Certified Reference Materials: The measurement results are traceable to SI through CPA from Ltd. 402-400, Wongsakorn Road, Bangkok No. 10, 10260

Buffer Solution	Manufacturer	Lot No.	Exp. Date
4.008	CPA chem	769021	13 Sep 2023
7.00	CPA chem	769017	06 Aug 2022
10.015	CPA chem	769021	06 Sep 2022

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

Calibration Results

Function: mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
			mV	pH		
pH Electrode Ser. J009351	4.00	17.45	17.7	4.01	0.50	2.00
	7.00	0.01	0	7.00	0.50	2.00
	10.00	0.05	0	10.01	0.50	2.00
	10.01	17.74	17.7	10.01	0.50	2.00

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Cert.No.: 22CH60
Page: 3 of 3

Calibration Results

Function: pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (pH)	Coverage factor k
pH Electrode Ser. J009351	4.008	4.01	17.7	1.0075	2.00
	6.902	6.98	0.0	0.011	2.00
	6.902	6.98	0.0	1.0080	2.00
	10.015	10.01	20.0	0.0086	2.00

Function: Temperature Measurement

(°C) Without adjustment

This equipment was connected with Temperature Probe:

- Model: TC072061A60501
- Serial No.: TC072061A60501
- Dimension of probe:
- Length: 1.0 m
- Diameter: 1.0 mm
- Insertion Depth: 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	UUC* (°C)	Uncertainty of measurement (°C)	Coverage factor k
25.0	25.003	25.1	0.097	0.13	2.00
30.0	30.002	30.1	0.098	0.13	2.00
35.0	35.004	35.0	0.004	0.13	2.00

Remark: * UUC* = Unit Under Calibration

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

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Cert.No.: 22TW184
Page: 1 of 1

Certificate of Testing

Equipment: DO Meter
Manufacturer: ISI
Model: Pro 200
Serial No.: ISH110495
ID No.: UAS.EFM.200.05675MM.D0.0465
Received Date: 30 August 2021
Test Date: 30 September 2021
Reference: 2108-0360VSC-8
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
256 Udomsak 41, Suburml Road, Bangkok, Phraekong, Bangkok 10260
Laboratory Condition: Temperature: (25 ± 5) °C
Humidity: (50 ± 10) %
Test Procedure: In-house method, CP-DRS
by Comparison Technique with 2000 Model 0501 Buffer

Tested by: Watsorn Longpradul

Approved by:
Approved Signatory

☒ Watsorn Longpradul
☐ Sathip Mesingm
☐ Watsorn Longpradul

Issue Date: 30 September 2021

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Cert. No.: 21TM184
Page: 2 of 2

Result Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 169100129

Calibration Method	DO Meter Reading	Standard Deviation
Air Sat. Method (Mettler)	Reading (mg/L)	(mg/L)
5.18	5.17	0.0055

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

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TECHNICAL ENGINEERING ASSOCIATION - THAILAND/JAPAN
CERTIFICATE OF CALIBRATION AND TESTING SERVICES
THAILAND JAPAN TECHNICAL ENGINEERING ASSOCIATION
JULY 2015 (REV. 07) - 16/01/2019 (REV. 01)



Cert. No.: 21TM184
Page: 1 of 2

Certificate of Calibration

Equipment: DO Meter with Sensor
Manufacturer: YSI
Model: Pro 2014
Serial No.: 16H110495
ID No.: IAE-EPM-20022561/ENV-DC-04W61
Submitted by: United Analytical and Engineering Consultant Co., Ltd.
108 Udonrath 41, Sukhumvit Road,
Bangkok, Phrakong, Bangkok 10250
Location: TPA On Site Calibration Laboratory
Received Date: 10 August 2021
Calibration Date: 1 September 2021
Ambient Temperature: 28 ± 10 °C
Relative Humidity: 50 ± 20 %
AC Line Voltage: 220 ± 22 V

Calibrated by: Nabea Rattanasri

Approved by:
Nabea Rattanasri
(Suff. Eng.)

Issue Date: 10 September 2021

This Uncertainty is for a confidence probability of approximately 95%
The uncertainty is calculated using the GUM method and is expressed as a percentage of the measured value.
The uncertainty is expressed as a percentage of the measured value.

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Equipment: DO Meter with Sensor
Condition As-Received: Used Item
Reference: 100-0037W5C-5

Cert. No.: 21TM184
Page: 2 of 2

Procedure Used: Calibration was completed using in-house calibration procedure CP-0701 according to comparison with In-house Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard verification:

1) Digital Thermometer: Model: 521, Serial No.: 3340075, Cert. No.: 211193, Due Date: 15 Feb 2021

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

3. This certificate is acceptable to the International System of Units.

Result of Calibration: 1) Without Argument

Function: Temperature measurement

On 5 instrument was calibrated with temperature sensor and immersion.

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	DO Meter Reading (°C)	Error (°C)	Uncertainty (°C)	Uncertainty Factor
25.0	50	25.008	24.9	-0.108	0.18	2.00
20.0	50	20.001	19.9	-0.101	0.15	2.00
15.0	50	15.002	14.9	-0.102	0.16	2.00

DO Meter Under Calibration

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

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11/10/21

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TECHNICAL ENGINEERING ASSOCIATION - THAILAND/JAPAN
CERTIFICATE OF CALIBRATION AND TESTING SERVICES
THAILAND JAPAN TECHNICAL ENGINEERING ASSOCIATION
JULY 2015 (REV. 07) - 16/01/2019 (REV. 01)



Cert. No.: 21TM184
Page: 1 of 2

Certificate of Calibration

Equipment: Conductivity Meter
Manufacturer: YSI
Model: Pro 31
Serial No.: 16C10525
ID No.: IAE-EPM-20022561/ENV-SC1104011
Condition As-Received: Used Item
Received Date: 10 October 2021
Calibration Date: 21 October 2021
Reference: 2110-0634W5C-4
Submitted by: United Analytical and Engineering Consultant Co., Ltd.
108 Udonrath 41, Sukhumvit Road,
Bangkok, Phrakong, Bangkok 10250
Ambient Temperature: 28 ± 10 °C
Relative Humidity: 50 ± 15 %
Calibration Procedure: In-house method:
• CP-CH6 by direct measurement with certified reference material (2100)
• CP-CH6 by comparison with standard thermometer

Calibrated by: Watsakorn Lamsaengsakul

Approved by:
Watsakorn Lamsaengsakul
(Suff. Eng.)

Issue Date: 29 October 2021

This Uncertainty is for a confidence probability of approximately 95%
The uncertainty is calculated using the GUM method and is expressed as a percentage of the measured value.
The uncertainty is expressed as a percentage of the measured value.

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Cert No: 21CH1470

Page: 2 of 3

Condition of use result of calibration

1. Reference Standard Instrument

Instrument	Serial No.	Lot No.	Calibration Date	Exp. Date
1) Thermometer	1623270	13080059	21/5/21	7 Sep 2024
2) Ref. BM Thermometer	3241076	03800001	21/5/21	4 Feb 2022

The certification is traceable to the International System of Unit maintained at:
(accessible to National Institute of Metrology (Thailand), NIMT)

2. Certified Reference Materials

Conductivity calibration solution, CPA Chem Ltd. The measurement results are traceable to SI through CPA Chem Ltd. 4MSI-450 Material Accreditation, Royal Accredited No. AR-1805

Conductivity Solution	Manufacturer	Lot No.	Exp. Date
1413.0 µS/cm	CPA Chem	761021	12 Aug 2022
2860.8 mS/cm	CPA Chem	754001	8 June 2021

- Control Conductivity calibration by using temperature by Water bath (22±0.1) °C

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

Calibration Results

Function: Conductivity Measurement

(*) After Adjustment at 1413.0 µS/cm

Conductivity Electrode Serial No.: 180101009

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (%)	Coverage factor
1413.0 µS/cm	1350 µS/cm	1410 µS/cm	0.1 µS/cm	2.00
2860.8 mS/cm	12.73 mS/cm	12.66 mS/cm	0.062 mS/cm	2.00

Remark: UUC* = Unit Under Calibration

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1079152



Cert No: 21CH1470

Page: 3 of 3

Calibration Results

Function: Temperature Measurement

(*) without adjustment

The temperature was calibrated with Temperature Probe

Model: PRO 30 COND T
Serial No: 10C100104

Dimension of probe:

Length	0 mm
Diameter	0.7 mm
Immersion Depth	0.7 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (1σ) (°C)	Coverage factor
25.0	25.005	25.0	-0.005	0.20	2.00
50.0	50.004	50.0	-0.004	0.20	2.00
75.0	75.004	75.0	-0.004	0.20	2.00

Remark: UUC* = Unit Under Calibration

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

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1079151



RECALIBRATION

DUE DATE:

July 27, 2021

Certificate of Calibration

Calibration Certification Information			
Lab Name: Juyi Co., Ltd.	Instrument S/N: 400000	Ref. Std: 749.3	°K
Operation: Jim Tisch			mm Hg
Calibration Model #: TS-1025A	Calibrator S/N: 3383		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4020	3.2	2.00
2	3	4	1	1.0000	6.3	4.00
3	5	6	1	0.8920	7.8	5.00
4	7	8	1	0.8430	8.7	5.50
5	9	10	1	0.7010	12.7	8.00

Data Tabulation

Vstd (m3)	Qstd (m3/min)	$\sqrt{\Delta H \left(\frac{P_a}{P_{std}} \right) \left(\frac{T_{std}}{T_a} \right)}$ (m3/min)	Va (m3/min)	Qa (m3/min)	$\sqrt{\Delta H \left(\frac{T_a}{P_a} \right)}$ (m3/min)
0.9817	0.7002	1.4042	0.9957	0.7102	0.8919
0.9776	0.9776	1.9859	0.9916	0.9916	1.2613
0.9757	1.0998	2.2208	0.9894	1.1094	1.4101
0.9745	1.1560	2.3286	0.9884	1.1775	1.4790
0.9692	1.3826	2.8084	0.9831	1.4024	1.7817
QSTD		m= 2.04993	QA		m= 1.28363
		b= -0.02762			b= -0.01754
		r= 0.99985			r= 0.99985

Calculations

$V_{std} = \Delta V / (\Delta P / P_{std}) (T_{std} / T_a)$	$V_a = \Delta V / (\Delta P / P_a)$
$Q_{std} = V_{std} / \Delta Time$	$Q_a = V_a / \Delta Time$
For subsequent flow rate calculations:	
$Q_{std} = 1/m \left(\sqrt{\Delta H \left(\frac{P_a}{P_{std}} \right) \left(\frac{T_{std}}{T_a} \right)} - b \right)$	$Q_a = 1/m \left(\sqrt{\Delta H \left(\frac{T_a}{P_a} \right)} - b \right)$

Standard Conditions	
Tstd:	293.15 °K
Pstd:	760 mm Hg
Key	
ΔH: calibrator manometer reading (in H2O)	
ΔP: root-mean-square reading (mm Hg)	
Ta: actual absolute temperature (°K)	
Pa: actual barometric pressure (mm Hg)	
b: intercept	
m: slope	

RECALIBRATION

US EPA recommends annual recalibration per 1993 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
354/1 POTHANAKARN ROAD BOX 18, SUKHUMVIT, SUKHUMVIT, BANGKOK 10250
TEL: 0-2717-5099-24 FAX: 0-2715-9484

Certificate of Calibration

Certificate No.: 21P425

Page: 1 of 2

Equipment: U Tube Manometer

Manufacturer: Dwyer

Model: 1225-06-WM

Serial No: -

ID No.: UAE EPM-1792501

Condition As-Received: Used Item

Received Date: 01 February 2021

Calibration Date: 02 February 2021

Reference: 2102-006WRC

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: 1.23 ± 0.1 °C

Relative Humidity: 1.30 ± 0.1 %

Atmospheric Pressure: 1012 mbars

61 Soi Udomsak 41, Sukhumvit Road, Bangkok,

Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P04, using "CND-R 6-1: Calibration of Pressure Gauges, Edition 020014" as a guideline.

Condition of this result of calibration

1. Reference standard's instruments:

Instrument	Model	Serial No.	Certificate No.	Exp. Date
1) Pressure Calibrator	PC100P	1180	MP-0113-20	14 Jul 2021

2. This result of calibration was made on request of the point specified by customer.

3. Scale and conversion factor is 1 kPa = 4.0146329 inHg

4. This instrument was used clean air as pressure media.

5. This instrument was installed in vertical orientation and center of connector was used as the reference level.

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

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

National Institute of Metrology Thailand (NIMT)

Calibrated by: Noppadol Phongsom

Issue Date: 11 February 2021

Approved Signatory: Attapol P.

I Phatree Phatphol

I Sure Sammanit

I Attapol Pananich

เอกสารไม่ควบคุม
0250403

Certificate No : 21-0154-896
Request No : Req-2021-0985

Result of Calibration :

Flow Setting	STD Flow Reading	UIC Flow Reading	Correction Flow	Uncertainty
LPM	LPM	LPM	LPM	LPM
14.3	14.367	14.31	-0.057	0.21
17.8	17.364	17.34	-0.024	0.22
17.8	17.805	17.72	-0.085	0.23
16.6	16.367	16.30	-0.067	0.24
16.3	16.365	16.29	-0.075	0.25

Note:
STD : Standard
UIC : Unit Under Calibration
* Indicate can accepted

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

Rev. 2018-07-04-08 Page 01 Issue Date 04/07/2018

เอกสารไม่ควบคุม

Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name :
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong,
Bangkok 10260

Certificate No : 21-0154-895
Request No : Req-2021-0985

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : BGI
Model : 400C4 OCT
Serial Number : 16901
ID : UAE/EPM/175/2567
Resolution : 0.1 (m³)
Serial Model : 2182110
Serial SN : M01070049-005
Serial ID : 00A/EPM/175/2567
Instrument Status : Used

Calibration Environment and Details

Temperature : 25 °C ± 0.1 °C
Humidity : 55 %RH ± 10 %RH
Received Date : 22 July 2021
Calibration Date : 31 August 2021
Calibration By : Mr. Sirachak Jirapongkarn
Location of Calibration : LAB 2 Tungsri
Calibration Method : In-house method CP-10M-40 by Comparison With Standard Relative Humidity Meter and Standard
Thermometer with RTD Probe in Humidity / Temperature Chamber

Reference Standard

Standard Thermometer Model: C711, SN: 12000077, Which was calibrated on 30 March 2021, Calibration of Certificate No.: QJ02-4719
and Relative Humidity Meter Model: HP22-A, SN: 6162878, Which was calibrated on 28 September 2020, Calibration of Certificate No.: QJ02-1851
Traceability:
This Certificate is traceable to SI Unit through Quality Reference Co., Ltd., NIST-KRISO Accreditation No. Calibration 0095

Note

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

Calibrated By :
Service Calibration Engineer

Approved By :
Mr. Patti Mahasarak
Calibration Engineer Supervisor
Issue Date : 1 September 2021

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

Rev. 2018-07-04-08 Page 01 Issue Date 04/07/2018

เอกสารไม่ควบคุม

Certificate No : 21-0154-893
Request No : Req-2021-0980

Calibration Results : Without Adjustment

Temperature Calibration : Water Temperature (TD)

Temperature Range °C	Without Adjustment (°C)			Uncertainty °C
	STD Reading °C	UIC Reading °C	Correction °C	
20	20.999	20.2	-0.799	0.10
25	24.997	24.2	-0.797	0.10
30	30.000	30.2	0.200	0.10
35	35.000	35.2	0.200	0.10
40	40.004	40.2	0.196	0.10

Temperature Calibration : Ambient Temperature (Ta)

Temperature Range °C	Without Adjustment (°C)			Uncertainty °C
	STD Reading °C	UIC Reading °C	Correction °C	
20	19.999	20.2	-0.201	0.10
25	24.997	25.1	-0.103	0.10
30	30.000	30.0	0.000	0.10
35	35.000	34.9	-0.100	0.10
40	40.004	39.9	-0.004	0.10

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

Rev. 2018-07-04-08 Page 01 Issue Date 04/07/2018

เอกสารไม่ควบคุม



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD.
214 Bangpakok Rd, Bangpak Bangkok Bangkok 10160
Tel: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



CALIBRATION CERTIFICATE

Certificate No. : AD2110-274-0002
Date Issued : 02-Nov-21

Customer : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260

Equipment : Mass Flow Meter

Manufacturer : Alicat Scientific
Model : MB-SSCCM-D/SM
Serial No. : 71015
ID No./Tag No. : UAE/EMA2.119/2555
Date Received : 22-Oct-21
Name of Calibration : 01 Nov 21

Calibrated by : Mr. Sorjjet Orbus

Calibration Method or Calibration Procedure Used

In-house method : CP-34 by comparison against mass flow calibrator.

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

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by :
K. Nathong
(Mr. Nathapong Krodum)



Page 1 of 3

เอกสารไม่ควบคุม

Certificate No.: AD2110-274-0002

Environment: Ambient temperature: (23 ± 2) °C
Relative humidity: (50 ± 15) % RH

Capacity Range: 5 ml/min

Calibration Media: Air

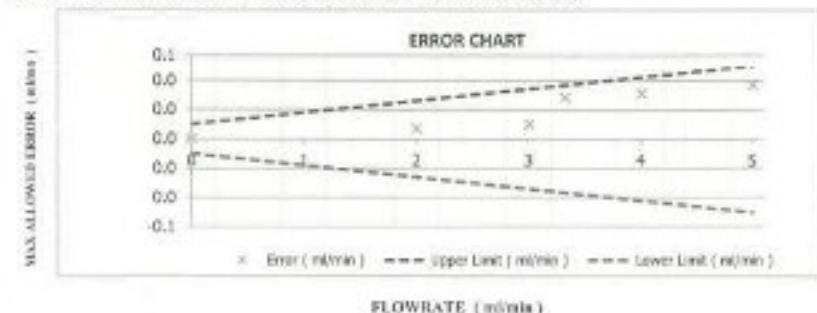
Type: Mass Flowmeter

Unit Under Calibration Reference Condition: Pressure: 101.325 kPa(abs), 25 °C, Air

Temperature (°C)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty (+/- ml/min)
24.32	100.87	0	0 *	0	0.063
24.36	100.95	2.002	1.995 *	0.007	0.094
24.41	101.03	3.008	2.998	0.010	0.13
24.46	101.07	3.333	3.305	0.028	0.14
24.52	101.14	4.012	3.981	0.031	0.16
24.56	101.26	5.005	4.968	0.037	0.19

Error = Unit Under Calibration - Standard

Marked * are not included in the NSC-ONSC accreditation schedule for our laboratory.



Page 2 of 3

เอกสารไม่ควบคุม

Certificate No.: AD2110-274-0002

Note: The actual flow rate is determined by the equation:

$$Q_{actual} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

Q = Flow rate
P = Absolute pressure
T = Absolute temperature
Subscript "Meas" = Measurement condition
Subscript "Ref" = Reference condition

Traceability of Certificate:

The International System of Units (SI) through

NIMT Calibration Certificate No. MW-0003-20 for Mass Flow Calibrator (20 SCCM) Serial No. G510971G20, Due 22-Jan-22

End of Certificate

Page 3 of 3

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/49 PATTANAKARN ROAD SOI 18, SUKHUMVIT, SUKHUMVIT, BANGKOK 10256
TEL: 0-27171800-04 FAX: 0-2719444



Certificate of Calibration

Certificate No.: 21P2400
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE/AN/1220250

Condition As Received: Used Item

Received Date: 20 July 2021

Calibration Date: 21 July 2021

Reference: 2107-0070450

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1009 hPa

81 Soi Udonrux 41, Sukhumvit Road, Bangkok,
Prachinong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P10, using "OIML R 6-1 : Calibration of Pressure Gauges, Edition 03/2014" as a guideline.

Condition of this result of calibration

1. Reference standards Instruments:

Instrument	Model	Serial No.	Certificate No.	Exp. Date
1) Standard Barometer	DP142	1422502046	MP-0053-21	08 Apr 2022

2. The instrument was installed in vertical orientation and center of the dial was used as the reference level.

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

4. This instrument was used clean air as process media.

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

6. This Calibration is traceable to the International System of Unit maintained at:

National Institute of Metrology Thailand (NIMT)

Calibrated by: Suwit Ausarnsom
Issue Date: 22 July 2021

Approved Signatory: Attapol P.
[] Prachin Pratsarpai
[] Suwit Ausarnsom
[x] Attapol Panumish

เอกสารไม่ควบคุม

0264452



Cert.No.: 21P2400
Page: 2 of 2

Result of calibration: Without adjustment
Function: Absolute Pressure Measurement

Range: 980 hPa to 1020 hPa
Scale Interval: 1 hPa (The Film Calibrator)

Increasing Pressure

Applied Pressure (hPa)	997.66	999.27	999.18	999.49	1000.66	1013.75	1020.58	1023.49
UUC* indication (hPa)	999.0	970.0	980.0	960.0	1000.0	9916.0	1020.8	1020.0
Error (hPa)	2.34	8.73	-0.15	-3.43	-0.68	-0.75	-0.58	-0.51

Decreasing Pressure

Applied Pressure (hPa)	1020.01	1020.69	1019.80	1000.79	990.69	980.50	969.41	957.70
UUC* indication (hPa)	1019.0	1009.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	0.99	-0.69	-0.80	-3.75	-0.59	-0.50	0.50	2.21

The uncertainty of measurement was ± 0.50 hPa

* UUC = Unit Under Calibration

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

-000-

เอกสารไม่ควบคุม

1062243



MULTI-POINT GAS TEST REPORT

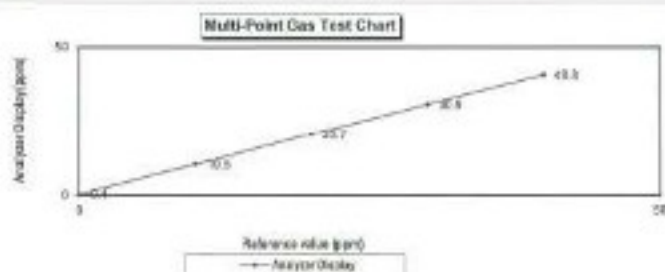
Test Date : Oct 14, 2021

Equipment : Gas Analyzer (CO) Model : 488
Manufacturer : Thermo Scientific Serial Number : 118054000

Standard Gas Concentration		Diluter Detail	
Sulphur Dioxide (SO ₂)	44.75	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	45.35	PPM	Model : 146
Methane (CH ₄)	-	PPM	Serial Number : 118054000
Carbon Monoxide (CO)	1002	PPM	
Cylinder No. :	CO159999		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.4	0.4	0.4
Level 2 20.00%	10.0	0.5	0.5	0.5
Level 3 50.00%	25.0	0.7	0.7	0.7
Level 4 80.00%	40.0	0.9	0.9	0.9
Level 5 100.00%	60.0	0.8	0.8	0.8
Remark : Measuring Range	50.0 ppm	Average Difference (%)	0.5	0.5
Acceptable Limit \pm 5%				



Calculate by
Srichai Y.
14, Oct, 2021

Approved by
Phan N.
14, Oct, 2021

CERTIFICATE OF ANALYSIS Grade of Product: EPA Protocol

Part Number: 034N59E15A0100 Reference Number: 180-40102180-1
Cylinder Number: CC195500 Cylinder Volume: 144.4 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12019 Valve Detail: 640
Gas Code: CO, NO, NOX, SO₂, BALN Certification Date: Jul 30, 2019
Expiration Date: Jul 30, 2022

Certification performed in accordance with EPA Testability Protocol for Analytical Certification of Gases (EPA 2017) Assumed: 20°C, 60% RH, 1.01325 bar, using the above procedures. Analytical Manufacturer does not require correction for ambient conditions. This cylinder has a 100% analytical quantity as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this cylinder. All concentrations are in volume/volume unless otherwise noted.
Do Not Use This Cylinder unless 100% purity is 100% guaranteed.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Date
NO ₂	45.00 PPM	44.75 PPM	Q1	\pm 0.5% NOT Traceable	03/20/21, 07/30/21
NITRIC OXIDE	45.00 PPM	44.75 PPM	Q1	\pm 0.5% NOT Traceable	03/20/21, 07/30/21
SULFUR DIOXIDE	45.00 PPM	45.35 PPM	Q1	\pm 1% NOT Traceable	03/20/21, 07/30/21
CARBON MONOXIDE	1002 PPM	1007 PPM	Q1	\pm 0.4% NOT Traceable	07/30/21
NITROGEN	Balance				

Type	Lot ID	Cylinder No.	Concentration	Uncertainty	Expiration Date
NTM	1000121	90108010	240.0 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Nov 05, 2023
NTM	900111	90108010	50.00 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Nov 05, 2023
NTM	1000121	90108010	240.0 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Nov 05, 2023
NTM	900111	90108010	50.00 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Nov 05, 2023
NTM	914778	90108010	45.00 PPM SULFUR DIOXIDE/NITROGEN	\pm 1.0%	Jan 28, 2022
NTM	912565	90108010	875.0 PPM CARBON MONOXIDE/NITROGEN	\pm 0.4%	May 14, 2021

Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
CO NO ₂ FTIR 00000000	FTIR	Jul 13, 2019
NO NO ₂ FTIR 00000000	FTIR	Jul 22, 2019
NO NO ₂ FTIR 00000000	FTIR	Jul 22, 2019
SO ₂ ANAL FTIR 00000000	FTIR	Jul 22, 2019

Test Data Available Upon Request

NOTES: GRADE 1519-CO-03
POTENTIAL 210
GROSS WEIGHT: 28.6 KG
NET WEIGHT: 4.1 KG



Signature on File
Approved for Release



MULTI-POINT GAS TEST REPORT

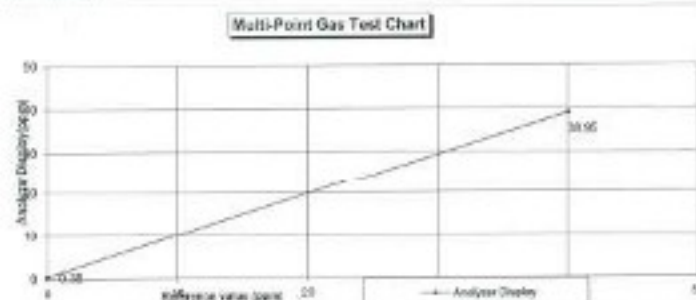
Test Date : Sep 16, 2020

Equipment : Hydrocarbon Analyzer Model : APHA-370
Manufacturer : HORIBA Serial Number : PD00007

Standard Gas Concentration		Diluter Detail	
Sulphur Dioxide (SO ₂)	-	PPM	Manufacturer :
Nitric Oxide (NO)	-	PPM	Model :
Methane (CH ₄)	39.8	PPM	Serial Number :
Carbon Monoxide (CO)	-	PPM	
Cylinder No. :	D804432		
Expiration Date :	Aug 4, 2021		

Multi-point gas test data

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.00	0.38	0.38	0.38
Level 2 80.00%	40.00	1.95	2.70	2.70
Remark : Measuring Range	50.00 ppm	Average Difference (%)	1.54	1.54
Acceptable Limit \pm 5%				



Calculate by
Srichai Y.
16, Sep, 2020

Approved by
Phan N.
16, Sep, 2020



Certificate of Analysis Special Gases Market

Customer Details		Address		Customer Tag No.	
United Analyst and Engineering Co., Ltd.		33 Soi Udomsak 41, Sukhumvit Rd, Bang			
		Bangkok, Thailand			
Cylinder Details		Lot Details		Expiry Date	
Number		000000		04-Aug-2020	
Material Details		000000		04-Aug-2020	
Product Name		000000		04-Aug-2020	
Gas Name		000000		04-Aug-2020	
Cylinder Details		000000		04-Aug-2020	

Laboratory Report		Analytical Result		Assay Date	
Component		Nominal Concentration		04-Aug-2020	
Methane		40.0 ppm		04-Aug-2020	
Air		1.0 ppm		04-Aug-2020	

Reference Standard		Reference Standard used in Assay		Expiry Date	
Reference Standard		Reference Standard		04-Aug-2020	
Reference Standard		Reference Standard		04-Aug-2020	

Reference Standard		Reference Standard used in Assay		Expiry Date	
Reference Standard		Reference Standard		04-Aug-2020	
Reference Standard		Reference Standard		04-Aug-2020	

Reference Standard		Reference Standard used in Assay		Expiry Date	
Reference Standard		Reference Standard		04-Aug-2020	
Reference Standard		Reference Standard		04-Aug-2020	

Reference Standard		Reference Standard used in Assay		Expiry Date	
Reference Standard		Reference Standard		04-Aug-2020	
Reference Standard		Reference Standard		04-Aug-2020	

Reference Standard		Reference Standard used in Assay		Expiry Date	
Reference Standard		Reference Standard		04-Aug-2020	
Reference Standard		Reference Standard		04-Aug-2020	

Reference Standard		Reference Standard used in Assay		Expiry Date	
Reference Standard		Reference Standard		04-Aug-2020	
Reference Standard		Reference Standard		04-Aug-2020	

Reference Standard		Reference Standard used in Assay		Expiry Date	
Reference Standard		Reference Standard		04-Aug-2020	
Reference Standard		Reference Standard		04-Aug-2020	

Reference Standard		Reference Standard used in Assay		Expiry Date	
Reference Standard		Reference Standard		04-Aug-2020	
Reference Standard		Reference Standard		04-Aug-2020	

Reference Standard		Reference Standard used in Assay		Expiry Date	
Reference Standard		Reference Standard		04-Aug-2020	
Reference Standard		Reference Standard		04-Aug-2020	





CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.302	+0.002	1.9
0.4	50 Hz		0.400	0.406	+0.006	1.9
0.5	50 Hz		0.500	0.508	+0.008	1.3
0.6	50 Hz		0.600	0.610	+0.010	1.3
0.7	50 Hz		0.700	0.714	+0.014	1.3
0.3	100 Hz	peak	0.300	0.303	+0.003	1.9
0.4	100 Hz		0.400	0.406	+0.006	1.9
0.5	100 Hz		0.500	0.508	+0.008	1.3
0.6	100 Hz		0.600	0.611	+0.011	1.3
0.7	100 Hz		0.700	0.715	+0.015	1.3

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.040	+0.040	1.8
4	50 Hz		4.000	4.053	+0.053	1.8
5	50 Hz		5.000	5.069	+0.069	1.8
6	50 Hz		6.000	6.088	+0.088	1.8
7	50 Hz		7.000	7.097	+0.097	1.8
3	100 Hz	peak	3.000	3.044	+0.044	1.8
4	100 Hz		4.000	4.053	+0.053	1.8
5	100 Hz		5.000	5.073	+0.073	1.8
6	100 Hz		6.000	6.081	+0.081	1.8
7	100 Hz		7.000	7.095	+0.095	1.8

Certificate No. Q21084993

P3-011-0401-12

page 3 of 4

เอกสารไม่ควบคุม



education

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

401-401/1 Sathorn Rd, Bangkok, Bangkok 10120 THAILAND
Tel: 02-2473-8805 Fax: 02-2473-1679 e-mail: info@cl-lab.com, info@cl-lab.com



ISO 17025:2017 CLM
CALIBRATION 0294

Cert. No. : 021.23367
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : SL-42 Microphone/DC-50 Pre-amplifier NH-24
Serial No. : 00400701 120610 100475
ID No. : -

Condition As Found : GOOD

Customer : UNITED ANALYSIS AND ENGINEERING CONSULTANT (UKF)
81 SOI UDONISUK 4L, SUDHUMVIT ROAD,
BANGKOK SUB-DISTRICT,
THIRAKHONGKOR DISTRICT, BANGKOK 10260
THAILAND.

Location : -
Ambient Temperature : (25.0 ± 3.0) °C
Pressure : (101.3 ± 5.0) hPa
Relative Humidity : (36.0 ± 3.0) %

Recal Date : 18 MONTHLY 5000
Calibration Date : 21-23 JANUARY 2021
Date of Issue : 26 JANUARY 2021

Calibrated by : Sotkorn Pongpisan

Approved by :

[Signature]
(Sotkorn Pongpisan)

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

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CALIBRATION DATA

***3. DISPLACEMENT RESULT**

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.036	0.000	2.1
0.04	50 Hz		0.040	0.046	0.000	1.7
0.05	50 Hz		0.050	0.056	0.000	1.5
0.06	50 Hz		0.060	0.061	-0.001	1.3
0.07	50 Hz		0.070	0.072	-0.002	1.2
0.03	100 Hz	peak	0.030	0.036	0.000	2.1
0.04	100 Hz		0.040	0.046	0.000	1.7
0.05	100 Hz		0.050	0.056	0.000	1.5
0.06	100 Hz		0.060	0.061	-0.001	1.3
0.07	100 Hz		0.070	0.072	-0.002	1.2

Note: * means Calibration marked "Not ANAB Accredited" in the Certificate have been included for completeness.

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 3 of 58

This report is valid for the above stated instrument's only.

