# ภาคผนวก ง

เอกสารการสอบเทียบเครื่องมือตรวจวิเคราะห์

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

| Sample Name | Parameter | Equipment Name | ID No. | Calibrated Date | Next Cal | Freq. Calibrate (Months) |
|---|---|---|---|---|---|---|
| Ambient | Particulate Matter (PM-10) | High Volume | RYG_FS0665 | - | - | On site Calibration |
| Ambient | Particulate Matter (PM-10) | High Volume | RYG_FS0186 | - | - | On site Calibration |
| Ambient | Particulate Matter (PM-10) | High Volume | RYG_FS0188 | - | - | On site Calibration |
| Ambient | Particulate Matter (PM-10) | High Volume | RYG_FS0668 | - | - | On site Calibration |
| Ambient | Particulate Matter (PM-10) | Digital Balance | RYG_EN0001 | 3-Feb-26 | 3-Feb-27 | 12 |
| Ambient | Total Suspended Particulate | High Volume | RYG_FS0393 | - | - | On site Calibration |
| Ambient | Total Suspended Particulate | High Volume | RYG_FS0395 | - | - | On site Calibration |
| Ambient | Total Suspended Particulate | High Volume | RYG_FS0664 | - | - | On site Calibration |
| Ambient | Total Suspended Particulate | High Volume | RYG_FS0178 | - | - | On site Calibration |
| Ambient | Total Suspended Particulate | Digital Balance | RYG_EN0001 | 3-Feb-26 | 3-Feb-27 | 12 |
| Ambient | Wind Speed / Wind Direction | Wind Speed / Wind Direction | RYG_FS0530 | 20-Feb-26 | 19-Aug-27 | 18 |
| Ambient | Wind Speed / Wind Direction | Wind Speed / Wind Direction | BKK_FS0143 | 23-Feb-26 | 22-Aug-27 | 18 |
| Ambient | Wind Speed / Wind Direction | Wind Speed / Wind Direction | BKK_FS0141 | 23-Feb-26 | 22-Aug-27 | 18 |
| Ambient | Wind Speed / Wind Direction | Wind Speed / Wind Direction | RYG_FS0531 | 20-Feb-26 | 19-Aug-27 | 18 |
| Noise | Leq 24 hrs | Sound Calibrator | RYG_FS0496 | 6-Apr-26 | 5-Apr-27 | 12 |
| Noise | Leq 24 hrs | Sound Level Meter | RYG_FS0627 | 21-Jan-26 | 20-Jan-27 | 12 |
| Noise | Leq 24 hrs | Sound Level Meter | RYG_FS0629 | 21-Jan-26 | 20-Jan-27 | 12 |
| Noise | Leq 24 hrs | Sound Level Meter | NKH_FS0131 | 14-Jul-25 | 14-Jul-26 | 12 |
| Noise | Leq 24 hrs | Sound Level Meter | NKH_FS0136 | 14-Jul-25 | 14-Jul-26 | 12 |
| Noise | Leq 5 min | Sound Calibrator | RYG_FS0496 | 6-Apr-26 | 5-Apr-27 | 12 |
| Noise | Leq 5 min | Sound Level Meter | RYG_FS0627 | 21-Jan-26 | 20-Jan-27 | 12 |
| Noise | Leq 5 min | Sound Level Meter | RYG_FS0629 | 21-Jan-26 | 20-Jan-27 | 12 |
| Noise | Leq 5 min | Sound Level Meter | NKH_FS0131 | 14-Jul-25 | 14-Jul-26 | 12 |
| Noise | Leq 5 min | Sound Level Meter | NKH_FS0136 | 14-Jul-25 | 14-Jul-26 | 12 |
| Noise | Noise Annoyance | Sound Calibrator | RYG_FS0496 | 6-Apr-26 | 5-Apr-27 | 12 |
| Noise | Noise Annoyance | Sound Level Meter | RYG_FS0629 | 21-Jan-26 | 20-Jan-27 | 12 |
| Noise | Noise Annoyance | Sound Level Meter | RYG_FS0627 | 21-Jan-26 | 20-Jan-27 | 12 |
| Noise | Noise Annoyance | Sound Level Meter | NKH_FS0131 | 14-Jul-25 | 14-Jul-26 | 12 |
| Noise | Noise Annoyance | Sound Level Meter | NKH_FS0136 | 14-Jul-25 | 14-Jul-26 | 12 |
| Noise | Leq 15 min | Sound Calibrator | RYG_FS0496 | 6-Apr-26 | 5-Apr-27 | 12 |
| Noise | Leq 15 min | Sound Level Meter | RYG_FS0616 | 22-Dec-25 | 21-Dec-26 | 12 |
| Noise | Leq 15 min | Sound Level Meter | RYG_FS0612 | 22-Dec-25 | 21-Dec-26 | 12 |
| Noise | Leq 15 min | Sound Level Meter | RYG_FS0613 | 22-Dec-25 | 21-Dec-26 | 12 |
| Noise | Leq 15 min | Sound Level Meter | RYG_FS0614 | 24-Dec-25 | 23-Dec-26 | 12 |
| Noise | Leq 15 min | Sound Level Meter | RYG_FS0615 | 22-Dec-25 | 21-Dec-26 | 12 |
| Noise | Leq 15 min | Sound Level Meter | RYG_FS0616 | 22-Dec-25 | 21-Dec-26 | 12 |
| Rayong Lab | pH at 25 °C | pH meter | RYG_EN0183 | 18-Jul-25 | 18-Jan-27 | 18 |
| Rayong Lab | Dissolved Oxygen (on site) | DO Meter | RYG_FS0601 | 28-Sep-25 | 28-Sep-26 | 12 |
| Rayong Lab | Temperature | DO Meter | RYG_FS0601 | 28-Sep-25 | 28-Sep-26 | 12 |
| Rayong Lab | Total Dissolved Solids 180°C | Electronic Balance | RYG_EN0163 | 3-Feb-26 | 3-Feb-27 | 12 |
| Rayong Lab | Total Dissolved Solids 180°C | Chamber (Oven) | RYG_EN0012 | 10-Sep-25 | 10-Mar-27 | 18 |
| Rayong Lab | BOD | DO meter with Sensor | RYG_EN0032 | 20-Jan-25 | 20-Jul-26 | 18 |
| Rayong Lab | BOD | Incubator | RYG_EN0154 | 18-Mar-26 | 18-Sep-27 | 18 |
| Rayong Lab | BOD | Burette | RYG_EN0216 | 18-Sep-25 | 18-Sep-26 | 12 |
| Rayong Lab | Sulfide | Chamber (Cold Room) | RYG_EN0184 | 27-Nov-25 | 27-May-27 | 18 |
| Rayong Lab | Nitrate | Spectrophotometer | RYG_EN0037 | 18-Mar-25 | 18-Sep-26 | 18 |
| Rayong Lab | Ammonia Nitrogen | SPECTROPHOTOMETER | RYG_EN0037 | 18-Mar-25 | 18-Sep-26 | 18 |
| Rayong Lab | Cyanide | SPECTROPHOTOMETER | RYG_EN0037 | 18-Mar-25 | 18-Sep-26 | 18 |
| Rayong Lab | Formaldehyde | SPECTROPHOTOMETER | RYG_EN0037 | 18-Mar-25 | 18-Sep-26 | 18 |
| Rayong Lab | Phenol | SPECTROPHOTOMETER | RYG_EN0037 | 18-Mar-25 | 18-Sep-26 | 18 |
| Rayong Lab | Color | Chamber (Cold Room) | RYG_EN0184 | 27-Nov-25 | 27-May-27 | 18 |
| Rayong Lab | Oil & Grease | Electronic Balance | RYG_EN0003 | 3-Feb-26 | 3-Feb-27 | 12 |
| Rayong Lab | Oil & Grease | Liquid Bath (Water) | RYG_EN0220 | 27-Nov-25 | 27-Nov-26 | 12 |
| Rayong Lab | Arsenic | ICP-OES | RYG_EN0224 | 22-Aug-25 | 22-Aug-26 | 12 |
| Rayong Lab | Arsenic | Hot Block | RYG_EN0227 | 4-Nov-25 | 4-Nov-26 | 12 |
| Rayong Lab | Cadmium | ICP-OES | RYG_EN0224 | 22-Aug-25 | 22-Aug-26 | 12 |
| Rayong Lab | Cadmium | Hot Block | RYG_EN0227 | 4-Nov-25 | 4-Nov-26 | 12 |





รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

| Sample Name | Parameter | Equipment Name | ID No. | Calibrated Date | Next Cal | Freq. Calibrate (Months) |
|---|---|---|---|---|---|---|
| Soil | pH aqueous phase 50% (w/v) | pH meter | BKK_EN0342 | 17-Oct-24 | 17-Oct-25 | 12 |
| Soil | Hexavalent Chromium | Spectrophotometer | BKK_EN0018 | 13-Sep-24 | 13-Sep-25 | 12 |
| Soil | Arsenic | ICP-OES | BKK_EL0037 | 23-Sep-24 | 23-Mar-26 | 18 |
| Soil | Arsenic | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Soil | Arsenic | Chamber (Cooling Room) | BKK_EN0167 | 6-Dec-23 | 6-Jun-25 | 18 |
| Soil | Copper | ICP-OES | BKK_EL0037 | 23-Sep-24 | 23-Mar-26 | 18 |
| Soil | Copper | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Soil | Copper | Chamber (Cooling Room) | BKK_EN0167 | 6-Dec-23 | 6-Jun-25 | 18 |
| Soil | Mercury | Mercury Analyzer | BKK_EL0128 | 6-Dec-24 | 6-Dec-25 | 12 |
| Soil | Cadmium | ICP-OES | BKK_EL0037 | 23-Sep-24 | 23-Mar-26 | 18 |
| Soil | Cadmium | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Soil | Cadmium | Chamber (Cooling Room) | BKK_EN0167 | 6-Dec-23 | 6-Jun-25 | 18 |
| Soil | Selenium | ICP-OES | BKK_EL0037 | 23-Sep-24 | 23-Mar-26 | 18 |
| Soil | Selenium | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Soil | Selenium | Chamber (Cooling Room) | BKK_EN0167 | 6-Dec-23 | 6-Jun-25 | 18 |
| Soil | Lead | ICP-OES | BKK_EL0037 | 23-Sep-24 | 23-Mar-26 | 18 |
| Soil | Lead | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Soil | Lead | Chamber (Cooling Room) | BKK_EN0167 | 6-Dec-23 | 6-Jun-25 | 18 |
| Soil | Nickel | ICP-OES | BKK_EL0037 | 23-Sep-24 | 23-Mar-26 | 18 |
| Soil | Nickel | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Soil | Nickel | Chamber (Cooling Room) | BKK_EN0167 | 6-Dec-23 | 6-Jun-25 | 18 |
| Soil | Manganese | ICP-OES | BKK_EL0037 | 23-Sep-24 | 23-Mar-26 | 18 |
| Soil | Manganese | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Soil | Manganese | Chamber (Cooling Room) | BKK_EN0167 | 6-Dec-23 | 6-Jun-25 | 18 |





รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

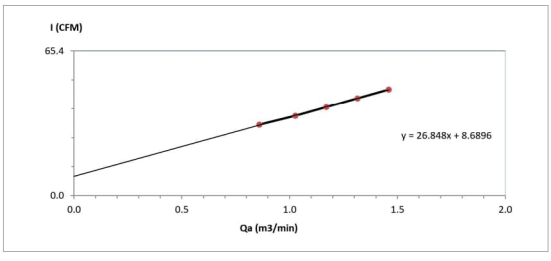
| Sample Name | Parameter | Equipment Name | ID No. | Calibrated Date | Next Cal | Freq. Calibrate (Months) |
|---|---|---|---|---|---|---|
| Rayong Lab | Copper | ICP-OES | RYG_EN0224 | 22-Aug-25 | 22-Aug-26 | 12 |
| Rayong Lab | Copper | Hot Block | RYG_EN0227 | 4-Nov-25 | 4-Nov-26 | 12 |
| Rayong Lab | Lead | ICP-OES | RYG_EN0224 | 22-Aug-25 | 22-Aug-26 | 12 |
| Rayong Lab | Lead | Hot Block | RYG_EN0227 | 4-Nov-25 | 4-Nov-26 | 12 |
| Rayong Lab | Manganese | ICP-OES | RYG_EN0224 | 22-Aug-25 | 22-Aug-26 | 12 |
| Rayong Lab | Manganese | Hot Block | RYG_EN0227 | 4-Nov-25 | 4-Nov-26 | 12 |
| Rayong Lab | Nickel | ICP-OES | RYG_EN0224 | 22-Aug-25 | 22-Aug-26 | 12 |
| Rayong Lab | Nickel | Hot Block | RYG_EN0227 | 4-Nov-25 | 4-Nov-26 | 12 |
| Rayong Lab | Zinc | ICP-OES | RYG_EN0224 | 22-Aug-25 | 22-Aug-26 | 12 |
| Rayong Lab | Zinc | Hot Block | RYG_EN0227 | 4-Nov-25 | 4-Nov-26 | 12 |
| Rayong Lab | Selenium | ICP-OES | RYG_EN0224 | 22-Aug-25 | 22-Aug-26 | 12 |
| Rayong Lab | Selenium | Hot Block | RYG_EN0227 | 4-Nov-25 | 4-Nov-26 | 12 |
| Rayong Lab | Hexavalent Chromium | Spectrophotometer | RYG_EN0037 | 18-Mar-25 | 18-Sep-26 | 18 |
| Rayong Lab | Mercury | Mercury Analyzer | RYG_EN0223 | 21-Jul-25 | 21-Jul-26 | 12 |
| Water Lab | Total Coliform | Autoclave | BKK_ML0041 | 4-Mar-25 | 4-Sep-26 | 18 |
| Water Lab | Total Coliform | Incubator | BKK_ML0231 | 21-Aug-25 | 21-Aug-26 | 12 |
| Water Lab | Total Coliform | Hot Air Oven | BKK_ML0013 | 9-Oct-25 | 9-Apr-27 | 18 |
| Water Lab | Fecal Coliform | Autoclave | BKK_ML0041 | 4-Mar-25 | 4-Sep-26 | 18 |
| Water Lab | Fecal Coliform | Incubator | BKK_ML0231 | 21-Aug-25 | 21-Aug-26 | 12 |
| Water Lab | Fecal Coliform | Hot Air Oven | BKK_ML0013 | 9-Oct-25 | 9-Apr-27 | 18 |
| Water Lab | Fecal Coliform | Water Bath | BKK_ML0056 | 4-Feb-26 | 4-Feb-27 | 12 |
| Water Lab | Organochlorine Pesticide | GC MSMS | BKK_EN0284 | 21-Nov-25 | 21-May-27 | 18 |
| Sludge | Zinc | ICP-OES | BKK_EL0037 | 23-Feb-26 | 22-Feb-27 | 12 |
| Sludge | Zinc | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Sludge | Zinc | Chamber (Cooling Room) | BKK_EN0167 | 4-Jun-25 | 4-Dec-26 | 18 |
| Sludge | Hexavalent Chromium | Spectrophotometer | BKK_EN0356 | 8-Oct-25 | 8-Oct-26 | 12 |
| Sludge | Arsenic | ICP-OES | BKK_EL0037 | 23-Feb-26 | 22-Feb-27 | 12 |
| Sludge | Arsenic | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Sludge | Arsenic | Chamber (Cooling Room) | BKK_EN0167 | 4-Jun-25 | 4-Dec-26 | 18 |
| Sludge | Copper | ICP-OES | BKK_EL0037 | 23-Feb-26 | 22-Feb-27 | 12 |
| Sludge | Copper | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Sludge | Copper | Chamber (Cooling Room) | BKK_EN0167 | 4-Jun-25 | 4-Dec-26 | 18 |
| Sludge | Mercury | Mercury Analyzer | BKK_EL0128 | 27-Nov-25 | 27-Nov-26 | 12 |
| Sludge | Cadmium | ICP-OES | BKK_EL0037 | 23-Feb-26 | 22-Feb-27 | 12 |
| Sludge | Cadmium | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Sludge | Cadmium | Chamber (Cooling Room) | BKK_EN0167 | 4-Jun-25 | 4-Dec-26 | 18 |
| Sludge | Lead | ICP-OES | BKK_EL0037 | 23-Feb-26 | 22-Feb-27 | 12 |
| Sludge | Lead | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Sludge | Lead | Chamber (Cooling Room) | BKK_EN0167 | 4-Jun-25 | 4-Dec-26 | 18 |
| Sludge | Nickel | ICP-OES | BKK_EL0037 | 23-Feb-26 | 22-Feb-27 | 12 |
| Sludge | Nickel | Hot Block | BKK_EL0054 | 4-Mar-25 | 4-Sep-26 | 18 |
| Sludge | Nickel | Chamber (Cooling Room) | BKK_EN0167 | 4-Jun-25 | 4-Dec-26 | 18 |



## High Volume Air Sampler Calibration Worksheet

| | | | |
|---|---|---|---|
| **Project Site :** | WHA Industrial Development Public Company Limited | **Barometric Pressure (mm Hg) :** | 756.3 |
| **Calibrate Location :** | ที่พักอาศัยยูงด้านทิศตะวันตกของโครงการ (A1) | **Temperature ( °C) :** | 29.3 |
| **Calibrate Date :** | 22-May-26 | **High Volume ID :** | RYG_FS0665 |
| **CalibrationSheet No.:** | C-220526-RYG_FS0665 | **High Volume Model :** | TE-5009X |
| **Calibrator ID:** | RYG_FS0205 | **High Volume S/N :** | 6264 |
| **Calibrator Model :** | TE-5028A | **Calibrator Slope :** | 0.95091 |
| **Calibrator S/N :** | 1166 | **Calibrator Intercept :** | -0.01856 |

| Test No. | Delta $H_2O$ (inch) | Qa ($m^3$/min) | I : Chart (CFM) | Linear Regression |
|---|---|---|---|---|
| 1 | 1.6 | 0.860 | 32 | Slope : 26.8476 |
| 2 | 2.3 | 1.027 | 36 | Intercept : 8.6896 |
| 3 | 3.0 | 1.170 | 40 | Correlation Coefficient : 0.9995 |
| 4 | 3.8 | 1.315 | 44 | |
| 5 | 4.7 | 1.460 | 48 | |




Calibrated by : ( Mr. Sitpawit Suwannarat )
RYG Field Services Scientist (1)

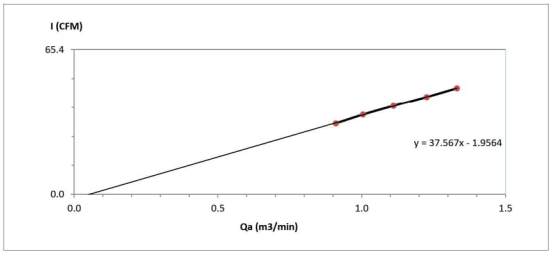
Approved by : ( Mr. Supot Salamteh )
Field Services Section Head

FORM NO.: F 06-074 REVISION NO.:2 ISSUE DATE: 20/11/23

## High Volume Air Sampler Calibration Worksheet

| | | | |
|---|---|---|---|
| **Project Site :** | WHA Industrial Development Public Company Limited | **Barometric Pressure (mm Hg) :** | 756.3 |
| **Calibrate Location :** | ที่พักอาศัยทางด้านทิศเหนือของโครงการ (A2) | **Temperature ( °C) :** | 29.3 |
| **Calibrate Date :** | 22-May-26 | **High Volume ID :** | RYG_FS0186 |
| **CalibrationSheet No.:** | C-220526-RYG_FS0186 | **High Volume Model :** | TE-5009X |
| **Calibrator ID:** | RYG_FS0205 | **High Volume S/N :** | 4794 |
| **Calibrator Model :** | TE-5028A | **Calibrator Slope :** | 0.95091 |
| **Calibrator S/N :** | 1166 | **Calibrator Intercept :** | -0.01856 |

| Test No. | Delta $H_2O$ (inch) | Qa ($m^3$/min) | I : Chart (CFM) | Linear Regression | |
|---|---|---|---|---|---|
| 1 | 1.8 | 0.911 | 32 | Slope : | 37.5669 |
| 2 | 2.2 | 1.005 | 36 | Intercept : | -1.9564 |
| 3 | 2.7 | 1.111 | 40 | Correlation Coefficient : | 0.9995 |
| 4 | 3.3 | 1.226 | 44 | | |
| 5 | 3.9 | 1.332 | 48 | | |




Calibrated by

( Mr. Sitpawit Suwannarat )
RYG Field Services Scientist (1)

Approved by :

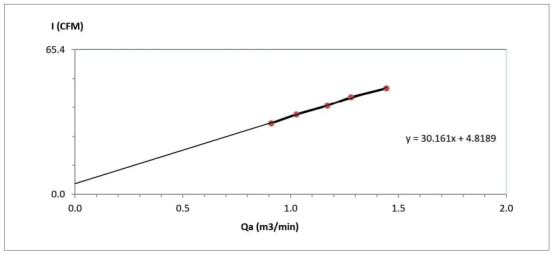
( Mr. Supot Salamteh )
Field Services Section Head



## High Volume Air Sampler Calibration Worksheet

| | | | |
|---|---|---|---|
| **Project Site :** | WHA Industrial Development Public Company Limited | **Barometric Pressure (mm Hg) :** | 756.3 |
| **Calibrate Location :** | ที่พักอาศัยทางด้านทิศใต้ของโครงการ (2)(A4) | **Temperature ( °C) :** | 29.3 |
| **Calibrate Date :** | 22-May-26 | **High Volume ID :** | RYG_FS0668 |
| **CalibrationSheet No.:** | C-220526-RYG_FS0668 | **High Volume Model :** | TE-5009X |
| **Calibrator ID:** | RYG_FS0205 | **High Volume S/N :** | 6267 |
| **Calibrator Model :** | TE-5028A | **Calibrator Slope :** | 0.95091 |
| **Calibrator S/N :** | 1166 | **Calibrator Intercept :** | -0.01856 |

| Test No. | Delta $H_2O$ (inch) | Qa ($m^3$/min) | I : Chart (CFM) | Linear Regression | |
|---|---|---|---|---|---|
| 1 | 1.8 | 0.911 | 32 | Slope : | 30.1613 |
| 2 | 2.3 | 1.027 | 36 | Intercept : | 4.8189 |
| 3 | 3.0 | 1.170 | 40 | Correlation Coefficient : | 0.9981 |
| 4 | 3.6 | 1.280 | 44 | | |
| 5 | 4.6 | 1.445 | 48 | | |




Calibrated by

( Mr. Sitpawit Suwannarat )
RYG Field Services Scientist (1)

Approved by :

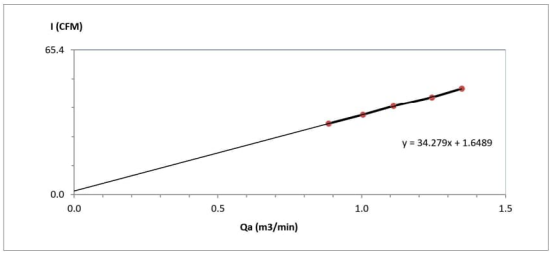
( Mr. Supot Salamteh )
Field Services Section Head



## High Volume Air Sampler Calibration Worksheet

| | | | |
|---|---|---|---|
| **Project Site :** | WHA Industrial Development Public Company Limited | **Barometric Pressure (mm Hg) :** | 756.3 |
| **Calibrate Location :** | ที่พักอาศัยทางด้านทิศใต้ของโครงการ (1)(A3) | **Temperature ( °C) :** | 29.3 |
| **Calibrate Date :** | 22-May-26 | **High Volume ID :** | RYG_FS0188 |
| **CalibrationSheet No.:** | C-220526-RYG_FS0188 | **High Volume Model :** | TE-5009X |
| **Calibrator ID:** | RYG_FS0205 | **High Volume S/N :** | 4796 |
| **Calibrator Model :** | TE-5028A | **Calibrator Slope :** | 0.95091 |
| **Calibrator S/N :** | 1166 | **Calibrator Intercept :** | -0.01856 |

| Test No. | Delta $H_2O$ (inch) | Qa ($m^3$/min) | I : Chart (CFM) | Linear Regression | |
|---|---|---|---|---|---|
| 1 | 1.7 | 0.885 | 32 | Slope : | 34.2789 |
| 2 | 2.2 | 1.005 | 36 | Intercept : | 1.6489 |
| 3 | 2.7 | 1.111 | 40 | Correlation Coefficient : | 0.9994 |
| 4 | 3.4 | 1.245 | 44 | | |
| 5 | 4.0 | 1.348 | 48 | | |




Calibrated by

( Mr. Sitpawit Suwannarat )
RYG Field Services Scientist (1)

Approved by :

( Mr. Supot Salamteh )
Field Services Section Head



SARTORIUS

Accredited by

NSC-TISI-TIS 17025
Calibration 0426

NSC-TISI-TIS 17025
CALIBRATION 0426

## Calibration certificate

Calibration Certificate No. 26BCI0067

| | |
|---|---|
| Object | Electronic non-automatic weighing instrument |
| Manufacturer | Sartorius |
| Type | LA130S-F |
| Serial \| QM Ident. no. | 25409664 \| RYG_EN0001 |
| Customer | ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)<br><br>616/10 Moo 5 T.Maenamkoo, A.Pluak Daeng, Rayong 21140, Thailand. |
| Order no. | 278579 |
| Number of pages | 4 |
| Date of calibration | 03 Feb 2026 |

This calibration certificate documents the traceability to national standards.

