

ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือวิเคราะห์





INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7139 MOO 13, SOI SINTINAKORN 11 TAMPON BANG KAEU,  
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL : (66)0-2116-5860-1 FAX: (66)0-2116-7140

## Certificate of Calibration

**Customer**  
Name : UNITED ANALYST AND ENGINEERING  
Address : CONSULTANT CO.,LTD.  
81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong,  
Bangkok 10260

Certificate No : 23-TPM-254  
Request No : Req-2023-0956  
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### Unit Under Calibration Details

Calibration Parameter : Temperature  
Instrument Name : Thermal Environment Monitor  
Manufacturer : 3M  
Model : QT-12  
Serial Number : TPO020024  
Resolution : 0.1 °C  
ID Number : UAE.EFM.007/2559  
Range Calibration : 20 °C to 60 °C  
Type of Sensor : RTD  
Sensor Diameter (mm) : 4.5  
Calibration Position (mm) : 67.5  
Instrument Status : Used

### Calibration Environment and Details

Temperature : 23 °C ± 3 °C  
Humidity : 55 %RH ± 15 %RH  
Received Date : 4 May 2023  
Calibrated Date : 12 May 2023  
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

**Reference Standard** : Digital Thermometer with Sensor, Manufacturer: GINGO/GINGO, Model: GT11/RTD100, SN: 08000057, ID: 02-TPM Which was calibrated on 27 February 2023, Calibration Certificate No. : QR23-0494

**Traceability** : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

### Note

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

Approved By :

Mr. Noppadon Luangart  
Technical Manager

Issue Date :

12 May 2023

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.  
FM-708-TPM-01 Rev.01 Issue date 13/02/20

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TEL : (66)0-2116-5860-1 FAX: (66)0-2116-7140

**Calibration Note**  
UUC Adjustment : Not Adjust

Certificate No : 23-TPM-254  
Request No : Req-2023-0956  
Page : 2/2

### Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
WET	20.031	20.0	0.0	0.13
	25.033	25.0	0.0	0.13
	30.036	30.0	0.0	0.13
	35.037	35.0	0.0	0.13
	40.038	40.1	-0.1	0.13
	45.042	45.1	-0.1	0.13
DRY	50.045	50.1	-0.1	0.13
	60.048	60.1	-0.1	0.13
	20.031	19.9	+0.1	0.13
	25.033	24.9	+0.1	0.13
	30.037	29.9	+0.1	0.13
	35.037	34.9	+0.1	0.13
GLOBE	40.040	40.0	0.0	0.13
	45.040	45.0	0.0	0.13
	50.042	50.0	0.0	0.13
	60.045	60.0	0.0	0.13
	20.033	19.9	+0.1	0.13
	25.033	24.9	+0.1	0.13
	30.034	29.9	+0.1	0.13
	35.037	34.9	+0.1	0.13
	40.038	40.0	0.0	0.13
	45.040	45.0	0.0	0.13
	50.044	50.0	0.0	0.13
	60.049	60.0	0.0	0.13

End of Certificate

Calibrated By :

Mr. Sittichok Jimpakdeekun

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FM-708-TPM-01 Rev.01 Issue date 13/02/20

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## Certificate of Calibration

**Customer**  
**Name** : UNITED ANALYST AND ENGINEERING CONSULTANT  
**Address** : CO.,LTD.  
81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong,  
Bangkok 10260

**Certificate No** : 22-TPM-454  
**Request No** : Req-2022-2009

**Page** : 1/2

### Unit Under Calibration Details

**Calibration Parameter** : Temperature  
**Instrument Name** : Thermal Environment Monitor  
**Manufacturer** : 3M  
**Model** : QT-32  
**Serial Number** : TFS030004  
**Resolution** : 0.1 °C  
**ID Number** : UAE.EFM.0792561  
**Range Calibration** : 20 °C to 60 °C  
**Type of Sensor** : RTD  
**Sensor Diameter (mm)** : 4.5  
**Calibration Position (mm)** : 67.5  
**Instrument Status** : Used

### Calibration Environment and Details

**Temperature** : 23 °C ± 3 °C  
**Humidity** : 55 %RH ± 15 %RH  
**Received Date** : 17 November 2022  
**Calibrated Date** : 23 November 2022  
**Calibration Procedure** : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

### Reference Standard

Digital Thermometer with Sensor, Manufacturer: GINGO/GINGO, Model: GT11/RTD100, SN: 08000057, ID: 02-TPM Which was calibrated on 10 March 2022, Calibration Certificate No. : QR22-0578  
**Traceability** : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

### Note

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

**Approved By** :

๑๖๕๗

Mr. Paeit Mathavom  
Calibration Engineer Supervisor  
24 November 2022

**Issue Date** :

24 November 2022



### Calibration Note

UUC Adjustment : Not Adjust

**Certificate No** : 22-TPM-154

**Request No** : Req-2022-2009

**Page** : 2/2

**Result of Calibration** :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
WET	20.003	20.2	-0.2	0.14
	25.003	25.2	-0.2	0.14
	30.006	30.2	-0.2	0.14
	35.005	35.2	-0.2	0.14
	40.005	40.2	-0.2	0.14
	45.007	45.2	-0.2	0.14
DRY	50.006	50.2	-0.2	0.14
	60.007	60.2	-0.2	0.14
	20.007	20.1	-0.1	0.14
	25.005	25.1	-0.1	0.14
GLOBE	30.002	30.1	-0.1	0.14
	35.003	35.1	-0.1	0.14
	40.004	40.1	-0.1	0.14
	45.004	45.1	-0.1	0.14
	50.005	50.1	-0.1	0.14
	60.005	60.2	-0.2	0.14