END End of Certificate END

Certificate No. Q21084993

P3-011-0401-12

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education

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : 021.23367
Ser. No. : 0065A0099
Pages : 1 of 8

Calibration Procedure : JIS A-01

Calibration Method :

This equipment was calibrated by using up (14-61675-0 (2/1)) Standard 3m sound level meter (SLM).
The SLM has tests in Acoustical and Electrical signal tests of frequency weighting, with standard theoretical Reference
Standard Instruments.
For test results of each items were made by observation of each instrument's display and also with NIM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Exp. Date	Exp. Date
Waveform Generator	3-210A	WY40217076	07-06-21	07-06-21
Waveform Generator	27511B	WY52002443	07-06-21	07-06-21
Digital Multimeter	3461A	WY5220049	07-06-21	07-06-21
Digital Multimeter	3461A	WY5220056	07-06-21	07-06-21
Digital Multimeter	3461A	WY5220074	07-06-21	07-06-21
Programmable Attenuator	3461A	WY5220074	07-06-21	07-06-21
Conductor Microphone	4030	2977000	07-06-21	07-06-21
Measuring Amplifier	3461A	WY5220074	07-06-21	07-06-21

2. This result of calibration was found accurate within the place of calibration for the calibrated item only.

3. The certificate is traceable to the international system of units (SI) as follows :

- 1.1 National Institute of Metrology (NIM)
- 1.2 Thailand Institute of Scientific and Technological Research (TISTR)

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No.: ACL22007
Job No.: VC65AC0044
Page: 2 of 8

Summary of Measurement Result

Parameter	Pass	Fail	Uncertainty	Maximum permitted uncertainty of measurement (dB)
1. Absolute sensitivity				±0.4
2. Self-generated noise				
3. Acoustical signal level of frequency weightings				
3.1 Flat			±0.3	±0.4
3.2 1/3 Oct			±0.3	±0.4
3.3 1/3 Oct			±0.3	±0.4
3.4 1/3 Oct			±0.3	±0.4
4. Electrical signal level of frequency weightings				
4.1 Flat			±0.3	±0.4
4.2 1/3 Oct			±0.3	±0.4
4.3 1/3 Oct			±0.3	±0.4
4.4 1/3 Oct			±0.3	±0.4
5. Frequency and time weighting at 1 kHz			±0.4	
6. Long-term stability			±0.1	
7. Level linearity on the reference level range			±0.2	
8. Level linearity including the level range control			±0.2	
9. Functional response				
10. Peak Channel level				±0.15
11. Electrical resolution				±0.25
12. Signal level stability				±0.3

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T. Ketch

Continuation of Calibration Certificate

Cert. No.: ACL22007
Job No.: VC65AC0044
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4. Electrical signal level of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	1/3 Oct	1/3 Oct	Acceptance Limit
10	0.0	-0.1	0.0	±0.2
15	0.0	0.1	0.0	±0.2
25	0.0	0.0	0.0	±0.2
50	0.0	0.0	0.0	±0.2
100	0.0	0.0	0.0	±0.2
200	0.0	0.0	0.0	±0.2
500	0.0	0.0	0.0	±0.2
1000	0.0	0.0	0.0	±0.2
2000	0.0	0.0	0.0	±0.2
5000	0.0	0.0	0.0	±0.2

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limit (dB)
1/3 Oct	20.0	0.0	±0.2
1/3 Oct	20.0	0.0	±0.2
1/3 Oct	20.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limit (dB)
Flat	20.0	0.0	±0.2
1/3 Oct	20.0	0.0	±0.2
1/3 Oct	20.0	0.0	±0.2

6. Long-term stability

Frequency Weighting	1st Reading (dB)	2nd Reading (dB)	Deviated Value (dB)	Acceptance Limit (dB)
1/3 Oct	20.0	20.0	0.0	±0.2

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T. Ketch

Continuation of Calibration Certificate

Cert. No.: ACL22007
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Result of calibration

1. Absolute sensitivity

Reference Frequency Weighting (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
125 (1/3 Oct)	20.0	0.0	±0.2

2. Self-generated noise

2.1 Noise level

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A-weight	13.1
C-weight	12.5
Flat	14.9

3. Acoustical signal level of frequency weightings

Note: Not-Fold acoustic response at 1 kHz (dB)

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limit (dB)
	Flat	1/3 Oct	1/3 Oct	
125	0.0	0.0	0.0	±0.2
1000	0.0	0.0	0.0	±0.2
2000	0.0	0.0	0.0	±0.2

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T. Ketch

Continuation of Calibration Certificate

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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
125.0	125.1	0.1	±0.2
135.0	135.1	0.1	±0.2
145.0	145.1	0.1	±0.2
155.0	155.1	0.1	±0.2
165.0	165.1	0.1	±0.2
175.0	175.1	0.1	±0.2
185.0	185.1	0.1	±0.2
195.0	195.1	0.1	±0.2
205.0	205.1	0.1	±0.2
215.0	215.1	0.1	±0.2
225.0	225.1	0.1	±0.2
235.0	235.1	0.1	±0.2
245.0	245.1	0.1	±0.2
255.0	255.1	0.1	±0.2
265.0	265.1	0.1	±0.2
275.0	275.1	0.1	±0.2
285.0	285.1	0.1	±0.2
295.0	295.1	0.1	±0.2
305.0	305.1	0.1	±0.2
315.0	315.1	0.1	±0.2
325.0	325.1	0.1	±0.2
335.0	335.1	0.1	±0.2
345.0	345.1	0.1	±0.2
355.0	355.1	0.1	±0.2
365.0	365.1	0.1	±0.2
375.0	375.1	0.1	±0.2
385.0	385.1	0.1	±0.2
395.0	395.1	0.1	±0.2
405.0	405.1	0.1	±0.2
415.0	415.1	0.1	±0.2
425.0	425.1	0.1	±0.2
435.0	435.1	0.1	±0.2
445.0	445.1	0.1	±0.2
455.0	455.1	0.1	±0.2
465.0	465.1	0.1	±0.2
475.0	475.1	0.1	±0.2
485.0	485.1	0.1	±0.2
495.0	495.1	0.1	±0.2
505.0	505.1	0.1	±0.2
515.0	515.1	0.1	±0.2
525.0	525.1	0.1	±0.2
535.0	535.1	0.1	±0.2
545.0	545.1	0.1	±0.2
555.0	555.1	0.1	±0.2
565.0	565.1	0.1	±0.2
575.0	575.1	0.1	±0.2
585.0	585.1	0.1	±0.2
595.0	595.1	0.1	±0.2
605.0	605.1	0.1	±0.2
615.0	615.1	0.1	±0.2
625.0	625.1	0.1	±0.2
635.0	635.1	0.1	±0.2
645.0	645.1	0.1	±0.2
655.0	655.1	0.1	±0.2
665.0	665.1	0.1	±0.2
675.0	675.1	0.1	±0.2
685.0	685.1	0.1	±0.2
695.0	695.1	0.1	±0.2
705.0	705.1	0.1	±0.2
715.0	715.1	0.1	±0.2
725.0	725.1	0.1	±0.2
735.0	735.1	0.1	±0.2
745.0	745.1	0.1	±0.2
755.0	755.1	0.1	±0.2
765.0	765.1	0.1	±0.2
775.0	775.1	0.1	±0.2
785.0	785.1	0.1	±0.2
795.0	795.1	0.1	±0.2
805.0	805.1	0.1	±0.2
815.0	815.1	0.1	±0.2
825.0	825.1	0.1	±0.2
835.0	835.1	0.1	±0.2
845.0	845.1	0.1	±0.2
855.0	855.1	0.1	±0.2
865.0	865.1	0.1	±0.2
875.0	875.1	0.1	±0.2
885.0	885.1	0.1	±0.2
895.0	895.1	0.1	±0.2
905.0	905.1	0.1	±0.2
915.0	915.1	0.1	±0.2
925.0	925.1	0.1	±0.2
935.0	935.1	0.1	±0.2
945.0	945.1	0.1	±0.2
955.0	955.1	0.1	±0.2
965.0	965.1	0.1	±0.2
975.0	975.1	0.1	±0.2
985.0	985.1	0.1	±0.2
995.0	995.1	0.1	±0.2
1005.0	1005.1	0.1	±0.2
1015.0	1015.1	0.1	±0.2
1025.0	1025.1	0.1	±0.2
1035.0	1035.1	0.1	±0.2
1045.0	1045.1	0.1	±0.2
1055.0	1055.1	0.1	±0.2
1065.0	1065.1	0.1	±0.2
1075.0	1075.1	0.1	±0.2
1085.0	1085.1	0.1	±0.2
1095.0	1095.1	0.1	±0.2
1105.0	1105.1	0.1	±0.2
1115.0	1115.1	0.1	±0.2
1125.0	1125.1	0.1	±0.2
1135.0	1135.1	0.1	±0.2
1145.0	1145.1	0.1	±0.2
1155.0	1155.1	0.1	±0.2
1165.0	1165.1	0.1	±0.2
1175.0	1175.1	0.1	±0.2
1185.0	1185.1	0.1	±0.2
1195.0	1195.1	0.1	±0.2
1205.0	1205.1	0.1	±0.2
1215.0	1215.1	0.1	±0.2
1225.0	1225.1	0.1	±0.2
1235.0	1235.1	0.1	±0.2
1245.0	1245.1	0.1	±0.2
1255.0	1255.1	0.1	±0.2
1265.0	1265.1	0.1	±0.2
1275.0	1275.1	0.1	±0.2
1285.0	1285.1	0.1	±0.2
1295.0	1295.1	0.1	±0.2
1305.0	1305.1	0.1	±0.2
1315.0	1315.1	0.1	±0.2
1325.0	1325.1	0.1	±0.2
1335.0	1335.1	0.1	±0.2
1345.0	1345.1	0.1	±0.2
1355.0	1355.1	0.1	±0.2
1365.0	1365.1	0.1	±0.2
1375.0	1375.1	0.1	±0.2
1385.0	1385.1	0.1	±0.2
1395.0	1395.1	0.1	±0.2
1405.0	1405.1	0.1	±0.2
1415.0	1415.1	0.1	±0.2
1425.0	1425.1	0.1	±0.2
1435.0	1435.1	0.1	±0.2
1445.0	1445.1	0.1	±0.2
1455.0	1455.1	0.1	±0.2
1465.0	1465.1	0.1	±0.2
1475.0	1475.1	0.1	±0.2
1485.0	1485.1	0.1	±0.2
1495.0	1495.1	0.1	±0.2
1505.0	1505.1	0.1	±0.2
1515.0	1515.1	0.1	±0.2
1525.0	1525.1	0.1	±0.2
1535.0	1535.1	0.1	±0.2
1545.0	1545.1	0.1	±0.2
1555.0	1555.1	0.1	±0.2
1565.0	1565.1	0.1	±0.2
1575.0	1575.1	0.1	±0.2
1585.0	1585.1	0.1	±0.2
1595.0	1595.1	0.1	±0.2
1605.0	1605.1	0.1	±0.2
1615.0	1615.1	0.1	±0.2
1625.0	1625.1	0.1	±0.2
1635.0	1635.1	0.1	±0.2
1645.0	1645.1	0.1	±0.2
1655.0	1655.1	0.1	±0.2
1665.0	1665.1	0.1	±0.2
1675.0	1675.1	0.1	±0.2
1685.0	1685.1	0.1	±0.2
1695.0	1695.1	0.1	±0.2
1705.0	1705.1	0.1	±0.2
1715.0	1715.1	0.1	±0.2
1725.0	1725.1	0.1	±0.2
1735.0	1735.1	0.1	±0.2
1745.0	1745.1	0.1	±0.2
1755.0	1755.1	0.1	±0.2
1765.0	1765.1	0.1	±0.2
1775.0	1775.1	0.1	±0.2
1785.0	1785.1	0.1	±0.2
1795.0	1795.1	0.1	±0.2
1805.0	1805.1	0.1	±0.2
1815.0	1815.1	0.1	±0.2
1825.0	1825.1	0.1	±0.2
1835.0	1835.1	0.1	±0.2
1845.0	1845.1	0.1	±0.2
1855.0	1855.1	0.1	±0.2
1865.0	1865.1	0.1	±0.2
1875.0	1875.1	0.1	±0.2
1885.0	1885.1	0.1	±0.2
1895.0	1895.1	0.1	±0.2
1905.0	1905.1	0.1	±0.2
1915.0	1915.1	0.1	±0.2
1925.0	1925.1	0.1	±0.2
1935.0	1935.1	0.1	±0.2
1945.0	1945.1	0.1	±0.2
1955.0	1955.1	0.1	±0.2
1965.0	1965.1	0.1	±0.2
1975.0	1975.1	0.1	±0.2
1985.0	1985.1	0.1	±0.2
1995.0	1995.1	0.1	±0.2
2005.0	2005.1	0.1	±0.2
2015.0	2015.1	0.1	±0.2
2025.0	2025.1	0.1	±0.2
2035.0	2035.1	0.1	±0.2
2045.0	2045.1	0.1	±0.2
2055.0	2055.1	0.1	±0.2
2065.0	2065.1	0.1	±

Cert. No. : ACL22667
Job No. : V065AC0044
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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.2

9. Time burst response

Time Weighting	Time burst (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	1.25		108.0	107.9	-0.1	±1.5
	2	5	117.0	116.9	-0.1	±1.2
	200	100	134.0	134.0	0.0	±1.0
Slow	2	5	108.0	108.0	0.0	±1.5
	100	100	117.4	117.6	0.2	±1.0
	0.25		90.0	90.8	0.8	±1.5
SIL	2		118.0	118.0	0.0	±1.2
	200	300	134.0	134.0	0.0	±1.0

10. Peak C-weight level

Number of cycle n	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	110.0	110.0	0.0	
One	136.0	136.0	0.0	±1.0

Number of cycle n	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	110.0	110.9	0.9	
relative half cycle	117.4	117.1	-0.3	±2.0
negative half cycle	117.4	118.1	0.7	±2.0

Tel: 02-010-0904 Fax: 020-200-7140

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Cert. No. : ACL22667
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11. Thermal indication

Measured value (dB)		Deviated Value	Acceptance Limits
Positive one half cycle	89.7	-0.1	±1.5

12. High level stability

Frequency Weighting	S.M. Display initial (dB)	S.M. Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	117.0	117.0	0.0	±0.3

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

End of Calibration Certificate

Tel: 02-010-0904 Fax: 020-200-7140

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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
1109 MOO 10, SOI SINTASARN 11, TAMBOON BANG KADU,
AMPHOE BANGKHLANG, PRAKARN PROVINCE, THAILAND
TEL: 080-210-0904 FAX: 080-200-7140



Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 181 Soi Udonrak 41, Sukhumvit Road, Bangkok,
Prakong, Bangkok 10260

Certificate No : 21-ACT-264
Request No : Req-2021-0793

Unit Under Calibration Details

Measurement Item : Acoustic Calibrator
Manufacturer : EMI
Model : CAL31
Serial Number : 84955
ID : UMEFNL1672561

Class : 1
Range : 94 dB / 1000 Hz
Integrity Status : Good

Calibration Environment and Details

Temperature : (23 ± 2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ± 10.0 hPa)
Received Date : 20 July 2021
Calibration Date : 20 July 2021
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	NV 35A	58079	EEL	14 May 2022
THD Multimeter	2015	1047765	NIMT	21 January 2022

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

Note

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

Calibrated By :
Mr. Noppadol Lungsat
Service Calibration Engineer

Approved By :
Mr. Pich Mechaiwim
Calibration Engineer Supervisor
Issue Date : 20 July 2021

INNOVATIVE INSTRUMENT CALIBRATION LAB
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AMPHOE BANGKHLANG, PRAKARN PROVINCE, THAILAND
TEL: 080-210-0904 FAX: 080-200-7140



Certificate No : 21-ACT-264

Request No : Req-2021-0793

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	93.88	-0.12	-	-	0.12	0.25

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
94 dB / 1000 Hz	1000.10	0.00	-	-	0.10	0.70

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

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (%)		Measured (%)			
94 dB / 1000 Hz	0.14		-		0.40	2.5

Note :

- Acceptance limit was IEC 60942:2017 Class 1
- The calibration results exclude the calibration pressure correction
- The calibration results exclude the atmospheric pressure correction

End of Calibration

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Thermo Scientific	G25A 1270	Tisch Environmental, Inc.	15052020	15 May 20	14 May 22	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	22P800	12 Mar 22	11 Mar 23	-
3	Flow Meter	Particular Matter (PM _{2.5})	Mesa Labs	DeltaCal DC1 159822	Innovative Instrument Co., Ltd.	21-AFM-095	31 Aug 21	30 Aug 22	-
4	Mass Flow Meter	VOCs	Alicat Scientific, Inc.	MB-5SCCM-D/5M 71015	Miracle International Technology Co., Ltd.	AD2110-274-0002	1 Nov 21	31 Oct 22	-
5	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5}) VOCs	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	21P2501	21 Jul 21	20 Jul 22	-
6	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5}) VOCs	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	22H772	5 Apr 22	4 Apr 23	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1201497726	UAE Consultant Co., Ltd.	17112021	17 Nov 21	16 Nov 22	-
8	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1201778105	UAE Consultant Co., Ltd.	17112021	17 Nov 21	16 Nov 22	-
9	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1201778106	UAE Consultant Co., Ltd.	17112021	17 Nov 21	16 Nov 22	-
10	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1201778107	UAE Consultant Co., Ltd.	17112021	17 Nov 21	16 Nov 22	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
11	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	CC159599 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01QC	30 Jul 19	30 Jul 22	-
12	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1200906880	UAE Consultant Co.,Ltd.	30112021	30 Nov 21	29 Nov 22	-
13	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201497730	UAE Consultant Co.,Ltd.	30112021	30 Nov 21	29 Nov 22	-
14	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201497732	UAE Consultant Co.,Ltd.	30112021	30 Nov 21	29 Nov 22	-
15	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201497733	UAE Consultant Co.,Ltd.	30112021	30 Nov 21	29 Nov 22	-
16	Standard Gases (Mixture)	Carbon Monoxide	Airgas	CC159599 2015PSIG	Airgas an Air Liquide company	160-401526192-1	30 Jul 19	30 Jul 22	-
17	Wind Speed/Wind Direction	WS/WD	Met One Instruments	580 / X23725 034B / X21189	Met One Instrument, Inc.	274/21	20 May 21	19 May 22	-
18	Wind Speed/Wind Direction	WS/WD	Met One Instruments	580 / X10448 034B / X10353	Thai Meteorological Department	273/21	20 May 21	19 May 22	-
19	Wind Speed/Wind Direction	WS/WD	Met One Instruments	580 X20003	Thai Meteorological Department	272/21	20 May 21	19 May 22	-
20	Wind Speed/Wind Direction	WS/WD	LSI LASTEM	E-LOG305 19040308	Thai Meteorological Department	385/21	16 Aug 21	15 Aug 22	-
21	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 HAMEHU5M	UAE Consultant Co.,Ltd.	12072021	12 Jul 21	11 Jul 22	-
22	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370	UAE Consultant Co.,Ltd.	02062021	2 Jun 21	1 Jun 22	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
23	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 93JN1MN9	UAE Consultant Co.,Ltd.	16072021	16 Jul 21	15 Jul 22	-
24	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 KWWV1R96	UAE Consultant Co.,Ltd.	09062021	9 Jun 21	8 Jun 22	-
25	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-

Certificate of Calibration

Calibration Certification Information			
Cal. Date: May 15, 2020	Readometer S/N: 438520	Val: 250	°K
Operator: Jim Tully	Calibrator S/N: 1270	Part: 7000.0	mm Hg
Calibration Model #: Q25A			

Run	Vol. Init (m3)	Vol. Final (m3)	dVol. (m3)	dTime (min)	dP (mm Hg)	dH (in H2O)
1	1	2	1	1.3700	3.2	2.00
2	3	4	1	0.3740	6.4	4.00
3	5	6	1	0.3670	7.5	5.00
4	7	8	1	0.3280	8.6	5.50
5	9	10	1	0.5840	12.7	8.00

Data Tabulation				
Vstd (m3)	Qstd (g-std)	$\sqrt{\Delta H \left(\frac{Pa}{Pa_{std}} \right) \left(\frac{V_{std}}{V_a} \right)}$	Va	$\sqrt{\Delta H \left(\frac{Pa}{Pa_{std}} \right) \left(\frac{V_{std}}{V_a} \right)}$
0.9900	0.7226	1.4102	0.9957	0.8881
0.9858	1.0211	1.3943	0.9915	1.0179
0.9830	1.1347	1.2296	0.9875	1.1413
0.9815	1.1867	1.3185	0.9863	1.1935
0.9774	1.4290	1.8208	0.9831	1.4373
QSTD		m= 1.99495	QA	
		b= -0.02954		
		r= 0.99998		

Calculations:	
$V_{std} = \Delta V / (P_a - P_{std}) (1 - \Delta P / P_a)$	$V_a = \Delta V / (P_a - P_{std}) (1 - \Delta P / P_a)$
$Q_{std} = V_{std} / \Delta t_{me}$	$Q_a = V_a / \Delta t_{me}$
For subsequent flow rate calculations:	
$Q_{std} = 1/n \left(\sqrt{\Delta H \left(\frac{P_a}{P_{std}} \right) \left(\frac{V_{std}}{V_a} \right)} \right)$	$Q_a = 1/n \left(\sqrt{\Delta H \left(\frac{P_a}{P_{std}} \right) \left(\frac{V_{std}}{V_a} \right)} \right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Bar:	
dH: calibrator manometer reading (in H2O)	
dP: readometer manometer reading (mm Hg)	
Tat: actual absolute temperature (°K)	
Pat: actual barometric pressure (mm Hg)	
b: intercept	
m: slope	

RECALIBRATION	
US EPA recommends annual recalibration per 1996 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30	

Tisch Environmental, Inc.
145 South Miami Avenue
Village of Ovees, OH 43002

www.tisch-env.com
TOLL FREE: (877) 263-7630
FAX: (513) 467-9009

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 2: EQUIPMENT CALIBRATION AND TESTING SERVICES
3044 ENTAMAKORN ROAD 501 18, SUKHUMVIT, SHAPE, JANG, BANGKOK 1025
TEL: 6-25713900-24 FAX: 6-2519-9484

Certificate of Calibration

Certificate No.: Z2P100
Page: 1 of 2

Equipment: U-Tube Manometer
Manufacturer: Dwyer
Model: 1221-25-WM
Serial No.: -
ID No.: UAE EPV 0022560

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 2: Equipment Calibration and Testing Services.

Condition As-Received: Used Item
Received Date: 03 March 2022
Calibration Date: 12 March 2022

Reference: 2023-013 YRSC Submitted by: United Analytical and Engineering Consultant Co., Ltd.
Ambient Temperature: $(20 \pm 2) ^\circ\text{C}$
Relative Humidity: $(50 \pm 10) \%$
Atmospheric Pressure: 1010 mbars
81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakharong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Precision Measuring Instruments Standard according to in-house calibration procedure CP-054, using "DHD-R 5-1" Calibration of Pressure Gauges, Edition 03/2014 " as a guideline.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PCT06P	1189	MP-0110-21	09 Aug 2022

- This result of calibration was made on request at the point specified by customer.
- Scale and conversion factor is 1 kPa = 4.0146223 inHg.
- This instrument was used clean air as pressure media.
- This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.
- This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.
- The certificate is valid only to the item calibrated on date and place of calibration.
- This Calibration is traceable to the International System of Unit maintained at - National Institute of Metrology Thailand (NIMT)

Calibrated by: Sawit Anussorn
Issue Date: 14 March 2022

Approved Signature: Alitapal P.
[] Phairat Phairatpal
[] Dan Suvannadit
[x] Alitapal Phairatpal

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B. 0262413



Cert.No.: Z2P100
Page: 2 of 2

Result of calibration: Without adjustment
Function: Pressure Measurement
Increasing Pressure

Range: 0 inH2O to 36 inH2O
Scale Interval: 0.1 inH2O (The Fifth Estimate)

Applied Pressure (inH2O)	High-port side (inH2O)	Low-port side (inH2O)	dP (inH2O)	Error (inH2O)
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.02
12.00	6.00	-6.00	12.00	0.02
14.00	7.00	-7.00	14.00	0.04
16.00	8.00	-8.00	16.00	0.04
18.00	9.00	-9.00	18.00	0.04
20.00	10.00	-10.00	20.00	0.04
22.00	11.00	-11.00	22.00	0.02
24.00	12.00	-12.00	24.00	0.02
26.00	13.00	-13.00	26.00	0.02
28.00	14.00	-14.00	28.00	0.04
30.00	15.00	-15.00	30.00	0.04
32.00	16.00	-16.00	32.00	0.04
34.00	17.00	-17.00	34.00	0.04
36.00	18.00	-18.00	36.00	0.16

The uncertainty of measurement was ± 0.11 inH2O
* UUC = Unit Under Calibration

* dP = High-port side - Low-port side

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

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เอกสารไม่ควบคุม
A. 1099526

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
715/5001 15, SOI 25, KHAOYANG, SUKHUMVIT ROAD, BANG KOK
HONGKONG, PHRAKHAO, PHRAKHAO PROVINCE, BANG KOK, THAILAND
TEL: 080-2115-9600 FAX: 080-2115-7100



Certificate of Calibration

Customer: UNITED ANALYTICAL AND ENGINEERING CONSULTANT CO., LTD.
Name: UNITED ANALYTICAL AND ENGINEERING CONSULTANT CO., LTD.
Address: 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakharong, Bangkok 10260
Certificate No.: Z1-ATM-055
Request To: May 2021-0508

Unit Under Calibration Details

Measurement Item: Air Flow Meter
Manufacturer: DGI
Model: d40aCo DCI
Serial Number: 159822
ID: UAE EPV 0022560
Location of Calibration: LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature: $(23^\circ\text{C} \pm 1^\circ\text{C})$
Humidity: $(55\% \pm 3\%)$
Barometric Pressure: $(1013\text{ hPa} \pm 10\text{ hPa})$
Received Date: 22 July 2021
Calibration Date: 14 August 2021
Calibration Procedure: In-house method CP-ATM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Recalibration
Air Flow Meter	Calibrator 4 High Flow	1000012042	Traceable	21 May 2022

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

Note:

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

Calibration By: MC
Mr. Supakorn Luangul
Service Calibration Engineer

Approved By: MC
Mr. Pich Mahasarak
Calibration Engineer Supervisor
Issue Date: 1 September 2021

This certificate is valid only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory Co., Ltd.

IMP-008-001M, 01 May 2021 (Issue date 01/05/21)

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Certificate No : 21-RTM-064
Request No : Req-2021-0648

Result of Calibration :

Flow Setting	STD Flow Reading	UTC Flow Reading	Correction Flow	Uncertainty
1.791	1.791	1.791	0.000	0.21
14.5	14.585	14.54	-0.045	0.22
15.8	15.899	15.88	-0.019	0.23
15.8	15.897	15.88	-0.017	0.24
16.8	16.695	16.72	0.025	0.25
18.3	18.286	18.40	0.114	0.25

Note
STD : Standard
UTC : Data Under Calibration
* Indicate flow corrected

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

Rev. 208-ATM-01 Rev. 01 issue date 01/05/20

เอกสารไม่ควบคุม

Certificate of Calibration

Certificate No : 21-RTM-064
Request No : Req-2021-0648

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,
Name :
Address : 83 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakasong,
Bangkok 10250

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : AGI
Model : 4440d DC1
Serial Number : 159022
ID : UWEETM-0082561
Resolution : 0.1 PCS
Sensor Model : 2182 (TD)
Sensor SN : MRE0624064-081
Sensor ID : UAL06FM-0092081
Intersect Sensor : Used

Calibration Environment and Details

Temperature : 25.4°C ± 0.1°C
Humidity : 55%RH ± 2%RH
Received Date : 22 July 2021
Calibration Date : 31 August 2021
Calibration By : Mr. Sirachok Rongkavonkarn
Location of Calibration : LAB 2 Temperature
Calibration Method : In-house method CP-T104-06 by Comparison With Standard Relative Humidity Meter and Standard Thermometer with RTD Probe in Humidity / Temperature Chamber

Reference Standard

Standard Thermometer Model: GT11, S/N: 12090877, Which was calibration on 30 March 2021, Calibration of Certificate No.: QR21-0719 and Relative Humidity Meter Model: HP22-A, S/N: 61629676, Which was calibration on 28 September 2020, Calibration of Certificate No.: QR20-1451

Traceability

This Certificate is traceable to SI Unit through Quality Robson Co., Ltd., NIST-GMSD Accreditation No.: Calibration 0293

Note

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

Calibrated By :
Senior Calibration Engineer

Approved By :
Mr. Pank Mahaveon
Calibration Engineer Supervisor
Issue Date : 1 September 2021

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

Rev. 208-ATM-01 Rev. 01 issue date 01/05/20

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Certificate No : 21-RTM-064
Request No : Req-2021-0958

Calibration Results : Without Adjustment

Temperature Calibration : Filter Temperature (TD)

Temperature Range (°C)	Without Adjustment (°C)			Uncertainty (°C)
	STD Reading (°C)	UTC Reading (°C)	Correction (°C)	
10	19.936	19.1	-0.836	0.19
25	24.971	25.1	0.129	0.19
30	30.836	30.2	-0.636	0.19
35	35.833	35.2	-0.633	0.19
40	40.834	40.2	-0.634	0.19

Temperature Calibration : Ambient Temperature (Ta)

Temperature Range (°C)	Without Adjustment (°C)			Uncertainty (°C)
	STD Reading (°C)	UTC Reading (°C)	Correction (°C)	
10	19.936	19.1	-0.836	0.19
25	24.971	25.1	0.129	0.19
30	30.836	30.2	-0.636	0.19
35	35.833	35.2	-0.633	0.19
40	40.834	40.5	-0.334	0.19

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

Rev. 208-ATM-01 Rev. 01 issue date 01/05/20

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MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD.
214 Bangwaek Rd, Bangwaek Bangkok Bangkok 10160
Tel : 0-2865-4647-8 Fax : 0-2865-4649 http://www.mit.in.th



CALIBRATION CERTIFICATE

Certificate No : AD2110-274-0002
Date Issued : 02-Nov-21

Customer : United Analyst and Engineering Consultant Co., Ltd.
83 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakasong, Bangkok 110260

Equipment : Mass Flow Meter

Manufacturer : Alicat Scientific
Model : MB-SSCCM-D/SM
Serial No. : 71015
ID No./Tag No. : UAE/EMA2.119/2555
Date Received : 22-Oct-21
Date of Calibration : 01-Nov-21

Calibrated by : Mr. Sorjjet Orbus

Calibration Method or Calibration Procedure Used

In-house method : CP-34 by comparison against mass flow calibrator.

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

Result of Calibration

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

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Approved by : K. Nathapong
(Mr. Nathapong Krudum)



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Certificate No.: AD2110-274-0002

Environment: Ambient temperature: (23 ± 2) °C
Relative humidity: (50 ± 15) % RH

Capacity Range: 5 ml/min

Calibration Media: Air

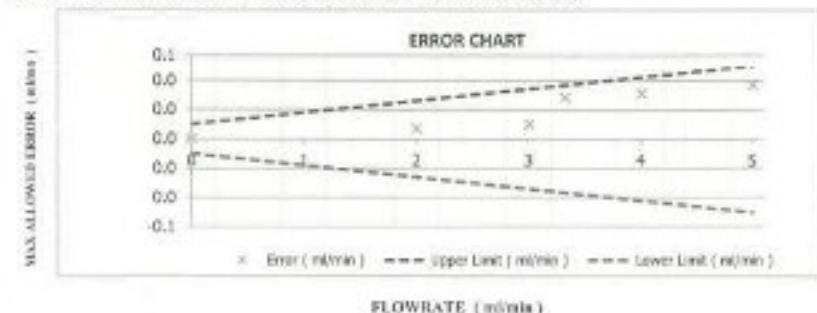
Type: Mass Flowmeter

Unit Under Calibration Reference Condition: Pressure: 101.325 kPa(abs), 25 °C, Air

Temperature (°C)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty (± ml/min)
24.32	100.87	0	0 *	0	0.063
24.36	100.95	2.002	1.995 *	0.007	0.094
24.41	101.03	3.008	2.998	0.010	0.13
24.46	101.07	3.333	3.305	0.028	0.14
24.52	101.14	4.012	3.981	0.031	0.16
24.56	101.26	5.005	4.968	0.037	0.19

Error = Unit Under Calibration - Standard

Marked * are not included in the NSO-ONSC accreditation schedule for our laboratory.



Page 2 of 3

เอกสารไม่ควบคุม

Certificate No.: AD2110-274-0002

Note: The actual flow rate is determined by the equation:

$$Q_{actual} = Q_{ref} \times \frac{P_{ref}}{P_{actual}} \times \frac{T_{actual}}{T_{ref}}$$

Q = Flow rate
P = Absolute pressure
T = Absolute temperature
Subscript "Meas" = Measurement condition
Subscript "Ref" = Reference condition

Traceability of Certificate:

The International System of Units (SI) through

NIMT Calibration Certificate No. MW-0003-20 for Mass Flow Calibrator (20 SCCM) Serial No. G510971G20, Due 22-Jan-23

End of Certificate

Page 3 of 3

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 2: EQUIPMENT CALIBRATION AND TESTING SERVICES
514/1 PATTANAKARN ROAD SOI 18, SANGHAN, SANGHAN, BANGKOK 10250
TEL: 0-2715-1008-34 FAX: 0-2715-4484



Certificate of Calibration

Certificate No.: 21P2501
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Suigo

Model: -

Serial No.: -

ID No.: UAEANW1262550

Condition As-Received: Used Item

Received Date: 20 July 2021

Calibration Date: 21 July 2021

Reference: 2107-0570W50

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 9002 mbar

81 Soi Udonrak 41, Sukhumvit Road, Bangkok,
Prawetbang, Bangkok 10280

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard, according to in-house calibration procedure CP-P10, using "DMD-41 6-1 : Calibration of Pressure Gauges, Edition 03/2014" as a reference.

Condition of this result of calibration

1. Reference standards Instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DP-142	542505246	MP-0553-21	18 Apr 2022

2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.