Uncertainties of measurements are taken into account when only statements of compliance are made.

This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.

This certificate relate and apply this equipment only.

REVIEW BY Thanitak.

APPROVED BY

NEXT CAL DATE 03/02/27

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TISI-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

| Date of issue | Approval of the Calibration Certificate | Person in charge |
|---|---|---|
| 03 Feb 2026 | Mr. Chonchai Inthana | Chonchai Inthana |

## Calibration object

**Single range instrument**

| | |
|---|---|
| Model | LA130S-F |
| Serial Number | 25409664 |
| QM Ident. no \| Inventory no. | RYG_EN0001 \| --- |

| | |
|---|---|
| Maximum capacity (Max. load) | 150.0000 g |
| Measured up to | 150.0000 g |
| Scale interval | 0.0001 g |

## Place of calibration

| | |
|---|---|
| Address | According to page 1 |
| Department \| Cost center | Laboratory Department. \| --- |
| Building \| Floor | --- \| 1st Floor. |
| Room | Balance Room. |
| Maximum temperature variation at place of calibration | 5 K |

## Calibration procedure

EURAMET Calibration Guide No. 18, Version 4.0 (11/2015) - Guidelines on the Calibration of Non-Automatic Weighing Instruments

## Test equipment

| Test equipment type | Test equipment ID | Valid until |
|---|---|---|
| Thermometer | Testo 174H H/T250743 (Traceable to Si unit through ENTECH) | 18 Nov 2026 |
| Test weight set OIML R111 E2 | Certificate No.M2508149S ,E2(Traceable to SI unit through TCS) | 19 Aug 2027 |





## Adjustment Status

The measuring device was internally adjusted before the calibration.

## Environmental and measuring conditions

| | |
|---|---|
| Date of calibration | 03 Feb 2026 |
| Temperature at place of calibration \| Temp. diff. $T_{weights}$ - $T_{place}$ | 24.5 °C \| 0.5 K |
| Measuring conditions | The installation site is suitable. The device is level. Balance was loaded up to Max before test. |
| Comments | Humidity 52.0 %RH. |

## Measurement results | Measurement uncertainties

Repeatability

| Test load (nominal): 10 g \| 100 g | | |
|---|---|---|
| | 10 g | 100 g |
| 1 | 10.0000 g | 100.0000 g |
| 2 | 10.0000 g | 99.9998 g |
| 3 | 9.9999 g | 100.0000 g |
| 4 | 10.0001 g | 100.0000 g |
| 5 | 10.0000 g | 99.9999 g |
| 6 | 9.9999 g | 100.0000 g |
| 7 | 9.9999 g | 99.9999 g |
| 8 | 9.9999 g | 100.0000 g |
| 9 | 9.9999 g | 100.0000 g |
| 10 | 9.9999 g | 99.9999 g |
| | $s$ = 0.00007 g | $s$ = 0.00007 g |

Eccentricity

| Test load (nominal): | 50 g |
|---|---|
| Center | 50.0000 g |
| Front left | 50.0001 g |
| Back left | 50.0001 g |
| Back right | 50.0000 g |
| Front right | 50.0001 g |
| Maximum deviation from centric loading indication $\lvert\Delta I_{ecc}\rvert_{max}$ = 0.0001 g | |

Error of indication

| Testload $L$ | Indication $I$ | Error $E$ | Expansion factor $k$ | Uncertainty $U(E)$ | Uncertainty relative $U_{rel}(E)$ |
|---|---|---|---|---|---|
| 0.0100 g | 0.0100 g | 0.0000 g | 2.00 | 0.00016 g | 1.6 % |
| 0.0500 g | 0.0500 g | 0.0000 g | 2.00 | 0.00016 g | 0.33 % |
| 0.1000 g | 0.1000 g | 0.0000 g | 2.00 | 0.00016 g | 0.16 % |
| 0.5000 g | 0.5000 g | 0.0000 g | 2.00 | 0.00016 g | 0.033 % |
| 1.0000 g | 1.0000 g | 0.0000 g | 2.00 | 0.00016 g | 0.016 % |
| 2.0000 g | 2.0000 g | 0.0000 g | 2.00 | 0.00017 g | 0.0083 % |
| 5.0000 g | 5.0001 g | 0.0001 g | 2.00 | 0.00017 g | 0.0033 % |
| 10.0000 g | 10.0001 g | 0.0001 g | 2.00 | 0.00017 g | 0.0017 % |
| 20.0000 g | 20.0000 g | 0.0000 g | 2.00 | 0.00017 g | 0.00086 % |
| 100.0000 g | 100.0001 g | 0.0001 g | 2.00 | 0.00023 g | 0.00023 % |
| 150.0000 g | 150.0001 g | 0.0001 g | 2.00 | 0.00030 g | 0.00020 % |
| Maximum error of indication | | $\lvert E\rvert_{max}$ = 0.0001 g | | | |

$U_{rel}(E)$ is the quotient of $U(E)$ and test load $L$. The uncertainty of measurement $U(E)$ is valid only if error $E$ is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

**End of calibration certificate**





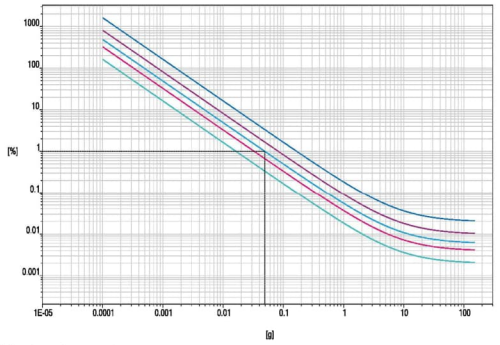
# Uncertainty of measurement in use

| | |
|---|---|
| Device adjusted before measurement | Yes |
| Temperature deviation considered | 1.5 K (isoCAL active) |
| Temperature coefficient considered | 1 · 10⁻⁶/K |
| **Uncertainty of the weighing result $U_{gl}(W)$** | **$U_{gl}(W) = 0.00016\ g + 1.95 \cdot 10^{-5} \cdot R$** |

Reference note: The current uncertainty of measurement is calculated by entering of the reading $R$ into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

| Indication in % from max load | Net indication $R$ | Uncertainty $U_{gl}(W)$ | Uncertainty relative $U_{gl}(W)_{rel}$ |
|---|---|---|---|
| 1 % | 1.5000 g | 0.00019 g | 0.013 % |
| 25 % | 37.5000 g | 0.00089 g | 0.0024 % |
| 50 % | 75.0000 g | 0.0016 g | 0.0022 % |
| 75 % | 112.5000 g | 0.0024 g | 0.0021 % |
| 100 % | 150.0000 g | 0.0031 g | 0.0021 % |

**Graphic realization of the relative uncertainty of measurement | process accuracy**




**Displayed example**

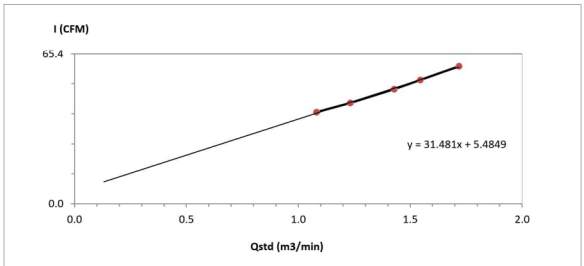
| | |
|---|---|
| Process accuracy | 1.00 % |
| Safety factor | 3 |
| Minimum sample weight | 0.0493 g |



**High Volume Air Sampler Calibration Worksheet**

| | | | |
|---|---|---|---|
| **Project Site :** | WHA Industrial Development Public Company Limited | **Barometric Pressure (mm Hg) :** | 756.3 |
| **Calibrate Location :** | ที่พักอาศัยทางด้านทิศตะวันตกของโครงการ (A1) | **Temperature ( °C) :** | 29.3 |
| **Calibrate Date :** | 22-May-26 | **High Volume ID :** | RYG_FS0393 |
| **CalibrationSheet No.:** | C-220526-RYG_FS0393 | **High Volume Model :** | TE-5170D |
| **Calibrator ID:** | RYG_FS0205 | **High Volume S/N :** | 5682 |
| **Calibrator Model :** | TE-5028A | **Calibrator Slope :** | 1.51825 |
| **Calibrator S/N :** | 1166 | **Calibrator Intercept :** | -0.02964 |

| Test No. | Delta $H_2O$ (inch) | $Q_{std}$ ($m^3$/min) | I : Chart (CFM) | Linear Regression | |
|---|---|---|---|---|---|
| 1 | 2.6 | 1.0815 | 40 | Slope : | 31.4810 |
| 2 | 3.4 | 1.2325 | 44 | Intercept : | 5.4849 |
| 3 | 4.6 | 1.4288 | 50 | Correlation Coefficient : | 0.9986 |
| 4 | 5.4 | 1.5456 | 54 | | |
| 5 | 6.7 | 1.7182 | 60 | | |




Calibrated by : ( Mr. Sitpawit Suwannarat )
RYG Field Services Scientist (1)

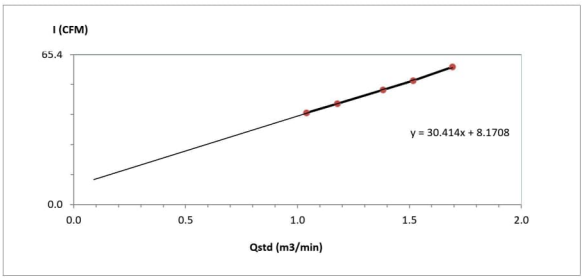
Approved by : ( Mr. Supot Salamteh )
Field Services Section Head

FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23

## High Volume Air Sampler Calibration Worksheet

| | | | |
|---|---|---|---|
| **Project Site :** | WHA Industrial Development Public Company Limited | **Barometric Pressure (mm Hg) :** | 756.3 |
| **Calibrate Location :** | ที่พักอาศัยทางด้านทิศเหนือของโครงการ (A2) | **Temperature ( °C) :** | 29.3 |
| **Calibrate Date :** | 22-May-26 | **High Volume ID :** | RYG_FS0395 |
| **CalibrationSheet No.:** | C-220526-RYG_FS0395 | **High Volume Model :** | TE-5170D |
| **Calibrator ID:** | RYG_FS0205 | **High Volume S/N :** | 5692 |
| **Calibrator Model :** | TE-5028A | **Calibrator Slope :** | 1.51825 |
| **Calibrator S/N :** | 1166 | **Calibrator Intercept :** | -0.02964 |

| Test No. | Delta $H_2O$ (inch) | $Q_{std}$ ($m^3$/min) | I : Chart (CFM) | Linear Regression | |
|---|---|---|---|---|---|
| 1 | 2.4 | 1.0403 | 40 | Slope : | 30.4137 |
| 2 | 3.1 | 1.1782 | 44 | Intercept : | 8.1708 |
| 3 | 4.3 | 1.3824 | 50 | Correlation Coefficient : | 0.9994 |
| 4 | 5.2 | 1.5172 | 54 | | |
| 5 | 6.5 | 1.6928 | 60 | | |




Calibrated by ..... ( Mr. Sitpawit Suwannarat )
RYG Field Services Scientist (1)

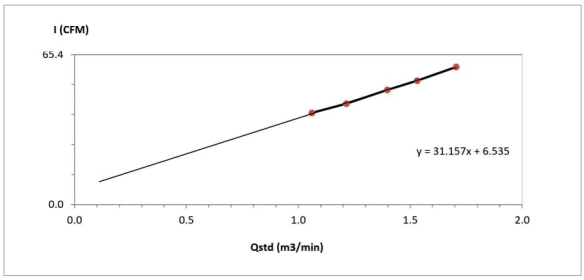
Approved by : ..... ( Mr. Supot Salamteh )
Field Services Section Head



## High Volume Air Sampler Calibration Worksheet

| | | | |
|---|---|---|---|
| **Project Site :** | WHA Industrial Development Public Company Limited | **Barometric Pressure (mm Hg) :** | 756.3 |
| **Calibrate Location :** | ที่พักอาศัยทางด้านทิศใต้ของโครงการ (2)(A4) | **Temperature ( °C) :** | 29.3 |
| **Calibrate Date :** | 22-May-26 | **High Volume ID :** | RYG_FS0178 |
| **CalibrationSheet No.:** | C-220526-RYG_FS0178 | **High Volume Model :** | TE-5170D |
| **Calibrator ID:** | RYG_FS0205 | **High Volume S/N :** | 4804 |
| **Calibrator Model :** | TE-5028A | **Calibrator Slope :** | 1.51825 |
| **Calibrator S/N :** | 1166 | **Calibrator Intercept :** | -0.02964 |

| Test No. | Delta $H_2O$ (inch) | $Q_{std}$ ($m^3$/min) | I : Chart (CFM) | Linear Regression | |
|---|---|---|---|---|---|
| 1 | 2.5 | 1.0611 | 40 | Slope : | 31.1574 |
| 2 | 3.3 | 1.2147 | 44 | Intercept : | 6.5350 |
| 3 | 4.4 | 1.3980 | 50 | Correlation Coefficient : | 0.9990 |
| 4 | 5.3 | 1.5315 | 54 | | |
| 5 | 6.6 | 1.7056 | 60 | | |




Calibrated by ..... ( Mr. Sitpawit Suwannarat )
RYG Field Services Scientist (1)

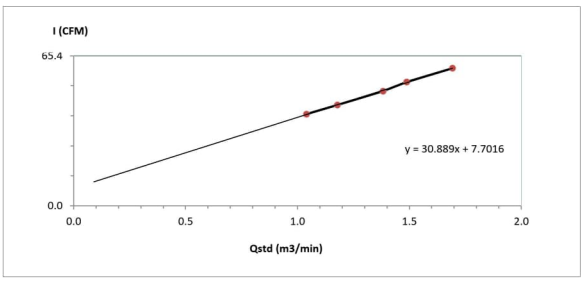
Approved by : ..... ( Mr. Supot Salamteh )
Field Services Section Head

FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23

## High Volume Air Sampler Calibration Worksheet

| | | | |
|---|---|---|---|
| **Project Site :** | WHA Industrial Development Public Company Limited | **Barometric Pressure (mm Hg) :** | 756.3 |
| **Calibrate Location :** | ที่พักอาศัยทางด้านทิศใต้ของโครงการ (1)(A3) | **Temperature ( °C) :** | 29.3 |
| **Calibrate Date :** | 22-May-26 | **High Volume ID :** | RYG_FS0664 |
| **CalibrationSheet No.:** | C-220526-RYG_FS0664 | **High Volume Model :** | TE-5009X |
| **Calibrator ID:** | RYG_FS0205 | **High Volume S/N :** | 6261 |
| **Calibrator Model :** | TE-5028A | **Calibrator Slope :** | 1.51825 |
| **Calibrator S/N :** | 1166 | **Calibrator Intercept :** | -0.02964 |

| Test No. | Delta $H_2O$ (inch) | $Q_{std}$ ($m^3$/min) | I : Chart (CFM) | Linear Regression | |
|---|---|---|---|---|---|
| 1 | 2.4 | 1.0403 | 40 | Slope : | 30.8892 |
| 2 | 3.1 | 1.1782 | 44 | Intercept : | 7.7016 |
| 3 | 4.3 | 1.3824 | 50 | Correlation Coefficient : | 0.9994 |
| 4 | 5.0 | 1.4883 | 54 | | |
| 5 | 6.5 | 1.6928 | 60 | | |




Calibrated by ..... ( Mr. Sitpawit Suwannarat )
RYG Field Services Scientist (1)

Approved by : ..... ( Mr. Supot Salamteh )
Field Services Section Head

FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23

JIRANATEE ASSOCIATES CO.,LTD.
Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
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Tel: +6608680812
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Web site: www.jiranatee.com

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

*Air speed measurement laboratory*
*Calibration services department.*

NSC – TISI – TIS 17025
CALIBRATION 0367

| Certificate Number |
|---|
| CWS-018-69 |

# CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

| | | | |
|---|---|---|---|
| **MEASUREMENT ITEM** | : Cup anemometer | | |
| **MANUFACTURER** | : Novalynx | | |
| **MODEL/TYPE** | : Sensor: WS-02F<br>Data logger: 110-WS-25DL-D | | |
| **SERIAL NUMBER** | : Sensor: WSD-A5660<br>Data logger: A5660 | | |
| **ID NUMBER** | : RYG_FS0530 | | |
| **CONDITION AS-RECEIVED** | : Used item | | |
| **CUSTOMER** | : ALS laboratory group (Thailand) Co., Ltd.<br>104 Phatthanakan 40, Phatthanakan Rd,<br>Khwaeng Suan Luang, Khet Suan Luang,<br>Bangkok 10250 Thailand. | | |
| **RECEIVED DATE** | : 10 Feb 2026 | | |
| **MEASUREMENT DATE** | : 20 Feb 2026 | | |
| **ISSUE DATE** | : 20 Feb 2026 | | |
| **ENVIRONMENTAL CONDITIONS:** | | | |
| Ambient condition in the laboratory are as follow: | | | |
| Temperature | : 23.0 ± 3.0 | °C | |
| Relative Humidity | : 55.0 ± 15.0 | %RH | |
| Atmospheric Pressure | : 1010± 10 | hPa | |
| **PLACE OF CALIBRATION** | : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd. | | |
| **CALIBRATION CONDITIONS** | : Wind tunnel cross-section area[1] | 900 | $cm^2$ |
| | Cup anemometer frontal area[2] | 100 | $cm^2$ |
| | Diameter of mounting pipe[3] | - | mm |
| | Blockage ratio of test object[4] | 0.111 | [-] |
| **Preconditioning** | : 24 hours at ambient conditions. | | |
| **Measurement Condition** | : The average values during measurement are (23.6) °C, (54.9) %RH and (1008.2) hPa. | | |

***Calibration procedure:***
*The Cup anemometer was calibrated against Standard air velocity transducer model: 8455-12 and pitot tube with precision differential pressure meter model: DPM2500 in an close test-section of Eiffel-type wind tunnel with 900 $cm^2$ cross test section area. The WI-CL-007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.*

***Traceability:***
*This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0019-25 and MW-0059-25*

***Uncertainty of Measurement:***
*The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'*

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE ..... 19/ 08/ 2027

**TABULATION OF RESULTS:**
The table on next page give the measured values.

**Calibrated by:**
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

**Approved signatory:** .....
Mr. Parinya Booncharoen
Calibration Department Manager

**Remark:**
[1] Nozzle cross-section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [2] to [1]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

| Certificate Number |
|---|
| CWS-018-69 |



**MEASUREMENT RESULTS** [5]

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section, UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

| $v_{std}$ [6] (m/s) | Temp. wind tunnel (°C) | Temp. room (°C) | $v_{uuc}$ [7] (m/s) | Error (m/s) | U (k=2) (m/s) |
|---|---|---|---|---|---|
| 1.022 | 23.72 | 23.55 | 0.9 | -0.1 | 0.31 |
| 2.180 | 23.46 | 23.55 | 2.0 | -0.2 | 0.31 |
| 3.014 | 23.52 | 23.55 | 2.9 | -0.1 | 0.31 |
| 4.212 | 23.54 | 23.55 | 4.0 | -0.2 | 0.31 |
| 5.01 | 23.32 | 23.55 | 4.9 | -0.1 | 0.31 |
| 6.01 | 23.52 | 23.55 | 6.0 | 0.0 | 0.31 |
| 7.01 | 23.26 | 23.55 | 7.0 | 0.0 | 0.31 |
| 8.00 | 23.40 | 23.55 | 8.0 | 0.0 | 0.31 |
| 9.01 | 23.30 | 23.55 | 9.1 | 0.1 | 0.31 |
| 10.00 | 23.32 | 23.55 | 10.1 | 0.1 | 0.31 |
| 11.00 | 23.42 | 23.55 | 11.1 | 0.1 | 0.31 |
| 11.98 | 23.40 | 23.55 | 12.2 | 0.2 | 0.31 |
| 12.99 | 23.50 | 23.55 | 13.2 | 0.2 | 0.31 |
| 13.97 | 23.50 | 23.55 | 14.3 | 0.3 | 0.32 |
| 14.99 | 23.50 | 23.55 | 15.4 | 0.4 | 0.34 |
| 16.03 | 23.54 | 23.55 | 16.4 | 0.4 | 0.32 |

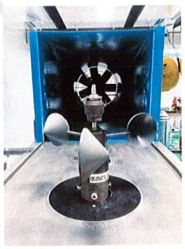
**Remark:**

[5] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

[6] Velocity of standard

[7] Velocity of Unit Under Calibration

**PHOTO OF CALIBRATION SET-UP**



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set- up is not true to scale due to imaging geometry.

***End of Certificate of Calibration***

JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co., Ltd.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600(Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

*Wind direction measurement laboratory*
*Calibration services department.*

NSC – TISI – TIS 17025
CALIBRATION 0367

| Certificate Number |
|---|
| CWD-018-69 |

# CERTIFICATE OF CALIBRATION



| | |
|---|---|
| **MEASUREMENT ITEM** | : Wind Direction Sensor |
| **MANUFACTURER** | : Novalynx |
| **MODEL/TYPE** | : Sensor: WS-02F<br>Data logger: 110-WS-25DL-D |
| **SERIAL NUMBER** | : Sensor: WSD-A5660<br>Data logger: A5660 |
| **ID NUMBER** | : RYG_FS0530 |
| **CONDITION AS-RECEIVED** | : Used item |
| **CUSTOMER** | : ALS laboratory group (Thailand) Co., Ltd.<br>104 Phatthanakan 40, Phatthanakan Rd,<br>Khwaeng Suan Luang, Khet Suan Luang,<br>Bangkok 10250 Thailand. |
| **RECEIVED DATE** | : 10 Feb 2026 |
| **MEASUREMENT DATE** | : 20 Feb 2026 |
| **ISSUE DATE** | : 20 Feb 2026 |

**ENVIRONMENTAL CONDITIONS:**
Ambient condition in the laboratory are as follow:

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

**PLACE OF CALIBRATION** : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

**CALIBRATION CONDITION**

| | | |
|---|---|---|
| : Wind tunnel cross-section area[1] | 900 | $cm^2$ |
| Wind direction frontal area[2] | 129 | $cm^2$ |
| Diameter of mounting pipe[3] | - | mm |
| Blockage ratio of test object[4] | 0.143 | [-] |

***Calibration procedure:***
*The wind direction sensor was calibrated against Standard Rotary Encoder model: AX400915-DM04-P3-S-U0 in an close test-section of Eiffel-type wind tunnel with 900 $cm^2$ cross test section area. The WI-CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.*

***Traceability:***
*This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: DA-0027-24.*

***Uncertainty of Measurement:***
*The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'*

**Preconditioning** : 24 hours at ambient conditions.
**Measurement Condition** : The average values during measurement are (23.7)°C, (59.3) %RH and (1007.5) hPa.