**End of Certificate**

**Calibrated By** :

Mr. Siudhok Jirapakdeasakun



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TEL. 0660-2116-5800-1 FAX. 0660-2116-7140

## Certificate of Calibration

**Customer**  
Name : UNITED ANALYST AND ENGINEERING  
CONSULTANT CO.,LTD.  
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong,  
Bangkok 10260

**Certificate No :** 23-TPM-254  
**Request No :** Req-2023-0956  
**Page :** 1/2

### Unit Under Calibration Details

Calibration Parameter : Temperature  
Instrument Name : Thermal Environment Monitor  
Manufacturer : 3M  
Model : QT-32  
Serial Number : TPQ020024  
Resolution : 0.1 °C  
ID Number : UAE.EFM.007/2559

Range Calibration : 20 °C to 60 °C  
Type of Sensor : RTD  
Sensor Diameter (mm) : 4.5  
Calibration Position (mm) : 67.5  
Instrument Status : Used

### Calibration Environment and Details

Temperature : 23 °C ± 3 °C  
Humidity : 55 %RH ± 15 %RH  
Received Date : 4 May 2023  
Calibrated Date : 12 May 2023  
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

**Reference Standard** : Digital Thermometer with Sensor, Manufacturer: GINGO/INGO, Model: GT11/RTD100, SN:  
08000057, ID: 02-TPM Which was calibrated on 27 February 2023, Calibration Certificate No. : QR23-  
0494

**Traceability** : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.:  
Calibration 0292

### Note

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

**Approved By :**

Mr. Noppadon Luangart  
Technical Manager  
12 May 2023

**Issue Date :**

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## Certificate of Calibration

**Customer**  
Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong,  
Bangkok 10260

**Certificate No :** 22-RHM-130  
**Request No :** Req-2022-2009

Resolution : 0.1 ( %RH )  
Resolution : ±  
Sensor Model : -  
Sensor SN : -  
Instrument Status : Used

### Unit Under Calibration Details

Measurement Item : Relative Humidity Meter  
Manufacturer : 3M  
Model : QT-32  
Serial Number : TPS030004  
ID : UAE.EFM.079/2561

Calibration Environment and Details  
Temperature : 25 °C ± 5 °C  
Humidity : 55 %RH ± 20 %RH  
Received Date : 17 November 2022  
Calibration Date : 23 November 2022  
Calibration By : Mr. Sitthichok Jirapakdeesakun  
Location of Calibration : LAB 2 Temperature  
Calibration Method : In-house method CP-THM-01 by Comparison With Standard Relative Humidity Meter and Standard  
Thermometer with RTD Probe in Humidity / Temperature Chamber

### Reference Standard

Standard Thermometer Model: GT11, SN: 08000057, Which was calibration on 10 March 2022, Calibration of Certificate No. : QR22-0578 and  
Relative Humidity Meter, Model: HRP23, SN: 5200886, Which was calibration on 14 March 2022, Calibration of Certificate No. : QR22-0579

### Traceability

This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC 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 :**

Service Calibration Engineer

**Approved By :**

Mr. Pucit Mathayom  
Calibration Engineer Supervisor

**Issue Date :**

24 November 2022

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Certificate No : 23-TPM-254  
Request No : Req-2023-0956  
Page : 2/2  
Calibration Note  
UUC Adjustment ☐ Not Adjust ☐

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
WET	20.031	20.0	0.0	0.13
	25.033	25.0	0.0	0.13
	30.036	30.0	0.0	0.13
	35.037	35.0	0.0	0.13
	40.038	40.1	-0.1	0.13
	45.042	45.1	-0.1	0.13
	50.045	50.1	-0.1	0.13
DRY	60.048	60.1	-0.1	0.13
	20.031	19.9	+0.1	0.13
	25.033	24.9	+0.1	0.13
	30.037	29.9	+0.1	0.13
	35.037	34.9	+0.1	0.13
	40.040	40.0	0.0	0.13
	45.040	45.0	0.0	0.13
GLOBE	50.042	50.0	0.0	0.13
	60.045	60.0	0.0	0.13
	20.033	19.9	+0.1	0.13
	25.033	24.9	+0.1	0.13
	30.034	29.9	+0.1	0.13
	35.037	34.9	+0.1	0.13
	40.038	40.0	0.0	0.13
	45.040	45.0	0.0	0.13
	50.044	50.0	0.0	0.13
	60.049	60.0	0.0	0.13

End of Certificate

Calibrated By :  
Mr. Sirichok Jimpakdeasitun



Certificate No : 22-RHM-130  
Request No : Req-2022-2009

Calibration Results : Without Adjustment  
Relative Humidity Calibration

Humidity Range (%RH)	Without Adjustment (%RH)		Uncertainty (%RH)
	STD Reading (%RH)	Correction (%RH)	
35	35.97	-2.0	0.9
80	79.90	0.1	1.9

End of Certificate