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

4. This instrument was used clean air as pressure media.

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

6. This Calibration is traceable to the International System of Unit maintained at:

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Savit Ausornse
Issue Date: 28 July 2021

Approved Signatory: Attapol P.
[] Pradise Pradipol
[] Sura Suvannari
[x] Attapol Panumart

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0264464



Cert.No.: 21P2501
Page: 2 of 2

Result of calibration: Without adjustment
Function: Absolute Pressure Measurement

Range: 960 hPa to 1030 hPa
Scale Interval: 1 hPa, The Fifth Estimate

Increasing Pressure

Applied Pressure (hPa)	965.89	966.80	967.32	968.60	969.89	970.73	970.98	970.98
UUC* Indication (hPa)	965.0	970.0	966.0	969.0	969.0	970.0	970.0	970.0
Error (hPa)	1.31	0.40	-0.32	-0.60	-0.99	-0.73	-0.98	-0.98

Decreasing Pressure

Applied Pressure (hPa)	1026.86	1027.50	1028.63	1029.67	990.46	980.19	969.47	968.34
UUC* Indication (hPa)	1030.0	1029.0	1030.0	1028.0	968.0	960.0	970.0	969.0
Error (hPa)	-0.86	-0.50	-0.33	-0.67	-0.46	-0.19	0.53	1.46

The uncertainty of measurement was ± 0.30 hPa

*UUC = Unit Under Calibration

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

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1062242



Certificate of Calibration

Certificate No.: 22H772
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE/ANV/0012548

Condition As-Received: Used Item

Received Date: 30 March 2022

Calibration Date: 01 April 2022

Reference: 2023-1124W-SC

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (30 ± 20) %

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

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

61 Soi Udomsak 41, Sukhumvit Road, Bangkok,
Prakhanong, Bangkok 10250

Procedure used: Calibration were conducted using in-house calibration procedure CP-002 according to comparison
with standard certified minor sensor for humidity measurement function and comparison with standard
temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments:

Instruments	Model	Serial No.	Certificate No.	Due Date
1) Standard Calibrated Minor Hygrometer Sensor	Dew Point 8	31683	19714	17 Sep 2022
2) Standard Humidity/Temperature Meter	430	1003007	TH-0003-31	01 Jul 2022

2. The 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 maintained at:-

- National Institute of Standards and Technology (NIST), The United States of America
- National Institute of Metrology Thailand (NIMT)

Calibrated by: Sornchai Gunvor
Issue Date: 08 April 2022

Approved Signatory:

[✓] Chakrit Watanajit
[] Pongthipon Tontayakul
[] Viporn Tanthayawatt

เอกสารไม่ควบคุม
0285424



Cert. No.: 22H772
Page: 2 of 2

Result of Calibration:

Function:

Without Adjustment

Humidity measurement

Reference Temperature (°C)	Standard Humidity (%RH)	UUC* Reading (%RH)	Error (%RH)	Uncertainty of Measurement (%RH)
25.0	40.1	40	-0.1	1.6
25.0	60.0	60	0.0	1.6
25.0	80.0	76	-4.0	2.0

Result of Calibration:

Function:

Without Adjustment

Temperature measurement

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (°C)
20.00	21.5	1.48	0.72
28.80	30.0	0.02	0.72
40.00	39.5	-0.53	0.72

UUC*: Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor k = 2.00, providing confidence level approximately 95%.

-o-o-

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1104140



United Analyst and Engineering Consultant Co., Ltd.
334/1 Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10250
Tel: 0 2763 2828 Fax: 0 2763 2830 www.uaeconsultant.com E-mail: uae@uaeconsultant.com



United Analyst and Engineering Consultant Co., Ltd.
334/1 Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10250
Tel: 0 2763 2828 Fax: 0 2763 2830 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date: Nov 17, 2021

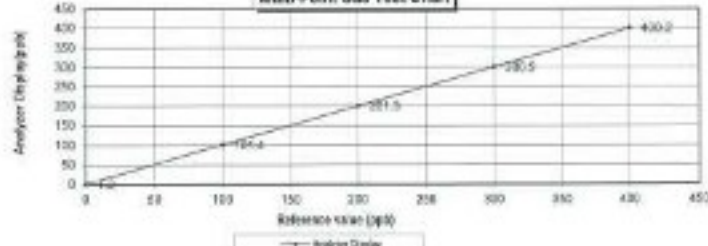
Equipment: Gas Analyzer (NO_x) Model: 421
Manufacturer: Thermo Scientific Serial Number: 1201497726

Standard Gas Concentration	Dilutor Detail
Sulphur Dioxide (SO ₂) 44.75 PPM	Manufacturer: Thermo Scientific
Nitric Oxide (NO) 45.35 PPM	Model: 1461
Methane (CH ₄) - PPM	Serial Number: 1180548071
Carbon Monoxide (CO) 1007 PPM	
Cylinder No.: CC159599	
Expiration Date: Jul 30, 2022	

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero 0.0	1.2	1.28	1.28	1.28
Level 2 20.02%	100.0	1.48	1.38	1.38
Level 3 40.04%	200.3	1.38	0.65	0.65
Level 4 60.06%	300.9	0.98	0.30	0.30
Level 5 80.08%	400.2	0.28	0.05	0.05
Remark: Measuring Range 500.0 ppb		Average Difference (%)		0.72
Acceptable Limit ± 5%				

Multi-Point Gas Test Chart



Calculated by
Sornchai G.
17 Nov 2021

Approved by
P. Watanajit
17 Nov 2021

MULTI-POINT GAS TEST REPORT

Test Date: Nov 17, 2021

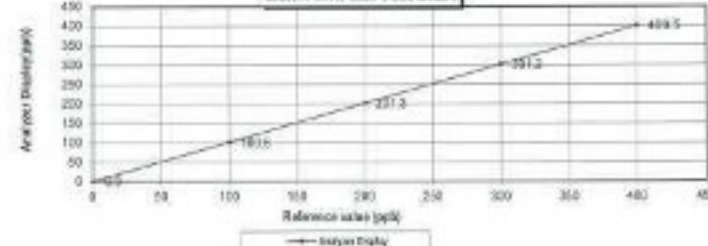
Equipment: Gas Analyzer (NO_x) Model: 421
Manufacturer: Thermo Scientific Serial Number: 1201778105

Standard Gas Concentration	Dilutor Detail
Sulphur Dioxide (SO ₂) 44.75 PPM	Manufacturer: Thermo Scientific
Nitric Oxide (NO) 45.35 PPM	Model: 1461
Methane (CH ₄) - PPM	Serial Number: 1180548071
Carbon Monoxide (CO) 1007 PPM	
Cylinder No.: CC159599	
Expiration Date: Jul 30, 2022	

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero 0.0	2.9	0.90	0.90	0.90
Level 2 20.02%	100.0	0.60	0.60	0.60
Level 3 40.04%	200.3	1.30	0.65	0.65
Level 4 60.06%	300.9	1.38	0.40	0.40
Level 5 80.08%	400.2	0.58	0.13	0.13
Remark: Measuring Range 500.0 ppb		Average Difference (%)		0.50
Acceptable Limit ± 5%				

Multi-Point Gas Test Chart



Calculated by
Sornchai G.
17 Nov 2021

Approved by
P. Watanajit
17 Nov 2021

MULTI-POINT GAS TEST REPORT

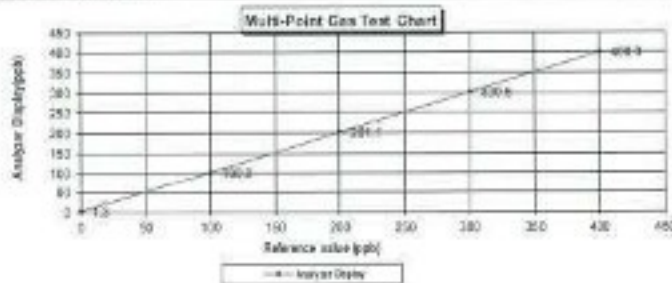
Test Date : Nov 17, 2021

Equipment : Gas Analyzer (NO_x) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1201778107

Standard Gas Concentration		Diluter Detail	
Sulphur Dioxide (SO ₂)	44.75	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	45.35	PPM	Model : 146
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	1007	PPM	
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.9	0.90	0.89
Level 3	40.00%	200.0	201.1	1.10	0.55
Level 4	60.00%	300.0	300.6	0.60	0.20
Level 5	80.00%	400.0	400.3	0.30	0.07
Remark : Measuring Range : 500.0 ppb			Average Difference (%)		
			0.60		



Calculate by
Srichai y.
12, 11, 21

Approve by
Patima u.
12, Nov, 2021

MULTI-POINT GAS TEST REPORT

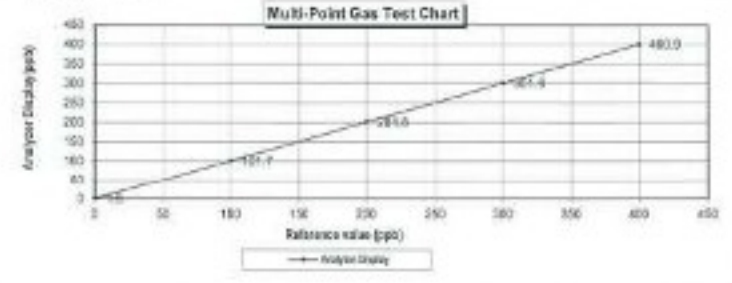
Test Date : Nov 17, 2021

Equipment : Gas Analyzer (NO_x) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1201778107

Standard Gas Concentration		Diluter Detail	
Sulphur Dioxide (SO ₂)	44.75	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	45.35	PPM	Model : 146
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	1007	PPM	
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	1.6	1.60	1.60
Level 2	20.00%	100.0	101.7	1.70	1.67
Level 3	40.00%	200.0	201.8	1.80	0.89
Level 4	60.00%	300.0	301.6	1.60	0.53
Level 5	80.00%	400.0	400.0	0.00	0.22
Remark : Measuring Range : 500.0 ppb			Average Difference (%) : 0.70		



Calculate by
Srichai y.
12, 11, 21

Approve by
Patima u.
12, Nov, 2021

MULTI-POINT GAS TEST REPORT

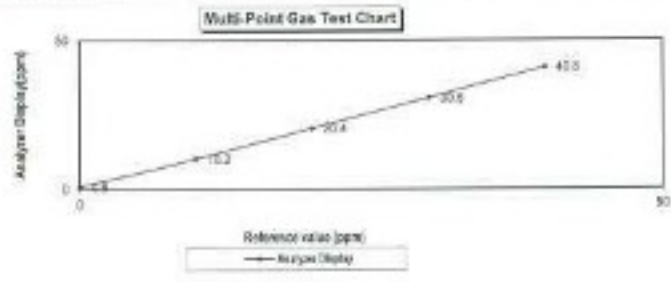
Test Date : Nov 30, 2021

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1201090688

Standard Gas Concentration		Diluter Detail	
Sulphur Dioxide (SO ₂)	44.75	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	45.35	PPM	Model : 146
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	1007	PPM	
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.2	0.2	2.0	2.0
Level 3	40.00%	20.0	20.4	0.4	2.0	2.0
Level 4	60.00%	30.0	30.6	0.6	2.0	2.0
Level 5	80.00%	40.0	40.8	0.8	2.0	2.0
Remark : Measuring Range			50.0 ppm	Average Difference (%)		1.75



Calculate by
Srichai y.
30, 10, 21

Approve by
Patima u.
30, Nov, 2021

MULTI-POINT GAS TEST REPORT

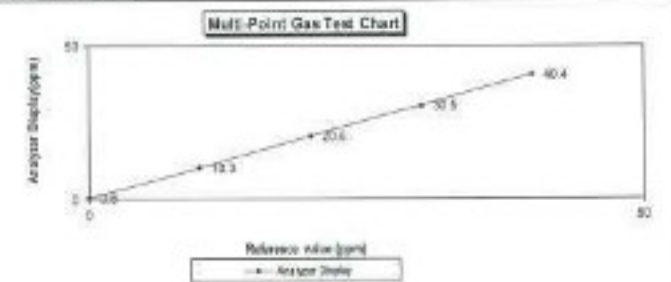
Test Date : Nov 30, 2021

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1201097730

Standard Gas Concentration		Diluter Detail	
Sulphur Dioxide (SO ₂)	44.75	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	45.35	PPM	Model : 146
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	1007	PPM	
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppm)		Analyzer Display (ppm)	Difference Error	Per-cent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.3	0.3	2.9
Level 3	40.00%	20.0	20.6	0.6	2.9
Level 4	60.00%	30.0	30.7	0.7	1.6
Level 5	80.00%	40.0	40.4	0.4	1.0
Remark : Measuring Range			50.0 ppm	Average Difference (%)	
				1.81	



Calculate by
Srichai y.
30, 10, 21

Approve by
Patima u.
30, Nov, 2021

MULTI-POINT GAS TEST REPORT

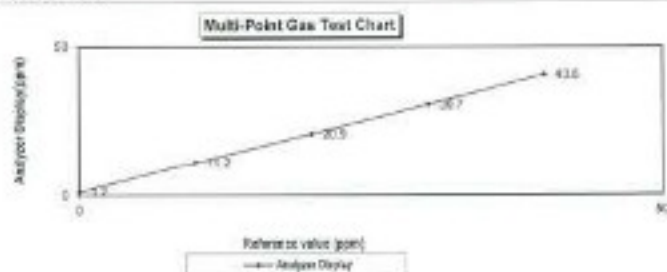
Test Date : Nov 30, 2021

Equipment : Gas Analyzer (CO) Model : 48
Manufacturer : Thermo Scientific Serial Number : 1281497732

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.75 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.35 PPM	Model :	146
Methane (CH ₄)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	1007 PPM		
Cylinder No. :	CC155589		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	1.2	1.2	1.2	1.2
Level 2	20.00%	10.0	11.2	1.2	10.7	10.7
Level 3	40.00%	20.0	20.9	0.9	4.3	-4.3
Level 4	60.00%	30.0	30.7	0.7	2.3	2.3
Level 5	80.00%	40.0	40.6	0.6	1.5	1.5
Remark : Measuring Range			50.0 ppm	Average Difference (%)		4.08



Calculate by
Srichai Y.
30.11.21

Approve by
[Signature]
30. Nov. 2021

Page 1 of 1

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MULTI-POINT GAS TEST REPORT

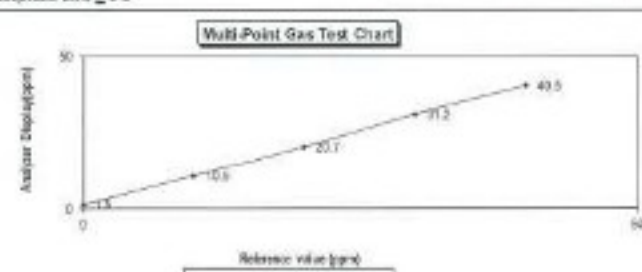
Test Date : Nov 30, 2021

Equipment : Gas Analyzer (CO) Model : 48
Manufacturer : Thermo Scientific Serial Number : 1281497733

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.75 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.35 PPM	Model :	146
Methane (CH ₄)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	1007 PPM		
Cylinder No. :	CC155589		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	1.5	1.5	1.5	1.5
Level 2	20.00%	10.0	10.9	0.9	8.3	8.3
Level 3	40.00%	20.0	20.7	0.7	3.4	3.4
Level 4	60.00%	30.0	31.7	1.7	5.6	5.6
Level 5	80.00%	40.0	40.5	0.5	1.2	1.2
Remark : Measuring Range			50.0 ppm	Average difference (%)		3.64



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Srichai Y.
30.11.21

Approve by
[Signature]
30. Nov. 2021

Page 1 of 1

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CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N99E15AD10C Reference Number: 180-401528132-1
Cylinder Number: CG180399 Cylinder Volume: 144.4 CF
Laboratory: 124 - Plumerville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12810 Valve Outlet: 950
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Jul 30, 2019
Expiration Date: Jul 30, 2022

Airgas Specialty Gases
Airgas USA, LLC
4001 Easton Road
Bldg 1
Plumerville, PA 17359
Airgas.com

Certification performed in accordance with Airgas Traceability Protocol for Analytical and Calibration of Gas Calibration Systems (May 2012) document with ISO 9001:2015 using the assay procedures listed. Analytical methodology does not require calibration for analytical reference. This cylinder has a dual analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration product. All concentrations are given in accordance with the following table.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	44.75 PPM	01	$\pm 0.05\%$ NOT Testable	8/03/2019, 8/10/2019
NITRIC OXIDE	45.00 PPM	44.75 PPM	01	$\pm 0.05\%$ NOT Testable	8/03/2019, 8/10/2019
SULFUR DIOXIDE	45.00 PPM	43.35 PPM	01	$\pm 1\%$ NOT Testable	8/03/2019, 8/10/2019
CARBON MONOXIDE	1000 PPM	1007 PPM	01	$\pm 0.45\%$ NOT Testable	8/03/2019
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No.	Concentration	Uncertainty	Expiration Date
LMMA	180399	KAL 804215	20.00 PPM NITRIC OXIDE/NITROGEN	$\pm 0.45\%$	Nov 08, 2021
MTM	052411	KAL 804307	50.00 PPM NITRIC OXIDE/NITROGEN	$\pm 0.50\%$	Nov 12, 2021
MTM	180399	KAL 804215	20.00 PPM NOX/NITROGEN	$\pm 0.45\%$	Nov 08, 2021
MTM	052411	KAL 804307	50.00 PPM NOX/NITROGEN	$\pm 0.50\%$	Nov 12, 2021
MTM	052411	KAL 804307	45.00 PPM SULFUR DIOXIDE/NITROGEN	$\pm 1.0\%$	Jul 20, 2022
MTM	052411	KAL 804307	100.0 PPM CARBON MONOXIDE/NITROGEN	$\pm 0.45\%$	Nov 12, 2021
ANALYTICAL EQUIPMENT					
Instrument Make/Model	Analytical Principle	Last Multi-point Calibration			
CO, NO, NOX FTR 00020902	FTR	Jul 22, 2019			
NO, NOX FTR 00020902	FTR	Jul 22, 2019			
NO, NOX FTR 00020902	FTR	Jul 22, 2019			
NO, NOX FTR 00020902	FTR	Jul 22, 2019			

Test Data Available Upon Request

NOTES: RANK 51519-CA003
PGR 6219022210
GROSS WEIGHT: 28.0 KG
NET WEIGHT: 4.1 KG



Signature on File
Approved for Release

Page 1 of 1 180-401528132-1

เอกสารไม่ควบคุม

THAI METEOROLOGICAL DEPARTMENT

Calibration Certificate

4555 Sukhumvit, Bangna, Bangkok 10260 Tel. 055-454-2804/0-2399-0468

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 20 May, 2021

Certification No. 27421

Page : 1 of 2

Object : Weather Station
Manufacturer : Met One Instruments
Model No. : Data Logger 580 Wind Sensor 0318
Mfr. Code : Data Logger X23725 Wind Sensor X21189
Customer : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsak 41, Sukhumvit Road,
Bangkok, Prachinong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1009.2 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 BN 91503

: HOOK GAGE NO 1425 : Wind Airt Plating Board

N.I.S.T. Test Reference Number 7310241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 123629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

Calibrated by : [Signature]
Mr. Watchornai Seebat
Mechanical Engineer

Signal : [Signature]
Mr. Pood Preesut





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel.081-454-2584/0-2399-0469

The Result of Calibration

Certification No. 274/21

20 May, 2021

Page : 2 of 2

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Pressure	Velocity	Correction
mmHg	inches	inches	hPa	mm/sec	mm/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.00	-	-	-	7.0	0.00
9.02	-	-	-	9.0	0.02
11.01	-	-	-	11.0	0.01
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	-0.59
17.02	-	-	-	17.0	-0.58
20.02	-	-	-	21.0	-0.59

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

Calibrated by :

Mr. Wacharapol Seiwat
Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau
เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel.081-454-2584/0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 20 May, 2021

Certification No. 273/21

Page : 1 of 2

Object : Weather Station

Manufacturer : Met One Instruments

Model No. : Data Logger 580 Wind Sensor 0348

Mfg Code : Data Logger X10448 Wind Sensor X10263

Customer : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1029.6 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 542 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731241460

: Ultrasonic Anemometer Model DA-850-STV (sensor TR-60NH)

Serial Number 110730029 (sensor 120629585)

JAPAN QUALITY ASSURANCE ORGANIZATION

Calibrated by :

Mr. Wacharapol Seiwat
Mechanical Engineer

Signed :

Mr. Pichai Promrat

Authorized Signatory

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THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel.081-454-2584/0-2399-0469

The Result of Calibration

Certification No. 273/21

20 May, 2021

Page : 2 of 2

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Pressure	Velocity	Correction
mmHg	inches	inches	hPa	mm/sec	mm/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.00	-	-	-	7.0	0.00
9.02	-	-	-	9.0	0.02
11.01	-	-	-	11.0	0.01
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

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

Calibrated by :

Mr. Wacharapol Seiwat
Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau
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THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel.081-454-2584/0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 20 May, 2021

Certification No. 272/21

Page : 1 of 2

Object : Weather Station

Manufacturer : Met One Instruments

Model No. : Data Logger 580 Wind Sensor 0348

Mfg Code : Data Logger X20013 Wind Sensor X21187

Customer : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1029.6 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 542 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731241460

: Ultrasonic Anemometer Model DA-850-STV (sensor TR-60NH)

Serial Number 110730029 (sensor 120629585)

JAPAN QUALITY ASSURANCE ORGANIZATION

Calibrated by :

Mr. Wacharapol Seiwat
Mechanical Engineer

Signed :

Mr. Pichai Promrat

Authorized Signatory

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangkok, Bangkok 10260 Tel. 081-454-2894/0-2359-0469

The Result of Calibration

Certification No. 272/21

20 May, 2021

Page : 2 of 2

Standard Ultrasonic Anemometer	BOOK GAGE NO. 1435			TESTED ANEMOMETER	
	Pressure	Vacuum	Pressure	Velocity	Correction
mmHg	inches	inches	hPa	m/sec	mm/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.9	0.12
5.00	-	-	-	4.9	0.10
7.00	-	-	-	7.2	-0.20
9.02	-	-	-	9.2	-0.18
11.01	-	-	-	11.1	-0.09
13.01	-	-	-	13.1	-0.09
15.01	-	-	-	15.1	-0.09
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

Wind Aloft Plotting Board	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	91
180	180
270	

Calibrated by:

Mr. Wacharapong Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Division

เอกสารไม่ควบคุม



United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date : July 12, 2021

Equipment : Hydrocarbon Analyzer
Manufacturer : HORIBA

Model : APHA-370
Serial Number : RANHEJSH

Standard Gas Concentration

Sulphur Dioxide (SO₂) : - PPM
Nitric Oxide (NO) : - PPM
Methane (CH₄) : 39.8 PPM
Carbon Monoxide (CO) : - PPM
Cylinder No. : D824432
Expiration Date : Aug 4, 2028

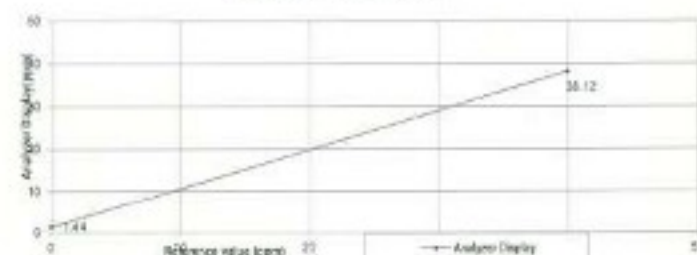
Diluter Detail

Manufacturer :
Model :
Serial Number :

Multi-point gas test data

Reference Value (ppm)		Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.00	1.44	1.44	1.44
Level 2	50.00%	40.00	-1.96	-4.93	-4.93
Remark : Measuring Range : 50.00 ppm			Average Difference (%) :		3.19
: Acceptable Limit $\pm 5\%$					

Multi-Point Gas Test Chart



Calculate by
Srichai Y.
12 July, 2021

Approve by
Pichai W.
12 July, 2021

Page 1 of 1

เอกสารไม่ควบคุม



United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date : June 2, 2021

Equipment : Hydrocarbon Analyzer
Manufacturer : HORIBA

Model : APHA-370
Serial Number : RTH03PDH

Standard Gas Concentration

Sulphur Dioxide (SO₂) : - PPM
Nitric Oxide (NO) : - PPM
Methane (CH₄) : 39.8 PPM
Carbon Monoxide (CO) : - PPM
Cylinder No. : D824432
Expiration Date : Aug 4, 2028

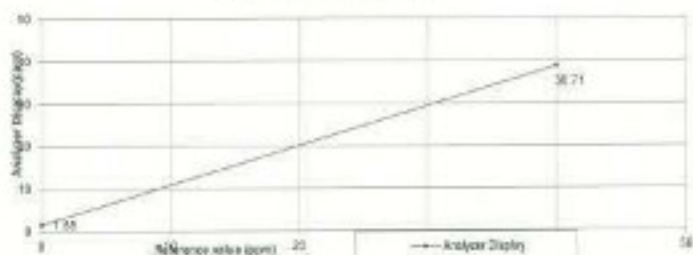
Diluter Detail

Manufacturer :
Model :
Serial Number :

Multi-point gas test data

Reference Value (ppm)		Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.00	1.58	1.58	1.58
Level 2	39.80%	38.71	-1.29	-3.33	-3.33
Remark : Measuring Range : 50.00 ppm			Average Difference (%) :		2.46
Acceptable Limit $\pm 5\%$					

Multi-Point Gas Test Chart



Calculate by
Srichai Y.
2 June, 2021

Approve by
Pichai W.
2 June, 2021

Page 1 of 1

เอกสารไม่ควบคุม



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3 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date : July 16, 2021

Equipment : Hydrocarbon Analyzer
Manufacturer : HORIBA

Model : APHA-370
Serial Number : 93301MNS

Standard Gas Concentration

Sulphur Dioxide (SO₂) : - PPM
Nitric Oxide (NO) : - PPM
Methane (CH₄) : 39.8 PPM
Carbon Monoxide (CO) : - PPM
Cylinder No. : D824432
Expiration Date : Aug 4, 2028

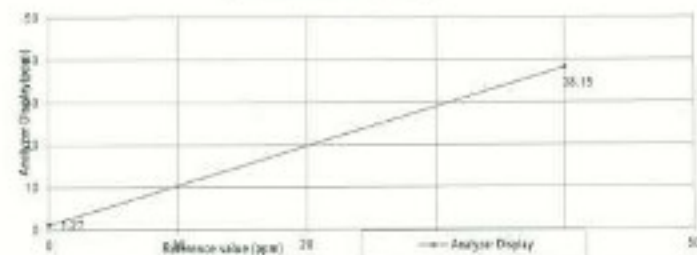
Diluter Detail

Manufacturer :
Model :
Serial Number :

Multi-point gas test data

Reference Value (ppm)		Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.00	1.27	1.27	1.27
Level 2	39.80%	38.15	-1.65	-4.15	-4.15
Remark : Measuring Range		50.00 ppm	Average Difference (%)		3.05
Acceptable Limit $\pm 5\%$					

Multi-Point Gas Test Chart



Calculate by
Srichai Y.
16 July, 2021

Approve by
Pichai W.
16 July, 2021

Page 1 of 1

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : June 9, 2021

Equipment : Hydrocarbon Analyzer Model : AHA-370
Manufacturer : HORIBA Serial Number : KWN/1R95

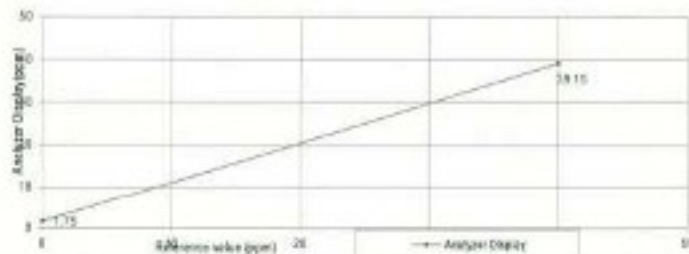
Standard Gas Concentration

Sulphur Dioxide (SO₂) : - PPM Manufacturer :
Nitric Oxide (NO) : - PPM Model :
Methane (CH₄) : 39.6 PPM Serial Number :
Carbon Monoxide (CO) : - PPM
Cylinder No. : D824432
Expiration Date : Aug 4, 2028

Multi-point gas test data

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.00	1.75	1.75	1.75
Level 2 80.06%	48.08	-3.85	-2.17	-2.17
Remark : Measuring Range	50.06 ppm	Average Difference (%)	1.96	
Acceptable Limit : ± 5%				

Multi-Point Gas Test Chart



Calculate by
Srichaiy.
16, June, 2021

Approved by
Pichai N.
16, June, 2021

Certificate of Analysis Special Gases Module

Customer Details
Name: United Analyst & Engineering Co., Ltd.
Address: 33 Soi Udomsak 41, Sukhumvit Rd, Bangchak, Phrasang, Bangkok 10260
Customer Ref No:

Certificate Details
Material: 8184/26
Date of Issue: 4 Aug 2021
Expiry Date: 4 Aug 2028
Material Grade: 4.0 x 10⁻³
Gas content: 6.69 MPa
Cylinder Number: 1535
Cylinder Material: Aluminum
Cylinder Size: 50L

Laboratory Report
Component: Nitrogen
Nominal Concentration: 40.0 ppm
Analysis Result: 39.6 ppm
Uncertainty: ± 1.75% of value
Method of Analysis: ISO 1578-1:2012
Analysis Date: 4 Aug 2021

Reference Standard: Nitrogen
Reference Material used in Analysis: Nitrogen
Reference Material used in Analysis: Nitrogen
Expiry Date: 4 Aug 2028

Instrument / Model used: FID Spectrometer Model 350
Analytical Instruments used in Analysis: Analytical Balance 110-004
Expiry Date: 4 Aug 2021

Recommend usage condition
Storage condition: Store in a cool, dry place, away from direct sunlight.
Storage condition: Store in a cool, dry place, away from direct sunlight.

Comments
When ordering, please quote the material number.

Note
1. All results are based on the analysis of the sample, and are not a guarantee of the quality of the sample.
2. The results are based on the analysis of the sample, and are not a guarantee of the quality of the sample.
3. The results are based on the analysis of the sample, and are not a guarantee of the quality of the sample.

Page 1 of 1
United Analyst & Engineering Co., Ltd.
Signature for and on behalf of United Analyst & Engineering Co., Ltd.

Signature for and on behalf of United Analyst & Engineering Co., Ltd.
Signature for and on behalf of United Analyst & Engineering Co., Ltd.
Signature for and on behalf of United Analyst & Engineering Co., Ltd.

เอกสารแนบ 47
สำเนาหนังสือขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์



ที่ อก ๐๓๑๐(๑)/ ๑๘๗ ๕



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๑๐๐

๐ ๙ กุมภาพันธ์ ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขีดความสามารถของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๒๗ ธันวาคม ๒๕๖๔

- สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๕๐ ราย
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย
๓. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม

ตามหนังสือที่อ้างถึง บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๕๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๕๑ ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้
ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๕๐ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย สิ่งปฏิกูล หรือวัสดุที่ไม่ใช่แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กุมภาพันธ์ ๒๕๖๕ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นสุดของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ทั้งหน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ห้อยหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางจินดา เศรษฐินทร)
ผู้อำนวยการกองวิจัยและประเมินผลกิจกรรม
ปฏิบัติการทางเทคนิคกรมโรงงานอุตสาหกรรม



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์

กองวิจัยและประเมินผลกิจกรรม

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๔

ไปรษณีย์อิเล็กทรอนิกส์ sarabang@dlw.go.th

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๕๕
ที่ อก ๐๓๑๐(๑)/ ๑๘๗ ๕ ลงวันที่ ๐ ๙ กุมภาพันธ์ ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๕๐ ราย

- | | |
|----------------------------------|----------------------------|
| ๑) นางสาวกชวรรณ ภัทรศิริกุล | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๐๑ |
| ๒) นายณรงค์ นิมาพิสิ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๐๒ |
| ๓) นางสาวนันทิดา บุญไชย | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๐๓ |
| ๔) นางปิยะพัชร สุทธิมงคล | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๐๔ |
| ๕) นางมานิดา เข้มไย | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๐๕ |
| ๖) นางสาวเบญจวรรณ วีระชัย | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๐๖ |
| ๗) นายพรรัตน์ วงศ์อุไรกษัตริย์ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๐๗ |
| ๘) นางสาววิวรรณ บุญลา | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๐๘ |
| ๙) นายสุวิทย์ จอดอก | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๐๙ |
| ๑๐) นางสาวโชติกา สมบูรณ์ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๑๐ |
| ๑๑) นางสาวบุษกร เลิศกาญจนา | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๑๑ |
| ๑๒) นางสาววิไลลักษณ์ ศรีสุข | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๑๒ |
| ๑๓) นางสาวปณิศา จรัสโชติพันธ์ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๑๓ |
| ๑๔) นายศิลา บรรจงใจรักษ์ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๑๔ |
| ๑๕) นายปฏิกรณ์ คณะนา | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๑๕ |
| ๑๖) นายธีรวัฒน์ ขมิ้ม | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๑๖ |
| ๑๗) นางสาวศิริพร ศรีประดิษฐ์ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๑๗ |
| ๑๘) นางสาวสวริศ วิริง | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๑๘ |
| ๑๙) นางสาวพรพรรณ สุวราชย์ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๑๙ |
| ๒๐) นายภูษงค์ พานิชย์เลิศอาไพ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๒๐ |
| ๒๑) นายณัฐวัฒน์ แดงสวัสดิ์ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๒๑ |
| ๒๒) นายเอกรัตน์ ปะคะมินทร์ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๒๒ |
| ๒๓) นางสาวนิศรัตน์ ศรีสุกสิวิโชค | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๒๓ |
| ๒๔) นางสาวเจตจันทร์ ทาสะอาด | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๒๔ |
| ๒๕) นางสาวสุพรรณ คงทอง | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๒๕ |
| ๒๖) นางสาววรรณ พัดสองชั้น | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๒๖ |
| ๒๗) นายวิรัช ไม้แก้ว | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๒๗ |
| ๒๘) นายธีรพงษ์ เทพนคร | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๒๘ |
| ๒๙) นายอนุศาสน์ สายดี | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๒๙ |
| ๓๐) นายกรวิทย์ เขียวศิริกุล | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๓๐ |
| ๓๑) นางสาวอริกา รังสวัสดิ์ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๓๑ |
| ๓๒) นางสาวนภาพรรม คงคำ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๓๒ |
| ๓๓) นายสุธีระ อนุจันทร์ | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๓๓ |
| ๓๔) นางสาวทนิษฐ์ อนุชา | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๓๔ |
| ๓๕) นางสาวพริ้มพรรณ สมบูรณ์ธรรม | ทะเบียนเลขที่ ๖-๑๕๕-ก-๐๐๓๕ |

(นางจินดา เศรษฐินทร)
ผู้อำนวยการกองวิจัยและประเมินผลกิจกรรม
ปฏิบัติการทางเทคนิคกรมโรงงานอุตสาหกรรม

๓๖) นายภูมิษฐ์...