**TABULATION OF RESULTS:**
The table on next page give the measured values.

**Calibrated by:**
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

JIRANATEE ASSOCIATES CO.,LTD.

**Approved signatory:** .....
Mr. Parinya Booncharoen
Calibration Department Manager

**Remark:**
[1] Nozzle cross-section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [2] to [1]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

| Certificate Number |
|---|
| CWD-018-69 |



**MEASUREMENT RESULTS** [5]

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

| Air speed m/s | $D^{\circ}_{std}$ Degree (°) | $D^{\circ}_{uuc}$ Degree (°) | Error Degree (°) | U (k=2) Degree (°) |
|---|---|---|---|---|
| 5.00 | 45.000 | 40 | -5 | 0.60 |
| | 90.000 | 86 | -4 | 0.60 |
| | 135.000 | 133 | -2 | 0.95 |
| | 180.000 | 180 | 0 | 0.82 |
| | 225.000 | 228 | 3 | 0.60 |
| | 270.000 | 274 | 4 | 0.60 |
| | 315.000 | 319 | 4 | 0.60 |
| | 360.000 | 359 | -1 | 0.60 |

**Remark:**

[5] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

[6] Direction of standard

[7] Direction of Unit Under Calibration

***End of Certificate of Calibration***

JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co., Ltd.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd.Watthapra, Bangkokyai,
Bangkok 10600(Thailand)
Tel: +6608680812
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E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

*Air speed measurement laboratory*
*Calibration services department.*

NSC – TISI – TIS 17025
CALIBRATION 0367

| Certificate Number |
|---|
| CWS-021-69 |

# CERTIFICATE OF CALIBRATION



| | |
|---|---|
| **MEASUREMENT ITEM** | : Cup anemometer |
| **MANUFACTURER** | : Novalynx |
| **MODEL/TYPE** | : Sensor: WS-02F<br>Data logger: WS-25DL |
| **SERIAL NUMBER** | : Sensor: WSD-A4562<br>Data logger: A4562 |
| **ID NUMBER** | : BKK_FS0143 |
| **CONDITION AS-RECEIVED** | : Used item |
| **CUSTOMER** | : ALS laboratory group (Thailand) Co., Ltd.<br>104 Phatthanakan 40, Phatthanakan Rd,<br>Khwaeng Suan Luang, Khet Suan Luang,<br>Bangkok 10250 Thailand. |
| **RECEIVED DATE** | : 10 Feb 2026 |
| **MEASUREMENT DATE** | : 23 Feb 2026 |
| **ISSUE DATE** | : 23 Feb 2026 |

**ENVIRONMENTAL CONDITIONS:**
Ambient condition in the laboratory are as follow:

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

**PLACE OF CALIBRATION** : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

**CALIBRATION CONDITIONS**

| | | |
|---|---|---|
| : Wind tunnel cross-section area[1] | 900 | $cm^2$ |
| Cup anemometer frontal area[2] | 100 | $cm^2$ |
| Diameter of mounting pipe[3] | - | mm |
| Blockage ratio of test object[4] | 0.111 | [-] |

***Calibration procedure:***
*The Cup anemometer was calibrated against Standard air velocity transducer model: 8455-12 and pitot tube with precision differential pressure meter model: DPM2500 in an close test-section of Eiffel-type wind tunnel with 900 $cm^2$ cross test section area. The WI-CL-007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.*

***Traceability:***
*This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0019-25 and MW-0059-25*

***Uncertainty of Measurement:***
*The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'*

**Preconditioning** : 24 hours at ambient conditions.
**Measurement Condition** : The average values during measurement are (24.0) °C, (51.9) %RH and (1011.3) hPa.

**TABULATION OF RESULTS:**
The table on next page give the measured values.

**Calibrated by:**
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

JIRANATEE ASSOCIATES CO.,LTD.

**Approved signatory:** .....
Mr. Parinya Booncharoen
Calibration Department Manager

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE 22/ 08/ 2027

**Remark:**
[1] Nozzle cross-section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [2] to [1]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

| Certificate Number |
|---|
| CWS-021-69 |



**MEASUREMENT RESULTS** [5]

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section, UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

| $v_{std}$ [6] (m/s) | Temp. wind tunnel (°C) | Temp. room (°C) | $v_{uuc}$ [7] (m/s) | Error (m/s) | U (k=2) (m/s) |
|---|---|---|---|---|---|
| 1.043 | 23.70 | 23.95 | 0.9 | -0.1 | 0.31 |
| 2.212 | 24.20 | 23.95 | 2.0 | -0.2 | 0.31 |
| 3.031 | 23.60 | 23.95 | 2.9 | -0.1 | 0.31 |
| 4.272 | 23.62 | 23.95 | 4.0 | -0.3 | 0.31 |
| 5.03 | 23.60 | 23.95 | 5.0 | 0.0 | 0.31 |
| 6.03 | 24.10 | 23.95 | 5.9 | -0.1 | 0.31 |
| 7.03 | 23.56 | 23.95 | 6.9 | -0.1 | 0.31 |
| 8.02 | 23.82 | 23.95 | 7.9 | -0.1 | 0.31 |
| 9.02 | 23.26 | 23.95 | 9.1 | 0.1 | 0.31 |
| 10.01 | 23.50 | 23.95 | 10.1 | 0.1 | 0.40 |
| 11.01 | 23.44 | 23.95 | 11.1 | 0.1 | 0.31 |
| 12.01 | 23.50 | 23.95 | 12.2 | 0.2 | 0.37 |
| 12.99 | 23.50 | 23.95 | 13.2 | 0.2 | 0.45 |
| 13.98 | 23.46 | 23.95 | 14.2 | 0.2 | 0.35 |
| 14.97 | 23.50 | 23.95 | 15.3 | 0.3 | 0.53 |
| 16.03 | 23.40 | 23.95 | 16.3 | 0.3 | 0.42 |

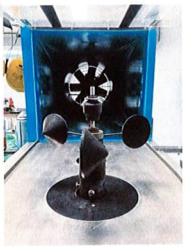
**Remark:**

[5] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

[6] Velocity of standard

[7] Velocity of Unit Under Calibration

**PHOTO OF CALIBRATION SET-UP**



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set- up is not true to scale due to imaging geometry.

***End of Certificate of Calibration***

JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
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Web site: www.jiranatee.com

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

*Wind direction measurement laboratory*
*Calibration services department.*

NSC – TISI – TIS 17025
CALIBRATION 0367

| Certificate Number |
|---|
| CWD-021-69 |

# CERTIFICATE OF CALIBRATION



**MEASUREMENT ITEM** : Wind Direction Sensor
**MANUFACTURER** : Novalynx
**MODEL/TYPE** : Sensor: WS-02F
Data logger: WS-25DL
**SERIAL NUMBER** : Sensor: WSD-A4562
Data logger: A4562
**ID NUMBER** : BKK_FS0143
**CONDITION AS-RECEIVED** : Used item
**CUSTOMER** : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

**RECEIVED DATE** : 10 Feb 2026
**MEASUREMENT DATE** : 23 Feb 2026
**ISSUE DATE** : 23 Feb 2026

**ENVIRONMENTAL CONDITIONS:**
Ambient condition in the laboratory are as follow:

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

**PLACE OF CALIBRATION** : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

**CALIBRATION CONDITION**

| | | |
|---|---|---|
| : Wind tunnel cross-section area [1] | 900 | $cm^2$ |
| Wind direction frontal area [2] | 129 | $cm^2$ |
| Diameter of mounting pipe [3] | - | mm |
| Blockage ratio of test object [4] | 0.143 | [-] |

**Preconditioning** : 24 hours at ambient conditions.
**Measurement Condition** : The average values during measurement are (23.8)°C, (56.0) %RH and (1006.9) hPa.

**TABULATION OF RESULTS:**
The table on next page give the measured values.

**Calibrated by:**
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

JIRANATEE ASSOCIATES CO.,LTD.

**Approved signatory:** .....
Mr. Parinya Booncharoen
Calibration Department Manager

***Calibration procedure:***
*The wind direction sensor was calibrated against Standard Rotary Encoder model: AX40095TS-DM04-P3-S-U0 in an close test-section of Eiffel-type wind tunnel with 900 $cm^2$ cross test section area. The WI-CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.*

***Traceability:***
*This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: DA-0027-24.*

***Uncertainty of Measurement:***
*The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'*

**Remark:**
[1] Nozzle cross-section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [2] to [1]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

| Certificate Number |
|---|
| CWS-020-69 |



**MEASUREMENT RESULTS** [5]

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

| Air speed m/s | $D'_{std}$ Degree (°) | $D'_{uuc}$ Degree (°) | Error Degree (°) | U (k=2) Degree (°) |
|---|---|---|---|---|
| 5.00 | 45.000 | 44 | -1 | 0.60 |
| | 90.000 | 89 | -1 | 0.60 |
| | 135.000 | 134 | -1 | 0.60 |
| | 180.000 | 181 | 1 | 0.82 |
| | 225.000 | 228 | 3 | 0.82 |
| | 270.000 | 273 | 3 | 0.82 |
| | 315.000 | 317 | 2 | 0.82 |
| | 360.000 | 359 | -1 | 0.60 |

**Remark:**

[5] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

[6] Direction of standard

[7] Direction of Unit Under Calibration

***End of Certificate of Calibration***

JIRANATEE ASSOCIATES CO.,LTD.

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Web site: www.jiranatee.com

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

*Air speed measurement laboratory*
*Calibration services department.*

NSC – TISI – TIS 17025
CALIBRATION 0367

| Certificate Number |
|---|
| CWS-020-69 |

# CERTIFICATE OF CALIBRATION



**MEASUREMENT ITEM** : Cup anemometer
**MANUFACTURER** : Novalynx
**MODEL/TYPE** : Sensor: WS-02F
Data logger: WS-25DL
**SERIAL NUMBER** : Sensor: WSD-A4481
Data logger: A4481
**ID NUMBER** : BKK_FS0141
**CONDITION AS-RECEIVED** : Used item
**CUSTOMER** : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

**RECEIVED DATE** : 10 Feb 2026
**MEASUREMENT DATE** : 23 Feb 2026
**ISSUE DATE** : 23 Feb 2026

**ENVIRONMENTAL CONDITIONS:**
Ambient condition in the laboratory are as follow:

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

**PLACE OF CALIBRATION** : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

**CALIBRATION CONDITIONS**

| | | |
|---|---|---|
| : Wind tunnel cross-section area [1] | 900 | $cm^2$ |
| Cup anemometer frontal area [2] | 100 | $cm^2$ |
| Diameter of mounting pipe [3] | - | mm |
| Blockage ratio of test object [4] | 0.111 | [-] |

**Preconditioning** : 24 hours at ambient conditions.
**Measurement Condition** : The average values during measurement are (24.0) °C, (56.0) %RH and (1006.0) hPa.

**TABULATION OF RESULTS:**
The table on next page give the measured values.

**Calibrated by:**
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

JIRANATEE ASSOCIATES CO.,LTD.

**Approved signatory:** .....
Mr. Parinya Booncharoen
Calibration Department Manager

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE... 22/ 08/ 2027

***Calibration procedure:***
*The Cup anemometer was calibrated against Standard air velocity transducer model: 8455-12 and pitot tube with precision differential pressure meter model: DPM2500 in an close test-section of Eiffel-type wind tunnel with 900 $cm^2$ cross test section area. The WI-CL-007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.*

***Traceability:***
*This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0019-25 and MW-0059-25*

***Uncertainty of Measurement:***
*The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'*

**Remark:**
[1] Nozzle cross-section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [2] to [1]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

| Certificate Number |
|---|
| CWS-020-69 |



**MEASUREMENT RESULTS** [5]

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section, UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

| $v_{std}$ [6] (m/s) | Temp. wind tunnel (°C) | Temp. room (°C) | $v_{uuc}$ [7] (m/s) | Error (m/s) | U (k=2) (m/s) |
|---|---|---|---|---|---|
| 1.031 | 23.86 | 23.95 | 0.9 | -0.1 | 0.31 |
| 2.164 | 23.84 | 23.95 | 2.0 | -0.2 | 0.31 |
| 3.001 | 23.90 | 23.95 | 2.9 | -0.1 | 0.31 |
| 4.227 | 23.88 | 23.95 | 3.9 | -0.3 | 0.31 |
| 5.03 | 23.70 | 23.95 | 5.0 | 0.0 | 0.31 |
| 6.02 | 23.90 | 23.95 | 5.9 | -0.1 | 0.31 |
| 7.02 | 23.60 | 23.95 | 7.0 | 0.0 | 0.31 |
| 8.02 | 23.86 | 23.95 | 8.0 | 0.0 | 0.31 |
| 9.02 | 23.40 | 23.95 | 9.1 | 0.1 | 0.31 |
| 10.01 | 23.70 | 23.95 | 10.1 | 0.1 | 0.31 |
| 11.00 | 23.50 | 23.95 | 11.2 | 0.2 | 0.31 |
| 12.00 | 23.50 | 23.95 | 12.2 | 0.2 | 0.31 |
| 12.99 | 23.50 | 23.95 | 13.3 | 0.3 | 0.31 |
| 13.98 | 23.50 | 23.95 | 14.3 | 0.3 | 0.31 |
| 14.98 | 23.50 | 23.95 | 15.3 | 0.3 | 0.31 |
| 16.03 | 23.50 | 23.95 | 16.4 | 0.4 | 0.31 |

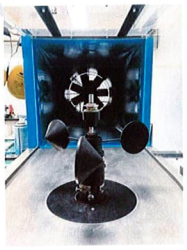
**Remark:**

[5] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

[6] Velocity of standard

[7] Velocity of Unit Under Calibration

**PHOTO OF CALIBRATION SET-UP**



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set- up is not true to scale due to imaging geometry.

***End of Certificate of Calibration***

JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co., Ltd.

| Certificate Number |
|---|
| CWD-020-69 |



**MEASUREMENT RESULTS** [5]

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

| Air speed m/s | $D°_{std}$ Degree (°) | $D°_{uuc}$ Degree (°) | Error Degree (°) | U (k=2) Degree (°) |
|---|---|---|---|---|
| 5.01 | 45.000 | 40 | -5 | 0.60 |
| | 90.000 | 87 | -3 | 0.60 |
| | 135.000 | 134 | -1 | 0.60 |
| | 180.000 | 182 | 2 | 0.60 |
| | 225.000 | 230 | 5 | 0.60 |
| | 270.000 | 276 | 6 | 0.60 |
| | 315.000 | 320 | 5 | 0.60 |
| | 360.000 | 359 | -1 | 0.60 |

**Remark:**

[5] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

[6] Direction of standard

[7] Direction of Unit Under Calibration

***End of Certificate of Calibration***

JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co., Ltd.

JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
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Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

*Wind direction measurement laboratory*
*Calibration services department.*

NSC – TISI – TIS 17025
CALIBRATION 0367

| Certificate Number |
|---|
| CWD-020-69 |

# CERTIFICATE OF CALIBRATION



**MEASUREMENT ITEM** : Wind Direction Sensor
**MANUFACTURER** : Novalynx
**MODEL/TYPE** : Sensor: WS-02F
Data logger: WS-25DL
**SERIAL NUMBER** : Sensor: WSD-A4481
Data logger: A4481
**ID NUMBER** : BKK_FS0141
**CONDITION AS-RECEIVED** : Used item
**CUSTOMER** : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

**RECEIVED DATE** : 10 Feb 2026
**MEASUREMENT DATE** : 23 Feb 2026
**ISSUE DATE** : 23 Feb 2026

**ENVIRONMENTAL CONDITIONS:**
Ambient condition in the laboratory are as follow:

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

**PLACE OF CALIBRATION** : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

**CALIBRATION CONDITION**

| | | |
|---|---|---|
| : Wind tunnel cross-section area[1] | 900 | $cm^2$ |
| Wind direction frontal area[2] | 129 | $cm^2$ |
| Diameter of mounting pipe[3] | - | mm |
| Blockage ratio of test object[4] | 0.143 | [-] |

**Preconditioning** : 24 hours at ambient conditions.
**Measurement Condition** : The average values during measurement are (23.6)°C, (56.5) %RH and (1006.8) hPa.

**TABULATION OF RESULTS:**
The table on next page give the measured values.

***Calibration procedure:***
*The wind direction sensor was calibrated against Standard Rotary Encoder model: AXK00915-DM04-P3-S-U0 in an close test-section of Eiffel-type wind tunnel with 900 $cm^2$ cross test section area. The WI-CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.*

***Traceability:***
*This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: DA-0027-24.*

***Uncertainty of Measurement:***
*The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'*

**Calibrated by:**
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

JIRANATEE ASSOCIATES CO.,LTD.

**Approved signatory:** .....
Mr. Parinya Booncharoen
Calibration Department Manager

**Remark:**
[1] Nozzle cross-section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [2] to [1]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

JIRANATEE ASSOCIATES CO.,LTD.

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Bangkok 10600 (Thailand)
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E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

*Air speed measurement laboratory*
*Calibration services department.*

NSC – TISI – TIS 17025
CALIBRATION 0367

| Certificate Number |
|---|
| CWS-019-69 |

# CERTIFICATE OF CALIBRATION



**MEASUREMENT ITEM** : Cup anemometer
**MANUFACTURER** : Novalynx
**MODEL/TYPE** : Sensor: WS-02F
Data logger: 110-WS-25DL-D
**SERIAL NUMBER** : Sensor: WSD-A5789
Data logger: A5789
**ID NUMBER** : RYG_FS0531
**CONDITION AS-RECEIVED** : Used item
**CUSTOMER** : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

**RECEIVED DATE** : 10 Feb 2026
**MEASUREMENT DATE** : 20 Feb 2026
**ISSUE DATE** : 20 Feb 2026

**ENVIRONMENTAL CONDITIONS:**
Ambient condition in the laboratory are as follow:

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

**PLACE OF CALIBRATION** : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

**CALIBRATION CONDITIONS**

| | | |
|---|---|---|
| : Wind tunnel cross-section area[1] | 900 | $cm^2$ |
| Cup anemometer frontal area[2] | 100 | $cm^2$ |
| Diameter of mounting pipe[3] | - | mm |
| Blockage ratio of test object[4] | 0.111 | [-] |

**Preconditioning** : 24 hours at ambient conditions.
**Measurement Condition** : The average values during measurement are (23.3) °C, (50.6) %RH and (1010.1) hPa

**TABULATION OF RESULTS:**
The table on next page give the measured values.

***Calibration procedure:***
*The Cup anemometer was calibrated against Standard air velocity transducer model: 8455-12 and pitot tube with precision differential pressure meter model: DPM2500 in an close test-section of Eiffel-type wind tunnel with 900 $cm^2$ cross test section area. The WI-CL-007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.*

***Traceability:***
*This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0019-25 and MW-0059-25*

***Uncertainty of Measurement:***
*The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'*

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE 19/ 08/ 2027

**Calibrated by:**
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

JIRANATEE ASSOCIATES CO.,LTD.

**Approved signatory:** .....
Mr. Parinya Booncharoen
Calibration Department Manager

**Remark:**
[1] Nozzle cross-section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [2] to [1]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

| Certificate Number |
|---|
| CWS-019-69 |



**MEASUREMENT RESULTS** [5]

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section, UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

| $v_{std}$ [6] (m/s) | Temp. wind tunnel (°C) | Temp. room (°C) | $v_{suc}$ [7] (m/s) | Error (m/s) | U (k=2) (m/s) |
|---|---|---|---|---|---|
| 1.031 | 23.30 | 23.30 | 0.8 | -0.2 | 0.31 |
| 2.208 | 23.30 | 23.30 | 1.9 | -0.3 | 0.31 |
| 3.007 | 23.50 | 23.30 | 2.8 | -0.2 | 0.31 |
| 4.242 | 23.46 | 23.30 | 3.9 | -0.3 | 0.31 |
| 5.01 | 23.26 | 23.30 | 5.0 | 0.0 | 0.31 |
| 6.01 | 23.28 | 23.30 | 6.0 | 0.0 | 0.31 |
| 7.02 | 23.20 | 23.30 | 7.0 | -0.1 | 0.31 |
| 8.02 | 23.28 | 23.30 | 8.0 | 0.0 | 0.31 |
| 9.00 | 23.30 | 23.30 | 9.1 | 0.1 | 0.31 |
| 10.00 | 23.30 | 23.30 | 10.1 | 0.1 | 0.31 |
| 11.00 | 23.34 | 23.30 | 11.1 | 0.1 | 0.31 |
| 11.99 | 23.40 | 23.30 | 12.2 | 0.2 | 0.31 |
| 12.98 | 23.40 | 23.30 | 13.4 | 0.4 | 0.31 |
| 13.98 | 23.40 | 23.30 | 14.3 | 0.3 | 0.31 |
| 14.97 | 23.40 | 23.30 | 15.3 | 0.4 | 0.31 |
| 16.03 | 23.40 | 23.30 | 16.4 | 0.4 | 0.32 |

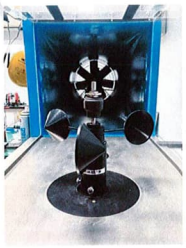
**Remark:**

[5] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

[6] Velocity of standard

[7] Velocity of Unit Under Calibration

**PHOTO OF CALIBRATION SET-UP**



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set- up is not true to scale due to imaging geometry.

***End of Certificate of Calibration***

JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co., Ltd.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
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E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

*Wind direction measurement laboratory*
*Calibration services department.*

NSC – TISI – TIS 17025
CALIBRATION 0367

| Certificate Number |
|---|
| CWD-019-69 |

# CERTIFICATE OF CALIBRATION



| | | | |
|---|---|---|---|
| **MEASUREMENT ITEM** | : Wind Direction Sensor | | |
| **MANUFACTURER** | : Novalynx | | |
| **MODEL/TYPE** | : Sensor: WS-02F<br>Data logger: 110-WS-25DL-D | | |
| **SERIAL NUMBER** | : Sensor: WSD-A5789<br>Data logger: A5789 | | |
| **ID NUMBER** | : RYG_FS0531 | | |
| **CONDITION AS-RECEIVED** | : Used item | | |
| **CUSTOMER** | : ALS laboratory group (Thailand) Co., Ltd.<br>104 Phatthanakan 40, Phatthanakan Rd,<br>Khwaeng Suan Luang, Khet Suan Luang,<br>Bangkok 10250 Thailand. | | |
| **RECEIVED DATE** | : 10 Feb 2026 | | |
| **MEASUREMENT DATE** | : 20 Feb 2026 | | |
| **ISSUE DATE** | : 20 Feb 2026 | | |
| **ENVIRONMENTAL CONDITIONS:** | | | |
| Ambient condition in the laboratory are as follow: | | | |
| Temperature | : 23.0 ± 3.0 | °C | |
| Relative Humidity | : 55.0 ± 15.0 | %RH | |
| Atmospheric Pressure | : 1010 ± 10 | hPa | |
| **PLACE OF CALIBRATION** | : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd. | | |
| **CALIBRATION CONDITION** | : Wind tunnel cross-section area[1] | 900 | $cm^2$ |
| | Wind direction frontal area[2] | 129 | $cm^2$ |
| | Diameter of mounting pipe[3] | - | mm |
| | Blockage ratio of test object[4] | 0.143 | [-] |
| **Preconditioning** | : 24 hours at ambient conditions. | | |
| **Measurement Condition** | : The average values during measurement are (23.6)°C, (56.6) %RH and (1007.1) hPa. | | |

***Calibration procedure:***
*The wind direction sensor was calibrated against Standard Rotary Encoder model: AX-00915-DM04-P3-S-U0 in an close test-section of Eiffel-type wind tunnel with 900 $cm^2$ cross test section area. The WI-CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.*

***Traceability:***
*This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: DA-0027-24.*

***Uncertainty of Measurement:***
*The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'*

**TABULATION OF RESULTS:**
The table on next page give the measured values.

**Calibrated by:**
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

JIRANATEE ASSOCIATES CO.,LTD.

**Approved signatory:** .....
Mr. Parinya Booncharoen
Calibration Department Manager

**Remark:**

[1] Nozzle cross-section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [2] to [1]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

| Certificate Number |
|---|
| CWD-019-69 |



**MEASUREMENT RESULTS** [5]

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

| Air speed m/s | $D^{\circ}_{std}$ Degree (°) | $D^{\circ}_{suc}$ Degree (°) | Error Degree (°) | U (k=2) Degree (°) |
|---|---|---|---|---|
| 5.00 | 45.000 | 43 | -2 | 0.60 |
| | 90.000 | 88 | -2 | 0.60 |
| | 135.000 | 133 | -2 | 0.60 |
| | 180.000 | 180 | 0 | 0.82 |
| | 225.000 | 228 | 3 | 0.60 |
| | 270.000 | 271 | 1 | 0.60 |
| | 315.000 | 315 | 0 | 0.60 |
| | 360.000 | 358 | -2 | 0.60 |

**Remark:**

[5] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

[6] Direction of standard

[7] Direction of Unit Under Calibration

***End of Certificate of Calibration***

JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
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Web site: www.jiranatee.com

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

*Temperature measurement laboratory*
*Calibration services department.*

NSC – TISI – TIS 17025
CALIBRATION 0367

# CERTIFICATE OF CALIBRATION

**Certificate No.** : CDT-064-69



| | |
|---|---|
| **MEASUREMENT ITEM** | : Data Logger with Temperature sensor |
| **MANUFACTURER** | : Novalynx |
| **MODEL/TYPE** | : 110-WS-25DL-D |
| **SERIAL NUMBER** | : A5789 |
| **ID NUMBER** | : RYG_FS0531 |
| **CONDITION AS-RECEIVED** | : Used item |
| **CUSTOMER** | : ALS laboratory group (Thailand) Co., Ltd.<br>104 Phatthanakan 40, Phatthanakan Rd.,<br>Khwaeng Suan Luang, Khet Suan Luang,<br>Bangkok 10250 Thailand. |
| **RECEIVED DATE** | : 10 Feb 2026 |
| **MEASUREMENT DATE** | : 20 Feb 2026 |
| **ISSUE DATE** | : 20 Feb 2026 |

**ENVIRONMENTAL CONDITIONS:**
Ambient condition in the laboratory are as follow:

| | | |
|---|---|---|
| Temperature | : 23.0 ± 3.0 | °C |
| Relative Humidity | : 55.0 ± 15.0 | %RH |

***NOTED:*** *The certificate is valid only to the item calibrated on date and place of calibration.*

**TABULATION OF RESULTS:**
The table on next page give the measured values.

***Calibration procedure:***
*The temperature calibration was done by In-House calibration method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.*

***Traceability:***
*The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-1013-25, Certificate number: ER-0061-25.*

***Reference Used During Calibration:***
*1. Standard Temperature Probe*
*Model: STS-100 A500, Serial No.: 667682-09, Due date: 9 Apr 2027*
*2. Digital Temperature Indicator*
*Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 22 Apr 2027*

***Uncertainty of Measurement:***
*The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'*

**Calibrated by:**
☐ Mr. Sorawit Thachalad
☑ Miss Jittraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit

JIRANATEE ASSOCIATES CO.,LTD.

**Approved signatory:** .....
Mr. Parinya Booncharoen
Calibration Department Manager

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

JIRANATEE ASSOCIATES CO.,LTD.

**Continuation of Certificate of Calibration Number CDT-064-69**



**Result of Calibration:** ☑ Without Adjustment ☐ With Adjustment

**Calibration Range:** 20 °C to 40 °C

**Function:**

**Table 1: This equipment was connected with temperature sensor Model: HMP60 S/N: T0210901. Dimension: Diameter 12 mm. Length 80 mm.**

| Immersion Depth (mm) | Standard Reading (°C) | UUC Reading (°C) | Error (°C) | Uncertainty (°C) |
|---|---|---|---|---|
| 80 | 20.026 | 19.9 | -0.1 | 0.099 |
| 80 | 25.009 | 24.8 | -0.2 | 0.099 |
| 80 | 30.001 | 29.8 | -0.2 | 0.099 |
| 80 | 34.998 | 34.7 | -0.3 | 0.099 |
| 80 | 39.995 | 40.0 | 0.0 | 0.099 |

**UUC*:** Unit Under Calibration

***End of Certificate of Calibration***

JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd.

JIRANATEE ASSOCIATES CO.,LTD.

**Continuation of Certificate of Calibration Number: CRT-009-69**



**Measurement Results:**

The results of calibration and associated measurement uncertainties are reported in the table below.

**Result of Calibration:** ☑ Without Adjustment ☐ With Adjustment

**Table 1:** The results of calibration of relative humidity at 30 °C are reported in table below.
**Calibration Range:** 20%RH to 80%RH

| Air Temperature (°C) | Standard Reading (%RH) | UUC Reading (%RH) | Error (%RH) | Uncertainty ±(%RH) |
|---|---|---|---|---|
| 30.07 | 19.96 | 20.8 | 0.8 | 0.78 |
| 30.03 | 50.13 | 51.5 | 1.4 | 1.3 |
| 30.02 | 80.18 | 81.7 | 1.5 | 2.1 |

**UUC*:** Unit Under Calibration

***End of Certificate of Calibration***

JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd.

JIRANATEE ASSOCIATES CO.,LTD.

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

NSC – TISI – TIS 17025
CALIBRATION 0367

Jiranatee Associates Co.,Ltd
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Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

*Relative humidity and Air Temperature measurement laboratory*
*Calibration services department.*

# CERTIFICATE OF CALIBRATION

**Certificate No.** : CRT-009-69



**MEASUREMENT ITEM** : Relative humidity with data logger
**MANUFACTURER** : Novalynx
**MODEL/TYPE** : Data Logger: 110-WS-25DL-D
Sensor: HMP60
**SERIAL NUMBER** : Data Logger: A5789
Sensor: T0210901
**ID NUMBER** : RYG_FS0531
**CONDITION AS-RECEIVED** : Used item
**CUSTOMER** : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

**RECEIVED DATE** : 10 Feb 2026
**MEASUREMENT DATE** : 20 Feb 2026
**ISSUE DATE** : 20 Feb 2026

**ENVIRONMENTAL CONDITIONS:**
Ambient condition in the laboratory are as follow:

| | | |
|---|---|---|
| Temperature | : 23.0 ± 3.0 | °C |
| Relative Humidity | : 55.0 ± 15.0 | %RH |

***NOTED:*** *The certificate is valid only to the item calibrated on date and place of calibration.*

***Calibration procedure:***
*The Relative humidity and Air Temperature calibration was done by In-House calibration method as WI-CL-009 and WI-CL-010 according to comparison method with Standard Chilled Mirror hygrometer with Temperature sensor and standard Humidity generator chamber.*

***Traceability:***
*The measurements are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT). Certificate number: TH-0146-24 and Jiranatee Associates Co., Ltd. Certificate number: CDT-027-69.*

***Uncertainty of Measurement:***
*The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'*

**TABULATION OF RESULTS:**
The table on next page give the measured values.

**Calibrated by:**
☐ Mr. Sorawit Thachalad
☑ Miss Jittraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit

JIRANATEE ASSOCIATES CO.,LTD.

**Approved signatory:**
Mr. Parinya Booncharoen
Calibration Department Manager

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140



## Certificate of Calibration

**Customer**

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250

**Certificate No** : 26-ACT-058
**Request No** : Req-2026-0707

**Unit Under Calibration Details**

Measurement item : Acoustic Calibrator
Manufacturer : RION
Model : NC-75
Serial Number : 35002736
ID : RYG_FS0496

Class : 1
Range : 94 dB / 1000 Hz
Instrument Status : Used

**Calibration Environment and Details**

Temperature : ( 23 ±2 °C )
Humidity : ( 50 ± 20 %RH )
Barometric Pressure : (1013 ±10.0 hPa )
Received Date : 11 March 2026
Calibration Date : 6 April 2026
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE... 05/ 04/ 2027

| Reference Standard | Model | Serial Number | Traceable | Due Calibration |
|---|---|---|---|---|
| Sound Calibrator | SV 35A | 58079 | EEI | 20 June 2026 |
| THD Multimeter | 2015 | 1047765 | NIMT | 22 January 2027 |

**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. Noppadon Luangart
Service Calibration Engineer

**Approved By :**
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

**Issue Date :** 6 April 2026

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.

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
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AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140



**Certificate No** : 26-ACT-058

**Request No** : Req-2026-0707

**Sound pressure level** **Calibration Results :** Without Adjustment

| Calibration Range (dB) | Without Adjustment (dB) | | Adjustment (dB) | | Uncertainty (± dB) |
|---|---|---|---|---|---|
| | Measured | Deviated value | Measured | Deviated value | |
| 94 dB / 1000 Hz | 93.99 | -0.01 | - | - | 0.13 |

**Frequency of Sound pressure level**

| Calibration Range (Hz) | Without Adjustment | | Adjustment | | Uncertainty (± %) |
|---|---|---|---|---|---|
| | Measured (Hz) | Deviated value (%) | Measured (Hz) | Deviated value (%) | |
| 94 dB / 1000 Hz | 1000.00 | 0.00 | - | - | 0.010 |

**Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)**

| Calibration Range (Hz) | Without Adjustment | Adjustment | Uncertainty (± %) |
|---|---|---|---|
| | Measured (%) | Measured (%) | |
| 94 dB / 1000 Hz | 0.51 | - | 0.17 |

**Note :**

- The calibration results exclude the calibrator pressure correction
- The calibration results exclude the microphone volume correction

**End of Calibration**

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.





**Cert. No. : ACL26085**
**Job No. : VC69AC0053**
**Pages : 2 of 8**

**Calibration Procedure :** CP-AC-02

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|---|---|---|---|---|
| Waveform Generator | 33210A | MY48017076 | EF-0011-25 | 11-FEB-26 |
| Waveform Generator | 33511B | MY52302742 | EF-0012-25 | 11-FEB-26 |
| Digital Multimeter | 33461A | MY53220104 | EEL.BP 24/0268 | 22-APR-26 |
| Digital Multimeter | 33461A | MY53220076 | EEL.BP 23/0268 | 22-APR-26 |
| Digital Multimeter | 34461A | MY60024273 | CA2025120EA | 18-MAR-26 |
| Programmable Attenuator | MAT-1070 | 62100114 | EF-0006-25 | 11-FEB-26 |
| Condenser Microphone | 4180 | 2977900 | AA-1002-25 | 19-FEB-26 |
| Measuring Amplifier | NA-42KAI | 34560495 | AA-3002-25 | 19-FEB-26 |

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   - 3.1 National Institute of Metrology (Thailand).
   - 3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   - 3.3 Electrical And Electronics Institute (EEI).

**SITHIPORN ASSOCIATES CO., LTD.**
**CALIBRATION LABORATORY**
451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiphorn.com

**Cert. No. : ACL26085**
**Pages : 1 of 8**

# Calibration Certificate

**Equipment :** SOUND LEVEL METER
**Manufacturer :** RION
**Model :** NL-52A / Microphone UC-59 / Preamplifier NH-25
**Serial No.:** 01120936 / 21737 / 22325
**ID No.:** RYG_FS0627

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

**Location :** -
**Ambient Temperature :** ( 23.0 ± 3 ) °C
**Pressure :** ( 101.3 ± 3 ) kPa
**Relative Humidity :** ( 50.0 ± 20 ) %

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE 20/ 01/ 2027

**Received Date :** 05 JANUARY 2026
**Calibration Date :** 21 - 23 JANUARY 2026
**Date of Issue :** 26 JANUARY 2026

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

( Nitinun Srihawan )

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 prior written approval of the head of Calibration Laboratory.



**Cert. No. : ACL26085**
**Job No. : VC69AC0053**
**Pages : 3 of 8**

**Summary of Measurement Result :**

| Parameter | Uncertainty (dB) | Maximum-permitted uncertainty of measurement (dB) |
|---|---|---|
| 1. Absolute sensitivity | 0.2 | N/A |
| 2. Self-generated noise | 0.2 | N/A |
| 3. Acoustical signal tests of frequency weightings | | |
| 125 Hz | 0.3 | 0.6 |
| 1000 Hz | 0.3 | 0.6 |
| 8000 Hz | 0.3 | 0.7 |
| 4. Electrical signal tests of frequency weightings | | |
| For 10 Hz to 4 kHz | 0.3 | 0.6 |
| For > 4 kHz to 10 kHz | 0.3 | 0.7 |
| For > 10 kHz to 20 kHz | 0.3 | 1.0 |
| 5. Frequency and time weightings at 1 kHz | 0.2 | 0.2 |
| 6. Long - term stability | 0.1 | 0.1 |
| 7. Level linearity on the reference level range | 0.2 | 0.3 |
| 8. Level linearity including the level range control | 0.2 | 0.3 |
| 9. Tone burst response | 0.2 | 0.3 |
| 10. Peak C sound level | 0.2 | 0.35 |
| 11. Overload indication | 0.2 | 0.25 |
| 12. High level stability | 0.1 | 0.1 |

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Job No. : VC69AC0053
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**Result of calibration :**

**1. Absolute sensitivity**

| Reference Acoustic Signal ( dB ) | Measured Value ( dB ) | Deviation ( dB ) | Acceptance Limit ( dB ) |
|---|---|---|---|
| 93.9 (93.94) | 94.0 | 0.0 | ±0.3 |

**2. Self-generated noise**

2.1 Normal test

| Measured Value ( dB ) |
|---|
| 14.3 |

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

| Frequency Weighting | Weighting ( dB ) |
|---|---|
| A - weight | 8.7 |
| C - weight | 14.1 |
| Flat | 19.7 |

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 125 | 0.2 | 0.2 | 0.2 | ± 1.0 |
| 1000 | 0.2 | 0.1 | 0.1 | ± 0.7 |
| 8000 | 0.3 | 0.4 | 0.4 | + 1.5, - 2.5 |

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Cert. No. : ACL26085
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**7. Level linearity on the reference level range**

| Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| 137.0 | 137.0 | 0.0 | ±0.8 |
| 136.0 | 136.0 | 0.0 | ±0.8 |
| 135.0 | 135.0 | 0.0 | ±0.8 |
| 134.0 | 134.0 | 0.0 | ±0.8 |
| 133.0 | 133.0 | 0.0 | ±0.8 |
| 132.0 | 132.0 | 0.0 | ±0.8 |
| 131.0 | 131.0 | 0.0 | ±0.8 |
| 129.0 | 129.0 | 0.0 | ±0.8 |
| 124.0 | 124.0 | 0.0 | ±0.8 |
| 119.0 | 119.0 | 0.0 | ±0.8 |
| 114.0 | 114.0 | 0.0 | ±0.8 |
| 109.0 | 109.0 | 0.0 | ±0.8 |
| 104.0 | 104.0 | 0.0 | ±0.8 |
| 99.0 | 99.0 | 0.0 | ±0.8 |
| 94.0 | 94.0 | 0.0 | ±0.8 |
| 89.0 | 89.0 | 0.0 | ±0.8 |
| 84.0 | 83.9 | -0.1 | ±0.8 |
| 79.0 | 78.9 | -0.1 | ±0.8 |
| 74.0 | 73.9 | -0.1 | ±0.8 |
| 69.0 | 68.9 | -0.1 | ±0.8 |
| 64.0 | 63.9 | -0.1 | ±0.8 |
| 59.0 | 58.9 | -0.1 | ±0.8 |
| 54.0 | 53.9 | -0.1 | ±0.8 |
| 49.0 | 48.9 | -0.1 | ±0.8 |
| 44.0 | 43.9 | -0.1 | ±0.8 |
| 39.0 | 38.9 | -0.1 | ±0.8 |
| 34.0 | 33.9 | -0.1 | ±0.8 |
| 30.0 | 29.9 | -0.1 | ±0.8 |
| 29.0 | 28.9 | -0.1 | ±0.8 |
| 28.0 | 28.0 | 0.0 | ±0.8 |
| 27.0 | 26.9 | -0.1 | ±0.8 |
| 26.0 | 25.9 | -0.1 | ±0.8 |
| 25.0 | 24.9 | -0.1 | ±0.8 |

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Job No. : VC69AC0053
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**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 63 | -0.1 | 0.0 | -0.1 | ±1.0 |
| 125 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 250 | 0.0 | 0.0 | -0.1 | ±1.0 |
| 500 | 0.0 | 0.0 | -0.1 | ±1.0 |
| 1000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 2000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 4000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 8000 | 0.0 | 0.1 | 0.1 | + 1.5, - 2.5 |
| 16000 | 0.0 | -1.2 | -1.2 | + 2.5, -16.0 |

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| C - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| Flat | 94.0 | 94.0 | 0.0 | ± 0.2 |

5.2 Time weighting at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Fast | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Slow | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Leq | 94.0 | 94.0 | 0.0 | ± 0.1 |

**6. Long - term stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.1 |

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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 ) |
|---|---|---|---|---|
| 130 | 94.0 | 94.1 | 0.1 | ±0.8 |

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 29.0 | 29.1 | 0.1 | ±0.8 |

**9. Tone burst response**

| Time Weighting | Tone burst duration, Tb ( ms ) | Cycle | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|---|---|
| Fast | 0.25 | 1 | 108.0 | 107.9 | -0.1 | 1.0 ; -3.0 |
| | 2 | 8 | 117.0 | 117.0 | 0.0 | 1.0 ; -1.5 |
| | 200 | 800 | 134.0 | 134.0 | 0.0 | ±0.5 |
| Slow | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -3.0 |
| | 200 | 800 | 127.6 | 127.6 | 0.0 | ±0.5 |
| SEL | 0.25 | 1 | 99.0 | 98.9 | -0.1 | 1.0 ; -3.0 |
| | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -1.5 |
| | 200 | 800 | 128.0 | 128.0 | 0.0 | ±0.5 |

**10. Peak C sound level**

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value, Lcpeak ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 130.0 | 130.0 | 0.0 | ±2.0 |
| One | 133.4 | 133.4 | 0.0 | ±2.0 |

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 133.0 | 133.0 | 0.0 | ±1.0 |
| Positive half cycle | 135.4 | 135.2 | -0.2 | ±1.0 |
| Negative half cycle | 135.4 | 135.2 | -0.2 | ±1.0 |

**11. Overload indication**

| Measured value ( dB ) | | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| Positive one-half cycle | Negative one-half cycle | | |
| 89.5 | 89.5 | 0.0 | ±1.5 |

**12. High level stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 137.0 | 137.0 | 0.0 | ±0.1 |

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

**End of Calibration Certificate**





**Calibration Procedure :** CP-AC-02

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|---|---|---|---|---|
| Waveform Generator | 33210A | MY48017076 | EF-0011-25 | 11-FEB-26 |
| Waveform Generator | 33511B | MY52302742 | EF-0012-25 | 11-FEB-26 |
| Digital Multimeter | 33461A | MY53220104 | EEL.BP 24/0268 | 22-APR-26 |
| Digital Multimeter | 33461A | MY53220076 | EEL.BP 23/0268 | 22-APR-26 |
| Digital Multimeter | 34461A | MY60024273 | CA2025120EA | 18-MAR-26 |
| Programmable Attenuator | MAT-1070 | 62100114 | EF-0006-25 | 11-FEB-26 |
| Condenser Microphone | 4180 | 2977900 | AA-1002-25 | 19-FEB-26 |
| Measuring Amplifier | NA-42KAI | 34560495 | AA-3002-25 | 19-FEB-26 |

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   - 3.1 National Institute of Metrology (Thailand).
   - 3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   - 3.3 Electrical And Electronics Institute (EEI).

**SITHIPORN ASSOCIATES CO., LTD.**
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# Calibration Certificate

**Equipment :** SOUND LEVEL METER
**Manufacturer :** RION
**Model :** NL-52A / Microphone UC-59 / Preamplifier NH-25
**Serial No.:** 01220938 / 21888 / 22327
**ID No.:** RYG_FS0629

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

**Location :** -
**Ambient Temperature :** ( 23.0 ± 3 ) °C
**Pressure :** ( 101.3 ± 3 ) kPa
**Relative Humidity :** ( 50.0 ± 20 ) %

**Received Date :** 05 JANUARY 2026
**Calibration Date :** 21 - 23 JANUARY 2026
**Date of Issue :** 26 JANUARY 2026

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE 20/ 01/ 2027

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

( Nitinun Srihawan )

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 prior written approval of the head of Calibration Laboratory.