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๕๕
ที่ อก ๐๓๑๐(๑)/ ๑๘๗ ๕ ลงวันที่ ๐ ๙ กุมภาพันธ์ ๒๕๖๕

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย

- | | |
|--------------------------------|----------------------------|
| ๑) นายสุสันต์ พันสิทธิ์ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๐๑ |
| ๒) นางสาวรามา แก้วชื่อนอก | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๐๒ |
| ๓) นายธีรณัฐ เจริญผล | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๐๓ |
| ๔) นางสาววิไลลักษณ์ แกโสม | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๐๔ |
| ๕) นายสมชาติ อุทุมรัตน์ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๐๕ |
| ๖) นางสาวปรมาภรณ์ ทองแก้ว | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๐๖ |
| ๗) นางสาวกัญญา สมพงษ์ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๐๗ |
| ๘) นายอรรถพร พงพอง | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๐๘ |
| ๙) นางสาวอมรรัตน์ พุฒาภิ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๐๙ |
| ๑๐) นางสาววรรณิ์ สายบุญเรือน | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๑๐ |
| ๑๑) นายภูษงค์ พานิชย์ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๑๑ |
| ๑๒) นางสาวอารณีย์ อ่อนคง | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๑๒ |
| ๑๓) นายกิตติศักดิ์ ทรงจำรัส | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๑๓ |
| ๑๔) นางสาวอักษรินทร์ บุญคง | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๑๔ |
| ๑๕) นางสาวพริ้มพล แวนทอง | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๑๕ |
| ๑๖) นายรัชฎ์ สุวรรณราช | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๑๖ |
| ๑๗) นายอภิวิชญ์ ท่าง | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๑๗ |
| ๑๘) นายณณิตย์ ปานโชติ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๑๘ |
| ๑๙) นายทศพร ชนะพิรุณ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๑๙ |
| ๒๐) นางสาวกัญญาณี โยธา | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๒๐ |
| ๒๑) นางสาวภาณี สุขี | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๒๑ |
| ๒๒) นางสาวชนนีย์ อภิพัทธ์ปภา | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๒๒ |
| ๒๓) นายศุภพัชร จงคุณเกียรติ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๒๓ |
| ๒๔) นางสาวสุภาวดี อธิยาหรี | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๒๔ |
| ๒๕) นางพศุภ เหล่าจระ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๒๕ |
| ๒๖) นายชวัญชัย พันทุก | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๒๖ |
| ๒๗) นางสาวพัชริศา คศิริกุล | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๒๗ |
| ๒๘) นางสาวมวิภา เลิศคำจันทร์ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๒๘ |
| ๒๙) นายณณทัต พงษ์พวง | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๒๙ |
| ๓๐) นางสาวพริดา เจริญสุขสมบัติ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๓๐ |
| ๓๑) นายพนรัตน์ จงโต | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๓๑ |
| ๓๒) นายพีรพัฒน์ บุญศิริศิลป์ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๓๒ |
| ๓๓) นายปรีดา ไชยภูมิสกุล | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๓๓ |
| ๓๔) นายชัชวาลย์ เลื่อนล่อง | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๓๔ |
| ๓๕) นายปิยะณัฐ ศรีภูวโรจน์ | ทะเบียนเลขที่ ๖-๑๕๕-ข-๐๐๓๕ |

(นางจินดา เศรษฐินทร)
ผู้อำนวยการกองวิจัยและประเมินผลกิจกรรม
ปฏิบัติการทางเทคนิคกรมโรงงานอุตสาหกรรม

๓๖) นายภูมิษฐ์...

๓๖) นายณภสินธุ์ อรุณธรรมรัตน์
๓๗) นายกันนิกร ระโส
๓๘) นายจักรพันธ์ กุมารินทร์
๓๙) นายปริญญา กลมเกลียว
๔๐) นายธีรวิจน์ มาตรโพธิ์ศรี
๔๑) นายธีรเมธ สุขศรี
๔๒) นายบุญญฤทธิ์ ก้อนสิน
๔๓) นายพรพจน์ ใจสกุล
๔๔) นายอชิต แสงจันทร์
๔๕) นายณัฐพงศ์ เมืองชัย
๔๖) นายธนัท เลิศประเสริฐ
๔๗) นางสาวนิภาพร จันทเขตต์
๔๘) นายพุทธพงษ์ อีสระสุข
๔๙) นายรณภพ ภูตะกุลพัฒนา
๕๐) นางสาวศิริวรรณ ขอนพา
๕๑) นายสมพงษ์ สกุลไทย
๕๒) นายสุวิทย์ นิลจิตตรง
๕๓) นายอัษฎาฐย ยศศิริ
๕๔) นายเอกภูมิ แสนใจ
๕๕) นายสุสันต์ บุญเลี้ยง
๕๖) นายธนเดช ทวามเสนา
๕๗) นายพิพัฒน์ ดันธนกุล
๕๘) นายอภิสิทธิ์ ทริคนแก้ว
๕๙) นายภูวตล มงคลสูง
๖๐) นายอุทัย แก้ววาท
๖๑) นางสาวนารินทร์ สานนท์
๖๒) นายศุภกร ริมนาค
๖๓) นายศักดิ์สิทธิ์ เกียรติ
๖๔) นางสาวศิริพร อภิรัตน์
๖๕) นางสาวจินตสุภา เมลิยนศิริ
๖๖) นางสาวเนตรนภา กลมบูรณ์
๖๗) นางสาวอารียา ทราธรรม
๖๘) นายจิรวัฒน์ สุขเกษม
๖๙) นายศักดิ์พงษ์ สอนชัยภูมิ
๗๐) นายจุฬพล สวนเพชร
๗๑) นางสาวพัชรภรณ์ แสงฟ้า
๗๒) นายรัตนชัย เหล่ามา

ทะเบียนเลขที่ ๖-๑๑๕-๖-๐๐๓๖
ทะเบียนเลขที่ ๖-๑๑๕-๖-๐๐๓๗
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ทะเบียนเลขที่ ๖-๑๑๕-๖-๐๐๗๐
ทะเบียนเลขที่ ๖-๑๑๕-๖-๐๐๗๑
ทะเบียนเลขที่ ๖-๑๑๕-๖-๐๐๗๒

๗๓) นายอิทธิพงษ์ ศรีเดช
๗๔) นางสาวกรรณิการ์ สาคีทา
๗๕) นายฐานกรณ์ พิมพ์ศรี
๗๖) นายพรชัย คุ้มวง
๗๗) นางสาวทัศนีย์ โพธิ์หา
๗๘) นายธีรพงษ์ ศรีคำแหง
๗๙) นางสาวณัฐชา พรหมศิริ
๘๐) นางสาวลลิตาวัลย์ โพธิ์พันธ์
๘๑) นางสาวกมลวรรณ เจริญพันธ์
๘๒) นายณพัทธ์นัย จันทะคุณ
๘๓) นายปิรวัฒน์ ไหมบุญ
๘๔) นางสาวพรวิภา กลิ่นอุบล
๘๕) นายณภสินธุ์ ศรีพิมพ์
๘๖) นางสาวลักขณา จันทะสุข
๘๗) นายสงกรานต์ นาสีทอง
๘๘) นางสาวสาธิตา แซ่เดียว
๘๙) นายศักดิ์คณิน นุ่มนัม
๙๐) นายวรพงษ์ นนทจันทร์
๙๑) นางสาวชนาภา นาคมาตร
๙๒) นางสาวอรอนงค์ คุณาพันธุ์ชัย
๙๓) นายวีระยุทธ สาระภักดิ์
๙๔) นางสาวธิดา วีระพันธุ์วัฒน์
๙๕) นายภูตพล พงศ์สาร
๙๖) นายณัฐชัย พรหมอารักษ์
๙๗) นายชินทร์ พานแก้ว
๙๘) นายปรัชชาพล โสภ
๙๙) นายวิวัฒน์ แสนงาม
๑๐๐) นางสาวอนภรณ์ ลาพรม
๑๐๑) นายอาทิตย์ อุดมผล
๑๐๒) นายบรรลพ บุณนาค
๑๐๓) นายอิทธิเดช ใจบุญ
๑๐๔) นายคณิน พงษ์อัคราพร
๑๐๕) นางสาวสุภารัตน์ จันทร์ประทีป
๑๐๖) นายเสกธราฐ เอ็มกลิ่นบัว

ทะเบียนเลขที่ ๖-๑๑๕-๖-๐๐๗๓
ทะเบียนเลขที่ ๖-๑๑๕-๖-๐๐๗๔
ทะเบียนเลขที่ ๖-๑๑๕-๖-๐๐๗๕
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ทะเบียนเลขที่ ๖-๑๑๕-๖-๐๐๘๑
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ทะเบียนเลขที่ ๖-๑๑๕-๖-๐๑๐๖


(นางจินดา เดชะศรีวัน)
ผู้อำนวยการกองส่งเสริมและประสานงาน
ปฏิบัติการทางเทคนิคในกรมอุตสาหกรรม

๗๓) นายอิทธิพงษ์...


(นางจินดา เดชะศรีวัน)
ผู้อำนวยการกองส่งเสริมและประสานงาน
ปฏิบัติการทางเทคนิคในกรมอุตสาหกรรม

สิ่งที่ส่งมาด้วย ๓

-๒-

เอกสารแนบท้ายหนังสือรับที่ออกขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกสาร
บริษัท ยูนิเคิล แอบนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๑๕-
ที่ ๑๑ ๐๓๐๐(๑)/ ๑ ๑๘๘๘๕ ลงวันที่ ๑๔ กุมภาพันธ์ ๒๕๖๕
ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๕๗ รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
2	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
3	Barium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
4	α-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
5	β-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
6	δ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
7	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method ⁽⁴⁾ 2) 5-Day BOD Test, Membrane Electrode Method ⁽⁴⁾
9	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
10	Chemical Oxygen Demand	1) Closed Reflux, Titrimetric Method ⁽⁴⁾ 2) Closed Reflux, Colorimetric Method ⁽⁴⁾ 3) Open Reflux, Titrimetric Method ⁽⁴⁾
11	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
12	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
13	Color	ADM Weighted-Ordinate Spectrophotometric Method ⁽⁴⁾
14	Copper	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
15	Cyanide	1) Distillation, Colorimetric Method ⁽⁴⁾ 2) Flow Injection Analysis Method ⁽⁴⁾

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
16	o,p'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
17	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
18	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
19	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
20	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
21	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
22	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
23	Endosulfan sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
25	Endrin aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
26	Formaldehyde	Distillation, Colorimetric Method ⁽⁴⁾
27	Free Chlorine	1) Iodometric Method ⁽⁴⁾ 2) DPD Ferrous Titrimetric Method ⁽⁴⁾
28	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
29	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
30	Hexavalent Chromium	1) Colorimetric Method ⁽⁴⁾ 2) Extraction, Direct Air-Acetylene Flame Method ⁽⁴⁾
31	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
32	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
33	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾
34	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
35	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
36	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾ 2) Soxhlet Extraction Method ⁽⁴⁾
37	pH	Electrometric Method ⁽⁴⁾
38	Phenols	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
40	Sulfide	1) Iodometric Method ⁽⁴⁾ 2) Methylene Blue Method ⁽⁴⁾
41	Temperature	Laboratory and Field Methods ⁽⁴⁾
42	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
43	Total Kjeldahl Nitrogen	Semi-Micro-Kjeldahl Method ⁽⁴⁾
44	Total Suspended Solids	Dried at 103-105 °C ⁽⁴⁾
45	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾
46	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
2	Acetone	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
3	Aldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ <u>2, 7, 10</u>

4 Anthracene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
4	Anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
5	Antimony	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
8	Barium	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
9	Benz(a)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
10	Benzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
11	Benzo(b)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
12	Benzo(k)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
13	Benzic acid	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
14	Benzo(a)pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ <u>2, 7, 10</u>

15 Benzo(g,h,i)perylene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	Benzo(g,h,i)perylene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
16	Beryllium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
19	Bromodichloromethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
20	Bromoform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
21	Butanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
23	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
25	Carbon disulfide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
26	Carbon tetrachloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
27	Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
29	Chlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ <u>2, 7, 10</u>

30 Chlorodibromomethane...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
30	Chlorodibromomethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
31	Chloroform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
33	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
34	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾
35	Chromium (VI)	1) Colorimetric Method ⁽⁴⁾ 2) Extraction, Air-Acetylene Flame Method ⁽⁴⁾
36	Chrysene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
37	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
39	DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
40	DOE	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
41	DOT	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ <u>2, 7, 10</u>

42 Dibenz(a,h)anthracene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
42	Dibenz(a,h)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
43	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
44	1,2-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
45	1,3-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
46	1,4-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
47	3,3'-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
48	1,1-Dichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
49	1,2-Dichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
50	1,1-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
51	cis-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
52	trans-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
54	1,2-Dichloropropane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
55	1,3-Dichloropropane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
56	1,3-Dichloropropene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
57	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ <i>สุกัญญา</i>

58 Diethyl phthalate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
58	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
63	Di-n-Octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
64	Endosulfan	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
65	Endrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
66	Ethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
67	Fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
68	Fluorene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
69	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ <i>สุกัญญา</i>

70 Heptachlor epoxide...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
70	Heptachlor epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
72	Hexachloro-1,3-butadiene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
73	n-Hexane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
74	α-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
75	β-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
76	γ-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
81	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ <i>สุกัญญา</i>

82 Manganese...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
82	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
83	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾
84	Methanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
86	Methyl bromide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
87	Methylene chloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
89	2-Methylnaphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
90	Methyl tert-butyl ether	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
91	Naphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
92	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
95	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ <i>สุกัญญา</i>

96 Polychlorinated Biphenyls...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB-1242 - PCB-1248 - PCB-1254 - PCB-1260	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
98	pH	Electrometric Method ^[4]
99	Phenanthrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
100	Phenol	1) Distillation, Chloroform Extraction Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
101	Pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
102	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
103	Silver	Digestion, Inductively Coupled Plasma Method ^[4]
104	Styrene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
105	1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
106	Tetrachloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
107	Toluene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]

108 Toxaphene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
108	Toxaphene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
109	TPH (C ₅ - C ₉)	1) Purge and Trap, Gas Chromatographic Method ^[11,21] 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[11,21]
110	TPH (C ₁₀ - C ₁₆)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[9,21]
111	TPH (C ₁₀ - C ₃₅)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[9,21]
112	1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
113	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
114	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
115	Trichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
118	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
119	Vanadium	Digestion, Inductively Coupled Plasma Method ^[4]
120	Vinyl acetate	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
121	Vinyl chloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
122	m-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
123	o-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]

124 p-Xylene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
124	p-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
125	Xylene (Total)	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
126	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]

อากาศเสีย (ปล่องระบาย) จำนวน 25 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
2	Arsenic	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
3	Cadmium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
4	Carbon Monoxide	Instrumental Analyzer Method ^[5]
5	Chlorine	Isokinetic Sampling, Ion Chromatographic Method ^[5]
6	Chromium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
7	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
8	Copper	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
9	Cresol	Absorption Sampling, Gas Chromatographic Method ^[5]

10 Dioxins/Furans...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
10	Dioxins/Furans	Isokinetic Sampling ^[5]
11	Hydrogen Chloride	Isokinetic Sampling, Ion Chromatographic Method ^[5]
12	Hydrogen Fluoride	Isokinetic Sampling, Ion Chromatographic Method ^[5]
13	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
14	Lead	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
15	Manganese	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
16	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[5]
17	Nickel	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
18	Opacity	Ringelmann's Method ^[5]
19	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic acid Method ^[5] 2) Instrumental Analyzer Method ^[5]
20	Selenium	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
21	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) Instrumental Analyzer Method ^[5]
22	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[5]
23	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[5]
24	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
25	Xylene	1) Bag Sampling, Gas Chromatographic Method ^[5] 2) Adsorption Sampling, Gas Chromatographic Method ^[5]

สิ่งบ่งชี้...

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
2	Antimony	Digestion, Inductively Coupled Plasma Method ^(7,13)
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(2,6,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,13) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13)

3) Digestion,...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
9	Chromium (III)	3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13) 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation ^(2,6,14,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation ^(2,6,13,16) 3) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,14,16) 4) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,13,14)
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(2,16) 2) Alkaline Digestion, Colorimetric Method ^(6,14)
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)

15 DDE...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
17	Dieldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
20	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(2,17) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13)

3) Digestion,...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
		3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁸⁾ 4) Digestion, Inductively Coupled Plasma Method ^(7,13) 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽¹⁹⁾
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
24	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
25	Nickel	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)
26	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4,5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3,4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)

- 2,2',4,5,5'...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
27	- 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6'-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5',6'-Heptachlorobiphenyl - 2,2',3,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(2,9,28) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) Electrometric Method ^(31,32)
28	pH	
29	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(2,6,20) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,28) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)

30 Silver...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
30	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13)
31	Thallium	2) Digestion, Inductively Coupled Plasma Method ^(7,13) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13)
32	Toxaphene	2) Digestion, Inductively Coupled Plasma Method ^(7,13) 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
33	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(2,12,25) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
35	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)

สิ้น จำนวน 125 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)

3 Aldrin...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
3	Aldrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
4	Anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
5	Antimony	Digestion, Inductively Coupled Plasma Method ^(7,13)
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
7	Atrazine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
8	Barium	Digestion, Inductively Coupled Plasma Method ^(7,13)
9	Benzo(a)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
11	Benzo(b)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
12	Benzo(k)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
13	Benzoic acid	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
14	Benzo(a)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

15 Benzo(g,h,i)perylene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	Benzo(g,h,i)perylene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
16	Beryllium	Digestion, Inductively Coupled Plasma Method ^(7,13)
17	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
18	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
21	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
22	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
23	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
24	Carbazole	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
27	Chlordane	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
28	p-Chloroaniline	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)

31 Chloroform...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
31	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
32	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
33	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
34	Chromium (III)	1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,14,16) 2) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,13,16)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,16)
36	Chrysene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(28,29,30)
38	2,4-D	Ultrasonic Extraction, Gas Chromatographic Method ⁽²⁷⁾
39	DDD	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
40	DDE	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
41	DDT	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
42	Dibenz(a,h)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

43 Di-n-butyl phthalate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
43	Di-n-butyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
47	3,3'-Dichlorobenzidine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
53	2,4-Dichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
57	Dieldrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
58	Diethyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
59	2,4-Dimethylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

60 2,4-Dinitrophenol...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
60	2,4-Dinitrophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
61	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
62	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
63	Di-n-Octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
64	Endosulfan	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
65	Endrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
67	Fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
68	Fluorene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
69	Heptachlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
70	Heptachlor epoxide	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

71 Hexachlorobenzene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
73	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
74	α-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
75	β-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
76	γ-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
77	Hexachlorocyclopentadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
78	Hexachloroethane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
79	Indeno(1,2,3-cd)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
80	Isophorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
81	Lead	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
82	Manganese	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)

83 Mercury...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁸⁾ 2) Digestion, Inductively Coupled Plasma Method ^(7,13) 3) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽¹⁹⁾
84	Methanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
85	Methoxychlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
86	Methyl bromide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
87	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
88	2-Methylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
89	2-Methylnaphthalene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
90	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
91	Naphthalene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
92	Nickel	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
93	Nitrobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
94	N-Nitrosodiphenylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
95	N-Nitrosodi-n-propylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) <i>เพิ่ม</i>

96 Polychlorinated Biphenyls...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 Polychlorinated Biphenyls - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4',5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6'-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6'-Heptachlorobiphenyl	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) <i>เพิ่ม</i>

- 2,2',3,4',5,5',6...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
97	- 2,2',3,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl Pentachlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
98	Phenanthrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
99	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
100	Pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
101	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,22) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
102	Silver	Digestion, Inductively Coupled Plasma Method ^(7,13)
103	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
106	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
107	Toxaphene	Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
108	TPH (C ₈ -C ₆)	1) Purge and Trap, Gas Chromatographic Method ^(12,21) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
109	TPH (C ₈ -C ₁₆)	Ultrasonic Extraction, Gas Chromatographic Method ^(10,21)
110	TPH (C ₁₆ -C ₃₅)	Ultrasonic Extraction, Gas Chromatographic Method ^(10,21)
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25) <i>เพิ่ม</i>

112 1,1,1-Trichloroethane...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
115	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
116	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
118	Vanadium	Digestion, Inductively Coupled Plasma Method ^(7,13)
119	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
120	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
121	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
122	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
123	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
125	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)

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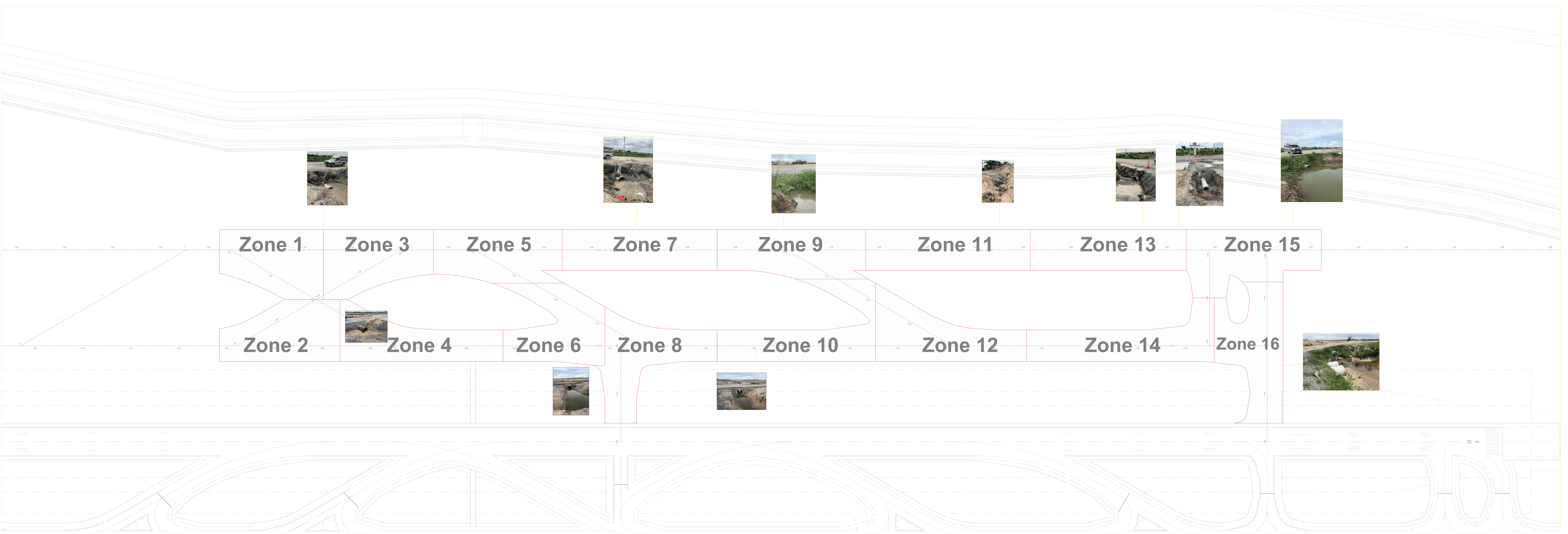
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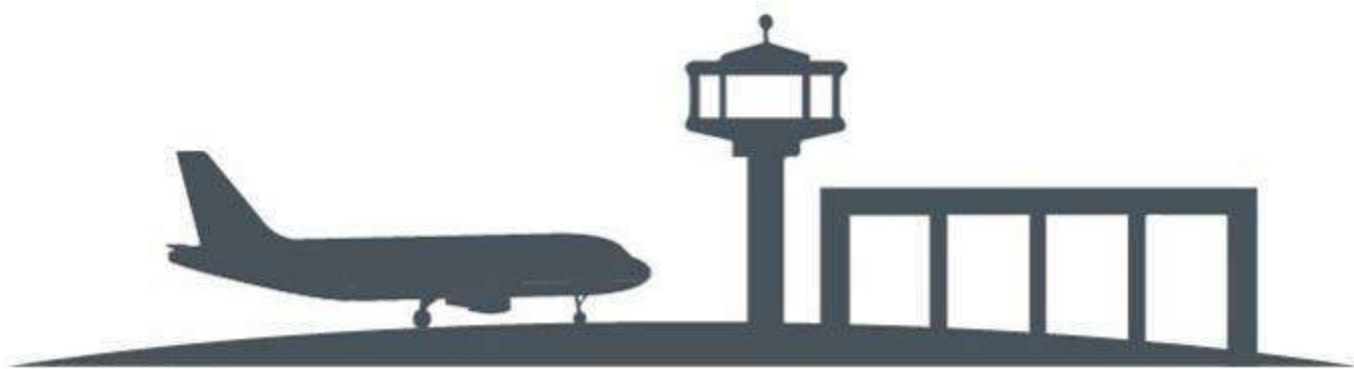
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เอกสารแนบ 48
เอกสารการขุดลอกทางระบายน้ำ





เอกสารแนบ 49
แผนการจัดกิจกรรมฝึกอบรมดับเพลิงเบื้องต้น
และซ้อมแผนอพยพฉุกเฉิน ประจำปี 2565





กิจการร่วมค้า ทีเอ็น (TN JOINT VENTURE)

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TN-SSHE-OUT-1757/2564

วันที่ 11 เดือน พฤศจิกายน พ.ศ. 2564

เรื่อง นำสำเนาแบบร่างการก่อสร้างถนนและสะพานข้ามคลองภาษีเจริญ ถนนสายที่ 3, Taxiway D Extension และงาน Perimeter Taxiway ท่าอากาศยานสุวรรณภูมิ

เรียน ประธานกรรมการตรวจรับพัสดุ (งานก่อสร้างสิ่งปลูกสร้าง BC10-631001)

บริษัท ท่าอากาศยานไทย จำกัด (มหาชน)

เลขที่ 999 หมู่ 1 ตำบลหนองปรือ อำเภอบางพลี จังหวัดสมุทรปราการ 10540

ผ่าน ผู้จัดการโครงการวิศวกรรม กลุ่มบริษัทที่ปรึกษา AEC Consortium

อ้างถึง กฎกระทรวง กำหนดมาตรฐานในการบริหารและการดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพ

แวดล้อมในการทำงาน เกี่ยวกับการป้องกันและรับอันตราย พ.ศ. 2555

สิ่งที่ส่งมาด้วย 1. แบบรายงานผลการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ จำนวน 1 เล่ม
2. รายงานผลการอบรมดับเพลิงและฝึกซ้อมอพยพหนีไฟ ประจำปี 2564 จำนวน 1 เล่ม

ตามที่ TN Joint Venture ได้รับให้เป็น ผู้ควบคุมงานก่อสร้างทางวิ่งเส้นที่ 3 ท่าอากาศยานสุวรรณภูมิ ซึ่งมีงานตามสัญญาจ้างมีระยะเวลา 35 เดือน นับตั้งแต่วันที่ 28 กันยายน 2563 ถึงวันที่ 15 สิงหาคม 2566 นั้น

ตามหนังสือที่อ้างถึง กิจการร่วมค้า ทีเอ็น ได้ดำเนินการจัดอบรมดับเพลิงเบื้องต้นให้กับพนักงานและซ้อมอพยพหนีไฟประจำปี 2564 ในวันที่ 25-26 กันยายน 2564 ณ สำนักงานควบคุมโครงการก่อสร้างทางวิ่งเส้นที่ 3, Taxiway D Extension และงาน Perimeter Taxiway ท่าอากาศยานสุวรรณภูมิเรียบร้อยแล้ว จึงได้จัดทำรายงานผลการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ ประจำปี 2564 ตามเอกสารที่แนบมา

สำเนาเรียน 1. ส่วนงานบริหารโครงการ สทส (สำเนา 1 ชุด)
2. กลุ่มบริษัทที่ปรึกษา AEC CONSORTIUM (สำเนา 1 ชุด)



กิจการร่วมค้า ทีเอ็น (TN JOINT VENTURE)

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TN-SSHE-OUT-1757/2564

วันที่ 20 ตุลาคม 2564

เรื่อง นำสำเนาแบบร่างการก่อสร้างถนนและฝึกซ้อมอพยพหนีไฟ ประจำปี 2564

โครงการก่อสร้างทางวิ่งเส้นที่ 3, Taxiway D Extension และงาน Perimeter Taxiway ท่าอากาศยานสุวรรณภูมิ

เรียน สำนักงานสวัสดิการและคุ้มครองแรงงาน จังหวัดสมุทรปราการ

อ้างถึง กฎกระทรวง กำหนดมาตรฐานในการบริหารและการดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน เกี่ยวกับการป้องกันและรับอันตราย พ.ศ. ๒๕๕๕

สิ่งที่ส่งมาด้วย 1. แบบรายงานผลการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ จำนวน 1 เล่ม
2. รายงานผลการอบรมดับเพลิงและฝึกซ้อมอพยพหนีไฟ ประจำปี 2564 จำนวน 1 เล่ม

ด้วยกิจการร่วมค้า ทีเอ็น (TN Joint Venture) ได้รับให้เป็น ผู้ควบคุมงานก่อสร้างทางวิ่งเส้นที่ 3 ท่าอากาศยานสุวรรณภูมิ ซึ่งมีงานตามสัญญาจ้างมีระยะเวลา 35 เดือน นับตั้งแต่วันที่ 28 กันยายน 2563 ถึงวันที่ 15 สิงหาคม 2566 นั้น

ตามหนังสือที่อ้างถึง กิจการร่วมค้า ทีเอ็น ได้ดำเนินการจัดอบรมดับเพลิงเบื้องต้นให้กับพนักงานและซ้อมอพยพหนีไฟประจำปี 2564 ในวันที่ 25 - 26 กันยายน 2564 ณ สำนักงานควบคุมโครงการก่อสร้างทางวิ่งเส้นที่ 3, Taxiway D Extension และงาน Perimeter Taxiway ท่าอากาศยานสุวรรณภูมิเรียบร้อยแล้ว จึงได้จัดทำรายงานผลการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ ประจำปี 2564 ตามเอกสารที่แนบมาพร้อมนี้

จึงเรียนมาเพื่อโปรดทราบ และดำเนินการต่อไป

ขอแสดงความนับถือ

ท่าอากาศยานสุวรรณภูมิ สมุทรปราการ
โทรศัพท์ 02-130-5803-05 ต่อ 510

25 ต.ค. 2564



กิจการร่วมค้า ทีเอ็น (TN JOINT VENTURE)

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แบบรายงานผลการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ

๑. ข้อมูลตามประกอบกิจการ

๑.๑ ชื่อสถานประกอบกิจการ..... กิจการร่วมค้า ทีเอ็น (มหาชน) (สาขา.....)
ประเภทกิจการ..... รับราชการ/รับจ้าง..... ที่อยู่ เลขที่...../๑๑๑ หมู่ที่.....
ซอย..... ถนน..... แขวง/ตำบล..... เขต/อำเภอ..... จังหวัด.....

๑.๒ จำนวนลูกจ้าง/พนักงาน/ผู้ปฏิบัติงาน..... 113 คน
๑.๓ ลักษณะกิจการประกอบกิจการ.....
○ เป็นสถานที่ที่มีลักษณะการประกอบกิจการตั้งอยู่ร่วมกัน
รอบพื้นที่เฉพาะ/สถานที่.....
✓ เป็นสถานประกอบกิจการเดียว (เข้ามโนทัศน์ ๒)

๑.๔ กรณีเป็นสถานที่ที่มีลักษณะการประกอบกิจการตั้งอยู่ร่วมกัน
○ ลูกจ้างที่ทำงานอยู่ภายในอาคารเดียวกัน และในวันและเวลาเดียวกันของงานจ้างอยู่ภายในสถานที่นั้น

ทำการฝึกซ้อมพร้อมกัน
○ ลูกจ้างที่ทำงาน ภายในอาคารเดียวกัน และในวันและเวลาเดียวกันของงานจ้างอยู่ภายในสถานที่นั้น
ไม่ได้ทำการฝึกซ้อมพร้อมกัน

๒. รายงานผลการดำเนินการ
๒.๑ วัน/เดือน/ปี ที่ทำการฝึกซ้อม..... 25 - 26 กันยายน 2564
๒.๒ ฝึกซ้อมกี่ครั้ง/จำนวนกี่ (วัน/เดือน/ปี).....
๒.๓ จำนวนผู้ฝึกซ้อมในการฝึกซ้อม..... 75 คน

๒.๔ ผลการดำเนินการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ
○ ไม่ดี ○ พอใช้ ○ ดี ✓ ดีมาก

๓. กำหนดการฝึกซ้อมโดย
○ ได้รับความเห็นชอบแผนและรายละเอียดการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟจากอธิบดี
หรือผู้ซึ่งมีอำนาจมอบหมาย พจนานุกรม..... เลขที่..... ลงวันที่.....
โดยได้แนบเอกสารไว้ตามเห็นชอบมาด้วยแล้ว

✓ ผู้ที่ได้รับอนุญาตจากกรมสวัสดิการและคุ้มครองแรงงานมาดำเนินการฝึกซ้อมไว้
คือ..... บริษัท..... เลขที่..... เลขที่ใบอนุญาต..... โดยได้แนบสำเนาใบอนุญาตและหนังสือรับรอง
และ.....

การฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ

1. หลักการและเหตุผล

กิจการร่วมค้า ทีเอ็น (TN JOINT VENTURE) ขอแจ้งให้ทราบถึงวัตถุประสงค์ของการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟประจำปี 2564 เพื่อให้ทราบถึงวัตถุประสงค์ของการฝึกซ้อมและทราบเรื่อง ดังนี้

๑. ทราบถึงวัตถุประสงค์ : เพื่อให้ทราบถึงวัตถุประสงค์และทราบเรื่องเพื่อให้ทราบถึงวัตถุประสงค์ของการฝึกซ้อมและทราบเรื่อง ดังนี้
๒. ทราบถึงวัตถุประสงค์ : เพื่อให้ทราบถึงวัตถุประสงค์และทราบเรื่องเพื่อให้ทราบถึงวัตถุประสงค์ของการฝึกซ้อมและทราบเรื่อง ดังนี้
๓. ทราบถึงวัตถุประสงค์และสิ่งอื่น : เพื่อให้ทราบถึงวัตถุประสงค์และทราบเรื่องเพื่อให้ทราบถึงวัตถุประสงค์ของการฝึกซ้อมและทราบเรื่อง ดังนี้

2. วัตถุประสงค์

๑. เพื่อให้ทราบถึงวัตถุประสงค์และทราบเรื่องเพื่อให้ทราบถึงวัตถุประสงค์ของการฝึกซ้อมและทราบเรื่อง ดังนี้
๒. เพื่อให้ทราบถึงวัตถุประสงค์และทราบเรื่องเพื่อให้ทราบถึงวัตถุประสงค์ของการฝึกซ้อมและทราบเรื่อง ดังนี้
๓. เพื่อให้ทราบถึงวัตถุประสงค์และทราบเรื่องเพื่อให้ทราบถึงวัตถุประสงค์ของการฝึกซ้อมและทราบเรื่อง ดังนี้

3. กลุ่มเป้าหมาย

๑. พนักงานทุกคนภายในสำนักงานโครงการ

4. วิธีการดำเนินงาน

๑. กำหนดแผนปฏิบัติงานและระเบียบปฏิบัติ
๒. กำหนดบุคลากรที่จะรับผิดชอบตามแผนปฏิบัติงานและระเบียบปฏิบัติ
๓. จัดเตรียมสถานที่และเครื่องมือการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟให้พร้อม
๔. แจ้งรายละเอียดการปฏิบัติงานให้ทราบถึงวัตถุประสงค์และทราบเรื่องเพื่อให้ทราบถึงวัตถุประสงค์ของการฝึกซ้อมและทราบเรื่อง ดังนี้
๕. จัดทำเอกสารให้ทุกคนที่รับผิดชอบในแผนปฏิบัติงานและระเบียบปฏิบัติ
๖. ให้ทุกคนปฏิบัติตามแผนปฏิบัติงานและระเบียบปฏิบัติ

5. ระยะเวลาดำเนินการ

วันที่ 25 กันยายน 2564 - วันที่ 26 กันยายน 2564

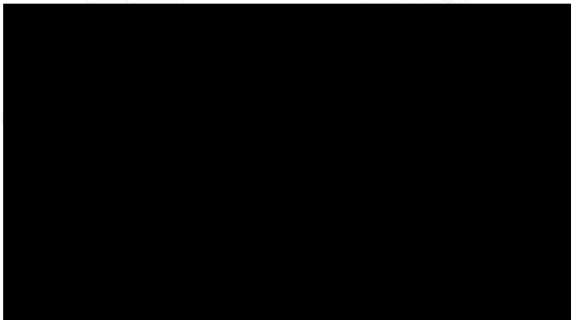
6. โปรแกรม

โปรแกรมที่ใช้ในการฝึกอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ 2564 ของกิจการร่วมค้า ทีเอ็น โดยสรุปเป็นจำนวนเงินดังนี้ 35,000 บาท (ยกเว้นค่าเดินทางและที่พัก)

- ค่าวิทยากรฝึกอบรม จำนวน 3 ท่าน และค่าอุปกรณ์สำหรับฝึกอบรม 2 วัน เป็นเงิน 35,000 บาท รวมค่าดังนี้
 - ค่าวิทยากร 15 คน จำนวน 2 วัน เป็นจำนวนเงิน 700 บาท
 - ค่าอุปกรณ์ 91 ชิ้น จำนวน 11 ชิ้น เป็นจำนวนเงิน 400 บาท
 - ค่าสิ่งอำนวยความสะดวกที่ใช้ในการฝึกอบรมจำนวน 10 ชิ้น เป็นจำนวนเงิน 3,000 บาท
- ค่าอาหารและเครื่องดื่ม 2 วัน เป็นจำนวนเงิน 1,500 บาท

7. ผลที่คาดว่าจะได้รับ

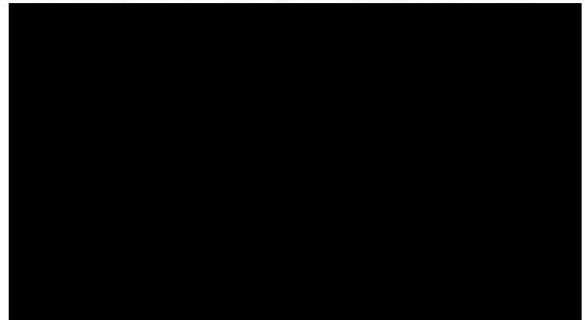
- พนักงานสามารถนำความรู้ที่ได้รับไปใช้ประโยชน์ในองค์กรเพื่อป้องกันและลดผลกระทบได้
- พนักงานสามารถตอบโต้ภัยพิบัติได้อย่างถูกต้อง ถูกวิธี เพื่อลดจำนวนผู้บาดเจ็บและเสียชีวิต หากเกิดเหตุภัยพิบัติจริง
- บริษัทฯ ได้ปฏิบัติตามกฎหมายว่าด้วยความปลอดภัยและอาชีวอนามัย (OSHA)



ประเภท

กิจการร่วมค้า ทีเอ็น ได้ดำเนินการจัดอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ 2564 และฝึกซ้อมแผนอพยพหนีไฟ ประจำปี 2564 ในวันที่ 25 กันยายน 2564 และวันที่ 26 กันยายน 2564 เวลา 8.00 น. ถึง 17.00 น. ณ ห้องอบรม THUV ทำการฝึกอบรมโดยหน่วยงานฝึกอบรม บริษัท ทรูเน็กซ์ จำกัด มีกำหนดการดังนี้

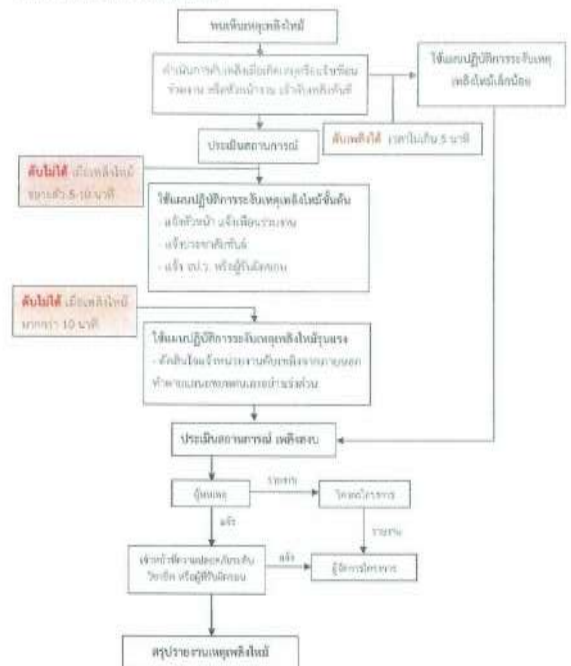
ระยะเวลา	หลักสูตร/วิชา	สถานที่
8.00 น. - 10.00 น.	- วิทยากรฝึกอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ การฝึกอบรมและฝึกซ้อม	ห้องอบรม THUV
	- วิทยากรฝึกอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ การฝึกอบรมและฝึกซ้อม	ห้องอบรม THUV
	- การฝึกอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ การฝึกอบรมและฝึกซ้อม	ห้องอบรม THUV
	- วิทยากรฝึกอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ การฝึกอบรมและฝึกซ้อม	ห้องอบรม THUV
10.00 น. - 10.15 น.	พักเบรก	
10.15 น. - 12.15 น.	- ฝึกอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ การฝึกอบรมและฝึกซ้อม	ห้องอบรม THUV
	- ฝึกอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ การฝึกอบรมและฝึกซ้อม	ห้องอบรม THUV
	- ฝึกอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ การฝึกอบรมและฝึกซ้อม	ห้องอบรม THUV
12.15 น. - 13.00 น.	พักรับประทานอาหารกลางวัน	
13.00 น. - 15.00 น.	- การฝึกอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ การฝึกอบรมและฝึกซ้อม	TWS CAMP
	- การฝึกอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ การฝึกอบรมและฝึกซ้อม	TWS CAMP
15.30 น. - 17.00 น.	- ฝึกอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ การฝึกอบรมและฝึกซ้อม	THUV OFFICE



กำหนดหน้าที่รับผิดชอบในการฝึกอบรมและฝึกซ้อมการตอบโต้ภัยพิบัติ

หน้าที่รับผิดชอบ	ผู้ปฏิบัติงาน	ชื่อ
1. ผู้อำนวยการฝึกอบรม	ผู้จัดการด้านความปลอดภัย	นายบุญชูกร สิริพันธ์ 081-568-6853
2. ผู้ช่วยวิทยากรฝึกอบรม	วิศวกรโครงการ	นายเกริก ธรรมธรรม 081-934-3124
3. หน่วยปฐมพยาบาล	พยาบาลโครงการ	นางสาวทวีพรธรรม ของกิจ 088-253-9477
4. หน่วยจัดการสนับสนุนในการฝึกอบรม	ธุรการ	นางสาวพัชรา สายมณฑ 062-635-5954
5. หน่วยรวมข่าวสาร	เจ้าหน้าที่ความปลอดภัย	นายดิเรก ธรรมน้อย 085-121-9406
6. หน่วยอำนวยความสะดวก	โพรแกรม	นายสมเดช เขาชวน 065-940-4631
7. ผู้ควบคุม	เขียนแบบ	นายกิตติคุณ ดวงแก้วภาค 089-430-7018

แผนผัง ขั้นตอนการรับเหตุเพลิงไหม้

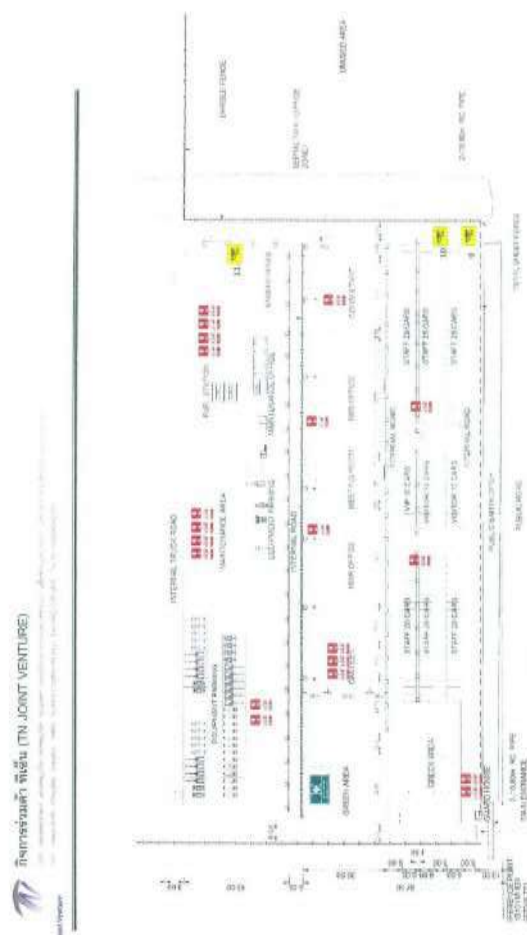
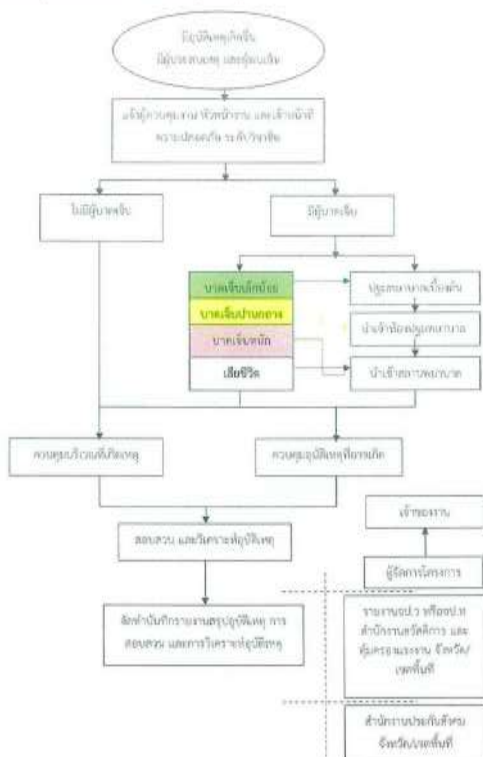