**Summary of Measurement Result :**

| Parameter | Uncertainty (dB) | Maximum-permitted uncertainty of measurement (dB) |
|---|---|---|
| 1. Absolute sensitivity | 0.2 | N/A |
| 2. Self-generated noise | 0.2 | N/A |
| 3. Acoustical signal tests of frequency weightings | | |
| 125 Hz | 0.3 | 0.6 |
| 1000 Hz | 0.3 | 0.6 |
| 8000 Hz | 0.3 | 0.7 |
| 4. Electrical signal tests of frequency weightings | | |
| For 10 Hz to 4 kHz | 0.3 | 0.6 |
| For > 4 kHz to 10 kHz | 0.3 | 0.7 |
| For > 10 kHz to 20 kHz | 0.3 | 1.0 |
| 5. Frequency and time weightings at 1 kHz | 0.2 | 0.2 |
| 6. Long - term stability | 0.1 | 0.1 |
| 7. Level linearity on the reference level range | 0.2 | 0.3 |
| 8. Level linearity including the level range control | 0.2 | 0.3 |
| 9. Tone burst response | 0.2 | 0.3 |
| 10. Peak C sound level | 0.2 | 0.35 |
| 11. Overload indication | 0.2 | 0.25 |
| 12. High level stability | 0.1 | 0.1 |

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Job No. : VC69AC0053
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**Result of calibration :**

**1. Absolute sensitivity**

| Reference Acoustic Signal ( dB ) | Measured Value ( dB ) | Deviation ( dB ) | Acceptance Limit ( dB ) |
|---|---|---|---|
| 93.9 (93.94) | 94.0 | 0.0 | ±0.3 |

**2. Self-generated noise**

2.1 Normal test

| Measured Value ( dB ) |
|---|
| 14.2 |

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

| Frequency Weighting | Weighting ( dB ) |
|---|---|
| A - weight | 9.9 |
| C - weight | 14.6 |
| Flat | 20.3 |

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 125 | 0.2 | 0.2 | 0.2 | ± 1.0 |
| 1000 | 0.2 | 0.2 | 0.2 | ± 0.7 |
| 8000 | 0.9 | 1.0 | 1.0 | + 1.5, - 2.5 |



Cert. No. : ACL26087
Job No. : VC69AC0053
Pages : 6 of 8

**7. Level linearity on the reference level range**

| Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| 137.0 | 137.0 | 0.0 | ±0.8 |
| 136.0 | 136.0 | 0.0 | ±0.8 |
| 135.0 | 135.0 | 0.0 | ±0.8 |
| 134.0 | 134.0 | 0.0 | ±0.8 |
| 133.0 | 133.0 | 0.0 | ±0.8 |
| 132.0 | 132.0 | 0.0 | ±0.8 |
| 131.0 | 131.0 | 0.0 | ±0.8 |
| 129.0 | 129.0 | 0.0 | ±0.8 |
| 124.0 | 124.0 | 0.0 | ±0.8 |
| 119.0 | 119.0 | 0.0 | ±0.8 |
| 114.0 | 114.0 | 0.0 | ±0.8 |
| 109.0 | 109.0 | 0.0 | ±0.8 |
| 104.0 | 104.1 | 0.1 | ±0.8 |
| 99.0 | 99.0 | 0.0 | ±0.8 |
| 94.0 | 94.0 | 0.0 | ±0.8 |
| 89.0 | 89.0 | 0.0 | ±0.8 |
| 84.0 | 84.0 | 0.0 | ±0.8 |
| 79.0 | 79.0 | 0.0 | ±0.8 |
| 74.0 | 74.0 | 0.0 | ±0.8 |
| 69.0 | 69.0 | 0.0 | ±0.8 |
| 64.0 | 64.0 | 0.0 | ±0.8 |
| 59.0 | 59.0 | 0.0 | ±0.8 |
| 54.0 | 54.0 | 0.0 | ±0.8 |
| 49.0 | 49.0 | 0.0 | ±0.8 |
| 44.0 | 44.0 | 0.0 | ±0.8 |
| 39.0 | 39.0 | 0.0 | ±0.8 |
| 34.0 | 34.0 | 0.0 | ±0.8 |
| 30.0 | 30.0 | 0.0 | ±0.8 |
| 29.0 | 29.0 | 0.0 | ±0.8 |
| 28.0 | 28.0 | 0.0 | ±0.8 |
| 27.0 | 27.0 | 0.0 | ±0.8 |
| 26.0 | 26.0 | 0.0 | ±0.8 |
| 25.0 | 25.0 | 0.0 | ±0.8 |



Cert. No. : ACL26087
Job No. : VC69AC0053
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 63 | 0.0 | 0.0 | 0.1 | ±1.0 |
| 125 | 0.0 | 0.1 | 0.0 | ±1.0 |
| 250 | 0.1 | 0.1 | 0.0 | ±1.0 |
| 500 | 0.0 | 0.1 | 0.0 | ±1.0 |
| 1000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 2000 | 0.0 | 0.1 | 0.0 | ±1.0 |
| 4000 | 0.0 | 0.1 | 0.0 | ±1.0 |
| 8000 | 0.0 | 0.1 | 0.1 | + 1.5, - 2.5 |
| 16000 | 0.0 | -1.2 | -1.1 | + 2.5, -16.0 |

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| C - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| Flat | 94.0 | 94.0 | 0.0 | ± 0.2 |

5.2 Time weighting at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Fast | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Slow | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Leq | 94.0 | 94.0 | 0.0 | ± 0.1 |

**6. Long - term stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.1 | 0.1 | ± 0.1 |



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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 ) |
|---|---|---|---|---|
| 130 | 94.0 | 94.0 | 0.0 | ±0.8 |

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 29.0 | 29.0 | 0.0 | ±0.8 |

**9. Tone burst response**

| Time Weighting | Tone burst duration, Tb ( ms ) | Cycle | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|---|---|
| Fast | 0.25 | 1 | 108.0 | 107.9 | -0.1 | 1.0 ; -3.0 |
| | 2 | 8 | 117.0 | 117.0 | 0.0 | 1.0 ; -1.5 |
| | 200 | 800 | 134.0 | 134.1 | 0.1 | ±0.5 |
| Slow | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -3.0 |
| | 200 | 800 | 127.6 | 127.6 | 0.0 | ±0.5 |
| SEL | 0.25 | 1 | 99.0 | 98.9 | -0.1 | 1.0 ; -3.0 |
| | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -1.5 |
| | 200 | 800 | 128.0 | 128.1 | 0.1 | ±0.5 |

Cert. No. : ACL26087
Job No. : VC69AC0053
Pages : 8 of 8

**10. Peak C sound level**

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value, Lcpeak ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 130.0 | 130.0 | 0.0 | ±2.0 |
| One | 133.4 | 133.4 | 0.0 | ±2.0 |

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 133.0 | 133.0 | 0.0 | ±1.0 |
| Positive half cycle | 135.4 | 135.1 | -0.3 | ±1.0 |
| Negative half cycle | 135.4 | 135.1 | -0.3 | ±1.0 |

**11. Overload indication**

| Measured value ( dB ) | | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| Positive one-half cycle | Negative one-half cycle | | |
| 89.5 | 89.5 | 0.0 | ±1.5 |

**12. High level stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 137.0 | 137.0 | 0.0 | ±0.1 |

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

**End of Calibration Certificate**



Cert. No. : ACL25272
Job No. : VC68AC0143
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|---|---|---|---|---|
| Waveform Generator | 33210A | MY48017076 | EF-0011-25 | 11-FEB-26 |
| Waveform Generator | 33511B | MY52302742 | EF-0012-25 | 11-FEB-26 |
| Digital Multimeter | 33461A | MY53220104 | EEL.BP 24/0268 | 22-APR-26 |
| Digital Multimeter | 33461A | MY53220076 | EEL.BP 23/0268 | 22-APR-26 |
| Digital Multimeter | 34461A | MY60024273 | CA2025120EA | 18-MAR-26 |
| Programmable Attenuator | MAT-1070 | 62100114 | EF-0006-25 | 11-FEB-26 |
| Condenser Microphone | 4180 | 2977900 | AA-1002-25 | 19-FEB-26 |
| Measuring Amplifier | NA-42KAI | 34560495 | AA-3002-25 | 19-FEB-26 |

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   - 3.1 National Institute of Metrology (Thailand).
   - 3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   - 3.3 Electrical And Electronics Institute (EEI).

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Tel. +66 2433 8331 Email : calibration@sithiphorn.com

NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACL25272
Pages : 1 of 8

# Calibration Certificate

**Equipment :** SOUND LEVEL METER
**Manufacturer :** RION
**Model :** NL-52A / Microphone UC-59 / Preamplifier NH-25
**Serial No.:** 00531295 / 23094 / 32971
**ID No.:** NKH_FS0131

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

**Location :** -
**Ambient Temperature :** ( 23.0 ±3 ) °C
**Pressure :** ( 101.3 ±3 ) kPa
**Relative Humidity :** ( 50.0 ±20 ) %

REVIEW BY Nathakorn P.
APPROVED BY
NEXT CAL DATE 14/07/26

**Received Date :** 03 JULY 2025
**Calibration Date :** 14 -15 JULY 2025
**Date of Issue :** 16 JULY 2025

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :** Wichok E.
( Wichok Ekpongpradit )

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Cert. No. : ACL25272
Job No. : VC68AC0143
Pages : 3 of 8

**Summary of Measurement Result :**

| Parameter | Uncertainty (dB) | Maximum-permitted uncertainty of measurement (dB) |
|---|---|---|
| 1. Absolute sensitivity | 0.2 | N/A |
| 2. Self-generated noise | 0.2 | N/A |
| 3. Acoustical signal tests of frequency weightings | | |
| 125 Hz | 0.3 | 0.6 |
| 1000 Hz | 0.3 | 0.6 |
| 8000 Hz | 0.3 | 0.7 |
| 4. Electrical signal tests of frequency weightings | | |
| For 10 Hz to 4 kHz | 0.3 | 0.6 |
| For > 4 kHz to 10 kHz | 0.3 | 0.7 |
| For > 10 kHz to 20 kHz | 0.3 | 1.0 |
| 5. Frequency and time weightings at 1 kHz | 0.2 | 0.2 |
| 6. Long - term stability | 0.1 | 0.1 |
| 7. Level linearity on the reference level range | 0.2 | 0.3 |
| 8. Level linearity including the level range control | 0.2 | 0.3 |
| 9. Tone burst response | 0.2 | 0.3 |
| 10. Peak C sound level | 0.2 | 0.35 |
| 11. Overload indication | 0.2 | 0.25 |
| 12. High level stability | 0.1 | 0.1 |

Cert. No. : ACL25272
Job No. : VC68AC0143
Page : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

| Reference Acoustic Signal ( dB ) | Measured Value ( dB ) | Deviation ( dB ) | Acceptance Limit ( dB ) |
|---|---|---|---|
| 93.9 (93.94) | 94.0 | 0.0 | ±0.3 |

**2. Self-generated noise**

2.1 Normal test

| Measured Value ( dB ) |
|---|
| 13.8 |

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

| Frequency Weighting | Weighting ( dB ) |
|---|---|
| A - weight | 8.7 |
| C - weight | 14.7 |
| Flat | 20.1 |

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 125 | 0.3 | 0.4 | 0.4 | ± 1.0 |
| 1000 | 0.2 | 0.2 | 0.2 | ± 0.7 |
| 8000 | -0.1 | 0.0 | -0.1 | + 1.5, - 2.5 |



Cert. No. : ACL25272
Job No. : VC68AC0143
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 63 | 0.0 | 0.0 | -0.1 | ±1.0 |
| 125 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 250 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 500 | 0.0 | 0.0 | -0.1 | ±1.0 |
| 1000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 2000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 4000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 8000 | 0.0 | 0.0 | 0.0 | + 1.5, - 2.5 |
| 16000 | 0.0 | -1.3 | -1.2 | + 2.5, -16.0 |

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| C - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| Flat | 94.0 | 94.0 | 0.0 | ± 0.2 |

5.2 Time weighting at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Fast | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Slow | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Leq | 94.0 | 94.0 | 0.0 | ± 0.1 |

**6. Long - term stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.1 |



Cert. No. : ACL25272
Job No. : VC68AC0143
Pages : 6 of 8

**7. Level linearity on the reference level range**

| Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| 137.0 | 137.0 | 0.0 | ±0.8 |
| 136.0 | 136.0 | 0.0 | ±0.8 |
| 135.0 | 135.0 | 0.0 | ±0.8 |
| 134.0 | 134.1 | 0.1 | ±0.8 |
| 133.0 | 133.0 | 0.0 | ±0.8 |
| 132.0 | 132.0 | 0.0 | ±0.8 |
| 131.0 | 131.0 | 0.0 | ±0.8 |
| 129.0 | 129.0 | 0.0 | ±0.8 |
| 124.0 | 124.0 | 0.0 | ±0.8 |
| 119.0 | 119.1 | 0.1 | ±0.8 |
| 114.0 | 114.1 | 0.1 | ±0.8 |
| 109.0 | 109.0 | 0.0 | ±0.8 |
| 104.0 | 104.1 | 0.1 | ±0.8 |
| 99.0 | 99.0 | 0.0 | ±0.8 |
| 94.0 | 94.0 | 0.0 | ±0.8 |
| 89.0 | 89.0 | 0.0 | ±0.8 |
| 84.0 | 84.0 | 0.0 | ±0.8 |
| 79.0 | 79.0 | 0.0 | ±0.8 |
| 74.0 | 74.0 | 0.0 | ±0.8 |
| 69.0 | 69.0 | 0.0 | ±0.8 |
| 64.0 | 64.0 | 0.0 | ±0.8 |
| 59.0 | 59.0 | 0.0 | ±0.8 |
| 54.0 | 54.0 | 0.0 | ±0.8 |
| 49.0 | 49.0 | 0.0 | ±0.8 |
| 44.0 | 44.0 | 0.0 | ±0.8 |
| 39.0 | 39.0 | 0.0 | ±0.8 |
| 34.0 | 34.0 | 0.0 | ±0.8 |
| 30.0 | 30.0 | 0.0 | ±0.8 |
| 29.0 | 29.0 | 0.0 | ±0.8 |
| 28.0 | 28.0 | 0.0 | ±0.8 |
| 27.0 | 27.0 | 0.0 | ±0.8 |
| 26.0 | 26.0 | 0.0 | ±0.8 |
| 25.0 | 25.0 | 0.0 | ±0.8 |



Cert. No. : ACL25272
Job No. : VC68AC0143
Pages : 7 of 8

**8. Level linearity including the level range control**

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 94.0 | 94.0 | 0.0 | ±0.8 |

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 29.0 | 29.0 | 0.0 | ±0.8 |

**9. Tone burst response**

| Time Weighting | Tone burst duration, Tb ( ms ) | Cycle | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|---|---|
| Fast | 0.25 | 1 | 108.0 | 107.9 | -0.1 | 1.0 ; -3.0 |
| | 2 | 8 | 117.0 | 116.9 | -0.1 | 1.0 ; -1.5 |
| | 200 | 800 | 134.0 | 134.0 | 0.0 | ±0.5 |
| Slow | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -3.0 |
| | 200 | 800 | 127.6 | 127.6 | 0.0 | ±0.5 |
| SEL | 0.25 | 1 | 99.0 | 98.9 | -0.1 | 1.0 ; -3.0 |
| | 2 | 8 | 108.0 | 107.9 | -0.1 | 1.0 ; -1.5 |
| | 200 | 800 | 128.0 | 128.0 | 0.0 | ±0.5 |

Cert. No. : ACL25272
Job No. : VC68AC0143
Pages : 8 of 8

**10. Peak C sound level**

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value, Lcpeak ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 130.0 | 130.0 | 0.0 | ±2.0 |
| One | 133.4 | 133.4 | 0.0 | ±2.0 |

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 133.0 | 133.0 | 0.0 | ±1.0 |
| Positive half cycle | 135.4 | 135.2 | -0.2 | ±1.0 |
| Negative half cycle | 135.4 | 135.2 | -0.2 | ±1.0 |

**11. Overload indication**

| Measured value ( dB ) | | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| Positive one-half cycle | Negative one-half cycle | | |
| 89.5 | 89.5 | 0.0 | ±1.5 |

**12. High level stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 137.0 | 137.0 | 0.0 | ±0.1 |

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

**End of Calibration Certificate**



Cert. No. : ACL25277
Job No. : VC68AC0143
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|---|---|---|---|---|
| Waveform Generator | 33210A | MY48017076 | EF-0011-25 | 11-FEB-26 |
| Waveform Generator | 33511B | MY52302742 | EF-0012-25 | 11-FEB-26 |
| Digital Multimeter | 33461A | MY53220104 | EEL.BP 24/0268 | 22-APR-26 |
| Digital Multimeter | 33461A | MY53220076 | EEL.BP 23/0268 | 22-APR-26 |
| Digital Multimeter | 34461A | MY60024273 | CA2025120EA | 18-MAR-26 |
| Programmable Attenuator | MAT-1070 | 62100114 | EF-0006-25 | 11-FEB-26 |
| Condenser Microphone | 4180 | 2977900 | AA-1002-25 | 19-FEB-26 |
| Measuring Amplifier | NA-42KAI | 34560495 | AA-3002-25 | 19-FEB-26 |

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   - 3.1 National Institute of Metrology (Thailand).
   - 3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   - 3.3 Electrical And Electronics Institute (EEI).

SITHIPORN ASSOCIATES CO., LTD.
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NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACL25277
Pages : 1 of 8

# Calibration Certificate

**Equipment :** SOUND LEVEL METER
**Manufacturer :** RION
**Model :** NL-52A / Microphone UC-59 / Preamplifier NH-25
**Serial No.:** 00531300 / 23231 / 32976
**ID No.:** NKH_FS0136

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

REVIEW BY Nnakorn P.
APPROVED BY
NEXT CAL DATE 14/07/26

**Location :** -
**Ambient Temperature :** ( 23.0 ±3 ) °C
**Pressure :** ( 101.3 ±3 ) kPa
**Relative Humidity :** ( 50.0 ±20 ) %

**Received Date :** 03 JULY 2025
**Calibration Date :** 14 -15 JULY 2025
**Date of Issue :** 16 JULY 2025

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :** Wichok E.
( Wichok Ekpongpradit )

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Cert. No. : ACL25277
Job No. : VC68AC0143
Pages : 3 of 8

**Summary of Measurement Result :**

| Parameter | Uncertainty (dB) | Maximum-permitted uncertainty of measurement (dB) |
|---|---|---|
| 1. Absolute sensitivity | 0.2 | N/A |
| 2. Self-generated noise | 0.2 | N/A |
| 3. Acoustical signal tests of frequency weightings | | |
| 125 Hz | 0.3 | 0.6 |
| 1000 Hz | 0.3 | 0.6 |
| 8000 Hz | 0.3 | 0.7 |
| 4. Electrical signal tests of frequency weightings | | |
| For 10 Hz to 4 kHz | 0.3 | 0.6 |
| For > 4 kHz to 10 kHz | 0.3 | 0.7 |
| For > 10 kHz to 20 kHz | 0.3 | 1.0 |
| 5. Frequency and time weightings at 1 kHz | 0.2 | 0.2 |
| 6. Long - term stability | 0.1 | 0.1 |
| 7. Level linearity on the reference level range | 0.2 | 0.3 |
| 8. Level linearity including the level range control | 0.2 | 0.3 |
| 9. Tone burst response | 0.2 | 0.3 |
| 10. Peak C sound level | 0.2 | 0.35 |
| 11. Overload indication | 0.2 | 0.25 |
| 12. High level stability | 0.1 | 0.1 |

Cert. No. : ACL25277
Job No. : VC68AC0143
Page : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

| Reference Acoustic Signal ( dB ) | Measured Value ( dB ) | Deviation ( dB ) | Acceptance Limit ( dB ) |
|---|---|---|---|
| 93.9 (93.94) | 94.0 | 0.0 | ±0.3 |

**2. Self-generated noise**

2.1 Normal test

| Measured Value ( dB ) |
|---|
| 13.4 |

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

| Frequency Weighting | Weighting ( dB ) |
|---|---|
| A - weight | 9.9 |
| C - weight | 15.2 |
| Flat | 20.8 |

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 125 | 0.3 | 0.4 | 0.4 | ± 1.0 |
| 1000 | 0.3 | 0.3 | 0.3 | ± 0.7 |
| 8000 | 0.0 | 0.1 | 0.1 | + 1.5, - 2.5 |



Cert. No. : ACL25277
Job No. : VC68AC0143
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 63 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 125 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 250 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 500 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 1000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 2000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 4000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 8000 | 0.0 | 0.1 | 0.1 | + 1.5, - 2.5 |
| 16000 | 0.0 | -1.2 | -1.2 | + 2.5, -16.0 |

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| C - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| Flat | 94.0 | 94.0 | 0.0 | ± 0.2 |

5.2 Time weighting at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Fast | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Slow | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Leq | 94.0 | 94.0 | 0.0 | ± 0.1 |

**6. Long - term stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.1 |



Cert. No. : ACL25277
Job No. : VC68AC0143
Pages : 6 of 8

**7. Level linearity on the reference level range**

| Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| 137.0 | 137.0 | 0.0 | ±0.8 |
| 136.0 | 136.0 | 0.0 | ±0.8 |
| 135.0 | 135.0 | 0.0 | ±0.8 |
| 134.0 | 134.0 | 0.0 | ±0.8 |
| 133.0 | 132.9 | -0.1 | ±0.8 |
| 132.0 | 131.9 | -0.1 | ±0.8 |
| 131.0 | 130.9 | -0.1 | ±0.8 |
| 129.0 | 129.0 | 0.0 | ±0.8 |
| 124.0 | 124.0 | 0.0 | ±0.8 |
| 119.0 | 119.0 | 0.0 | ±0.8 |
| 114.0 | 114.0 | 0.0 | ±0.8 |
| 109.0 | 109.0 | 0.0 | ±0.8 |
| 104.0 | 104.0 | 0.0 | ±0.8 |
| 99.0 | 99.0 | 0.0 | ±0.8 |
| 94.0 | 94.0 | 0.0 | ±0.8 |
| 89.0 | 89.0 | 0.0 | ±0.8 |
| 84.0 | 84.0 | 0.0 | ±0.8 |
| 79.0 | 79.0 | 0.0 | ±0.8 |
| 74.0 | 74.0 | 0.0 | ±0.8 |
| 69.0 | 69.0 | 0.0 | ±0.8 |
| 64.0 | 64.0 | 0.0 | ±0.8 |
| 59.0 | 59.0 | 0.0 | ±0.8 |
| 54.0 | 54.0 | 0.0 | ±0.8 |
| 49.0 | 49.0 | 0.0 | ±0.8 |
| 44.0 | 44.0 | 0.0 | ±0.8 |
| 39.0 | 39.0 | 0.0 | ±0.8 |
| 34.0 | 34.0 | 0.0 | ±0.8 |
| 30.0 | 30.0 | 0.0 | ±0.8 |
| 29.0 | 29.0 | 0.0 | ±0.8 |
| 28.0 | 28.0 | 0.0 | ±0.8 |
| 27.0 | 27.0 | 0.0 | ±0.8 |
| 26.0 | 26.0 | 0.0 | ±0.8 |
| 25.0 | 25.0 | 0.0 | ±0.8 |



Cert. No. : ACL25277
Job No. : VC68AC0143
Pages : 7 of 8

**8. Level linearity including the level range control**

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 94.0 | 94.0 | 0.0 | ±0.8 |

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 29.0 | 28.9 | -0.1 | ±0.8 |

**9. Tone burst response**

| Time Weighting | Tone burst duration, Tb ( ms ) | Cycle | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|---|---|
| Fast | 0.25 | 1 | 108.0 | 107.9 | -0.1 | 1.0 ; -3.0 |
| | 2 | 8 | 117.0 | 117.0 | 0.0 | 1.0 ; -1.5 |
| | 200 | 800 | 134.0 | 134.0 | 0.0 | ±0.5 |
| Slow | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -3.0 |
| | 200 | 800 | 127.6 | 127.6 | 0.0 | ±0.5 |
| SEL | 0.25 | 1 | 99.0 | 98.9 | -0.1 | 1.0 ; -3.0 |
| | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -1.5 |
| | 200 | 800 | 128.0 | 128.0 | 0.0 | ±0.5 |

Cert. No. : ACL25277
Job No. : VC68AC0143
Pages : 8 of 8

**10. Peak C sound level**

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value, Lcpeak ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 130.0 | 130.0 | 0.0 | ±2.0 |
| One | 133.4 | 133.4 | 0.0 | ±2.0 |

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 133.0 | 133.0 | 0.0 | ±1.0 |
| Positive half cycle | 135.4 | 135.2 | -0.2 | ±1.0 |
| Negative half cycle | 135.4 | 135.2 | -0.2 | ±1.0 |

**11. Overload indication**

| Measured value ( dB ) | | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| Positive one-half cycle | Negative one-half cycle | | |
| 89.5 | 89.5 | 0.0 | ±1.5 |

**12. High level stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 137.0 | 137.0 | 0.0 | ±0.1 |

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

**End of Calibration Certificate**



Cert. No. : ACL25501
Job No. : VC69AC0045
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|---|---|---|---|---|
| Waveform Generator | 33210A | MY48017076 | EF-0011-25 | 11-FEB-26 |
| Waveform Generator | 33511B | MY52302742 | EF-0012-25 | 11-FEB-26 |
| Digital Multimeter | 33461A | MY53220104 | EEL.BP 24/0268 | 22-APR-26 |
| Digital Multimeter | 33461A | MY53220076 | EEL.BP 23/0268 | 22-APR-26 |
| Digital Multimeter | 34461A | MY60024273 | CA2025120EA | 18-MAR-26 |
| Programmable Attenuator | MAT-1070 | 62100114 | EF-0006-25 | 11-FEB-26 |
| Condenser Microphone | 4180 | 2977900 | AA-1002-25 | 19-FEB-26 |
| Measuring Amplifier | NA-42KAI | 34560495 | AA-3002-25 | 19-FEB-26 |

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   3.3 Electrical And Electronics Institute (EEI).

**SITHIPORN ASSOCIATES CO., LTD.**
**CALIBRATION LABORATORY**
451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiphorn.com

NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACL25501
Pages : 1 of 8

# Calibration Certificate

**Equipment :** SOUND LEVEL METER
**Manufacturer :** RION
**Model :** NL-42A / Microphone UC-52 / Preamplifier NH-24
**Serial No.:** 00623391 / 198635 / 26419
**ID No.:** RYG_FS0616

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

**Location :** -
**Ambient Temperature :** ( 23.0 ±3 ) °C
**Pressure :** ( 101.3 ±3 ) kPa
**Relative Humidity :** ( 50.0 ±20 ) %

REVIEW BY
APPROVED BY
NEXT CAL DATE 21/ 12/ 2026

**Received Date :** 11 DECEMBER 2025
**Calibration Date :** 22 DECEMBER 2025
**Date of Issue :** 24 DECEMBER 2025

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

( Nitinun Srihawan )

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Cert. No. : ACL25501
Job No. : VC69AC0045
Pages : 3 of 8

**Summary of Measurement Result :**

| Parameter | Uncertainty (dB) | Maximum-permitted uncertainty of measurement (dB) |
|---|---|---|
| 1. Absolute sensitivity | 0.2 | N/A |
| 2. Self-generated noise | 0.2 | N/A |
| 3. Acoustical signal tests of frequency weightings | | |
| 125 Hz | 0.3 | 0.6 |
| 1000 Hz | 0.3 | 0.6 |
| 8000 Hz | 0.3 | 0.7 |
| 4. Electrical signal tests of frequency weightings | | |
| For 10 Hz to 4 kHz | 0.3 | 0.6 |
| For > 4 kHz to 10 kHz | 0.3 | 0.7 |
| For > 10 kHz to 20 kHz | 0.3 | 1.0 |
| 5. Frequency and time weightings at 1 kHz | 0.2 | 0.2 |
| 6. Long - term stability | 0.1 | 0.1 |
| 7. Level linearity on the reference level range | 0.2 | 0.3 |
| 8. Level linearity including the level range control | 0.2 | 0.3 |
| 9. Tone burst response | 0.2 | 0.3 |
| 10. Peak C sound level | 0.2 | 0.35 |
| 11. Overload indication | 0.2 | 0.25 |
| 12. High level stability | 0.1 | 0.1 |

Cert. No. : ACL25501
Job No. : VC69AC0045
Page : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

| Reference Acoustic Signal ( dB ) | Measured Value ( dB ) | Deviation ( dB ) | Acceptance Limit ( dB ) |
|---|---|---|---|
| 93.9 (93.94) | 93.9 | 0.0 | ±0.3 |

**2. Self-generated noise**

2.1 Normal test

| Measured Value ( dB ) |
|---|
| 14.2 |

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

| Frequency Weighting | Weighting ( dB ) |
|---|---|
| A - weight | 10.8 |
| C - weight | 17.4 |
| Flat | 22.9 |

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 125 | 0.3 | 0.3 | 0.3 | ± 1.5 |
| 1000 | 0.0 | 0.0 | 0.0 | ± 1.0 |
| 8000 | 0.6 | 0.7 | 0.7 | ±5.0 |



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Job No. : VC69AC0045
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**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 63 | -0.1 | -0.1 | -0.1 | ±2.0 |
| 125 | 0.0 | 0.0 | -0.1 | ±1.5 |
| 250 | 0.0 | 0.0 | -0.1 | ±1.5 |
| 500 | 0.0 | 0.0 | -0.1 | ±1.5 |
| 1000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 2000 | 0.0 | 0.0 | 0.0 | ±2.0 |
| 4000 | 0.0 | 0.0 | 0.0 | ±3.0 |
| 8000 | 0.0 | 0.1 | 0.1 | ±5.0 |

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| C - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| Flat | 94.0 | 94.0 | 0.0 | ± 0.2 |

5.2 Time weighting at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Fast | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Slow | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Leq | 94.0 | 94.0 | 0.0 | ± 0.1 |

**6. Long - term stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.3 |



Cert. No. : ACL25501
Job No. : VC69AC0045
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**7. Level linearity on the reference level range**

| Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| 137.0 | 137.0 | 0.0 | ± 1.1 |
| 136.0 | 136.0 | 0.0 | ± 1.1 |
| 135.0 | 135.0 | 0.0 | ± 1.1 |
| 134.0 | 134.0 | 0.0 | ± 1.1 |
| 133.0 | 133.0 | 0.0 | ± 1.1 |
| 132.0 | 132.0 | 0.0 | ± 1.1 |
| 131.0 | 131.0 | 0.0 | ± 1.1 |
| 129.0 | 129.0 | 0.0 | ± 1.1 |
| 124.0 | 124.0 | 0.0 | ± 1.1 |
| 119.0 | 119.0 | 0.0 | ± 1.1 |
| 114.0 | 114.0 | 0.0 | ± 1.1 |
| 109.0 | 109.0 | 0.0 | ± 1.1 |
| 104.0 | 104.0 | 0.0 | ± 1.1 |
| 99.0 | 99.0 | 0.0 | ± 1.1 |
| 94.0 | 94.0 | 0.0 | ± 1.1 |
| 89.0 | 89.0 | 0.0 | ± 1.1 |
| 84.0 | 84.0 | 0.0 | ± 1.1 |
| 79.0 | 79.0 | 0.0 | ± 1.1 |
| 74.0 | 74.0 | 0.0 | ± 1.1 |
| 69.0 | 69.0 | 0.0 | ± 1.1 |
| 64.0 | 64.0 | 0.0 | ± 1.1 |
| 59.0 | 59.0 | 0.0 | ± 1.1 |
| 54.0 | 54.0 | 0.0 | ± 1.1 |
| 49.0 | 49.0 | 0.0 | ± 1.1 |
| 44.0 | 44.0 | 0.0 | ± 1.1 |
| 39.0 | 39.0 | 0.0 | ± 1.1 |
| 34.0 | 34.0 | 0.0 | ± 1.1 |
| 30.0 | 30.0 | 0.0 | ± 1.1 |
| 29.0 | 29.0 | 0.0 | ± 1.1 |
| 28.0 | 28.0 | 0.0 | ± 1.1 |
| 27.0 | 27.0 | 0.0 | ± 1.1 |
| 26.0 | 26.0 | 0.0 | ± 1.1 |
| 25.0 | 25.0 | 0.0 | ± 1.1 |



Cert. No. : ACL25501
Job No. : VC69AC0045
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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 ) |
|---|---|---|---|---|
| 130 | 94.0 | 94.0 | 0.0 | ±1.1 |

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 29.0 | 29.0 | 0.0 | ±1.1 |

**9. Tone burst response**

| Time Weighting | Tone burst duration, Tb ( ms ) | Cycle | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|---|---|
| Fast | 0.25 | 1 | 108.0 | 107.9 | -0.1 | 1.5 ; -5.0 |
| | 2 | 8 | 117.0 | 117.0 | 0.0 | 1.0 ; -2.5 |
| | 200 | 800 | 134.0 | 134.0 | 0.0 | ±1.0 |
| Slow | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -5.0 |
| | 200 | 800 | 127.6 | 127.6 | 0.0 | ±1.0 |
| SEL | 0.25 | 1 | 99.0 | 98.9 | -0.1 | 1.5 ; -5.0 |
| | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -2.5 |
| | 200 | 800 | 128.0 | 128.0 | 0.0 | ±1.0 |

Cert. No. : ACL25501
Job No. : VC69AC0045
Pages : 8 of 8

**10. Peak C sound level**

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value, Lcpeak ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 130.0 | 130.0 | 0.0 | ±3.0 |
| One | 133.4 | 133.4 | 0.0 | ±3.0 |

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 133.0 | 133.0 | 0.0 | ±2.0 |
| Positive half cycle | 135.4 | 135.1 | -0.3 | ±2.0 |
| Negative half cycle | 135.4 | 135.2 | -0.2 | ±2.0 |

**11. Overload indication**

| Measured value ( dB ) | | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| Positive one-half cycle | Negative one-half cycle | | |
| 89.5 | 89.6 | 0.1 | ±1.5 |

**12. High level stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 137.0 | 137.0 | 0.0 | ±0.3 |

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

**End of Calibration Certificate**

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Cert. No. : ACL25498
Job No. : VC69AC0045
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|---|---|---|---|---|
| Waveform Generator | 33210A | MY48017076 | EF-0011-25 | 11-FEB-26 |
| Waveform Generator | 33511B | MY52302742 | EF-0012-25 | 11-FEB-26 |
| Digital Multimeter | 33461A | MY53220104 | EEL.BP 24/0268 | 22-APR-26 |
| Digital Multimeter | 33461A | MY53220076 | EEL.BP 23/0268 | 22-APR-26 |
| Digital Multimeter | 34461A | MY60024273 | CA2025120EA | 18-MAR-26 |
| Programmable Attenuator | MAT-1070 | 62100114 | EF-0006-25 | 11-FEB-26 |
| Condenser Microphone | 4180 | 2977900 | AA-1002-25 | 19-FEB-26 |
| Measuring Amplifier | NA-42KAI | 34560495 | AA-3002-25 | 19-FEB-26 |

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   - 3.1 National Institute of Metrology (Thailand).
   - 3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   - 3.3 Electrical And Electronics Institute (EEI).

**SITHIPORN ASSOCIATES CO., LTD.**
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NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACL25498
Pages : 1 of 8

# Calibration Certificate

**Equipment :** SOUND LEVEL METER
**Manufacturer :** RION
**Model :** NL-42A / Microphone UC-52 / Preamplifier NH-24
**Serial No.:** 00623387 / 198634 / 26415
**ID No.:** RYG_FS0612

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

**Location :** -
**Ambient Temperature :** ( 23.0 ± 3 ) °C
**Pressure :** ( 101.3 ± 3 ) kPa
**Relative Humidity :** ( 50.0 ± 20 ) %

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE.....21/ 12/ 2026.....

**Received Date :** 11 DECEMBER 2025
**Calibration Date :** 22 DECEMBER 2025
**Date of Issue :** 24 DECEMBER 2025

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

( Nitinun Srihawan )

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Cert. No. : ACL25498
Job No. : VC69AC0045
Pages : 3 of 8

**Summary of Measurement Result :**

| Parameter | Uncertainty (dB) | Maximum-permitted uncertainty of measurement (dB) |
|---|---|---|
| 1. Absolute sensitivity | 0.2 | N/A |
| 2. Self-generated noise | 0.2 | N/A |
| 3. Acoustical signal tests of frequency weightings | | |
| 125 Hz | 0.3 | 0.6 |
| 1000 Hz | 0.3 | 0.6 |
| 8000 Hz | 0.3 | 0.7 |
| 4. Electrical signal tests of frequency weightings | | |
| For 10 Hz to 4 kHz | 0.3 | 0.6 |
| For > 4 kHz to 10 kHz | 0.3 | 0.7 |
| For > 10 kHz to 20 kHz | 0.3 | 1.0 |
| 5. Frequency and time weightings at 1 kHz | 0.2 | 0.2 |
| 6. Long - term stability | 0.1 | 0.1 |
| 7. Level linearity on the reference level range | 0.2 | 0.3 |
| 8. Level linearity including the level range control | 0.2 | 0.3 |
| 9. Tone burst response | 0.2 | 0.3 |
| 10. Peak C sound level | 0.2 | 0.35 |
| 11. Overload indication | 0.2 | 0.25 |
| 12. High level stability | 0.1 | 0.1 |

Cert. No. : ACL25498
Job No. : VC69AC0045
Page : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

| Reference Acoustic Signal ( dB ) | Measured Value ( dB ) | Deviation ( dB ) | Acceptance Limit ( dB ) |
|---|---|---|---|
| 93.9 (93.94) | 93.9 | 0.0 | ±0.3 |

**2. Self-generated noise**

2.1 Normal test

| Measured Value ( dB ) |
|---|
| 15.4 |

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

| Frequency Weighting | Weighting ( dB ) |
|---|---|
| A - weight | 12.6 |
| C - weight | 18.7 |
| Flat | 24.4 |

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 125 | 0.2 | 0.3 | 0.3 | ± 1.5 |
| 1000 | 0.0 | 0.0 | 0.0 | ± 1.0 |
| 8000 | 0.4 | 0.5 | 0.5 | ±5.0 |



Cert. No. : ACL25498
Job No. : VC69AC0045
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 63 | 0.0 | -0.1 | 0.0 | ±2.0 |
| 125 | 0.0 | 0.0 | 0.0 | ±1.5 |
| 250 | 0.0 | 0.0 | 0.0 | ±1.5 |
| 500 | 0.0 | 0.0 | 0.0 | ±1.5 |
| 1000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 2000 | 0.0 | 0.0 | 0.0 | ±2.0 |
| 4000 | 0.0 | 0.0 | 0.0 | ±3.0 |
| 8000 | 0.0 | 0.1 | 0.1 | ±5.0 |

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| C - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| Flat | 94.0 | 94.0 | 0.0 | ± 0.2 |

5.2 Time weighting at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Fast | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Slow | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Leq | 94.0 | 94.0 | 0.0 | ± 0.1 |

**6. Long - term stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.3 |



Cert. No. : ACL25498
Job No. : VC69AC0045
Pages : 6 of 8

**7. Level linearity on the reference level range**

| Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| 137.0 | 137.0 | 0.0 | ± 1.1 |
| 136.0 | 136.0 | 0.0 | ± 1.1 |
| 135.0 | 135.0 | 0.0 | ± 1.1 |
| 134.0 | 134.0 | 0.0 | ± 1.1 |
| 133.0 | 133.0 | 0.0 | ± 1.1 |
| 132.0 | 132.0 | 0.0 | ± 1.1 |
| 131.0 | 131.0 | 0.0 | ± 1.1 |
| 129.0 | 129.0 | 0.0 | ± 1.1 |
| 124.0 | 124.0 | 0.0 | ± 1.1 |
| 119.0 | 119.0 | 0.0 | ± 1.1 |
| 114.0 | 114.0 | 0.0 | ± 1.1 |
| 109.0 | 109.0 | 0.0 | ± 1.1 |
| 104.0 | 104.0 | 0.0 | ± 1.1 |
| 99.0 | 99.0 | 0.0 | ± 1.1 |
| 94.0 | 94.0 | 0.0 | ± 1.1 |
| 89.0 | 89.0 | 0.0 | ± 1.1 |
| 84.0 | 84.0 | 0.0 | ± 1.1 |
| 79.0 | 79.0 | 0.0 | ± 1.1 |
| 74.0 | 74.0 | 0.0 | ± 1.1 |
| 69.0 | 69.0 | 0.0 | ± 1.1 |
| 64.0 | 64.0 | 0.0 | ± 1.1 |
| 59.0 | 59.0 | 0.0 | ± 1.1 |
| 54.0 | 53.9 | -0.1 | ± 1.1 |
| 49.0 | 48.9 | -0.1 | ± 1.1 |
| 44.0 | 44.0 | 0.0 | ± 1.1 |
| 39.0 | 38.9 | -0.1 | ± 1.1 |
| 34.0 | 33.9 | -0.1 | ± 1.1 |
| 30.0 | 29.9 | -0.1 | ± 1.1 |
| 29.0 | 28.9 | -0.1 | ± 1.1 |
| 28.0 | 27.9 | -0.1 | ± 1.1 |
| 27.0 | 26.9 | -0.1 | ± 1.1 |
| 26.0 | 25.9 | -0.1 | ± 1.1 |
| 25.0 | 24.9 | -0.1 | ± 1.1 |



Cert. No. : ACL25498
Job No. : VC69AC0045
Pages : 7 of 8

**8. Level linearity including the level range control**

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 94.0 | 94.0 | 0.0 | ±1.1 |

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 29.0 | 28.9 | -0.1 | ±1.1 |

**9. Tone burst response**

| Time Weighting | Tone burst duration, Tb ( ms ) | Cycle | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|---|---|
| Fast | 0.25 | 1 | 108.0 | 107.9 | -0.1 | 1.5 ; -5.0 |
| | 2 | 8 | 117.0 | 117.0 | 0.0 | 1.0 ; -2.5 |
| | 200 | 800 | 134.0 | 134.0 | 0.0 | ±1.0 |
| Slow | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -5.0 |
| | 200 | 800 | 127.6 | 127.6 | 0.0 | ±1.0 |
| SEL | 0.25 | 1 | 99.0 | 98.9 | -0.1 | 1.5 ; -5.0 |
| | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -2.5 |
| | 200 | 800 | 128.0 | 128.0 | 0.0 | ±1.0 |

Cert. No. : ACL25498
Job No. : VC69AC0045
Pages : 8 of 8

**10. Peak C sound level**

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value, Lcpeak ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 130.0 | 130.0 | 0.0 | ±3.0 |
| One | 133.4 | 133.3 | -0.1 | ±3.0 |

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 133.0 | 133.0 | 0.0 | ±2.0 |
| Positive half cycle | 135.4 | 135.2 | -0.2 | ±2.0 |
| Negative half cycle | 135.4 | 135.2 | -0.2 | ±2.0 |

**11. Overload indication**

| Measured value ( dB ) | | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| Positive one-half cycle | Negative one-half cycle | | |
| 89.6 | 89.6 | 0.0 | ±1.5 |

**12. High level stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 137.0 | 137.0 | 0.0 | ±0.3 |

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

**End of Calibration Certificate**

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Cert. No. : ACL25499
Job No. : VC69AC0045
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|---|---|---|---|---|
| Waveform Generator | 33210A | MY48017076 | EF-0011-25 | 11-FEB-26 |
| Waveform Generator | 33511B | MY52302742 | EF-0012-25 | 11-FEB-26 |
| Digital Multimeter | 33461A | MY53220104 | EEL.BP 24/0268 | 22-APR-26 |
| Digital Multimeter | 33461A | MY53220076 | EEL.BP 23/0268 | 22-APR-26 |
| Digital Multimeter | 34461A | MY60024273 | CA2025120EA | 18-MAR-26 |
| Programmable Attenuator | MAT-1070 | 62100114 | EF-0006-25 | 11-FEB-26 |
| Condenser Microphone | 4180 | 2977900 | AA-1002-25 | 19-FEB-26 |
| Measuring Amplifier | NA-42KAI | 34560495 | AA-3002-25 | 19-FEB-26 |

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   - 3.1 National Institute of Metrology (Thailand).
   - 3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   - 3.3 Electrical And Electronics Institute (EEI).

**SITHIPORN ASSOCIATES CO., LTD.**
**CALIBRATION LABORATORY**
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Tel. +66 2433 8331 Email : calibration@sithiphorn.com

Cert. No. : ACL25499
Pages : 1 of 8

# Calibration Certificate

**Equipment :** SOUND LEVEL METER
**Manufacturer :** RION
**Model :** NL-42A / Microphone UC-52 / Preamplifier NH-24
**Serial No.:** 00623388 / 198638 / 26416
**ID No.:** RYG_FS0613

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

**Location :** -
**Ambient Temperature :** ( 23.0 ± 3 ) °C
**Pressure :** ( 101.3 ± 3 ) kPa
**Relative Humidity :** ( 50.0 ± 20 ) %

REVIEW BY
APPROVED BY
NEXT CAL DATE 21/ 12/ 2026

**Received Date :** 11 DECEMBER 2025
**Calibration Date :** 22 DECEMBER 2025
**Date of Issue :** 24 DECEMBER 2025

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

( Nitinun Srihawan )

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Cert. No. : ACL25499
Job No. : VC69AC0045
Pages : 3 of 8

**Summary of Measurement Result :**

| Parameter | Uncertainty (dB) | Maximum-permitted uncertainty of measurement (dB) |
|---|---|---|
| 1. Absolute sensitivity | 0.2 | N/A |
| 2. Self-generated noise | 0.2 | N/A |
| 3. Acoustical signal tests of frequency weightings | | |
| 125 Hz | 0.3 | 0.6 |
| 1000 Hz | 0.3 | 0.6 |
| 8000 Hz | 0.3 | 0.7 |
| 4. Electrical signal tests of frequency weightings | | |
| For 10 Hz to 4 kHz | 0.3 | 0.6 |
| For > 4 kHz to 10 kHz | 0.3 | 0.7 |
| For > 10 kHz to 20 kHz | 0.3 | 1.0 |
| 5. Frequency and time weightings at 1 kHz | 0.2 | 0.2 |
| 6. Long - term stability | 0.1 | 0.1 |
| 7. Level linearity on the reference level range | 0.2 | 0.3 |
| 8. Level linearity including the level range control | 0.2 | 0.3 |
| 9. Tone burst response | 0.2 | 0.3 |
| 10. Peak C sound level | 0.2 | 0.35 |
| 11. Overload indication | 0.2 | 0.25 |
| 12. High level stability | 0.1 | 0.1 |

Cert. No. : ACL25499
Job No. : VC69AC0045
Page : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

| Reference Acoustic Signal ( dB ) | Measured Value ( dB ) | Deviation ( dB ) | Acceptance Limit ( dB ) |
|---|---|---|---|
| 93.9 (93.94) | 93.9 | 0.0 | ±0.3 |

**2. Self-generated noise**

2.1 Normal test

| Measured Value ( dB ) |
|---|
| 15.2 |

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

| Frequency Weighting | Weighting ( dB ) |
|---|---|
| A - weight | 12.6 |
| C - weight | 18.8 |
| Flat | 24.0 |

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 125 | 0.0 | 0.1 | 0.1 | ± 1.5 |
| 1000 | 0.0 | 0.0 | 0.0 | ± 1.0 |
| 8000 | 1.1 | 1.2 | 1.2 | ±5.0 |



Cert. No. : ACL25499
Job No. : VC69AC0045
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 63 | 0.0 | -0.1 | 0.0 | ±2.0 |
| 125 | 0.0 | 0.0 | 0.0 | ±1.5 |
| 250 | 0.1 | 0.0 | 0.0 | ±1.5 |
| 500 | 0.0 | 0.0 | 0.0 | ±1.5 |
| 1000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 2000 | 0.0 | 0.0 | 0.1 | ±2.0 |
| 4000 | 0.1 | 0.0 | 0.1 | ±3.0 |
| 8000 | 0.1 | 0.0 | 0.1 | ±5.0 |

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| C - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| Flat | 94.0 | 94.0 | 0.0 | ± 0.2 |

5.2 Time weighting at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Fast | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Slow | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Leq | 94.0 | 94.0 | 0.0 | ± 0.1 |

**6. Long - term stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.1 | 0.1 | ± 0.3 |



Cert. No. : ACL25499
Job No. : VC69AC0045
Pages : 6 of 8

**7. Level linearity on the reference level range**

| Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| 137.0 | 137.0 | 0.0 | ± 1.1 |
| 136.0 | 136.0 | 0.0 | ± 1.1 |
| 135.0 | 135.0 | 0.0 | ± 1.1 |
| 134.0 | 134.1 | 0.1 | ± 1.1 |
| 133.0 | 133.0 | 0.0 | ± 1.1 |
| 132.0 | 132.0 | 0.0 | ± 1.1 |
| 131.0 | 131.0 | 0.0 | ± 1.1 |
| 129.0 | 129.0 | 0.0 | ± 1.1 |
| 124.0 | 124.0 | 0.0 | ± 1.1 |
| 119.0 | 119.1 | 0.1 | ± 1.1 |
| 114.0 | 114.1 | 0.1 | ± 1.1 |
| 109.0 | 109.0 | 0.0 | ± 1.1 |
| 104.0 | 104.1 | 0.1 | ± 1.1 |
| 99.0 | 99.0 | 0.0 | ± 1.1 |
| 94.0 | 94.0 | 0.0 | ± 1.1 |
| 89.0 | 89.0 | 0.0 | ± 1.1 |
| 84.0 | 84.0 | 0.0 | ± 1.1 |
| 79.0 | 79.0 | 0.0 | ± 1.1 |
| 74.0 | 74.0 | 0.0 | ± 1.1 |
| 69.0 | 69.0 | 0.0 | ± 1.1 |
| 64.0 | 64.0 | 0.0 | ± 1.1 |
| 59.0 | 59.0 | 0.0 | ± 1.1 |
| 54.0 | 54.0 | 0.0 | ± 1.1 |
| 49.0 | 49.0 | 0.0 | ± 1.1 |
| 44.0 | 44.0 | 0.0 | ± 1.1 |
| 39.0 | 39.0 | 0.0 | ± 1.1 |
| 34.0 | 34.0 | 0.0 | ± 1.1 |
| 30.0 | 30.0 | 0.0 | ± 1.1 |
| 29.0 | 28.9 | -0.1 | ± 1.1 |
| 28.0 | 28.0 | 0.0 | ± 1.1 |
| 27.0 | 27.0 | 0.0 | ± 1.1 |
| 26.0 | 25.9 | -0.1 | ± 1.1 |
| 25.0 | 24.9 | -0.1 | ± 1.1 |