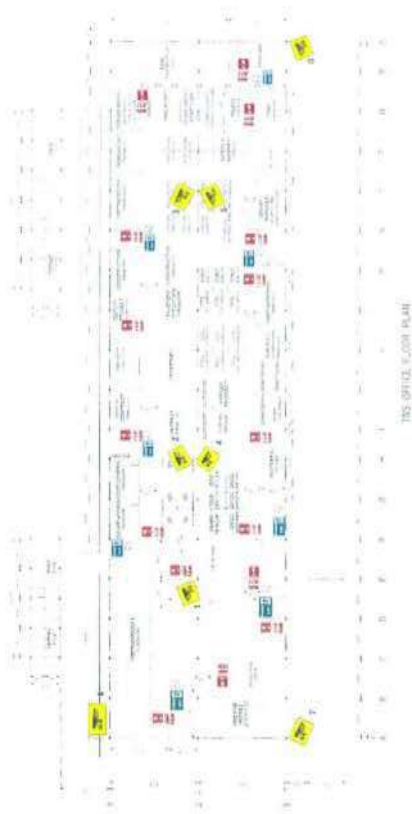
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graph TD
    A[ผู้จ้างบริการ หรือผู้ขายมีอำนาจลงนามในใบ  
สั่งซื้อและจ่ายค่าจ้างก่อนเสมอ] --> B[เป็นรายตัว หรือ เป็นรายเดือนหรือรายปีหรือ  
รายปีครึ่ง]
    B --> C[ผู้จ้างบริการ สัญญาจ้าง อาจมีหลาย  
ฉบับแต่ต้องมีใบสั่งซื้อและจ่ายค่าจ้างก่อนเสมอ เพื่อจำนวน]
    C --> D[ผู้จ้างบริการ มีเอกสารการเป็น "บุคคลธรรมดา"]
    D --> E[ผู้จ้างบริการธรรมดา หรือผู้ขาย ผู้จ้างบริการ หรือ  
ผู้ขายผู้จ้างบริการตามกฎหมายไทย มี ๒ ประเภทคือ]
    E --> F[ผู้จ้างบริการหรือผู้ขายเป็นผู้ขายตามกฎหมาย  
ไทย มี ๒ ประเภท คือผู้ขายตามกฎหมาย  
ธรรมดาและตามกฎหมาย]
    E --> G[ผู้จ้างบริการ หรือ ผู้ขาย  
ผู้จ้างบริการตามกฎหมายไทย มี  
หน้าที่ตามกฎหมายไทย หรือผู้จ้างมี  
หน้าที่ตามกฎหมายธรรมดาตามกฎหมาย  
ผู้  
จ้าง]
    F --> H[หน่วยงานนิติกร หรือเจ้าหน้าที่ตามกฎหมาย  
ตามกฎหมายไทย และตามกฎหมายผู้จ้างบริการ หรือ  
ผู้จ้างตามกฎหมายธรรมดาตามกฎหมาย]
    G --> H
  
```

การวัด	เป้าหมายการวัด	พื้นที่ประเมินผล	กรรมการประเมินผล	แหล่งข้อมูลที่ใช้ประเมิน
ความรู้ด้านเกษตรกรรมและ การเกษตร	วัดพื้นที่	ประเมินผลในเชิงพื้นที่ พื้นที่ในเชิงพื้นที่	มหาวิทยาลัยเกษตรศาสตร์	พื้นที่เกษตร
สิ่งแวดล้อม	วัดความยั่งยืน	ประเมินผลในเชิงพื้นที่ ประเมินผลในเชิงพื้นที่	มหาวิทยาลัยเกษตรศาสตร์	พื้นที่เกษตร
วัฒนธรรม	วัดการวัดพื้นที่ในเชิงพื้นที่	ประเมินผลในเชิงพื้นที่	มหาวิทยาลัยเกษตรศาสตร์	พื้นที่เกษตร
พื้นที่เกษตร	วัดพื้นที่เกษตรในพื้นที่เกษตร	ประเมินผลในเชิงพื้นที่	มหาวิทยาลัยเกษตรศาสตร์	พื้นที่เกษตร
ประเพณีวิถีชีวิต	วัดประเพณีวิถีชีวิต	ประเมินผลในเชิงพื้นที่	มหาวิทยาลัยเกษตรศาสตร์	พื้นที่เกษตร

ผลการประเมินผลการ	ห้องพยาบาล	เตียง	พยาบาล	สหวิชาชีพ	หมายเหตุ
200 คนขึ้นไป	มีแผนกพยาบาล จำเป็น	1	1 (ประจำ)	1 (เรียกตามนัดหรือภาวะ)	
1,000 คนขึ้นไป	มีแผนกพยาบาล จำเป็น	2	2 (ประจำ)	2 (เรียกตามนัดหรือภาวะ)	1-2 ขึ้นไป





Remark

- Main Gate uses Dry Chemical 10 lbs. = 6 Pack.
- Track Gate uses Dry Chemical 10lbs. = 3 Pack.
- Equipment Parking uses Dry Chemical 10 lbs. = 6 Pack.
- Canteen uses Dry Chemical 10 lbs. = 9 Pack. [Kitchen Fixed]
- Maintenance Area uses Dry Chemical 10 lbs. = 8 Pack.
- Fuel Station uses Foam & Co₂ fire extinguisher 10L = 12 Pack.
- Electronic Control Room uses Co₂ fire extinguisher 10L = 2 Pack.



CCTV



Fire Extinguisher



Assembly Point

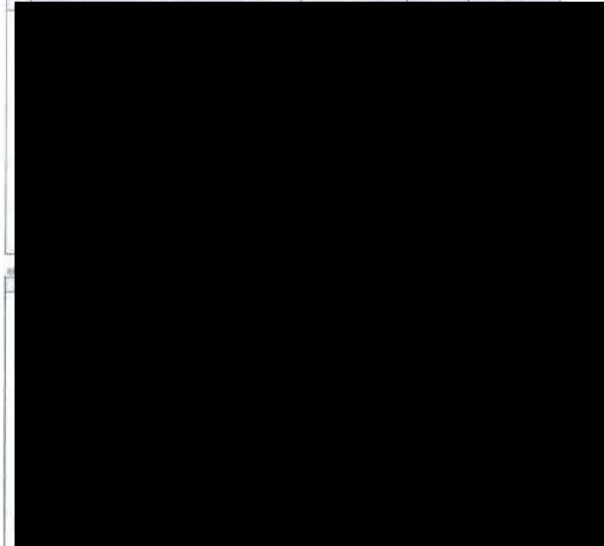


Emergency Exit



Emergency Light

Good to know Dry Chemical Type Fire extinguisher is effective for all types of fire like Class A, B and C types of fires as well as Electrical fires also Multipurpose uses, under 3rd Runway Project uses fire Rating : 6A20B

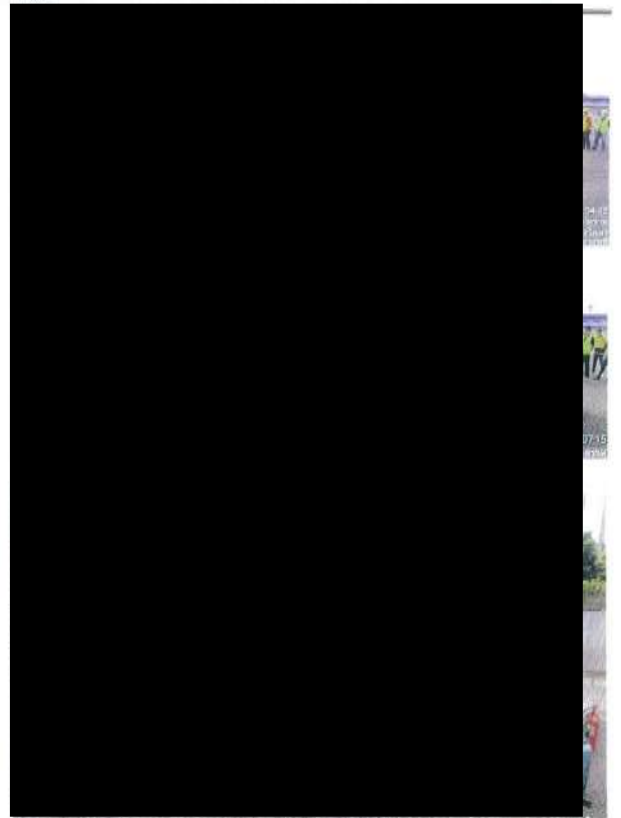


การฝึกซ้อมดับเพลิง และการฝึกซ้อมอพยพหนีไฟ



การฝึกอบรมดับเพลิงเบื้องต้น

การฝึกซ้อมดับเพลิงขั้นต้น

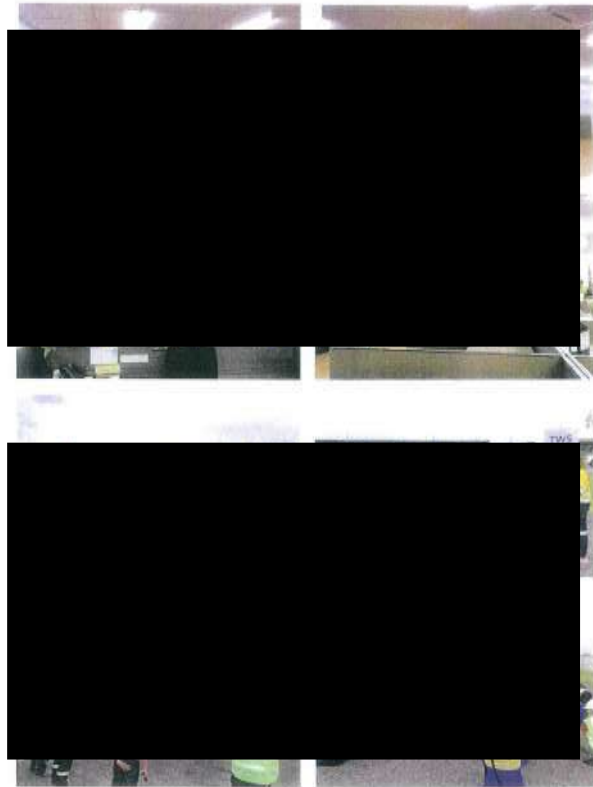


การฝึกซ้อมอพยพหนีไฟ



กิจการร่วมค้า ทีเอ็น (TN JOINT VENTURE)

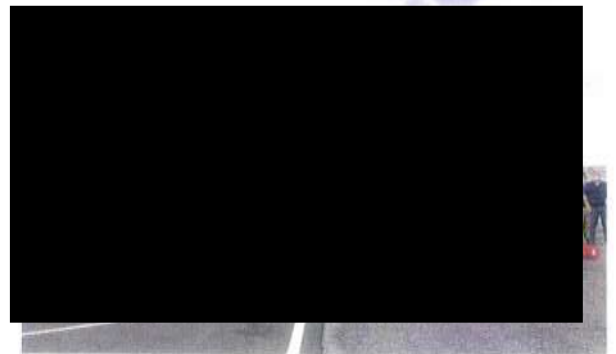
1. บริษัท ทีเอ็น จำกัด (มหาชน) - บริษัท ร่วมมือร่วมทุนกับ บริษัท ทีเอ็น จำกัด (มหาชน)
2. บริษัท ทีเอ็น จำกัด (มหาชน) - บริษัท ร่วมมือร่วมทุนกับ บริษัท ทีเอ็น จำกัด (มหาชน)



กิจการร่วมค้า ทีเอ็น (TN JOINT VENTURE)

1. บริษัท ทีเอ็น จำกัด (มหาชน) - บริษัท ร่วมมือร่วมทุนกับ บริษัท ทีเอ็น จำกัด (มหาชน)
2. บริษัท ทีเอ็น จำกัด (มหาชน) - บริษัท ร่วมมือร่วมทุนกับ บริษัท ทีเอ็น จำกัด (มหาชน)

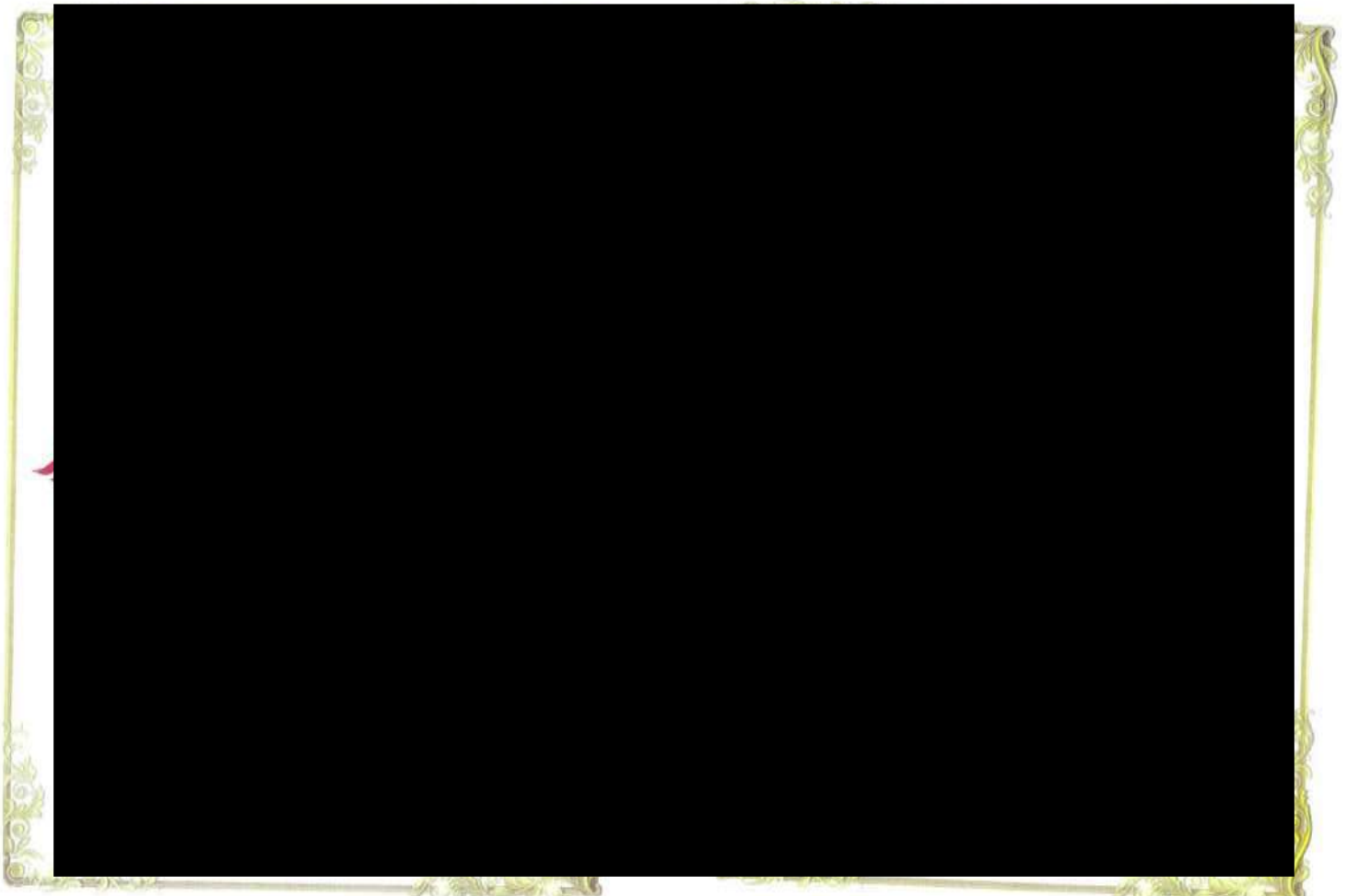
ภาพฝึกซ้อมอพยพหนีไฟ ประจำปี 2564

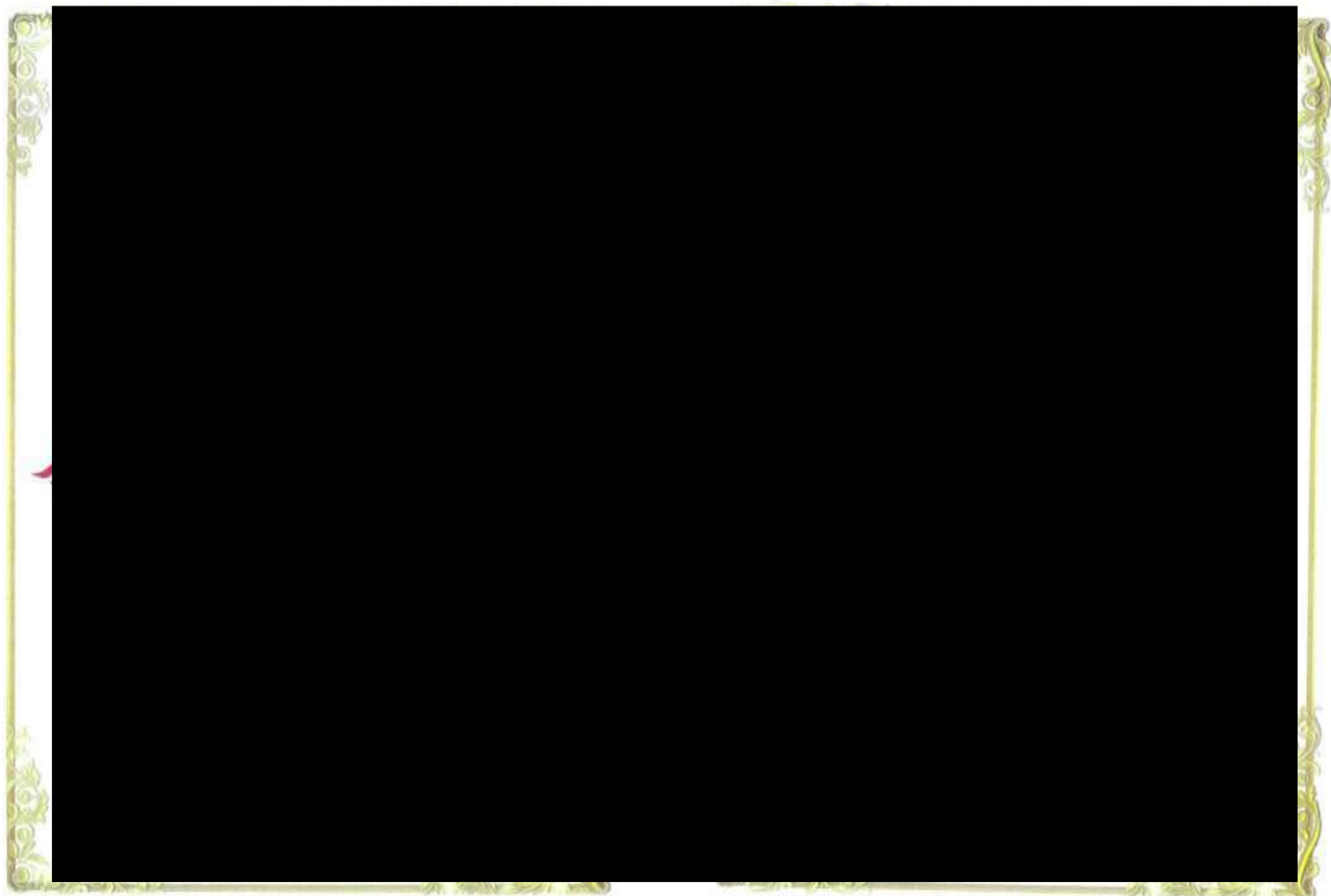


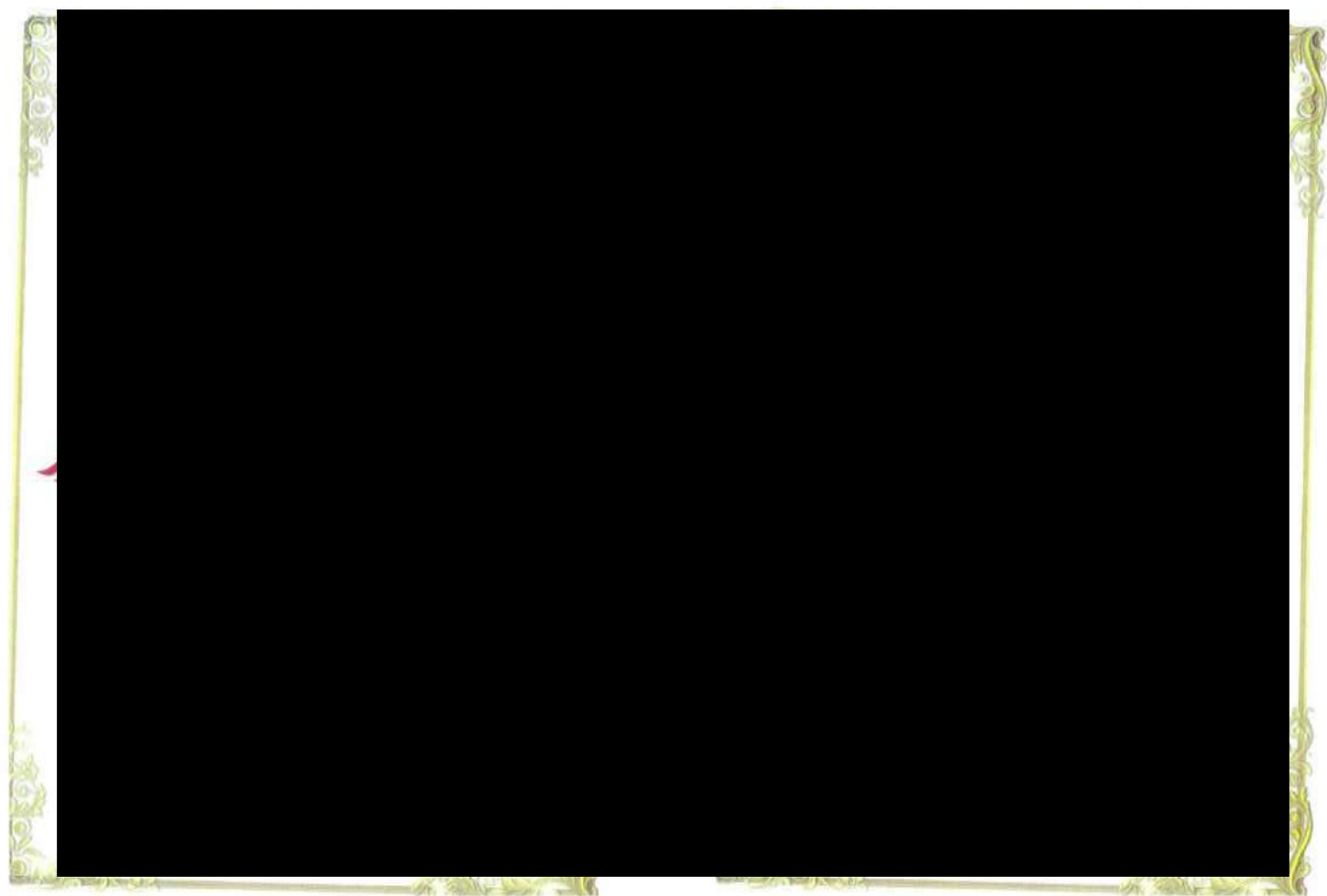
วันที่ 26 กันยายน 2564

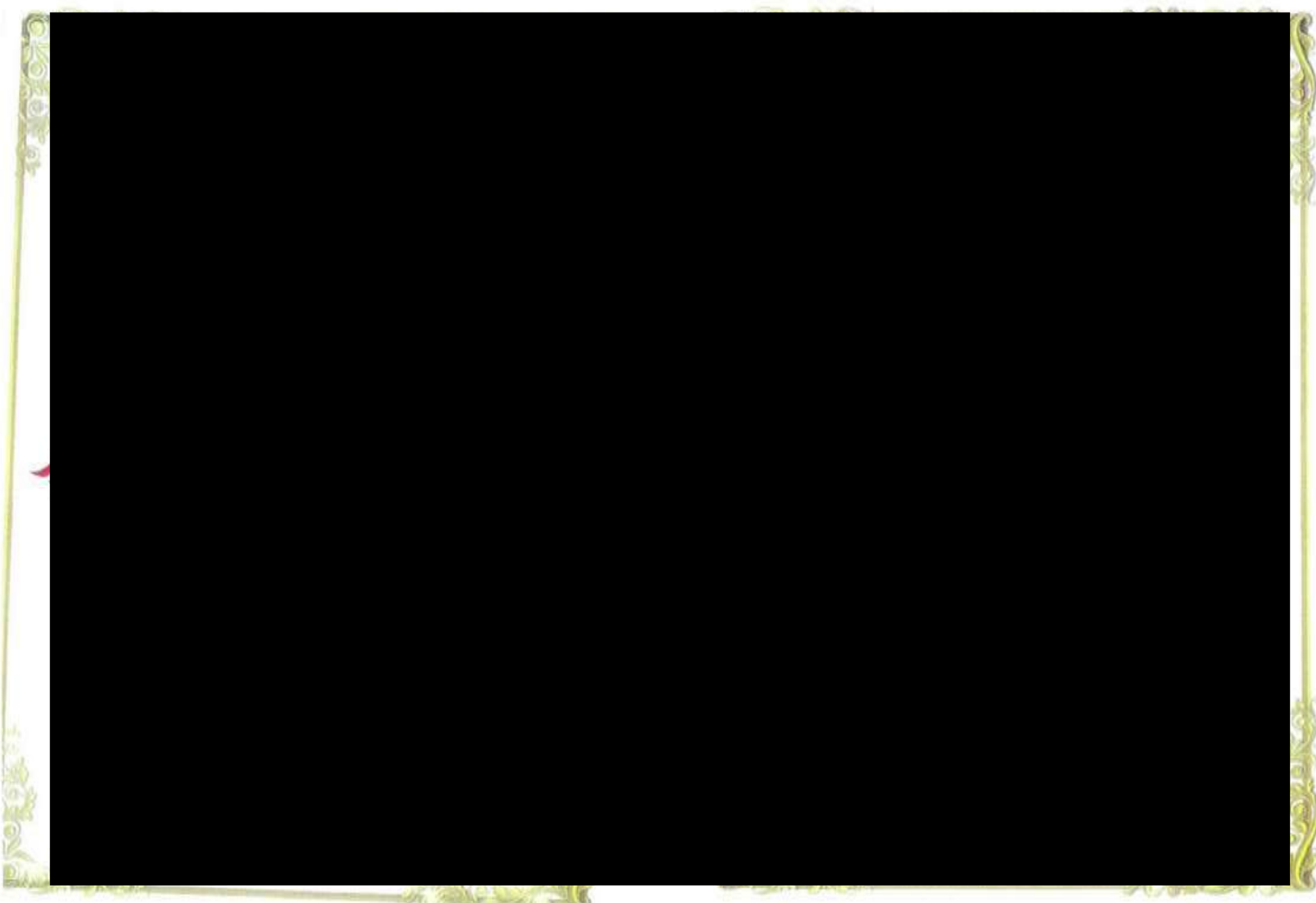
ผู้ปฏิบัติงานในสำนักงานโครงการ จำนวน 75 คน

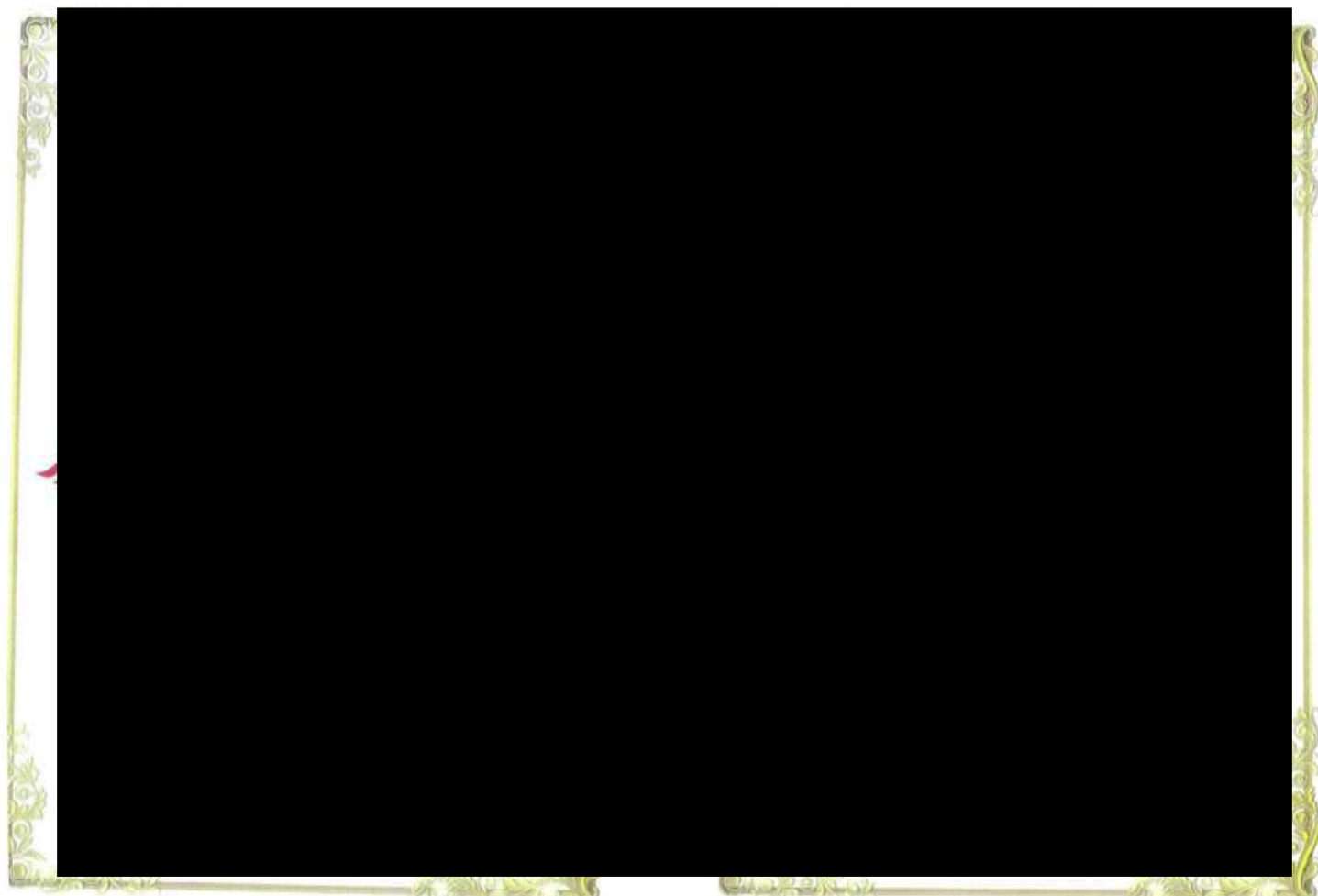
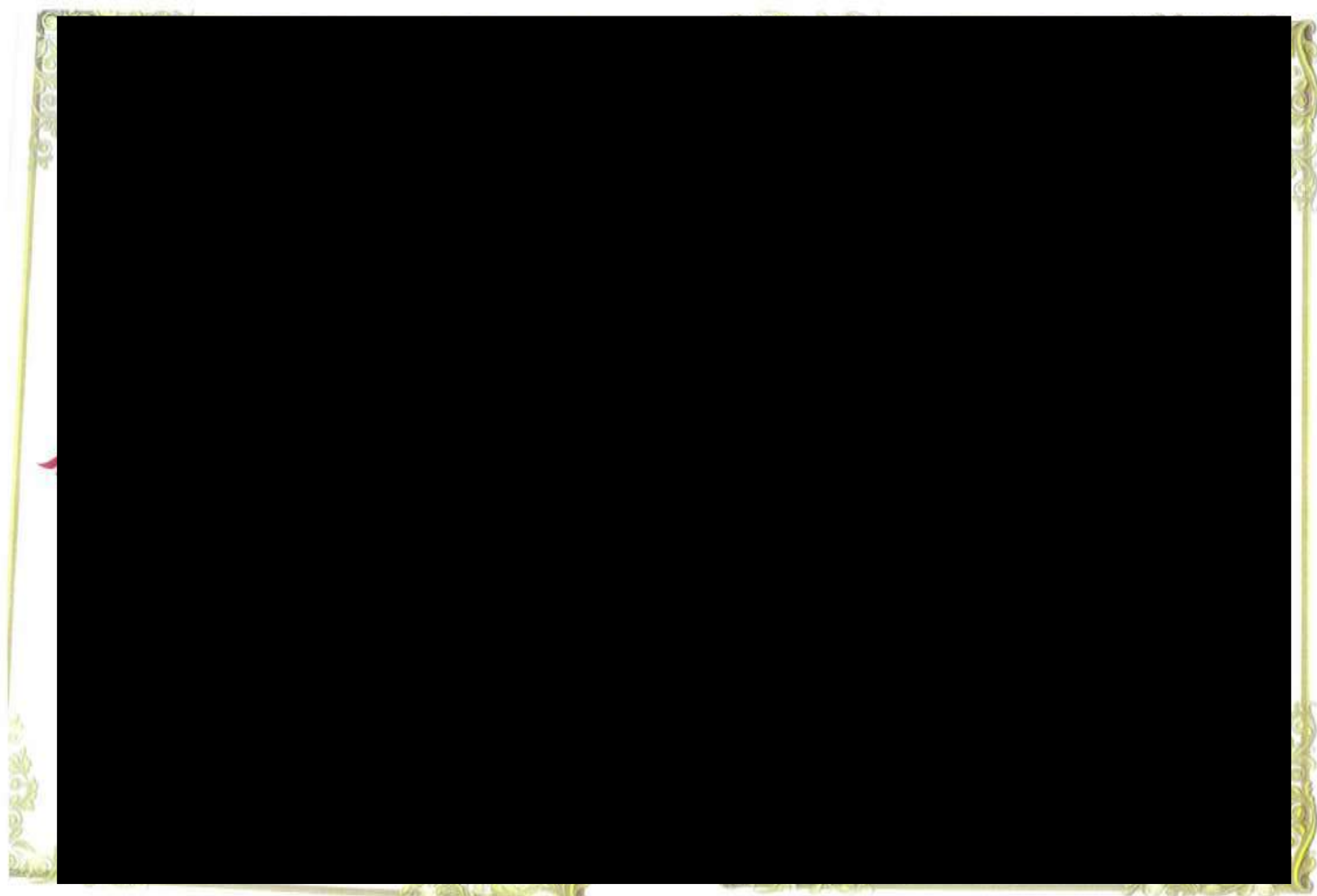
จำนวนผู้เข้าร่วมฝึกซ้อมอพยพหนีไฟประจำปี จำนวน 75 คน

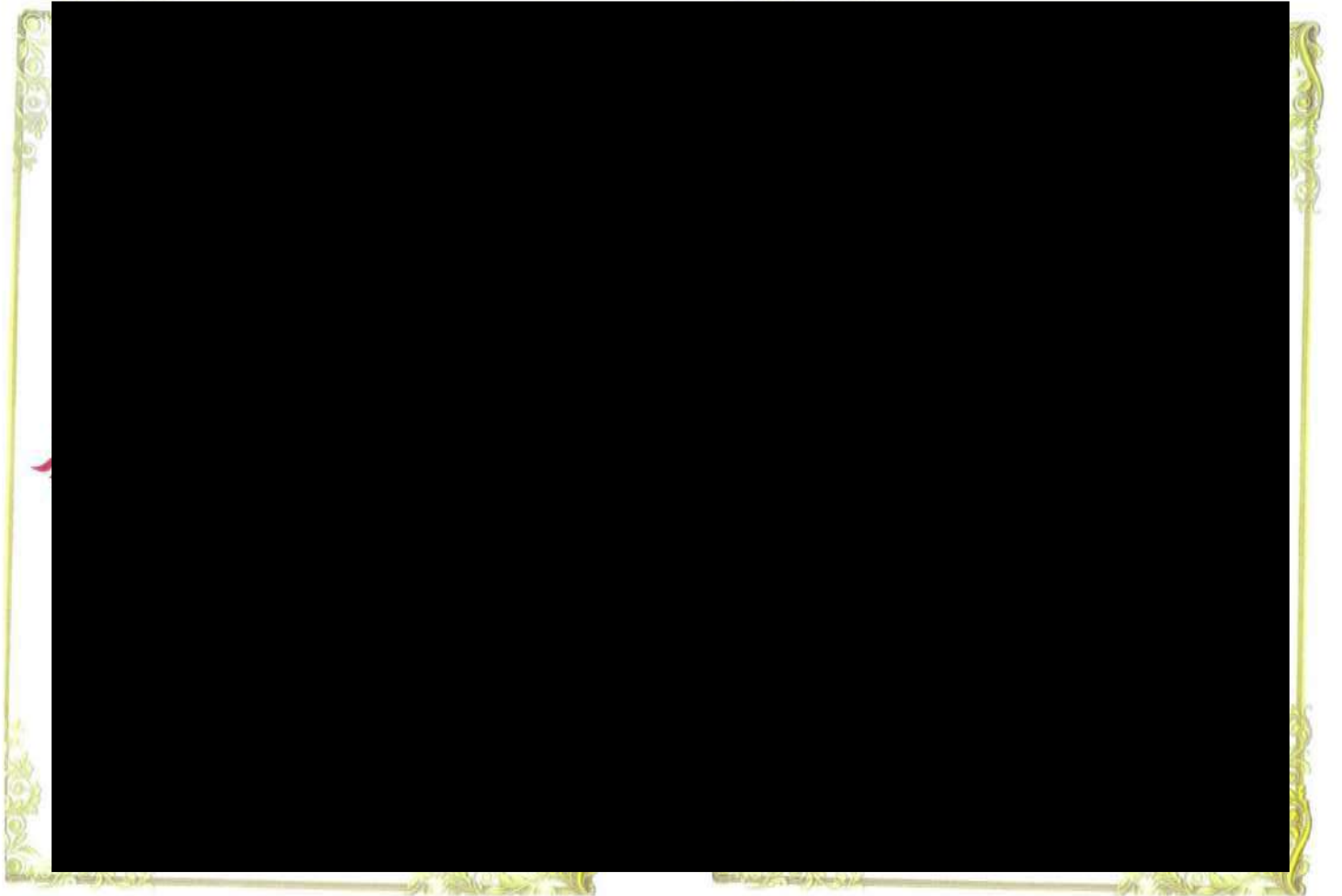
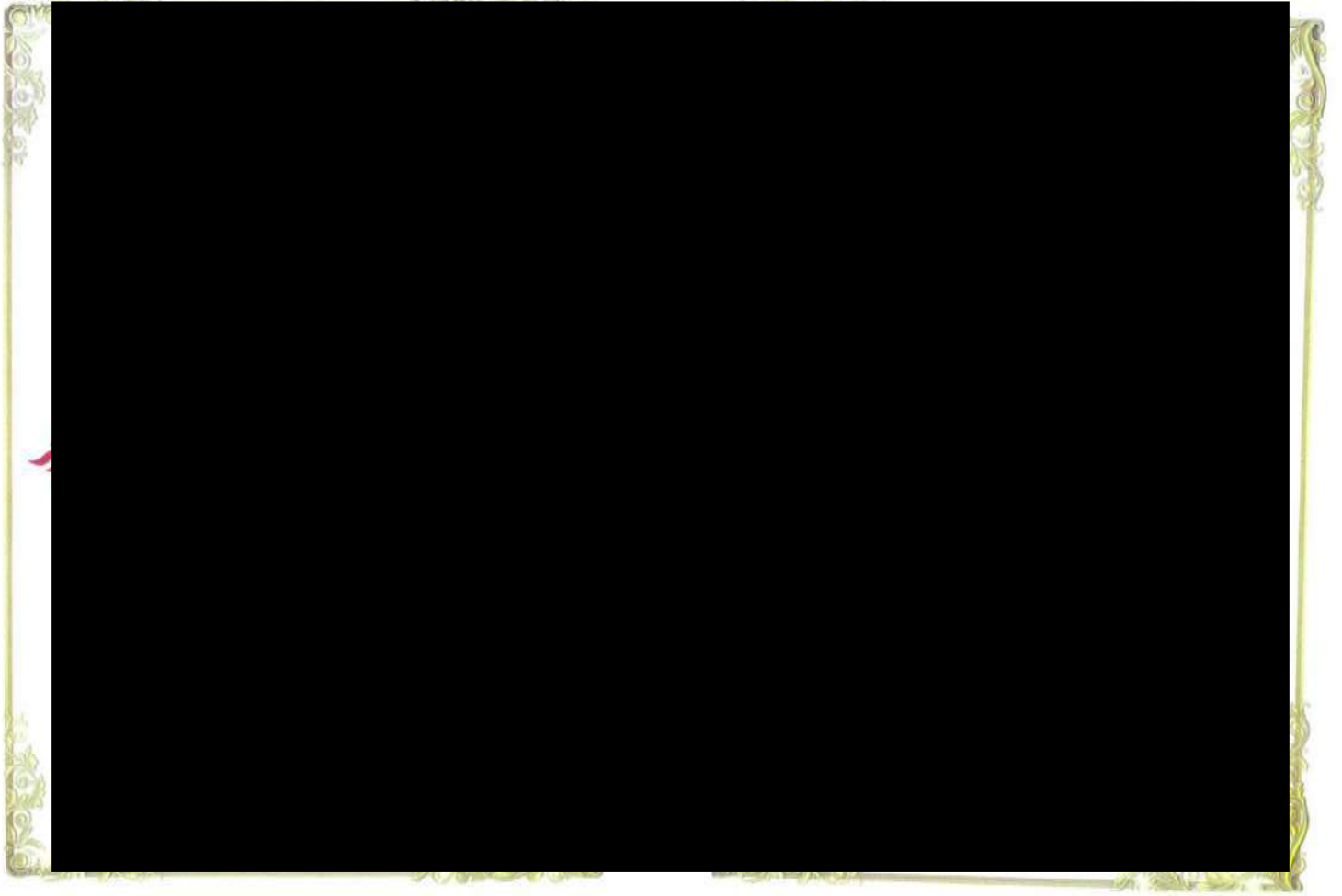


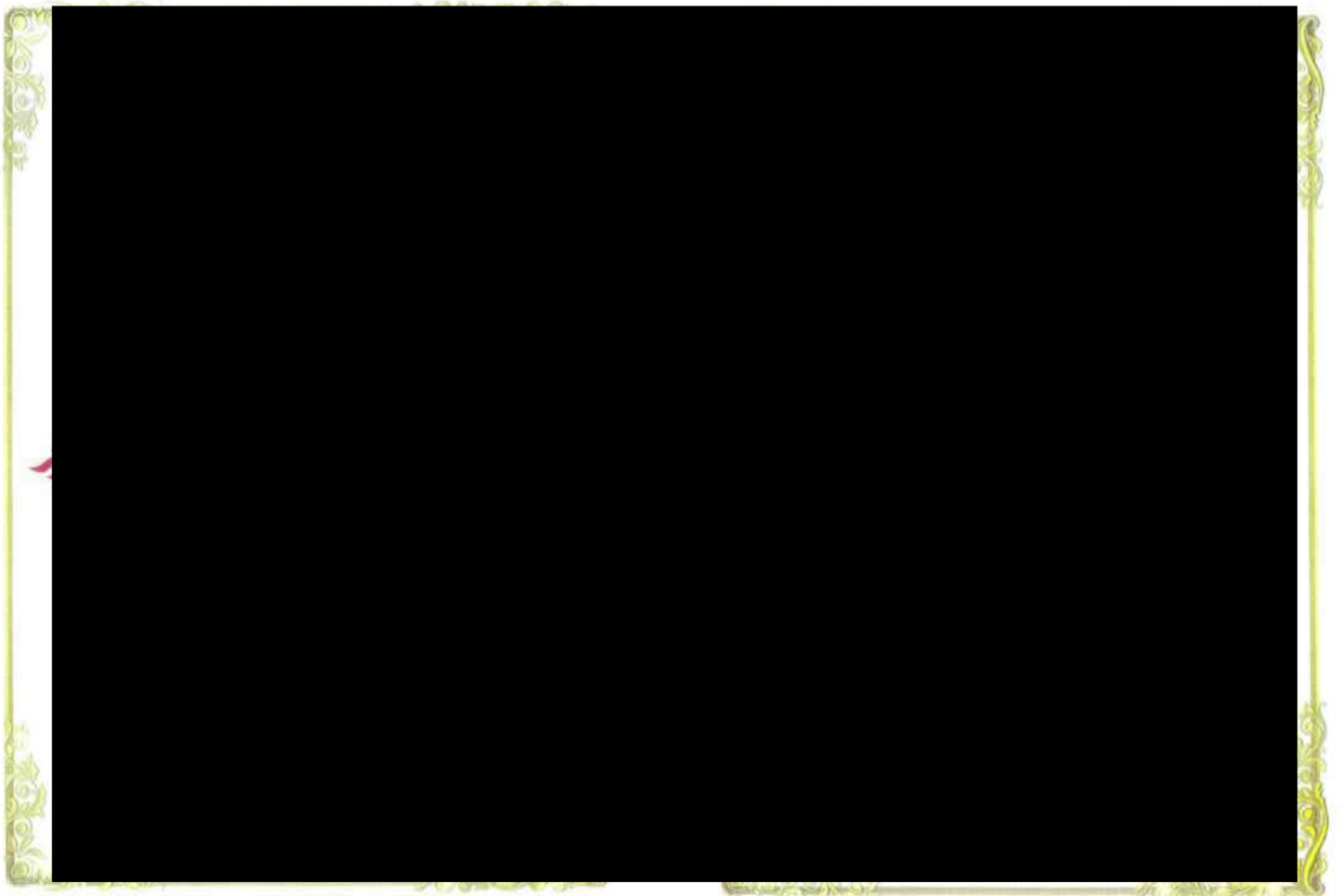


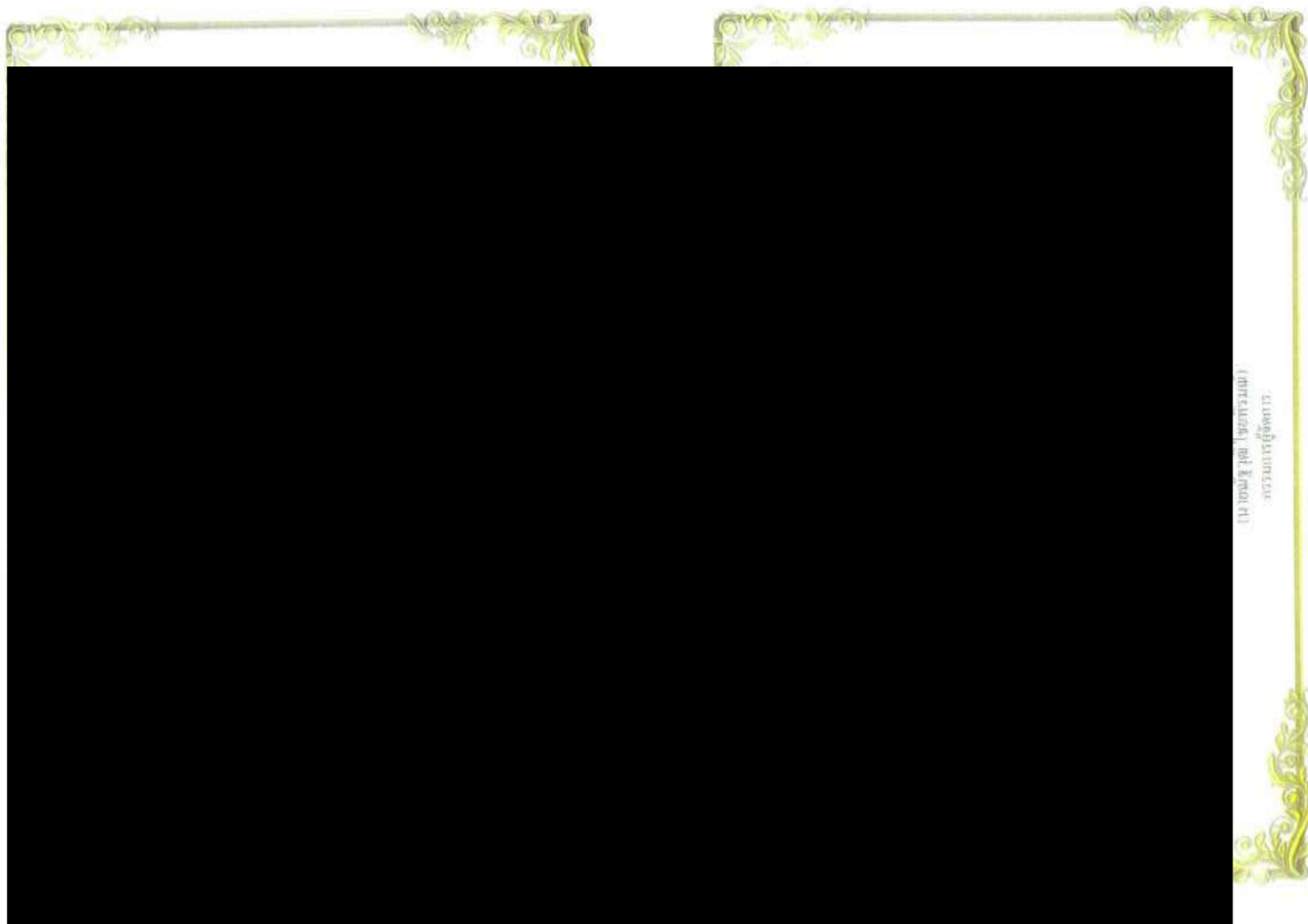






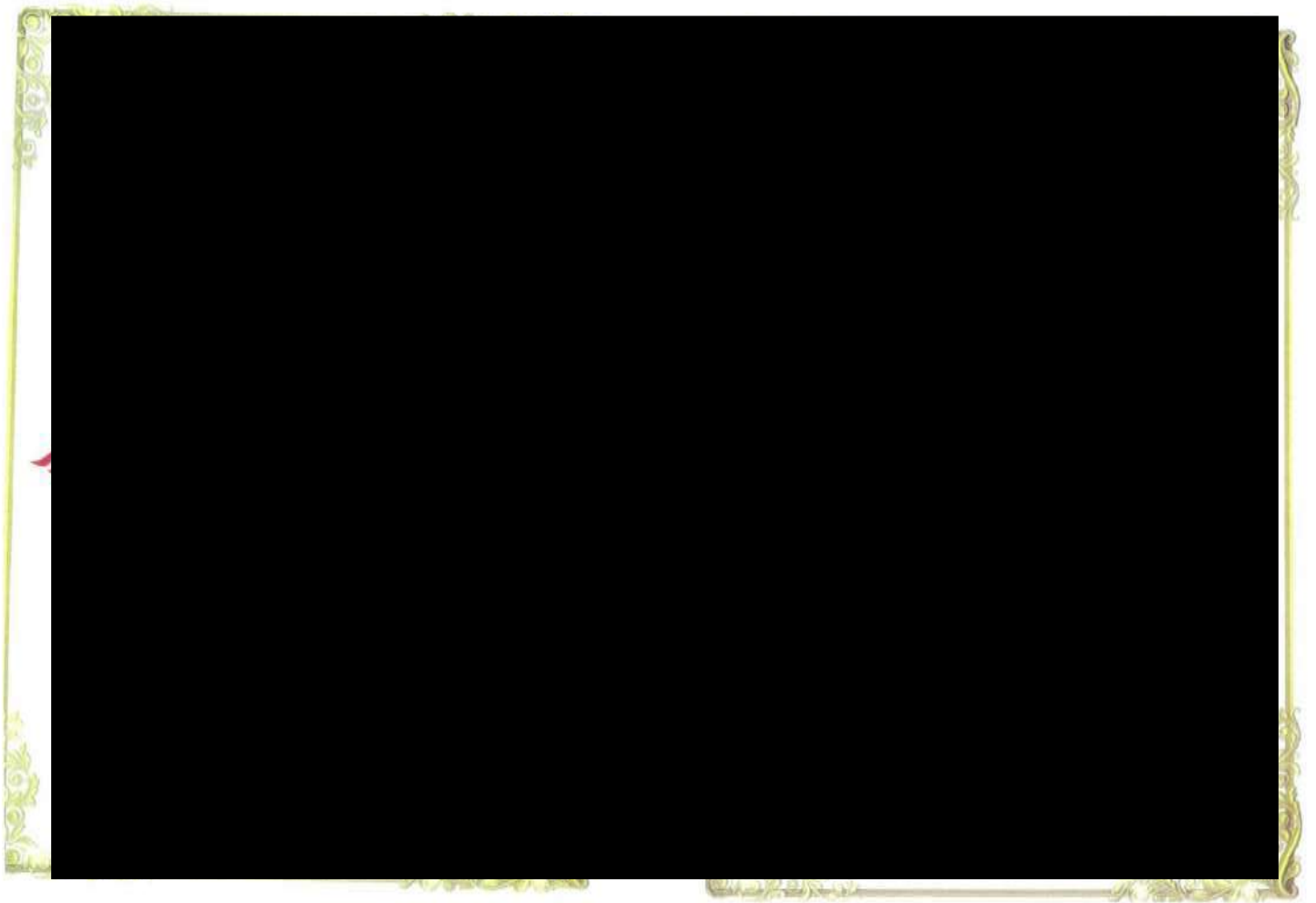


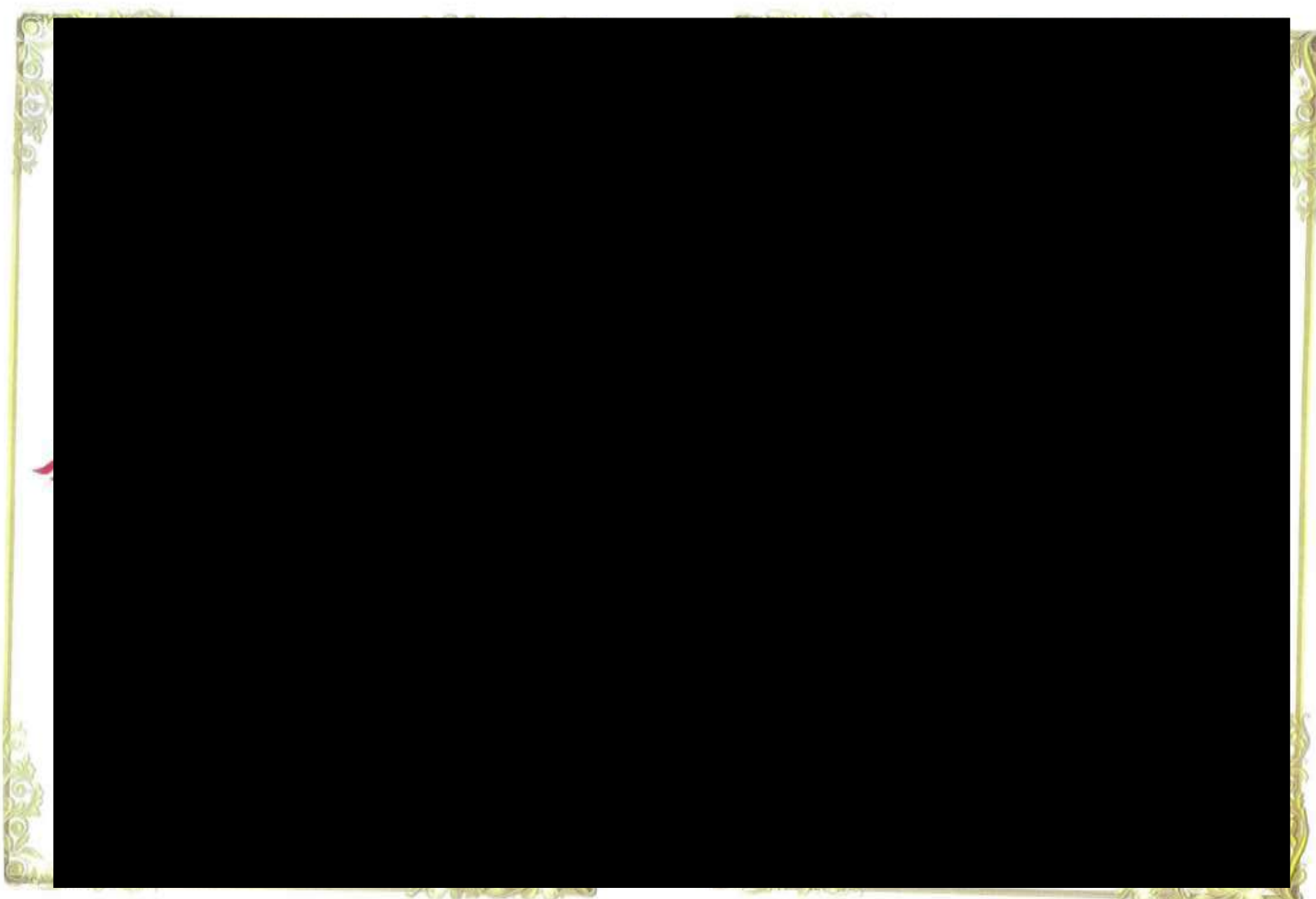




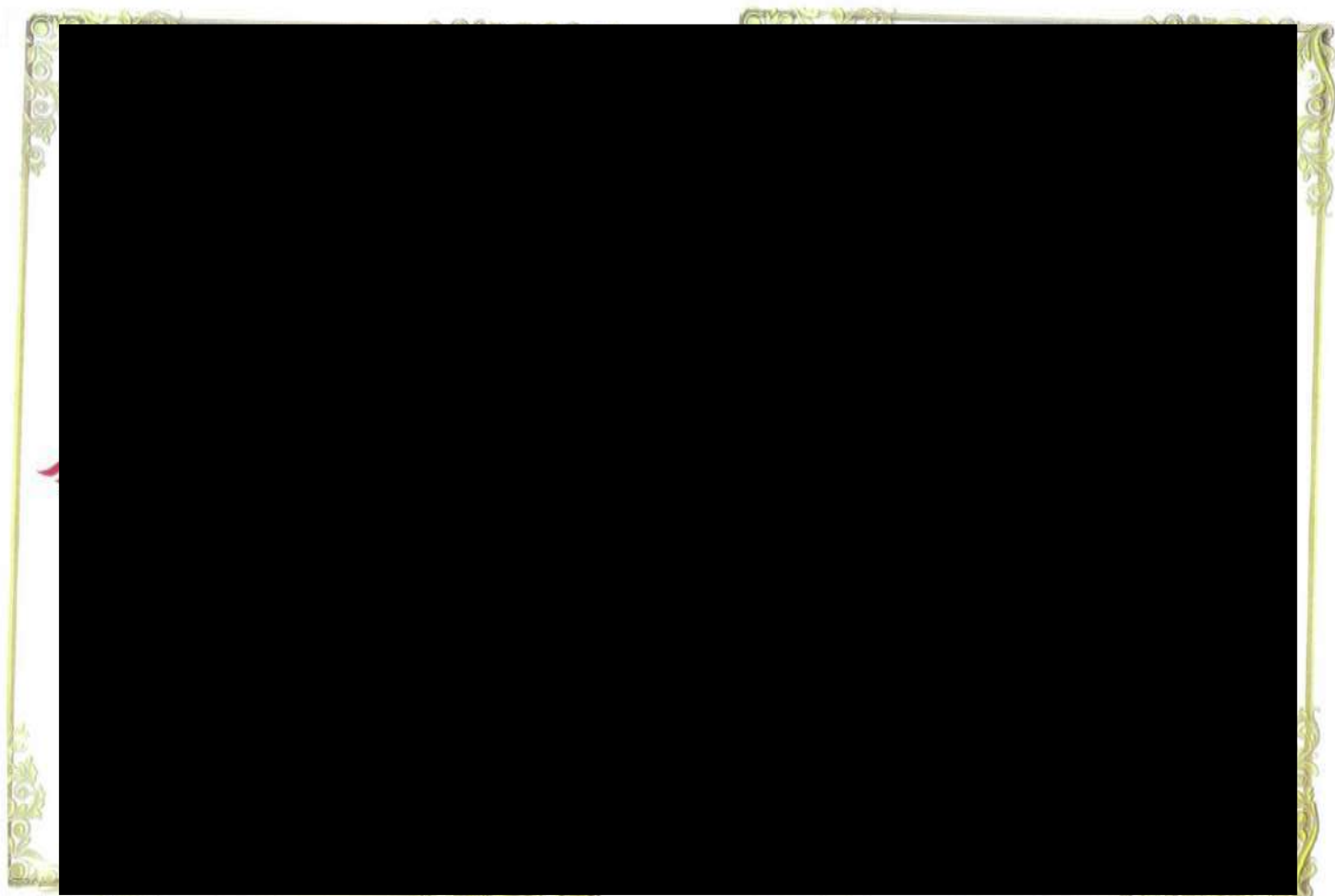
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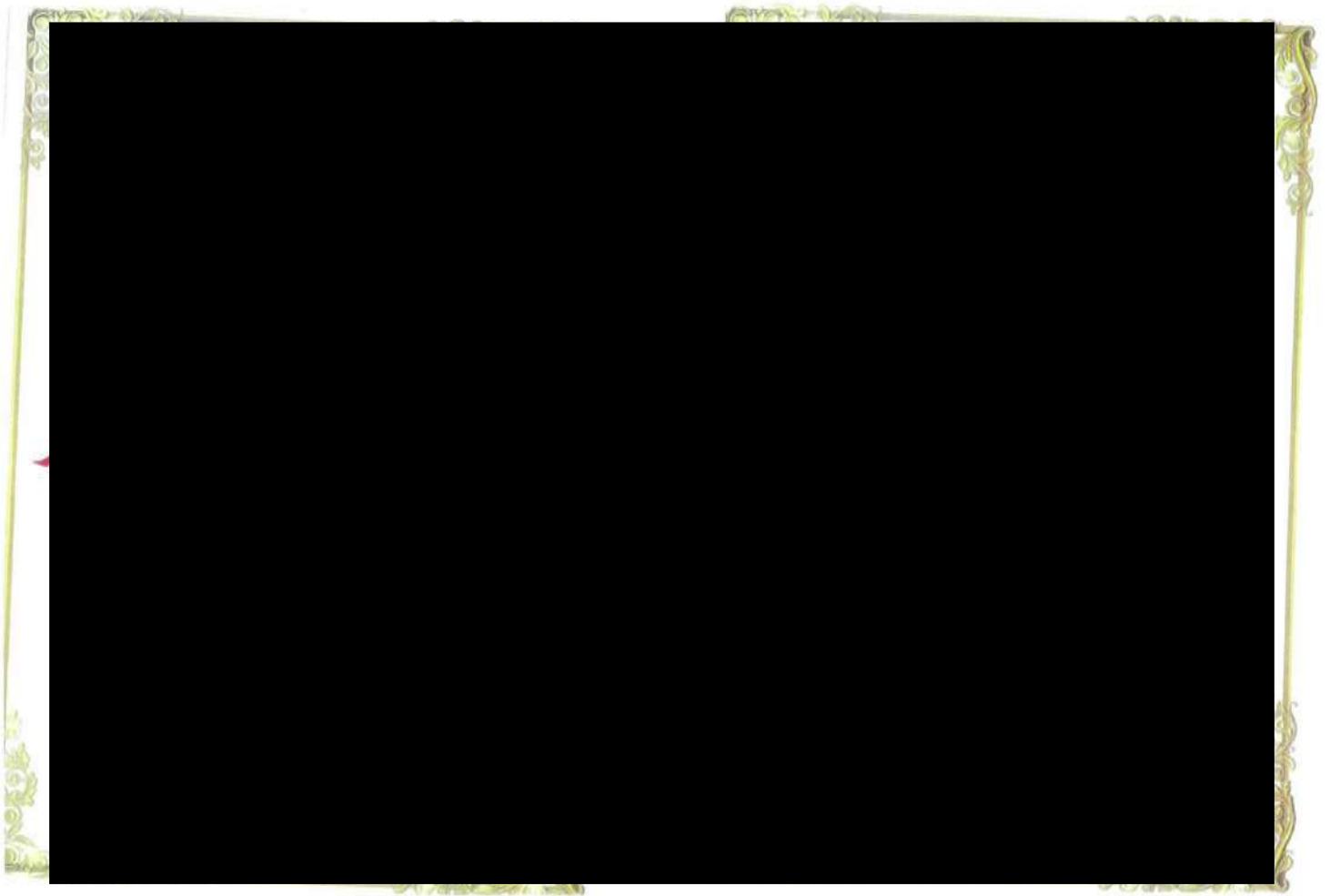












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บริษัท ท่าอากาศยานไทย จำกัด (มหาชน)
Airports of Thailand Public Company Limited

สัญญาจ้างก่อสร้างและปรับปรุงเส้นทาง (ส่วน) Runway D Extension
และถนน Perimeter Roadway ท่าอากาศยานสุวรรณภูมิ

สัญญาเลขที่ ๘.1๓๐-๖๓๖๐๐๑

ฉบับที่ ๑๕ สิงหาคม ๒๕๖๓

ระหว่าง

บริษัท ท่าอากาศยานไทย จำกัด (มหาชน)

กับ

บริษัท สหจก.บจ. บริการ จำกัด

บริษัท แนวคิดพัฒนาระบบ จำกัด (มหาชน)

เล่ม 1/1

ព្រឹត្តិបត្រ

အိန္ဒိယနိုင်ငံရှိ နေရာအများစုတွင်



ข้อ ๕ คำจ้างเฉพาะการจ้างเหิน

[illegible]

การอนุมัติจากผู้จ้างก่อน

การจ้างเงินแต่ไม่ส่งมอบจะเข้าอาชญากรรมฉ้อโกงที่ทำได้จริงในแต่ละเดือนและ
อัตราดอกเบี้ยที่คิดดอกเบี้ยในโปรแกรมการธนาคาร

ในการยื่นขออนุมัติให้จ้างเหมาบริการ แผนและผลงานการก่อสร้างโครงการใน แต่ละเดือนให้เป็นผลงานรวม เพื่อให้ผู้รับจ้างแสดงผลงานแยกแต่ละกิจกรรมแบบรายเพื่อประกอบการ ขอเบิกเงินค่าจ้าง (Payment Application) ด้วย

- ผู้ริบจ้างต้องทำงานต่างๆ เพื่อให้ซื้อกำหนดกิจกรรมแล้วเสร็จ (Milestones:

ฯที่กำหนดไว้หากไม่ทราบการดำเนินการที่กำหนดไว้ในข้อกำหนดกิจกรรมแล้ว

มีอารมณ์เบิกบานแจ่มใสจนสำหรับสมทบในเพื่อนนั้นๆ และเห็นต่อไปจนกว่า
 (เวลา ๑- ๓๕) วันแล้วเสร็จ

- การแก้ปัญหาค่าจ้างลูกหนี้ซึ่งจะจ่ายได้ต้องผ่านกระบวนการตรวจสอบคุณภาพและปริมาณ
ที่หน่วยงาน

- กรณีการเบิกจ่ายค่าจ้างที่มีข้อก้ำกั้นกิจกรรมแล้วเสร็จ (Milestones: MS)

ท่าน จะต้องเฝ้าสังเกตการตรวจสอบหรือทดสอบคุณภาพผลงานก่อนที่เข้าหน้าที่ควบคุมงานจะออกใบรับรองข้อกำหนดกิจกรรมเพื่อสำเร็จ (Milestones Certificate) เพื่อประกอบการขอเบิกเงินค่าจ้าง (Payment Application)

เอกสารนี้เป็นทรัพย์สินของทางราชการ ซึ่งขอคืนให้เจ้าของคืนก่อนจะหมดอายุ
ของเอกสารของทางราชการ (Indefinite Hold) มาด้วยจึงขอสงวน
ลิขสิทธิ์แล้วเสร็จ (Milleniums Certificate) ไว้

ข้อ ๕ เงินค่าจ้างล่วงหน้า

ผู้วิจัยกำหนดจ่ายเงินค่าจ้างแก่ทนายให้แก่มูลนิธิผู้รับจ้าง เป็นจำนวนเงิน ๓๓๓,๒๓๓.๕๐ บาท (น้าร้อยยี่เจ็ดพันสามพันสองร้อยสามบาทถ้วน) ซึ่งเท่ากับร้อยละ ๑๐ (สิบ) ของราคาค่าจ้าง ตามสัญญาที่ลงนามไว้กับ ก.

เนื่องจากข้างต้นมีบันทึกว่าผู้ว่าราชการจังหวัดได้มีการประชุม (สทศ) วันที่ ๒๖ สิงหาคม ๒๕๖๒
เพื่อสรุปงานเป็นต้นไป และผู้รับแจ้งได้วางหลักประกันการปรับค่าเสียหายลงแล้วเรียบร้อยในวันถัดมา
นอกจากนี้ยังได้แจ้งผู้ว่าฯ ผู้รับแจ้งจะดำเนินการนำผู้ว่าราชการจังหวัดมาลงนามในใบแจ้งความ
ผู้ว่าราชการจังหวัดจะดำเนินการนำผู้ว่าราชการจังหวัดมาลงนามในใบแจ้งความผู้ว่าราชการจังหวัด
ผู้ว่าราชการจังหวัดจะดำเนินการนำผู้ว่าราชการจังหวัดมาลงนามในใบแจ้งความผู้ว่าราชการจังหวัด



ผู้รับจ้างรายชน โดยผู้รับจ้างจะต้องส่งหลักฐานทางสื่อต่างๆ กับทางกรมการฯ ซึ่งหากโดยมากการภายในประเทศไทย ตามมูลค่าที่สหกรณ์บางรายได้คิดผู้จ้างเพิ่มเป็นหลักประกันแทน

เชื่อว่าจ้างจะตีเงินบาทละหมื่นผลงาน แะหะ/หรือหนังสือคำปรกาศของธนาคารดังกล่าว
ตามบรรณานุกรมไทยไม่มีติดฉบับนี้ให้แก่ผู้รับจ้างพร้อมกับการชำระเงินค่าจ้างงวดสุดท้าย

[illegible]

ข้อ ๗ กำหนดเวลาแล้วเสร็จและพิธีของคู่เจ้าข้างในการขบวนแห่ขันหมาก

ภายในกำหนดวัน ๑๕.๕๐ (หนึ่งพันห้าสิบล้าน) วัน นับตั้งแต่วันที่ พทท. จะได้รับแจ้งจาก ไบโอบังค์ให้ส่งมอบอำนาจ (Notice to Proceed) ผู้รับจ้างจะต้องส่งมอบแผนงานให้เป็นที่ยอมรับจากผู้รับจ้าง โดยแสดงถึงขั้นตอนของการทำงานและกำหนดเวลาที่ต้นเริ่มและกำหนดการส่งมอบให้ได้ว่าพร้อมที่จะดำเนินการต่อได้บ้างหรือไม่หรือการติดกันเป็น ๓๐ (สามสิบ) วัน นับจากวันที่เริ่มโยกโยนไปจนถึงการดำเนินการ (Notice to Proceed) โดยแผนงานดังกล่าวจะรวมรายการข้อกำหนดทั้งหมดแล้วซึ่งผู้รับจ้างจะต้องพิจารณาขออุปทานจากผู้จำหน่ายหลักแล้ว จะต้องมีความสอดคล้องกับข้อกำหนดการเชื่อมประสานงานแบบหัวใจ (Key data : KD) ที่ผู้จำหน่ายหลักกำหนด

ตัวผู้ตัวเมียจึงมีลักษณะขนานาน หรือมีได้สองอย่างภายในกำหนดเวลาหนึ่งโดยไม่มีการทำงานให้แล้วเสร็จตามกำหนดเวลา หรือมีเวลาให้แล้วเสร็จซึ่งลักษณะการทำงานนั้นแล้วเสร็จก่อนกำหนดเวลา หรือจะแล้วเสร็จช้ากว่ากำหนดก็ได้ หรือมีลักษณะไม่ปฏิบัติตามกำหนดเวลาที่กำหนดไว้ (ผู้ดูแลพฤติกรรมได้ศึกษา หรือสังเกตผู้เป็นต้นตระกูล หรือมีเพื่อนไม่ปฏิบัติตามคำสั่งของแม่จนกระทั่งตนเจริญพันธุ์หรือผู้ควบคุมดูแลหรือบริวารซึ่งมีเพศชายซึ่งได้มีบทบาทเช่นแม่จนกระทั่งผู้เลี้ยงดูผู้เจริญพันธุ์ตายไป) และเมื่อมีเพศผู้ตัวผู้เลี้ยงดูใหม่เข้ามาแทนที่ตนแล้วผู้เลี้ยงดูเดิมก็ไม่ได้ตาย การให้เพศผู้ดูแลลูกตัวอ่อนหรือตัวอ่อนที่เจริญหรือตัวอ่อนที่ตายแล้วแก่ลูกหลานของผู้เลี้ยงดู

การที่ผู้จ้างไม่ใช้สิทธิเลิกสัญญาดังกล่าวข้างต้นนั้น ไม่เป็นเหตุให้ผู้รับจ้างพ้นจาก
 ภาระอันมีต่อผู้จ้าง

ข้อ ๕ ความรู้เบื้องต้นเกี่ยวกับความหมายของงานวิจัย

เป็นกรณีแก้ไขปรับปรุง และตั้งค่าใช้จ่ายมอบหมายจากผู้รับจ้างหรือหากผู้จ้าง
รายใด ไม่กระทำการตามหลักสัญญาตามที่ข้อ ๗ หากมีเหตุสุดวิสัยแห่งหรือภัยเกิดขึ้นจากภายนอกซึ่ง
ภายใต้งานตาม ข้อ ๗ (ซึ่งมีผลย้อนกลับ) ให้มีผลโดยการจัดให้มีระบบและเงื่อนไขการ
หนี้เสียหากไม่เกิดจากความบกพร่องของงานที่ได้รับมอบหมายจากผู้จ้างหรือหากผู้จ้าง
หรือหากผู้จ้างไม่ปฏิบัติตามภาระตามสัญญาที่กำหนดไว้ การกระทำดังกล่าวเป็นไปโดย
หรือหากผู้จ้างไม่ปฏิบัติตามภาระตามสัญญาที่กำหนดไว้ การกระทำดังกล่าวเป็นไปโดย

๕.๖ ผู้รับจ้างจะได้อำนาจค่าจ้างล่วงหน้าเพื่อเป็นค่าใช้จ่ายในการปฏิบัติงานตามสัญญา
เท่านั้น ขยายสิทธิการใช้เงินค่าจ้างล่วงหน้าเพื่อใช้ในส่วนอื่นของเงินค่าจ้างล่วงหน้านั้นในภายหลัง
ผู้ว่าจ้างอาจจะยกเลิกเงินค่าจ้างล่วงหน้านั้นนับจากผู้รับจ้างไม่ปฏิบัติตามการขังเงินค่าจ้าง
ล่วงหน้าไว้ได้ทันที

๕.๒ เมื่อผู้จ้างหรือวิศวกร ผู้รับจ้างได้พร้อมส่งหลักฐานการใช้จ่ายเงินค่าจ้างทั้งหมดนี้
เพื่อพิสูจน์ว่าได้ไปเป็นไปตามข้อ ๕.๑ มาตราในกำหนด ๓๕ (สิบห้า) วัน นับตั้งแต่วันที่ได้รับหนังสือแจ้งหักจาก
ผู้ว่าจ้าง หากผู้รับจ้างไม่อาจแสดงหลักฐานดังกล่าว ภายในกำหนด ๓๕ (สิบห้า) วัน ผู้ว่าจ้างอาจเรียกเงิน
ค่าจ้างส่วนที่เหลือจากผู้จ้างหรือวิศวกรหลังจากหักเงินจากวิศวกรหรือบริษัทรับเงินค่าจ้างส่วนที่เหลือได้ทันที

๗.๖ เงินค่าจ้างของพนักงานที่ได้รับค่าจ้างให้แก่วินิจฉัยเงินปันผล ผู้ชำระจะต้องคืนเงินค่าจาก กทพ.เงินปันผลของเขตสหภาพ ตั้งแต่วันที่ ๑ (หนึ่ง) เป็นต้นไป โดยคณะกรรมการจัดตั้งคดีความไว้แก่จำนวนเงิน ๒๒๖,๐๐๐ (สอง) แสนยอของพนักงานในกองทุนนี้ เมื่อได้ทำการหักเงินดังกล่าวแล้ว ขงคณะกรรมการเงินปันผลของเขตสหภาพแล้ว หากมีเงินค่าจ้างของพนักงานที่จะต้องจ่ายคืนค่าของอีกเท่าใด ให้ทำการหักเงินค่าจากยอดที่จ่ายเหนือให้พนักงานชำระคืนแก่กองทุนเงินปันผลในกรณีนี้ ประการจากเรื่องเงินค่าจ้างดังกล่าวนี้ หากมีข้อพิพาทเกี่ยวกับเงินปันผลของเขตสหภาพแล้ว ให้พนักงานชำระคืนเงินค่าของเขตสหภาพ

๓๖. เว้นจำนวนใบปะทานที่ผู้รับจ้างจะต้องจ่ายให้แก่ผู้จ้างเพื่อทำประกันภัยหรือเพื่ออุทิศส่วนสืบทาย่างๆ ตามสัญญา ผู้ว่าจ้างจะหักเอาจากเงินค่าจ้างงวดที่จะจ่ายให้แก่ผู้รับจ้างจนกว่าจะหักชดใช้ครบถ้วนค่าจ้างล่วงหน้า

๕.๕ ในกรณีที่มีการนอกหลักสูตร หากเจ้าหน้าที่ส่งมอบทรัพย์สินหรือเอกสารจำนวนเงิน
ที่ผู้รับจ้างจะได้รับจากเหตุการณ์กรณีนี้แล้ว ผู้รับจ้างจะต้องจ่ายคืนเงินจำนวนที่เหลือให้แก่ผู้จ้าง
ภายใน ๗ (เจ็ด) วัน นับตั้งแต่วันที่ผู้รับแจ้งเป็นหนังสือจากผู้จ้าง

[illegible]

ชั้น ๒ การหักเงินประกันผลงาน

ใบปะหน้าพิมพ์สีน้ำเงินให้แก่วิทยาลัยแห่งละสอง ใบผู้จ้างจะเก็บไว้เก็บจำนวนร้อยละ๑๐ (สิบ) ของเงินที่ต้องจ่ายในวันอาทิตย์เพื่อเป็นประกันการปฏิบัติงาน ใบประกันนี้ให้ไว้แก่ผู้จ้างและมอบให้แก่ตนในได้วันที่สิบ ของเดือนมิ.ย (หก) เดือน ผู้จ้างมีหน้าที่ที่จะจัดหาเงินประกันคืนตามเดิม โดยผู้จ้างจะต้องพิจารณาถึงสีน้ำเงินของธนบัตรที่จะออกโดยธนาคารภายในประเทศตามสภาพที่เห็น ผู้จ้างจะนำเงินไปฝากไว้กับธนาคารแห่งใดก็ได้เพื่อเป็นประกันเงินที่จะเก็บตามวันที่สิบให้ไว้ในวันอาทิตย์ก่อนออกใบปะหน้าคืนตามกำหนดจ่ายและ



ผู้คิดจากรัฐไม่ได้เรียนจบเป็นหมอส่งมาหาผู้ว่าจ้างพวกนี้ไปทำการแก้ไขให้ถูกต้องจนเวียนว่ายภายในเวลา
ผู้ว่าจ้างกำหนดให้ผู้ว่าจ้างมีสิทธิที่จะทำการขึ้นเองหรือส่งผู้อื่นให้ทำงานนั้น โดยผู้ว่าจ้างต้องเป็นผู้ยอม
ค่าจ้างแก่พวกของตน

ใบประเมินส่วนงานเกี่ยวกับทรัพย์สินทางปัญญาของบุคลากรหรืออาสาสมัครชั่วคราว และ/หรืออาจ
รอให้ผู้ปฏิบัติงานแก้ไขในระยะเวลาที่กำหนดไว้ตามบรรทัดที่ ๓๓ ผู้ปฏิบัติงานมีสิทธิเข้าพิจารณาใบประเมินผู้ถูก
ประเมินต่อที่ปรึกษากฎหมายในชั้นรอง หรือข้างผู้ถือใบประเมินขอแสดงความขาดตกบกพร่องหรือเพิ่มพูนการ โทษผู้ปฏิบัติงาน
ด้วยวิธีที่เหมาะสมกับเวลาให้แจ้งกับทั้งหมดยกเว้น

การที่ผู้ว่าฯ ทำการขึ้นเอง หรือจ้างผู้รับไปทำงานนั้นแล้วผู้รับจ้าง ไม่ทำให้ผู้รับจ้างหลุดพ้นจากความรับผิดชอบตามกฎหมาย หากผู้รับจ้างไม่พอใจให้จ้างทนายมาฟ้องคดีกับผู้ว่าฯ เรียกค่าเสียหายถึงขั้นบังคับให้ทนายประกันการปฏิบัติความผิดเอาไว้

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ผู้เข้าร่วมสหกรณ์ไม่ว่ามาจากพื้นที่หรือเขตตำบลชนบทหรือเมือง มีปัจจัยทางสังคมที่ก่อให้เกิดแนวคิดทางธุรกิจแตกต่างกันไปขึ้นอยู่กับขนาดของสหกรณ์ที่เข้าร่วม การที่ผู้เข้าร่วมได้มีโอกาสให้คำแนะนำแก่สหกรณ์ส่วนกลางทำให้มีแนวโน้มที่จะเห็นคุณค่าของการมีส่วนร่วมในสหกรณ์มากขึ้น ไม่เพียงแต่ได้รู้ถึงเป้าหมายของสหกรณ์เท่านั้น แต่ยังได้เรียนรู้ถึงขั้นตอนการดำเนินงานที่สหกรณ์ได้ดำเนินการอยู่ และผู้เข้าร่วมยังจะต้องได้พบกับผู้ที่มีความรู้และประสบการณ์ทางธุรกิจจากผู้เข้าร่วมสหกรณ์ส่วนกลางและได้แลกเปลี่ยนเรียนรู้กับสมาชิกสหกรณ์

กรณีผู้รับจ้างไปทำงานจนได้รับบาดเจ็บโดยฝ่ายความในระบอบหนึ่ง ผู้รับจ้างต้องชำระค่ารักษาให้แก่ผู้จ้างเป็นจำนวนเงินในอัตราร้อยละ ๑๐ (สิบ) ของเงินค่าของงานที่จ้างซ่อมแซม
 รัฐบาล หรือ ไม่ตัดสินผู้จ้างว่าจำในการยกเลิกสัญญา

ข้อ ๓๖ การควบคุมงานของผู้รับจ้าง

ผู้ได้รับแจ้งจะต้องตรวจสอบการขึ้นบัญชีจ่ายอย่างใกล้ชิด ตัวกรมจะต้องรายงานและตรวจสอบบัญชีภายในและในระหว่างทำงานขึ้นบัญชีจ่ายขององค์กรที่มีผู้ไม่ปฏิบัติตามซึ่งทำงานเดิมเวลาขึ้นบัญชีได้ผิดหรือขาดความชำนาญขององค์กรผู้ขึ้นบัญชี ผู้แทนของหน่วยงาน บริษัทหรือสถาบันอื่นจะต้องคอยติดตามผู้ไม่ปฏิบัติตามอย่างใกล้ชิดและแจ้งให้หน่วยงานที่เกี่ยวข้องทราบทันทีเมื่อพบการฝ่าฝืนหรือการละเมิดกฎระเบียบของกรมผู้ขึ้นบัญชีจ่าย การละเมิดกฎระเบียบดังกล่าวจะต้องทำให้หน่วยงานที่เกี่ยวข้องได้รับทราบโดยเร็วที่สุดเท่าที่จะเป็นไปได้และแจ้งผู้เกี่ยวข้อง การละเมิดกฎระเบียบดังกล่าวจะต้องทำให้หน่วยงานที่เกี่ยวข้องได้รับทราบโดยเร็วที่สุดเท่าที่จะเป็นไปได้และแจ้งผู้เกี่ยวข้อง

ผู้ว่าฯ จักรทิพย์ก็จะขอให้เปลี่ยนตัวผู้แทนตามวาระหนึ่ง โดยแจ้งเป็นหนังสือไปยังผู้รับจ้าง และผู้รับจ้างจะต้องทำการเปลี่ยนตัวผู้แทนไปโดยพลัน โดยไม่คิดค่าจ้างหรือรางวัลเพิ่มเติม



ข้อ ๑๕ แบบรูปและรายการสะท้อนถึงตลาดหลักทรัพย์

ผู้รับจ้างรับมอบรายได้จากผลตอบแทนจากการเข้าใช้ประโยชน์จากทรัพยากรธรรมชาติและ
โดยที่ส่วนแล้ว หากปรากฏว่าในรูปของผลประโยชน์ที่เกิดขึ้นมีค่าเท่ากับหรือมากกว่าเงินไปจากหลักกา
การวิศวกรรมหรือทางเทคนิค ผู้รับจ้างดังกล่าวที่ลงทะเบียนกับบริษัทที่มีถิ่นที่อยู่ในต่างประเทศ
ผู้ถือหุ้นจากต่างประเทศ หรือบริษัทที่ปรึกษาที่ผู้รับจ้างดังกล่าว เพื่อให้ทราบแล้วเสร็จเกี่ยวกับบริษัทที่มีถิ่นที่อยู่ในต่างประเทศ
หรือบริษัทที่ปรึกษา ผู้รับจ้างจะต้องจัดทำเอกสารที่เกี่ยวข้อง หรือค่าใช้จ่ายเพิ่มเติมจากผู้รับจ้าง หรือหน่วยงาน
อันมีอำนาจในคดี

ข้อ ๓๕ การมอบหมายงานโดยผู้ว่าจ้าง

ผู้ว่าจ้างจะส่งมอบงานแก่กรรมการบริหารของบริษัทผู้ว่าจ้าง ผู้ควบคุมงาน หรือบริษัทที่ปรึกษา
ผู้ว่าจ้างแต่งตั้งให้มีอำนาจที่จะตรวจหากและขอทราบคุณสมบัติที่เป็นไปตามสัญญาจ้างและอำนาจที่จะขอให้
แก้ไขข้อบกพร่องและแจ้งเพิ่มเติม หรือตัดทอนซึ่งงานตามสัญญาจ้าง หากผู้ว่าจ้างตัดสินใจไม่ปฏิบัติตาม ผู้ว่าจ้าง
จะถือว่ากรรมการควบคุมบริษัทผู้ควบคุมงาน หรือบริษัทที่ปรึกษา มีอำนาจที่จะสั่งให้หยุดงานชั่วคราวได้
ความเข้าใจในบทนี้จะเป็นที่ ผู้ว่าจ้างจะเปิดให้เหตุผลขอขมขื่นเวลาการปฏิบัติตามแผนงานหรือวิธีการ
ดำเนินการหากไม่เป็นที่พอใจ

ข้อ ๑๓ งานพิเศษนอกเวลาแก่นักเรียน

ผู้ว่าจ้างมีสิทธิที่จะละเว้นหนังสือให้ผู้รับจ้างทราบเพื่อละเว้นไม่ให้แสดงไว้หรือรวมอยู่ในเอกสารสัญญาฯ หากงานมีค่าน้อยๆ อยู่ในขอบข่ายการที่ไม่ได้ตั้งวัตถุประสงค์ของสัญญาฯ นอกจากนี้ ผู้รับจ้างยังมีสิทธิที่จะได้เปลี่ยนแปลงหรือแก้ไขแบบแปลนข้อกำหนดต่างๆ ในเอกสารสัญญาฯ ด้วย

ถ้าความจำเป็นหรือราคาที่สามารถรับได้สูงเกินไป ให้กำหนดใบใส่สำหรับรวมพิเศษ หรือรวมที่เพิ่มเติมขึ้น หรือที่ทดแทนสิ่งที่ขาดความสำคัญของผู้ผู้จ้าง หากใบสัญญาใบนี้ไม่ได้กำหนดไว้ให้ใช้ ราคาจ้าง หรือราคาใบใหม่ ที่จะมีใบใส่สำหรับงานพิเศษหรืองานที่เพิ่มขึ้นหรือทดแทนเพิ่มเข้า ผู้จ้างและผู้รับจ้างจะต้องตกลงกันที่จะกำหนดหมวดแห่งหรือราคาใบที่เพิ่มขึ้นหรือลดลง ตามที่กรมการขายหลวง (ถ้ามี) กำหนดหรือแนะนำตามใบแจ้งที่ติดกันกับใบนี้ได้ ผู้จ้างจะกำหนดราคาจ้างหรือราคาตามใบแจ้งที่ติดกันกับใบใหม่รวมและจะถูกตัดสินว่า ผู้รับจ้างจะต้องเพิ่มใบแจ้งที่ตามราคาใบแจ้งของผู้จ้างใบใหม่ เพื่อให้ได้ความแตกต่างและใบแจ้งที่จ้าง

ថ្ងៃ ពុធ ទី១១/៩

จากหลักฐานทางคดีนี้ เห็นว่ารถบรรทุก (Lawry D) ได้เกิดอุบัติเหตุบน Roadway ทางภาคกลางตอนกลางแล้วแล่นรถหนีไปชนรถจักรยานยนต์คันหนึ่ง (รถจักรยานยนต์) ในบริเวณสี่แยกที่ ๓ ทางเข้าใต้สะพาน (Notice to Proceed) ทางขึ้นข้างใต้ถนนถนนกรมการขนส่งทางบกที่ ๓ ผู้ขับขี่รถจักรยานยนต์คันดังกล่าวจึงบาดเจ็บสาหัสและเสียชีวิต บาดเจ็บสาหัส ๒ ราย บาดเจ็บเล็กน้อย ๑ ราย และทรัพย์สินเสียหายมูลค่าประมาณ ๑๐,๐๐๐ บาท ของรถจักรยานยนต์ของรถบรรทุกคันดังกล่าว



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ในกรณีส่งมอบงานตามเวลาที่กำหนดไว้ในสัญญาหากการที่กรมประมงสามารถที่จะ

นโยบายนี้ที่ผู้จ้างงานออกให้โดยผู้จ้างจ้างอาจอ้างหากมีและหรือว่าจ้างผู้ใดให้ทำงานนั้น
 ตลอดจนแล้วบริษัทให้ ผู้จ้างงานหรือผู้ใดที่เข้าทำงานนั้นต้องมิให้ไปใช้เครื่องมือในการก่อการร้าย จึงที่จะเข้าขึ้น
 ข้าราชการหรือพนักงานเอกชน และบุคคลต่างๆ ซึ่งเห็นว่าจะต้องลงโทษหนักไว้เพื่อการปฏิบัติงานตามวิสัย
 ตามที่จะเห็นสมควร

ใบรวมนี้เพื่อแจ้งว่า ผู้จ้างงานมีสิทธิหรือข้อบังคับจากหลักประกันการปฏิบัติงานตามสัญญา
ทั้งหมดที่ผู้จ้างงานเสนอ ตามข้อตกลงฉบับนั้นจะ นอกเหนือนี้ ผู้จ้างงานจะต้องทำวิธีคิดประกันในแง่ของ เงินซึ่งเป็น