Cert. No. : ACL25499
Job No. : VC69AC0045
Pages : 7 of 8

**8. Level linearity including the level range control**

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 94.0 | 94.0 | 0.0 | ±1.1 |

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 29.0 | 28.9 | -0.1 | ±1.1 |

**9. Tone burst response**

| Time Weighting | Tone burst duration, Tb ( ms ) | Cycle | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|---|---|
| Fast | 0.25 | 1 | 108.0 | 107.9 | -0.1 | 1.5 ; -5.0 |
| | 2 | 8 | 117.0 | 116.9 | -0.1 | 1.0 ; -2.5 |
| | 200 | 800 | 134.0 | 134.0 | 0.0 | ±1.0 |
| Slow | 2 | 8 | 108.0 | 107.9 | -0.1 | 1.0 ; -5.0 |
| | 200 | 800 | 127.6 | 127.6 | 0.0 | ±1.0 |
| SEL | 0.25 | 1 | 99.0 | 98.8 | -0.2 | 1.5 ; -5.0 |
| | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -2.5 |
| | 200 | 800 | 128.0 | 128.0 | 0.0 | ±1.0 |

Cert. No. : ACL25499
Job No. : VC69AC0045
Pages : 8 of 8

**10. Peak C sound level**

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value, Lcpeak ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 130.0 | 130.0 | 0.0 | ±3.0 |
| One | 133.4 | 133.4 | 0.0 | ±3.0 |

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 133.0 | 133.0 | 0.0 | ±2.0 |
| Positive half cycle | 135.4 | 135.1 | -0.3 | ±2.0 |
| Negative half cycle | 135.4 | 135.1 | -0.3 | ±2.0 |

**11. Overload indication**

| Measured value ( dB ) | | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| Positive one-half cycle | Negative one-half cycle | | |
| 89.5 | 89.5 | 0.0 | ±1.5 |

**12. High level stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 137.0 | 137.0 | 0.0 | ±0.3 |

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

**End of Calibration Certificate**



Cert. No. : ACL25504
Job No. : VC69AC0047
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|---|---|---|---|---|
| Waveform Generator | 33210A | MY48017076 | EF-0011-25 | 11-FEB-26 |
| Waveform Generator | 33511B | MY52302742 | EF-0012-25 | 11-FEB-26 |
| Digital Multimeter | 33461A | MY53220104 | EEL.BP 24/0268 | 22-APR-26 |
| Digital Multimeter | 33461A | MY53220076 | EEL.BP 23/0268 | 22-APR-26 |
| Digital Multimeter | 34461A | MY60024273 | CA2025120EA | 18-MAR-26 |
| Programmable Attenuator | MAT-1070 | 62100114 | EF-0006-25 | 11-FEB-26 |
| Condenser Microphone | 4180 | 2977900 | AA-1002-25 | 19-FEB-26 |
| Measuring Amplifier | NA-42KAI | 34560495 | AA-3002-25 | 19-FEB-26 |

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   - 3.1 National Institute of Metrology (Thailand).
   - 3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   - 3.3 Electrical And Electronics Institute (EEI).

**SITHIPORN ASSOCIATES CO., LTD.**
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Cert. No. : ACL25504
Pages : 1 of 8

# Calibration Certificate

**Equipment :** SOUND LEVEL METER
**Manufacturer :** RION
**Model :** NL-42A / Microphone UC-52 / Preamplifier NH-24
**Serial No.:** 00623389 / 198636 / 26417
**ID No.:** RYG_FS0614

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

**Location :** -
**Ambient Temperature :** ( 23.0 ±3 ) °C
**Pressure :** ( 101.3 ±3 ) kPa
**Relative Humidity :** ( 50.0 ±20 ) %

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE 23/ 12/ 2026

**Received Date :** 15 DECEMBER 2025
**Calibration Date :** 24 DECEMBER 2025
**Date of Issue :** 26 DECEMBER 2025

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

( Nitinun Srihawan )

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Cert. No. : ACL25504
Job No. : VC69AC0047
Pages : 3 of 8

**Summary of Measurement Result :**

| Parameter | Uncertainty (dB) | Maximum-permitted uncertainty of measurement (dB) |
|---|---|---|
| 1. Absolute sensitivity | 0.2 | N/A |
| 2. Self-generated noise | 0.2 | N/A |
| 3. Acoustical signal tests of frequency weightings | | |
| 125 Hz | 0.3 | 0.6 |
| 1000 Hz | 0.3 | 0.6 |
| 8000 Hz | 0.3 | 0.7 |
| 4. Electrical signal tests of frequency weightings | | |
| For 10 Hz to 4 kHz | 0.3 | 0.6 |
| For > 4 kHz to 10 kHz | 0.3 | 0.7 |
| For > 10 kHz to 20 kHz | 0.3 | 1.0 |
| 5. Frequency and time weightings at 1 kHz | 0.2 | 0.2 |
| 6. Long - term stability | 0.1 | 0.1 |
| 7. Level linearity on the reference level range | 0.2 | 0.3 |
| 8. Level linearity including the level range control | 0.2 | 0.3 |
| 9. Tone burst response | 0.2 | 0.3 |
| 10. Peak C sound level | 0.2 | 0.35 |
| 11. Overload indication | 0.2 | 0.25 |
| 12. High level stability | 0.1 | 0.1 |

Cert. No. : ACL25504
Job No. : VC69AC0047
Page : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

| Reference Acoustic Signal ( dB ) | Measured Value ( dB ) | Deviation ( dB ) | Acceptance Limit ( dB ) |
|---|---|---|---|
| 93.9 (93.94) | 93.9 | 0.0 | ±0.3 |

**2. Self-generated noise**

2.1 Normal test

| Measured Value ( dB ) |
|---|
| 13.8 |

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

| Frequency Weighting | Weighting ( dB ) |
|---|---|
| A - weight | 10.8 |
| C - weight | 17.1 |
| Flat | 22.9 |

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 125 | 0.1 | 0.1 | 0.2 | ± 1.5 |
| 1000 | 0.0 | 0.0 | 0.0 | ± 1.0 |
| 8000 | 1.0 | 1.1 | 1.1 | ±5.0 |



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Cert. No. : ACL25504
Job No. : VC69AC0047
Pages : 6 of 8

**7. Level linearity on the reference level range**

| Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| 137.0 | 137.0 | 0.0 | ± 1.1 |
| 136.0 | 136.0 | 0.0 | ± 1.1 |
| 135.0 | 135.0 | 0.0 | ± 1.1 |
| 134.0 | 134.0 | 0.0 | ± 1.1 |
| 133.0 | 133.0 | 0.0 | ± 1.1 |
| 132.0 | 132.0 | 0.0 | ± 1.1 |
| 131.0 | 131.0 | 0.0 | ± 1.1 |
| 129.0 | 129.0 | 0.0 | ± 1.1 |
| 124.0 | 124.0 | 0.0 | ± 1.1 |
| 119.0 | 119.0 | 0.0 | ± 1.1 |
| 114.0 | 114.0 | 0.0 | ± 1.1 |
| 109.0 | 109.0 | 0.0 | ± 1.1 |
| 104.0 | 104.0 | 0.0 | ± 1.1 |
| 99.0 | 99.0 | 0.0 | ± 1.1 |
| 94.0 | 94.0 | 0.0 | ± 1.1 |
| 89.0 | 89.0 | 0.0 | ± 1.1 |
| 84.0 | 84.0 | 0.0 | ± 1.1 |
| 79.0 | 79.0 | 0.0 | ± 1.1 |
| 74.0 | 74.0 | 0.0 | ± 1.1 |
| 69.0 | 69.0 | 0.0 | ± 1.1 |
| 64.0 | 64.0 | 0.0 | ± 1.1 |
| 59.0 | 59.0 | 0.0 | ± 1.1 |
| 54.0 | 54.0 | 0.0 | ± 1.1 |
| 49.0 | 49.0 | 0.0 | ± 1.1 |
| 44.0 | 44.0 | 0.0 | ± 1.1 |
| 39.0 | 39.0 | 0.0 | ± 1.1 |
| 34.0 | 34.0 | 0.0 | ± 1.1 |
| 30.0 | 30.0 | 0.0 | ± 1.1 |
| 29.0 | 28.9 | -0.1 | ± 1.1 |
| 28.0 | 27.9 | -0.1 | ± 1.1 |
| 27.0 | 26.9 | -0.1 | ± 1.1 |
| 26.0 | 25.9 | -0.1 | ± 1.1 |
| 25.0 | 24.9 | -0.1 | ± 1.1 |

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Cert. No. : ACL25504
Job No. : VC69AC0047
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 63 | 0.0 | 0.0 | 0.0 | ±2.0 |
| 125 | 0.0 | 0.1 | 0.0 | ±1.5 |
| 250 | 0.0 | 0.0 | 0.0 | ±1.5 |
| 500 | 0.0 | 0.1 | 0.0 | ±1.5 |
| 1000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 2000 | 0.0 | 0.1 | 0.0 | ±2.0 |
| 4000 | 0.0 | 0.0 | 0.0 | ±3.0 |
| 8000 | 0.0 | 0.1 | 0.1 | ±5.0 |

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| C - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| Flat | 94.0 | 94.0 | 0.0 | ± 0.2 |

5.2 Time weighting at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Fast | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Slow | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Leq | 94.0 | 94.0 | 0.0 | ± 0.1 |

**6. Long - term stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.3 |

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Cert. No. : ACL25504
Job No. : VC69AC0047
Pages : 7 of 8

**8. Level linearity including the level range control**

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 94.0 | 94.0 | 0.0 | ±1.1 |

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 29.0 | 28.8 | -0.2 | ±1.1 |

**9. Tone burst response**

| Time Weighting | Tone burst duration, Tb ( ms ) | Cycle | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|---|---|
| Fast | 0.25 | 1 | 108.0 | 107.9 | -0.1 | 1.5 ; -5.0 |
| | 2 | 8 | 117.0 | 117.0 | 0.0 | 1.0 ; -2.5 |
| | 200 | 800 | 134.0 | 134.1 | 0.1 | ±1.0 |
| Slow | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -5.0 |
| | 200 | 800 | 127.6 | 127.6 | 0.0 | ±1.0 |
| SEL | 0.25 | 1 | 99.0 | 98.9 | -0.1 | 1.5 ; -5.0 |
| | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -2.5 |
| | 200 | 800 | 128.0 | 128.1 | 0.1 | ±1.0 |

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Cert. No. : ACL25504
Job No. : VC69AC0047
Pages : 8 of 8

**10. Peak C sound level**

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value, Lcpeak ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 130.0 | 130.0 | 0.0 | ±3.0 |
| One | 133.4 | 133.4 | 0.0 | ±3.0 |

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 133.0 | 133.1 | 0.1 | ±2.0 |
| Positive half cycle | 135.4 | 135.2 | -0.2 | ±2.0 |
| Negative half cycle | 135.4 | 135.2 | -0.2 | ±2.0 |

**11. Overload indication**

| Measured value ( dB ) | | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| Positive one-half cycle | Negative one-half cycle | | |
| 89.6 | 89.5 | -0.1 | ±1.5 |

**12. High level stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 137.0 | 137.0 | 0.0 | ±0.3 |

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

**End of Calibration Certificate**



Cert. No. : ACL25500
Job No. : VC69AC0045
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|---|---|---|---|---|
| Waveform Generator | 33210A | MY48017076 | EF-0011-25 | 11-FEB-26 |
| Waveform Generator | 33511B | MY52302742 | EF-0012-25 | 11-FEB-26 |
| Digital Multimeter | 33461A | MY53220104 | EEL.BP 24/0268 | 22-APR-26 |
| Digital Multimeter | 33461A | MY53220076 | EEL.BP 23/0268 | 22-APR-26 |
| Digital Multimeter | 34461A | MY60024273 | CA2025120EA | 18-MAR-26 |
| Programmable Attenuator | MAT-1070 | 62100114 | EF-0006-25 | 11-FEB-26 |
| Condenser Microphone | 4180 | 2977900 | AA-1002-25 | 19-FEB-26 |
| Measuring Amplifier | NA-42KAI | 34560495 | AA-3002-25 | 19-FEB-26 |

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   3.3 Electrical And Electronics Institute (EEI).

**SITHIPORN ASSOCIATES CO., LTD.**
**CALIBRATION LABORATORY**
451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiphorn.com

Cert. No. : ACL25500
Pages : 1 of 8

# Calibration Certificate

**Equipment :** SOUND LEVEL METER
**Manufacturer :** RION
**Model :** NL-42A / Microphone UC-52 / Preamplifier NH-24
**Serial No.:** 00623890 / 198637 / 26418
**ID No.:** RYG_FS0615

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

**Location :** -
**Ambient Temperature :** ( 23.0 ±3 ) °C
**Pressure :** ( 101.3 ±3 ) kPa
**Relative Humidity :** ( 50.0 ±20 ) %

REVIEW BY
APPROVED BY
NEXT CAL DATE 21/ 12/ 2026

**Received Date :** 11 DECEMBER 2025
**Calibration Date :** 22 DECEMBER 2025
**Date of Issue :** 24 DECEMBER 2025

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :** NITINUN S.
( Nitinun Srihawan )

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 prior written approval of the head of Calibration Laboratory.



Cert. No. : ACL25500
Job No. : VC69AC0045
Pages : 3 of 8

**Summary of Measurement Result :**

| Parameter | Uncertainty (dB) | Maximum-permitted uncertainty of measurement (dB) |
|---|---|---|
| 1. Absolute sensitivity | 0.2 | N/A |
| 2. Self-generated noise | 0.2 | N/A |
| 3. Acoustical signal tests of frequency weightings | | |
| 125 Hz | 0.3 | 0.6 |
| 1000 Hz | 0.3 | 0.6 |
| 8000 Hz | 0.3 | 0.7 |
| 4. Electrical signal tests of frequency weightings | | |
| For 10 Hz to 4 kHz | 0.3 | 0.6 |
| For > 4 kHz to 10 kHz | 0.3 | 0.7 |
| For > 10 kHz to 20 kHz | 0.3 | 1.0 |
| 5. Frequency and time weightings at 1 kHz | 0.2 | 0.2 |
| 6. Long - term stability | 0.1 | 0.1 |
| 7. Level linearity on the reference level range | 0.2 | 0.3 |
| 8. Level linearity including the level range control | 0.2 | 0.3 |
| 9. Tone burst response | 0.2 | 0.3 |
| 10. Peak C sound level | 0.2 | 0.35 |
| 11. Overload indication | 0.2 | 0.25 |
| 12. High level stability | 0.1 | 0.1 |

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Job No. : VC69AC0045
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**Result of calibration :**

**1. Absolute sensitivity**

| Reference Acoustic Signal ( dB ) | Measured Value ( dB ) | Deviation ( dB ) | Acceptance Limit ( dB ) |
|---|---|---|---|
| 93.9 (93.94) | 93.9 | 0.0 | ±0.3 |

**2. Self-generated noise**

2.1 Normal test

| Measured Value ( dB ) |
|---|
| 18.6 |

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

| Frequency Weighting | Weighting ( dB ) |
|---|---|
| A - weight | 11.6 |
| C - weight | 18.1 |
| Flat | 23.6 |

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 125 | 0.3 | 0.3 | 0.3 | ± 1.5 |
| 1000 | 0.1 | 0.1 | 0.1 | ± 1.0 |
| 8000 | 1.6 | 1.6 | 1.6 | ±5.0 |



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**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 63 | -0.1 | -0.1 | -0.1 | ±2.0 |
| 125 | 0.0 | 0.0 | 0.0 | ±1.5 |
| 250 | -0.1 | 0.0 | -0.1 | ±1.5 |
| 500 | 0.0 | 0.0 | -0.1 | ±1.5 |
| 1000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 2000 | 0.0 | 0.0 | 0.0 | ±2.0 |
| 4000 | 0.0 | 0.0 | 0.0 | ±3.0 |
| 8000 | 0.0 | 0.0 | 0.0 | ±5.0 |

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| C - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| Flat | 94.0 | 94.0 | 0.0 | ± 0.2 |

5.2 Time weighting at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Fast | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Slow | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Leq | 94.0 | 94.0 | 0.0 | ± 0.1 |

**6. Long - term stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.1 | 0.1 | ± 0.3 |



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**7. Level linearity on the reference level range**

| Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| 137.0 | 137.0 | 0.0 | ± 1.1 |
| 136.0 | 136.0 | 0.0 | ± 1.1 |
| 135.0 | 135.0 | 0.0 | ± 1.1 |
| 134.0 | 134.1 | 0.1 | ± 1.1 |
| 133.0 | 133.0 | 0.0 | ± 1.1 |
| 132.0 | 132.0 | 0.0 | ± 1.1 |
| 131.0 | 131.0 | 0.0 | ± 1.1 |
| 129.0 | 129.0 | 0.0 | ± 1.1 |
| 124.0 | 124.0 | 0.0 | ± 1.1 |
| 119.0 | 119.1 | 0.1 | ± 1.1 |
| 114.0 | 114.1 | 0.1 | ± 1.1 |
| 109.0 | 109.0 | 0.0 | ± 1.1 |
| 104.0 | 104.1 | 0.1 | ± 1.1 |
| 99.0 | 99.0 | 0.0 | ± 1.1 |
| 94.0 | 94.0 | 0.0 | ± 1.1 |
| 89.0 | 89.0 | 0.0 | ± 1.1 |
| 84.0 | 84.0 | 0.0 | ± 1.1 |
| 79.0 | 79.0 | 0.0 | ± 1.1 |
| 74.0 | 74.0 | 0.0 | ± 1.1 |
| 69.0 | 69.0 | 0.0 | ± 1.1 |
| 64.0 | 64.0 | 0.0 | ± 1.1 |
| 59.0 | 59.0 | 0.0 | ± 1.1 |
| 54.0 | 54.0 | 0.0 | ± 1.1 |
| 49.0 | 49.0 | 0.0 | ± 1.1 |
| 44.0 | 44.0 | 0.0 | ± 1.1 |
| 39.0 | 39.0 | 0.0 | ± 1.1 |
| 34.0 | 34.0 | 0.0 | ± 1.1 |
| 30.0 | 29.9 | -0.1 | ± 1.1 |
| 29.0 | 28.9 | -0.1 | ± 1.1 |
| 28.0 | 27.9 | -0.1 | ± 1.1 |
| 27.0 | 26.9 | -0.1 | ± 1.1 |
| 26.0 | 26.0 | 0.0 | ± 1.1 |
| 25.0 | 24.9 | -0.1 | ± 1.1 |



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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 ) |
|---|---|---|---|---|
| 130 | 94.0 | 94.0 | 0.0 | ±1.1 |

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 29.0 | 28.9 | -0.1 | ±1.1 |

**9. Tone burst response**

| Time Weighting | Tone burst duration, Tb ( ms ) | Cycle | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|---|---|
| Fast | 0.25 | 1 | 108.0 | 107.9 | -0.1 | 1.5 ; -5.0 |
| | 2 | 8 | 117.0 | 116.9 | -0.1 | 1.0 ; -2.5 |
| | 200 | 800 | 134.0 | 134.0 | 0.0 | ±1.0 |
| Slow | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -5.0 |
| | 200 | 800 | 127.6 | 127.6 | 0.0 | ±1.0 |
| SEL | 0.25 | 1 | 99.0 | 98.8 | -0.2 | 1.5 ; -5.0 |
| | 2 | 8 | 108.0 | 107.9 | -0.1 | 1.0 ; -2.5 |
| | 200 | 800 | 128.0 | 128.0 | 0.0 | ±1.0 |

Cert. No. : ACL25500
Job No. : VC69AC0045
Pages : 8 of 8

**10. Peak C sound level**

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value, Lcpeak ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 130.0 | 130.0 | 0.0 | ±3.0 |
| One | 133.4 | 133.4 | 0.0 | ±3.0 |

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 133.0 | 133.0 | 0.0 | ±2.0 |
| Positive half cycle | 135.4 | 135.1 | -0.3 | ±2.0 |
| Negative half cycle | 135.4 | 135.1 | -0.3 | ±2.0 |

**11. Overload indication**

| Measured value ( dB ) | | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| Positive one-half cycle | Negative one-half cycle | | |
| 89.6 | 89.5 | -0.1 | ±1.5 |

**12. High level stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 137.0 | 137.0 | 0.0 | ±0.3 |

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

**End of Calibration Certificate**



Cert. No. : ACL25501
Job No. : VC69AC0045
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|---|---|---|---|---|
| Waveform Generator | 33210A | MY48017076 | EF-0011-25 | 11-FEB-26 |
| Waveform Generator | 33511B | MY52302742 | EF-0012-25 | 11-FEB-26 |
| Digital Multimeter | 33461A | MY53220104 | EEL.BP 24/0268 | 22-APR-26 |
| Digital Multimeter | 33461A | MY53220076 | EEL.BP 23/0268 | 22-APR-26 |
| Digital Multimeter | 34461A | MY60024273 | CA2025120EA | 18-MAR-26 |
| Programmable Attenuator | MAT-1070 | 62100114 | EF-0006-25 | 11-FEB-26 |
| Condenser Microphone | 4180 | 2977900 | AA-1002-25 | 19-FEB-26 |
| Measuring Amplifier | NA-42KAI | 34560495 | AA-3002-25 | 19-FEB-26 |

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   3.3 Electrical And Electronics Institute (EEI).

**SITHIPORN ASSOCIATES CO., LTD.**
**CALIBRATION LABORATORY**
451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiphorn.com

NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACL25501
Pages : 1 of 8

# Calibration Certificate

**Equipment :** SOUND LEVEL METER
**Manufacturer :** RION
**Model :** NL-42A / Microphone UC-52 / Preamplifier NH-24
**Serial No.:** 00623391 / 198635 / 26419
**ID No.:** RYG_FS0616

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

**Location :** -
**Ambient Temperature :** ( 23.0 ±3 ) °C
**Pressure :** ( 101.3 ±3 ) kPa
**Relative Humidity :** ( 50.0 ±20 ) %

REVIEW BY
APPROVED BY
NEXT CAL DATE 21/ 12/ 2026

**Received Date :** 11 DECEMBER 2025
**Calibration Date :** 22 DECEMBER 2025
**Date of Issue :** 24 DECEMBER 2025

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

( Nitinun Srihawan )

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 prior written approval of the head of Calibration Laboratory.