จำนวนเงินค่าจ้างหลักประกันการปฏิบัติงานตามสัญญา รวมทั้งค่าใช้จ่ายที่เพิ่มขึ้นในการทำงานบนเครื่องใช้แล้วเสร็จ
ตามสัญญา และจะมอบใบแจ้งนี้ให้แก่ผู้จ้างงานก่อนจะเริ่ม (ได้มี) ซึ่งผู้จ้างงานจะหักออกจากผลประโยชน์ประกันของงานนั้น
จำนวนเงินใบนี้ ซึ่งค่าจ้างใหม่ (ผู้จ้างงาน) ให้

ในกรณีระยะเวลาดำเนินการเชื่อมโยงประสานงานก่อนแล้ว (Key dates: KUW)

โครงการนี้ผู้รับจ้างไม่ปฏิบัติตามสัญญาตามที่ให้พร้อมทั้งกรมเหตุใหญ่ กิจงาน เงินเบียด
ให้ให้คิดค่ารับ ค่าเสียหาย หรือค่าใช้จ่ายแก่ผู้รับจ้าง ผู้รับจ้างต้องขอได้ค่ารับ ค่าเสียหาย หรือค่าใช้จ่าย
ต้องสำรับได้ผู้รับจ้างให้พร้อมทั้งเงินภายในกำหนดตามที่ผู้รับจ้างระบุไว้ในหนังสือแจ้งผู้รับจ้าง หากผู้รับจ้างไม่
ขอได้ให้พร้อมทั้งเงินแล้วภายในกำหนดแล้ว ผู้รับจ้างจะไม่มีสิทธิ์ที่จะนำค่าจ้างจำนวนเงินค่าจ้างที่เนื่อง

[illegible]

ควรคำนึงความจำเป็นสำหรับปี ค่าเสียภาษี หรือค่าใช้จ่ายอื่น ภายในกำหนดเวลาที่ผู้ว่าจ้างอยู่ในขอบเขตแห่งข้อบังคับ
พลเรือนเห็นว่าค่าจ้างสัญญาที่ให้ไว้จ่ายเป็นค่าปรับ ค่าเสียหาย หรือค่าใช้จ่ายแก่มวล

ต้องเหลียวหลังดูที่บรรพบุรุษ ผู้มาข้างหลังหันไปหาผู้ไว้เบื้องหลัง

หากผู้รับจ้างไม่สามารถทำงานให้เสร็จแล้วเสร็จภายในเวลาที่กำหนดไว้ในสัญญา

ผู้รับจ้างจะตั้งวงราชการเรียนผลงานที่ปฏิบัติงานตามสัญญาเพื่อร่วมพิจารณาหรือ
ถึงอำนาจควบคุมดูแลในการปฏิบัติงานของผู้รับจ้าง สุดท้าย ต้นแบบ หรือผู้รับจ้างจะ (แก้ไข) ให้ขอ ๒ ปีก่อน
และมีโอกาสฝึกงานใหม่ในการใช้แบบก่อสร้างระยะเวลาการจ้าง และเมื่อทำการเสร็จสิ้นแล้วจะมีการทบทวน

กลุ่มเบสก็เพิ่มต้นโพธิ์บริเวณพื้นที่บริเวณน้ำทิ้งหอยอยู่ใกล้ปากที่จะอาศัยและใช้การไต่ต้น

[illegible]

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๒๕๖๓.๓ ทิวาเก๋ไก๋
 ๒๕๖๓.๔ ฟ้าใสใจดี
 ๒๕๖๓.๕ ฟ้าใสใจดี
 ๒๕๖๓.๖ ฟ้าใสใจดี

ผู้รับจ้างจะต้องจัดทำบัญชีแสดงผลการดำเนินงานโดยชี้แจงแยกแยะผลประโยชน์ของ
แผนของแต่ละฝ่าย พร้อมกับบัญชีค่าใช้จ่ายที่เกิดขึ้นในการดำเนินงานตามสัญญาสิทธิการให้บริการที่มีขึ้นเพื่อวัตถุประสงค์
ในบางกรณีนี้ อาจนำผลกำไรหรือผลขาดทุนต่าง ๆ ของโครงการการบริการของรัฐทั้งหมด หรือส่วนคุณสมบัติอันหนึ่งอัน
หนึ่งมา และพร้อมที่จะให้ผู้รับจ้างหรือเจ้าหน้าที่ของรัฐผู้จ้างหรืออาสาสมัครได้ตลอดเวลาพิจารณาโดยปราศ
จากการรบกวน

สัญญาที่ทำขึ้นเป็นสองฉบับ มีข้อความถูกต้องตรงกัน คู่สัญญาได้ทวนและเข้าใจข้อความ
โดยละเอียดทุกข้อแล้ว จึงได้ลงนามมีชื่อ พร้อมทั้งประทับตรา (ถ้ามี) ไว้เป็นสำคัญต่อหน้าพยาน
และผู้สัญญาต่างฝ่ายมิได้คัดค้านกัน

1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 26



มหาวิทยาลัยราชภัฏวชิรวิทยากุล



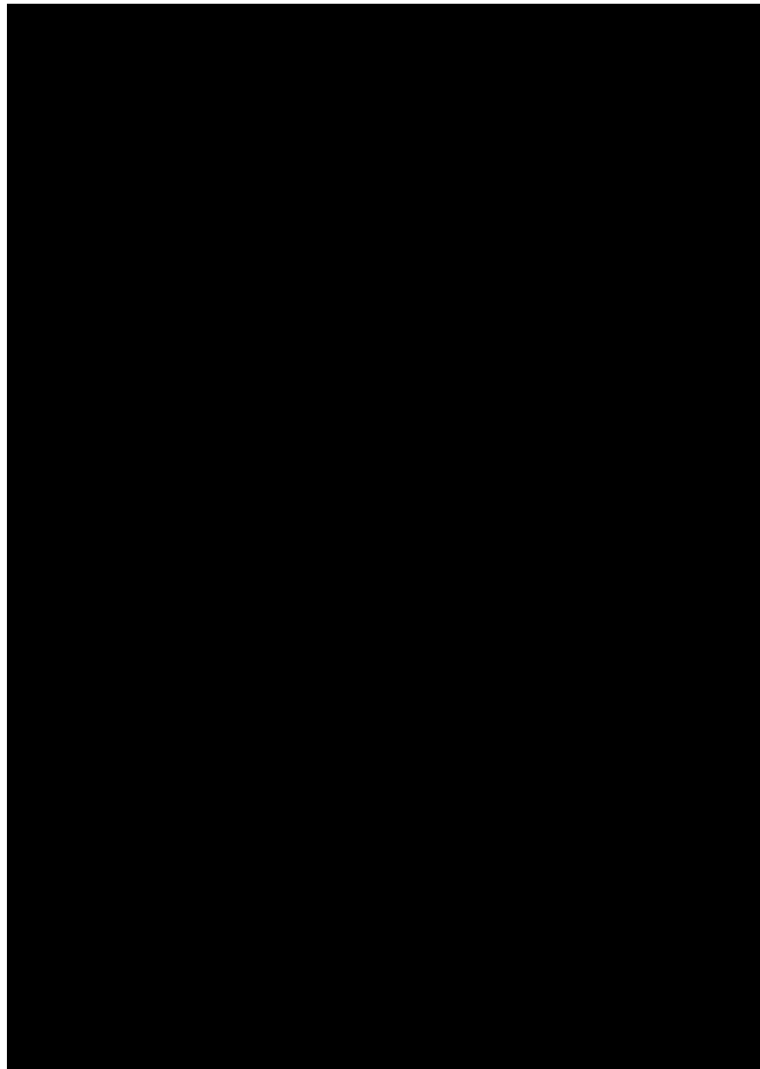
เรื่อง แจ้งบอกกล่าวให้เข้มนงาน (Notice to Proceed)

อ้างถึง หนังสือกระทรวง ทบวง กรมไทย จ้ากิต (มหาชน) เลขที่ 11490/2563 ลงวันที่ 31 กรกฎาคม 2563

ที่ตั้งใน โดเมนท้องถิ่นเป็น **ชื่อ** ขององค์กรหรือการรวมกัน ที่นิยม เข้ามามีชีวิตงานแต่ละวันที่ ๒๕๖3 และใช้ชื่อวันที่ 28 กันยายน 2563 เป็นวันเริ่มนับเวลาตั้งแต่บัดนั้น ชื่อนี้มีการรวมค่า Domain ของโดเมนที่อยู่ที่ทำการตั้งอยู่ที่ 3, Trowley D Extension และฐาน Perimeter (axway) การรวมกัน เลขที่ 83100-633001 ให้ตัวเลขส่วนภายใน 1,050 (หนึ่งพันห้าสิบ) ขึ้น ซึ่งจะมีเลขศูนย์ใน **เลข** 2566

ชื่อ: สุวิมล งามวงศ์

สำนักงานบริหารโครงการเพื่อสังคม
โทรศัพท์ 0 2132 8760
โทรสาร 0 2132 8715



เอกสารแนบ 50
เอกสารบันทึกปริมาณขยะติดเชื้อ
ที่นำไปกำจัดใน ทอท.



บันทึกปริมาณขยะอันตรายและขยะติดเชื้อประจำเดือน



ครั้งที่	วัน/เดือน/ปี	ปริมาณขยะติดเชื้อห้องพยาบาล	ปริมาณขยะติดเชื้อจาก ATK	ผู้รับผิดชอบนำไปกำจัด	หมายเหตุ
1	13 มกราคม 2565	-	2485 กรัม	wellness	รวม 1100 กรัม
2	25 มกราคม 2565	-	525 กรัม	wellness	
3	4 กุมภาพันธ์ 2565	-	990 กรัม	wellness	
4	16 กุมภาพันธ์ 2565	-	600 กรัม	wellness	รวม 750 กรัม
5	2 มีนาคม 2565	-	665 กรัม	wellness	
6	3 มีนาคม 2565	-	1400 กรัม	wellness	รวม 6155 กรัม
7	5 มีนาคม 2565	-	925 กรัม	wellness	
8	7 มีนาคม 2565	-	600 กรัม	wellness	
9	8 มีนาคม 2565	-	260 กรัม	wellness	
10	9 มีนาคม 2565	-	240 กรัม	wellness	
11	10 มีนาคม 2565	-	65 กรัม	TNJV	
12	11 มีนาคม 2565	-	75 กรัม	TNJV	
13	12 มีนาคม 2565	-	195 กรัม	TNJV	
14	13 มีนาคม 2565	-	25 กรัม	TNJV	
15	14 มีนาคม 2565	-	185 กรัม	TNJV	
16	15 มีนาคม 2565	-	30 กรัม	TNJV	
17	16 มีนาคม 2565	-	35 กรัม	TNJV	
18	17 มีนาคม 2565	-	25 กรัม	TNJV	
19	19 มีนาคม 2565	-	25 กรัม	TNJV	

บันทึกปริมาณขยะอันตรายและขยะติดเชื้อประจำเดือน



ครั้งที่	วัน/เดือน/ปี	ปริมาณขยะติดเชื้อห้องพยาบาล	ปริมาณขยะติดเชื้อจาก ATK	ผู้รับผิดชอบนำไปกำจัด	หมายเหตุ
20	21 มีนาคม 2565	-	25 กรัม	TNJV	
21	22 มีนาคม 2565	-	60 กรัม	TNJV	
22	26 มีนาคม 2565	-	50 กรัม	TNJV	
23	29 มีนาคม 2565	-	125 กรัม	TNJV	
24	1-6 เมษายน 2565	-	175 กรัม	TNJV	รวม 2075 กรัม
25	21 เมษายน 2565	-	1900 กรัม	wellness	
26	6 พฤษภาคม 2565	-	1800 กรัม	wellness	รวม 1825 กรัม
27	26 พฤษภาคม 2565	-	25 กรัม	TNJV	
28	10 มิถุนายน 2565	-	50 กรัม	TNJV	รวม 280 กรัม
29	14 มิถุนายน 2565	-	80 กรัม	TNJV	
30	25 มิถุนายน 2565	-	150 กรัม	TNJV	

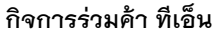
บันทึกปริมาณขยะอันตรายและขยะติดเชื้อประจำเดือน

ครั้งที่	วัน/เดือน/ปี	ปริมาณขยะติดเชื้อห้องพยาบาล นำไป ทิ้งจุดทิ้งขยะติดเชื้อ AOT	ปริมาณขยะติดเชื้อ จาก การทำ ATK โดย Wellness	ผู้รับผิดชอบนำไปกำจัด	หมายเหตุ
1	4 มกราคม 2565	-	300 กรัม	Wellness	รวม 2000 กรัม
2	10 มกราคม 2565	-	300 กรัม	Wellness	
3	17 มกราคม 2565	-	350 กรัม	Wellness	
4	24 มกราคม 2565	-	350 กรัม	Wellness	
5	31 มกราคม 2565	350 กรัม	350 กรัม	TNJV – Wellness	
6	7 กุมภาพันธ์ 2565	-	350 กรัม	Wellness	รวม 2100 กรัม
7	14 กุมภาพันธ์ 2565	-	350 กรัม	Wellness	
8	21 กุมภาพันธ์ 2565	-	350 กรัม	Wellness	
9	28 กุมภาพันธ์ 2565	400 กรัม	350 กรัม	TNJV – Wellness	
10	7 มีนาคม 2565	-	400 กรัม	Wellness	รวม 1900 กรัม
11	14 มีนาคม 2565	-	400 กรัม	Wellness	
12	21 มีนาคม 2565	-	400 กรัม	Wellness	
13	28 มีนาคม 2565	300 กรัม	400 กรัม	TNJV – Wellness	
14	4 เมษายน 2565	-	300 กรัม	Wellness	รวม 1700 กรัม
15	11 เมษายน 2565	-	350 กรัม	Wellness	
16	18 เมษายน 2565	-	350 กรัม	Wellness	
17	25 เมษายน 2565	300 กรัม	400 กรัม	TNJV – Wellness	
18	17 พฤษภาคม 2565	-	300 กรัม	Wellness	รวม 800 กรัม
19	30 พฤษภาคม 2565	200 กรัม	300 กรัม	TNJV – Wellness	

ครั้งที่	วัน/เดือน/ปี	ปริมาณขยะติดเชื้อห้องพยาบาล นำไป ทิ้งจุดทิ้งขยะติดเชื้อ AOT	ปริมาณขยะติดเชื้อ จาก การทำ ATK โดย Wellness	ผู้รับผิดชอบนำไปกำจัด	หมายเหตุ
20	13 มิถุนายน 2565	-	300 กรัม	Wellness	รวม 600 กรัม
21	27 มิถุนายน 2565	-	300 กรัม	Wellness	

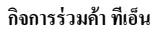
เอกสารแนบ 51
แผนการตรวจสอบสุขภาพประจำปี 2565





โครงการก่อสร้างทางวิ่งเส้นที่ 3 Taxiway D Extension และ Perimeter Taxiway ท่าอากาศยานสุวรรณภูมิ โครงการพัฒนาท่าอากาศยานสุวรรณภูมิ

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โครงการโครงการก่อสร้างทางวิ่งเส้นที่ 3 Taxiway D Extension และ Perimeter Taxiway ท่าอากาศยานสุวรรณภูมิ โครงการพัฒนาท่าอากาศยานสุวรรณภูมิ

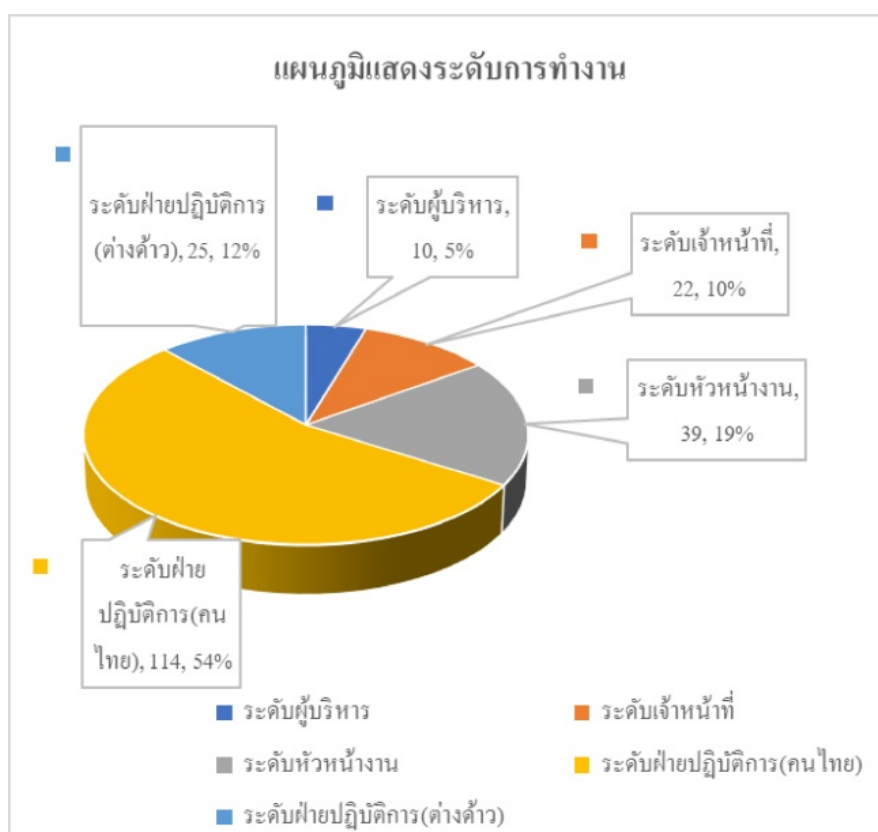
TNJV/NWR ตรวจเดือนพฤศจิกายน 65

เอกสารแนบ 52
เอกสารบันทึกรายละเอียดแรงงานท้องถิ่น

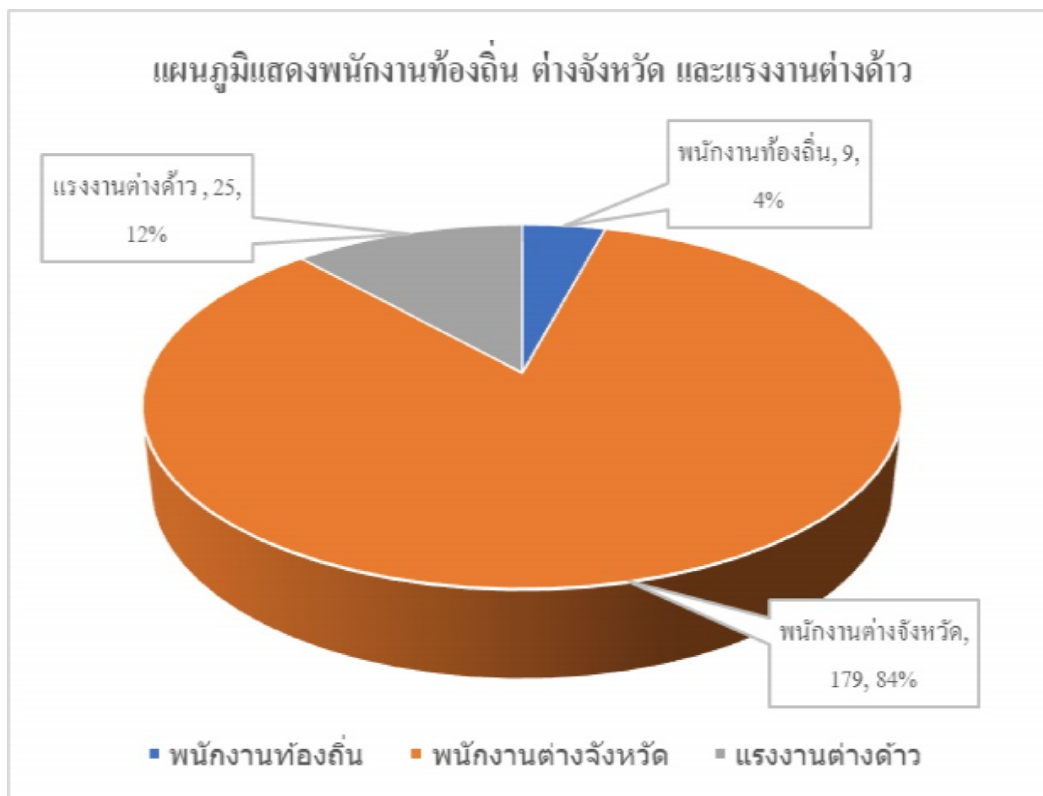




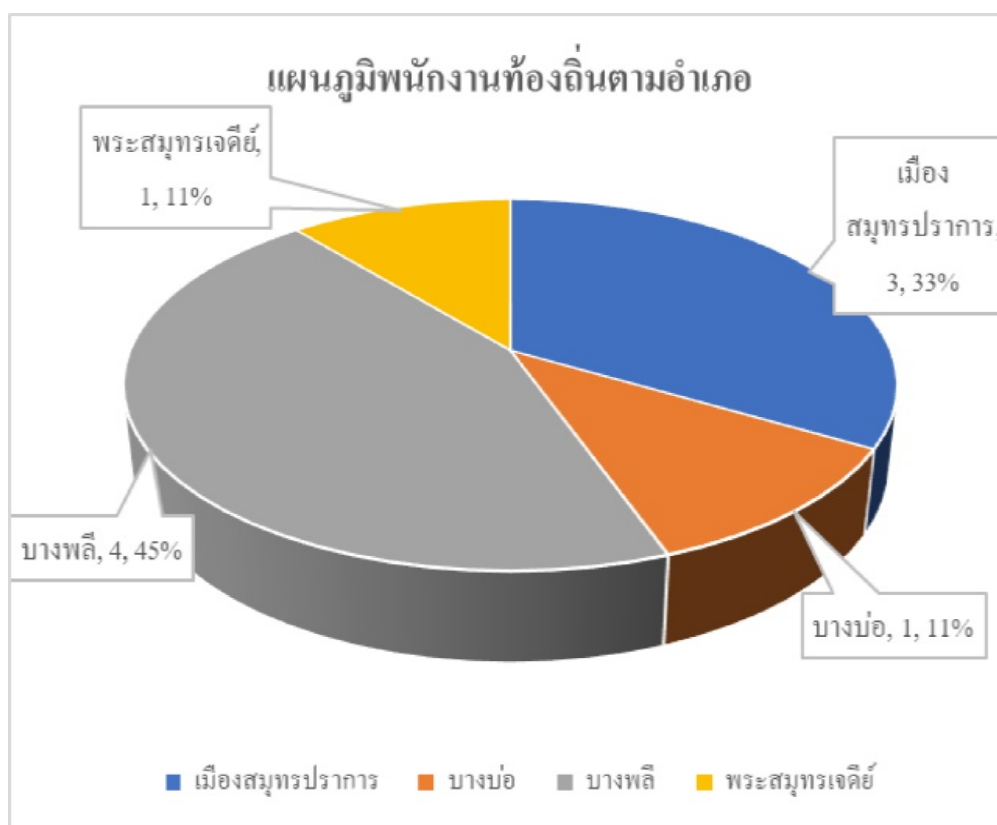
พนักงานท้องถิ่น ต่างจังหวัดและแรงงานต่างด้าว



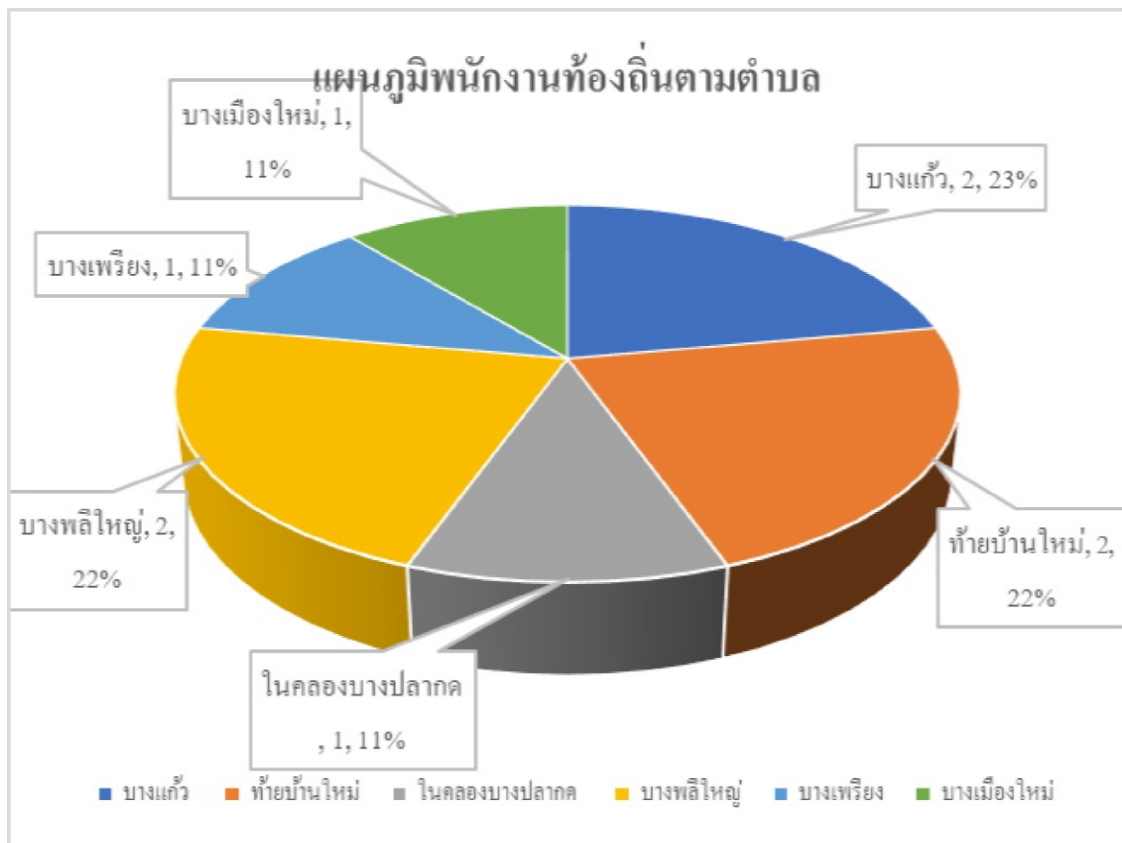
แยกเป็นพนักงานตามระดับการทำงาน



แยกประเภทพนักงานท้องถิ่น พนักงานต่างจังหวัด และแรงงานต่างด้าว



แยกประเภทพนักงานท้องถิ่นตามอำเภอ



แยกประเภทพนักงานท้องถิ่นตามตำบล

เอกสารแนบ 53
หนังสือขออนุญาตนำรถสูบล้างสิ่งปฏิกูลทิ้งของเสีย
ลงบ่อรวบรวมน้ำเสีย ทอท.



สวนสุขาภิบาล
เลขที่ 1538
วันที่ 12 พ.ค 65
เวลา 13.49

เลขที่.....

(เอกสาร ๑ งคน.สสภ.ฝสอ.ทสภ.)

แบบคำขออนุญาตนำรถดูดสิ่งปฏิกูลทิ้งของเสียลงบ่อรวบรวมน้ำเสีย ทอท.

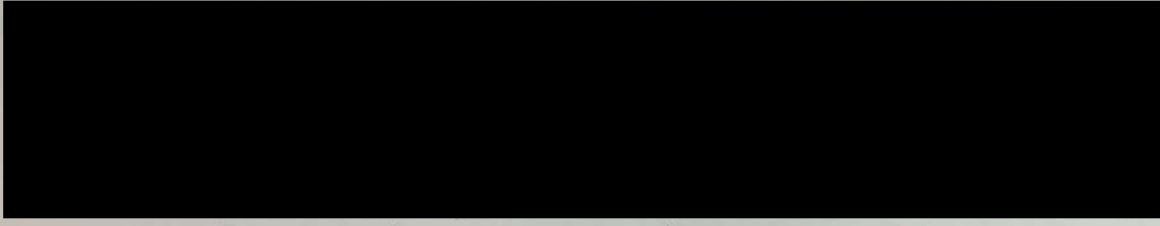
เขียนที่.....สสภ.ฝสอ.ทสภ.....

วันที่ 12 เดือน พ.ค. พ.ศ. 2565

เรื่อง ขออนุญาตนำรถดูดสิ่งปฏิกูลทิ้งของเสียลงบ่อรวบรวมน้ำเสีย ทอท.

เรียน หัวหน้างานควบคุมระบบน้ำ

- สิ่งที่แนบมาด้วย ๑. ☒ เอกสารแสดงทะเบียนรถพร้อมรูปถ่ายด้านหน้ารถ- ด้านข้างรถ
๒. ☒ สำเนาบัตรประชาชนผู้มีอำนาจดูแลรับผิดชอบ



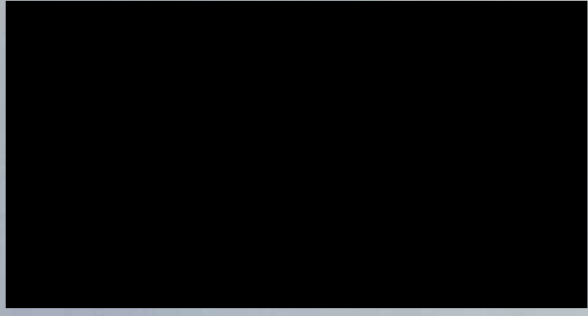
- ระบายน้ำเสียจากรถดูดสิ่งปฏิกูลลงในบ่อรวบรวมน้ำเสียของ ทอท. (พร้อมตักเศษขยะและไขมัน)
- ดูดน้ำเสีย - ขนถ่าย น้ำเสียจากบ่อรวบรวมน้ำเสีย ทอท. (พร้อมทำความสะอาดหลังเสร็จภารกิจ)

ถนนสาย 3

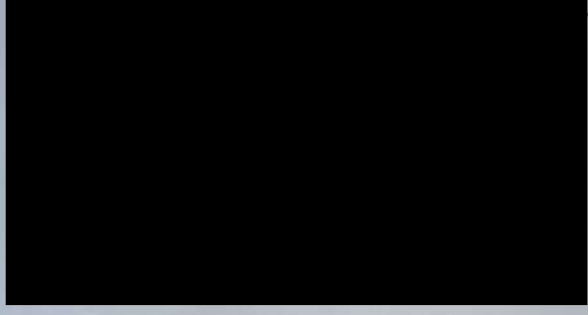
ทั้งนี้บริษัทฯ พร้อมกำชับพนักงานให้ปฏิบัติตามระเบียบของ ทอท. และได้เตรียมอุปกรณ์ป้องกันอันตรายส่วนบุคคล Personal Protective Equipment (PPE) มาด้วยดังนี้

๑. ☒ หมวกป้องกันศีรษะ ๒. ☒ เสื้อสะท้อนแสง (สีแสด-สีส้ม)

จึงเรียนมาเพื่อโปรดพิจารณา



☒ อนุญาต ☐ ไม่อนุญาต เพราะ



ฝสอ.ทสภ.

เอกสารแนบ 54
บันทึกการนำน้ำทิ้งไปบำบัด
ที่โรงบำบัดน้ำเสีย ทสภ.



บันทึกการนำน้ำเสียไปบำบัด ณ สำนักงานบำบัดน้ำเสีย ท่าอากาศยานสุวรรณภูมิ

[illegible]

บันทึกการนำน้ำเสียไปบำบัด ณ สำนักงานบำบัดน้ำเสีย ท่าอากาศยานสุวรรณภูมิ

[illegible]