Cert. No. : ACL25501
Job No. : VC69AC0045
Pages : 3 of 8

**Summary of Measurement Result :**

| Parameter | Uncertainty (dB) | Maximum-permitted uncertainty of measurement (dB) |
|---|---|---|
| 1. Absolute sensitivity | 0.2 | N/A |
| 2. Self-generated noise | 0.2 | N/A |
| 3. Acoustical signal tests of frequency weightings | | |
| 125 Hz | 0.3 | 0.6 |
| 1000 Hz | 0.3 | 0.6 |
| 8000 Hz | 0.3 | 0.7 |
| 4. Electrical signal tests of frequency weightings | | |
| For 10 Hz to 4 kHz | 0.3 | 0.6 |
| For > 4 kHz to 10 kHz | 0.3 | 0.7 |
| For > 10 kHz to 20 kHz | 0.3 | 1.0 |
| 5. Frequency and time weightings at 1 kHz | 0.2 | 0.2 |
| 6. Long - term stability | 0.1 | 0.1 |
| 7. Level linearity on the reference level range | 0.2 | 0.3 |
| 8. Level linearity including the level range control | 0.2 | 0.3 |
| 9. Tone burst response | 0.2 | 0.3 |
| 10. Peak C sound level | 0.2 | 0.35 |
| 11. Overload indication | 0.2 | 0.25 |
| 12. High level stability | 0.1 | 0.1 |

Cert. No. : ACL25501
Job No. : VC69AC0045
Page : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

| Reference Acoustic Signal ( dB ) | Measured Value ( dB ) | Deviation ( dB ) | Acceptance Limit ( dB ) |
|---|---|---|---|
| 93.9 (93.94) | 93.9 | 0.0 | ±0.3 |

**2. Self-generated noise**

2.1 Normal test

| Measured Value ( dB ) |
|---|
| 14.2 |

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

| Frequency Weighting | Weighting ( dB ) |
|---|---|
| A - weight | 10.8 |
| C - weight | 17.4 |
| Flat | 22.9 |

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 125 | 0.3 | 0.3 | 0.3 | ± 1.5 |
| 1000 | 0.0 | 0.0 | 0.0 | ± 1.0 |
| 8000 | 0.6 | 0.7 | 0.7 | ±5.0 |



Cert. No. : ACL25501
Job No. : VC69AC0045
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

| Frequency ( Hz ) | Deviation from various frequency weighting response curve (dB) | | | |
|---|---|---|---|---|
| | Flat | C-weight | A-weight | Acceptance Limits |
| 63 | -0.1 | -0.1 | -0.1 | ±2.0 |
| 125 | 0.0 | 0.0 | -0.1 | ±1.5 |
| 250 | 0.0 | 0.0 | -0.1 | ±1.5 |
| 500 | 0.0 | 0.0 | -0.1 | ±1.5 |
| 1000 | 0.0 | 0.0 | 0.0 | ±1.0 |
| 2000 | 0.0 | 0.0 | 0.0 | ±2.0 |
| 4000 | 0.0 | 0.0 | 0.0 | ±3.0 |
| 8000 | 0.0 | 0.1 | 0.1 | ±5.0 |

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| C - weight | 94.0 | 94.0 | 0.0 | ± 0.2 |
| Flat | 94.0 | 94.0 | 0.0 | ± 0.2 |

5.2 Time weighting at 1 kHz

| Frequency Weighting | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Fast | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Slow | 94.0 | 94.0 | 0.0 | ± 0.1 |
| Leq | 94.0 | 94.0 | 0.0 | ± 0.1 |

**6. Long - term stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 94.0 | 94.0 | 0.0 | ± 0.3 |



Cert. No. : ACL25501
Job No. : VC69AC0045
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**7. Level linearity on the reference level range**

| Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| 137.0 | 137.0 | 0.0 | ± 1.1 |
| 136.0 | 136.0 | 0.0 | ± 1.1 |
| 135.0 | 135.0 | 0.0 | ± 1.1 |
| 134.0 | 134.0 | 0.0 | ± 1.1 |
| 133.0 | 133.0 | 0.0 | ± 1.1 |
| 132.0 | 132.0 | 0.0 | ± 1.1 |
| 131.0 | 131.0 | 0.0 | ± 1.1 |
| 129.0 | 129.0 | 0.0 | ± 1.1 |
| 124.0 | 124.0 | 0.0 | ± 1.1 |
| 119.0 | 119.0 | 0.0 | ± 1.1 |
| 114.0 | 114.0 | 0.0 | ± 1.1 |
| 109.0 | 109.0 | 0.0 | ± 1.1 |
| 104.0 | 104.0 | 0.0 | ± 1.1 |
| 99.0 | 99.0 | 0.0 | ± 1.1 |
| 94.0 | 94.0 | 0.0 | ± 1.1 |
| 89.0 | 89.0 | 0.0 | ± 1.1 |
| 84.0 | 84.0 | 0.0 | ± 1.1 |
| 79.0 | 79.0 | 0.0 | ± 1.1 |
| 74.0 | 74.0 | 0.0 | ± 1.1 |
| 69.0 | 69.0 | 0.0 | ± 1.1 |
| 64.0 | 64.0 | 0.0 | ± 1.1 |
| 59.0 | 59.0 | 0.0 | ± 1.1 |
| 54.0 | 54.0 | 0.0 | ± 1.1 |
| 49.0 | 49.0 | 0.0 | ± 1.1 |
| 44.0 | 44.0 | 0.0 | ± 1.1 |
| 39.0 | 39.0 | 0.0 | ± 1.1 |
| 34.0 | 34.0 | 0.0 | ± 1.1 |
| 30.0 | 30.0 | 0.0 | ± 1.1 |
| 29.0 | 29.0 | 0.0 | ± 1.1 |
| 28.0 | 28.0 | 0.0 | ± 1.1 |
| 27.0 | 27.0 | 0.0 | ± 1.1 |
| 26.0 | 26.0 | 0.0 | ± 1.1 |
| 25.0 | 25.0 | 0.0 | ± 1.1 |



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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 ) |
|---|---|---|---|---|
| 130 | 94.0 | 94.0 | 0.0 | ±1.1 |

| Range | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| 130 | 29.0 | 29.0 | 0.0 | ±1.1 |

**9. Tone burst response**

| Time Weighting | Tone burst duration, Tb ( ms ) | Cycle | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|---|---|
| Fast | 0.25 | 1 | 108.0 | 107.9 | -0.1 | 1.5 ; -5.0 |
| | 2 | 8 | 117.0 | 117.0 | 0.0 | 1.0 ; -2.5 |
| | 200 | 800 | 134.0 | 134.0 | 0.0 | ±1.0 |
| Slow | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -5.0 |
| | 200 | 800 | 127.6 | 127.6 | 0.0 | ±1.0 |
| SEL | 0.25 | 1 | 99.0 | 98.9 | -0.1 | 1.5 ; -5.0 |
| | 2 | 8 | 108.0 | 108.0 | 0.0 | 1.0 ; -2.5 |
| | 200 | 800 | 128.0 | 128.0 | 0.0 | ±1.0 |

**10. Peak C sound level**

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value, Lcpeak ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 130.0 | 130.0 | 0.0 | ±3.0 |
| One | 133.4 | 133.4 | 0.0 | ±3.0 |

| Number of cycle in test signal | Anticipated Value ( dB ) | Measured Value ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| Continuous | 133.0 | 133.0 | 0.0 | ±2.0 |
| Positive half cycle | 135.4 | 135.1 | -0.3 | ±2.0 |
| Negative half cycle | 135.4 | 135.2 | -0.2 | ±2.0 |

**11. Overload indication**

| Measured value ( dB ) | | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|
| Positive one-half cycle | Negative one-half cycle | | |
| 89.5 | 89.6 | 0.1 | ±1.5 |

**12. High level stability**

| Frequency Weighting | SLM Display at initial ( dB ) | SLM Display at final ( dB ) | Deviated Value ( dB ) | Acceptance Limits ( dB ) |
|---|---|---|---|---|
| A - weight | 137.0 | 137.0 | 0.0 | ±0.3 |

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

**End of Calibration Certificate**



**Condition of this calibration result**

1. Reference Standard Instrument

| Instrument | Serial No. | ID No. | Cert. No. | Due Date |
|---|---|---|---|---|
| 1) Document Process Calibrator | 54030049 | 130RC116 | 24E2759 | 25 Aug 2025 |
| 2) Ref. Standard Thermometer | 3240076 | 60RC033 | 25I394 | 01 Apr 2026 |

- This measurement result is traceable to SI throught Technology Promotion Association (Thailand - Japan)

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

| Buffer Solution | Manufacturer | Lot No. | Exp. date |
|---|---|---|---|
| pH 4.007 | CPA chem | 1066665 | 18 Jan 2027 |
| pH 6.965 | CPA chem | 1066667 | 18 Jan 2026 |
| pH 10.010 | CPA chem | 1114385 | 08 June 2026 |

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 Document Process Calibrator at pH (4,7,10)**

| Unit Under Calibration | Nominal Value | Standard Voltage Input | Actual Reading | | Uncertainty of Measurement ( ±mV ) | Coverage factor k |
|---|---|---|---|---|---|---|
| | pH | mV | mV | pH | | |
| pH Meter | 4.000 | 177.48 | 177.3 | 4.000 | 0.058 | 2.00 |
| S/N.: C104059460 | 7.000 | 0.00 | -0.2 | 7.000 | 0.058 | 2.00 |
| | 10.000 | -177.48 | -177.6 | 10.000 | 0.058 | 2.00 |

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

NSC-TISI-TIS17025 CALIBRATION 0008

# Certificate of Calibration



| | |
|---|---|
| **Equipment :** | pH Meter |
| **Manufacturer :** | Mettler Toledo |
| **Model :** | SevenCompact S220 |
| **Serial No. :** | C104059460 |
| **ID No. :** | RYG_EN0183 |
| **Condition As-Received:** | Used Item |
| **Received Date :** | 17 July 2025 |
| **Calibration Date :** | 18 July 2025 |
| **Reference :** | 2507-0561DSC-3 |
| **Submitted by :** | ALS Laboratory Group (Thailand) Co.,Ltd.<br>Rayong Branch<br>616/10 Moo 5, T.Maenam Khu,<br>A.Pluakdaeng, Rayong 21140, Thailand |
| **Ambient Temperature :** | (25 ± 2.5) °C |
| **Relative Humidity :** | (50 ± 15) % |
| **Calibration Procedure :** | In - house method :<br>- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)<br>- CP-CH8 by comparison with temperature standard |

REVIEW BY PhotchanaS.
APPROVED BY
NEXT CAL DATE 18/01/27

**Calibrated by :** Walalak Sirithean

**Approved by :** Saithip
Approved Signatory

( ) Chakrit Waewwanjua
( ) Ponpan Paipim
(✓) Saithip Meangmai

**Issue Date :** 21 July 2025

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

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**Calibration Results**

**Function : pH Measurement**

**Performing three buffers standard curve by using buffer nominal pH (4,7,10)**

| Unit Under Calibration | Standard pH Buffer Solution | Actual pH Reading | Actual mV Reading (mV) | Uncertainty of pH Measurement (±) | Coverage factor k |
|---|---|---|---|---|---|
| pH Electrode | 4.007 | 4.008 | 184.6 | 0.0044 | 2.00 |
| S/N.: 5240606 | 6.965 | 6.966 | 10.2 | 0.0084 | 2.00 |
| | 10.010 | 10.009 | -164.9 | 0.0065 | 2.00 |

**Function : Temperature Measurement**

**( * ) Without adjustment**

This equipment was connected with Temperature Probe;

- Model : InLabExpert Pro-ISM
- Serial No. : 5240606

Dimension of probe

- Length : 120 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

| Calibration Point ( °C ) | Standard Temperature ( °C ) | UUC* Reading ( °C ) | Error ( °C ) | Uncertainty of measurement ( ± °C ) | Coverage factor k |
|---|---|---|---|---|---|
| 25.0 | 25.001 | 25.0 | -0.001 | 0.13 | 2.00 |

**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 %.

-o0o-

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

NSC-TISI-TIS17025 CALIBRATION 0008

# Certificate of Calibration

**Certificate No. :** 25E2372
**Page :** 1 of 2

**Equipment :** pH Meter
**Manufacturer:** Mettler Toledo
**Model :** SevenCompact S220
**Serial No.:** C104059460
**ID No.:** RYG_EN0183
**Condition As-Received:** Used Item
**Received Date:** 17 July 2025
**Calibration Date:** 22 July 2025

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

**Reference:** 2507-0561DSC
**Ambient Temperature:** ( 23 ± 2 ) °C
**Relative Humidity:** ( 50 ± 10 ) %

**Submitted by:** ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand

**Procedure used:** Calibration were conducted using calibration procedure No. CP-E17 according to EURAMET cg-15.

**Condition of this result of calibration**

1.Reference standards instruments :

| Instrument | Model | Serial No. | Certificate No. | Due Date |
|---|---|---|---|---|
| 1) Multi-Product Calibrator | 5500A | 6315011 | 25E1627 | 19 May 2026 |

2.This result of calibration was made on requested at the point specified by customer.
3.The certificate is valid only to the item calibrated on date and place of calibration.
4.This measurement result is traceable to the International System of Unit maintained through:-
-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

**Calibrated by :** Napachanok Prasomsoosiri
**Issue Date :** 23 July 2025

**Approved Signatory :**
[ ] Phalinee Prabpaipai
[ ] Nuntawat Khamchai
[✓] Pongsagorn Boonyaporn

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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NSC-TISI-TIS17025 CALIBRATION 0008

# Certificate of Calibration

**Cert. No.:** 25LM147
**Page.:** 1 of 2

**Equipment :** DO Meter with Sensor
**Manufacturer :** Mettler Toledo
**Model :** Seven2GO S9
**Serial No. :** C231550464
**ID No. :** RYG_FS0601

REVIEW BY Pitthaya T.
APPROVED BY Supt S
NEXT CAL DATE 28/09/26

**Submitted by :** ALS Laboratory Group (Thailand) Co.,Ltd.
(Rayong Branch)
616/10 Moo 5 T. Maenam Koo, A. Pluakdaeng,
Rayong 21140 Thailand

**Location :** TPA On Site Calibration Laboratory

**Received Order :** 19 September 2025
**Calibrated Date :** 28 September 2025
**Ambient Temperature :** ( 26 ± 10 ) °C
**Relative Humidity :** ( 50 ± 30 ) %
**AC Line Voltage :** ( 220 ± 22 ) V

**Calibrated by :** Khit Ruttanaprapachai

**Approved by :**
Approved Signatory

( ) Chakrit Waewwanjua
(✓) Suwit Imjai
( ) Kunchit Promprat

**Issue Date :** 30 September 2025

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

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



**Result of calibration :-** (*) Without adjustment ( ) After adjustment
**Function:** DC voltage measurement **Range:** 2000 mV

| Standard Value | UUC* Reading | Error | Uncertainty |
|---|---|---|---|
| ( mV ) | ( mV ) | ( mV ) | ( ± µV ) |
| -200.0000 | -200.0 | 0.0 | 68 |
| -150.0000 | -150.0 | 0.0 | 65 |
| -100.0000 | -100.0 | 0.0 | 63 |
| -50.0000 | -50.0 | 0.0 | 61 |
| 0.0000 | 0.0 | 0.0 | 58 |
| 50.0000 | 49.9 | -0.1 | 61 |
| 100.0000 | 99.9 | -0.1 | 63 |
| 150.0000 | 149.9 | -0.1 | 65 |
| 200.0000 | 199.9 | -0.1 | 68 |

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 %

**UUC* = Unit Under Calibration.**

**-o0o-**



**Procedure Used :-**
Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer ( IPRT ) into Temperature Bath.
The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

| Instrument | Serial No. | Cert. No. | Traceable | Due Date |
|---|---|---|---|---|
| 1) Digital Thermometer | 2188080 | 25I953 | TPA | 05 Sep 2026 |

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This measurement result is traceable to the International System of Unit maintained through :
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

**Result of Calibration :-** ( * ) Without Adjustment
**Function :** Temperature measurement.
This instrument was connected with temperature sensor, S/N.: 940132

| Calibration Point ( °C ) | Immersion Depth ( mm ) | Standard Temperature ( °C ) | UUC* Reading ( °C ) | Error ( °C ) | Uncertainty ( ± °C ) | Coverage Factor *k* |
|---|---|---|---|---|---|---|
| 20.0 | 80 | 20.005 | 20.2 | 0.195 | 0.16 | 2.00 |

**UUC* :** Unit Under Calibration

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

**-o0o-**

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

# Certificate of Testing

**Cert.No.:** 25TW192
**Page.:** 1 of 2

| | |
|---|---|
| **Equipment :** | DO Meter |
| **Manufacturer :** | Mettler Toledo |
| **Model :** | Seven2GO S9 |
| **Serial No. :** | C231550464 |
| **ID No. :** | RYG_FS0601 |
| **Received Date :** | 19 September 2025 |
| **Test Date :** | 22 September 2025 |
| **Reference :** | 2509-0713DSC-1 |
| **Submitted by :** | ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch<br>616/10 Moo 5 T.MaenamKoo, A.Pluakdaeng,<br>Rayong 21140, Thailand |
| **Laboratory Condition :** | Temperature ( 25 ± 5 ) °C<br>Humidity ( 50 ± 20 ) % |
| **Test Procedure :** | In - house method : CP-CH9<br>by Comparison Technique with Azide Modification Method |
| **Tested by :** | Walalak Sirithean |
| **Approved by :** | Approved Signatory |

( ) Chakrit Waewwanjua
( ) Ponpan Paipim
(✓) Saithip Meangmai

**Issue Date :** 25 September 2025

**Cert.No.:** 25TW192
**Page.:** 2 of 2

**Condition of this result of calibration**

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

| Instruments | ID No. | Certificate No. | Due Date |
|---|---|---|---|
| 1. Burette | 130BU10 | 25CG1126 | 18 Mar 2027 |
| 2. Balance | 110RC001 | 25MM316 | 02 July 2026 |

2. Standard Material :-

| Material | Manufacturer | Lot.No. | Assay |
|---|---|---|---|
| Sodium Thiosulfate 5-Hydrate AR | KEMAUS | 2203162447 | 99.6% |

**Result :** **Dissolved Oxygen Meter Adjustment With Air 100 %**
**Dissolved Oxygen Probe No.:** 940132

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|---|---|---|
| 8.20 | 8.20 | 0.0045 |

This report was certified only for the instrument we tested.It is allowable to use for study Intend to use for advertising and referral purpose is prohibited.This report may not be reproduced other in full, without written approval of the laboratory

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SARTORIUS

Accredited by
NSC-TISI-TIS 17025
Calibration 0426

NSC-TISI-TIS 17025
CALIBRATION 0426

## Calibration certificate

Calibration Certificate No. 26BCI0064

| | |
|---|---|
| Object | Electronic non-automatic weighing instrument |
| Manufacturer | Sartorius |
| Type | MCE224S-2S00-U |
| Serial \| QM Ident. no. | 38101399 \| RYG_EN0163 |
| Customer | ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)<br>616/10 Moo 5 T.Maenamkoo, A.Pluak Daeng, Rayong 21140, Thailand. |
| Order no. | 278579 |
| Number of pages | 4 |
| Date of calibration | 03 Feb 2026 |

This calibration certificate documents the traceability to national standards.

Uncertainties of measurements are taken into account when only statements of compliance are made.

This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.

This certificate relate and apply this equipment only.

REVIEW BY Thanitak.
APPROVED BY
NEXT CAL DATE 03/02/27

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TISI-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

| Date of issue | Approval of the Calibration Certificate | Person in charge |
|---|---|---|
| 03 Feb 2026 | Mr. Chonchai Inthana | Chonchai Inthana |



Calibration certificate No.: **26BCI0064**
Calibration Certificate

## Calibration object

**Single range instrument**

| | |
|---|---|
| Model | MCE224S-2S00-U |
| Serial Number | 38101399 |
| QM Ident. no \| Inventory no. | RYG_EN0163 \| --- |
| Maximum capacity (Max. load) | 220.0000 g |
| Measured up to | 220.0000 g |
| Scale interval | 0.0001 g |

## Place of calibration

| | |
|---|---|
| Address | According to page 1 |
| Department \| Cost center | Laboratory Department. \| --- |
| Building \| Floor | --- \| 1st Floor. |
| Room | Balance Room. |
| Maximum temperature variation at place of calibration | 5 K |

## Calibration procedure

EURAMET Calibration Guide No. 18, Version 4.0 (11/2015) - Guidelines on the Calibration of Non-Automatic Weighing Instruments

## Test equipment

| Test equipment type | Test equipment ID | Valid until |
|---|---|---|
| Thermometer | Testo 174H H/T250743 (Traceable to Si unit through ENTECH) | 18 Nov 2026 |
| Test weight set OIML R111 E2 | Certificate No.M2508149S ,E2(Traceable to SI unit through TCS) | 19 Aug 2027 |

## Adjustment Status

The measuring device was internally adjusted before the calibration.

## Environmental and measuring conditions

| | |
|---|---|
| Date of calibration | 03 Feb 2026 |
| Temperature at place of calibration \| Temp. diff. $T_{weights}$ - $T_{place}$ | 25 °C \| 0.5 K |
| Measuring conditions | The installation site is suitable. The device is level. Balance was loaded up to Max before test. |
| Comments | Humidity 49.0 %RH. |

## Measurement results | Measurement uncertainties

Repeatability

**Test load (nominal): 10 g | 200 g**

| | 10 g | 200 g |
|---|---|---|
| 1 | 10.0000 g | 200.0000 g |
| 2 | 10.0000 g | 199.9999 g |
| 3 | 10.0000 g | 200.0000 g |
| 4 | 10.0000 g | 200.0001 g |
| 5 | 9.9999 g | 199.9999 g |
| 6 | 10.0000 g | 200.0000 g |
| 7 | 10.0000 g | 199.9999 g |
| 8 | 10.0000 g | 200.0000 g |
| 9 | 9.9999 g | 200.0001 g |
| 10 | 10.0000 g | 200.0000 g |
| | $s$ = 0.00004 g | $s$ = 0.00007 g |

Eccentricity

| Test load (nominal): | 100 g |
|---|---|
| Center | 100.0001 g |
| Front left | 100.0002 g |
| Back left | 100.0002 g |
| Back right | 100.0000 g |
| Front right | 100.0000 g |

Maximum deviation from centric loading indication
$|\Delta I_{ecc}|_{max}$ = 0.0001 g

Error of indication

| Testload $L$ | Indication $I$ | Error $E$ | Expansion factor $k$ | Uncertainty $U(E)$ | Uncertainty relative $U_{rel}(E)$ |
|---|---|---|---|---|---|
| 0.0100 g | 0.0100 g | 0.0000 g | 2.00 | 0.00012 g | 1.2 % |
| 0.1000 g | 0.1000 g | 0.0000 g | 2.00 | 0.00017 g | 0.17 % |
| 0.5000 g | 0.5000 g | 0.0000 g | 2.00 | 0.00017 g | 0.034 % |
| 1.0000 g | 1.0000 g | 0.0000 g | 2.00 | 0.00017 g | 0.017 % |
| 5.0000 g | 5.0000 g | 0.0000 g | 2.00 | 0.00017 g | 0.0034 % |
| 10.0000 g | 10.0000 g | 0.0000 g | 2.00 | 0.00017 g | 0.0017 % |
| 20.0000 g | 20.0000 g | 0.0000 g | 2.00 | 0.00018 g | 0.00088 % |
| 50.0000 g | 50.0000 g | 0.0000 g | 2.00 | 0.00018 g | 0.00037 % |
| 100.0000 g | 100.0001 g | 0.0001 g | 2.00 | 0.00021 g | 0.00021 % |
| 200.0000 g | 200.0000 g | 0.0000 g | 2.00 | 0.00030 g | 0.00015 % |
| 220.0000 g | 220.0001 g | 0.0001 g | 2.00 | 0.00034 g | 0.00015 % |
| Maximum error of indication | | $\|E\|_{max}$ = 0.0001 g | | | |

$U_{rel}(E)$ is the quotient of $U(E)$ and test load $L$. The uncertainty of measurement $U(E)$ is valid only if error $E$ is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

**End of calibration certificate**



Interpretation of measurement results | Appendix to the calibration certificate

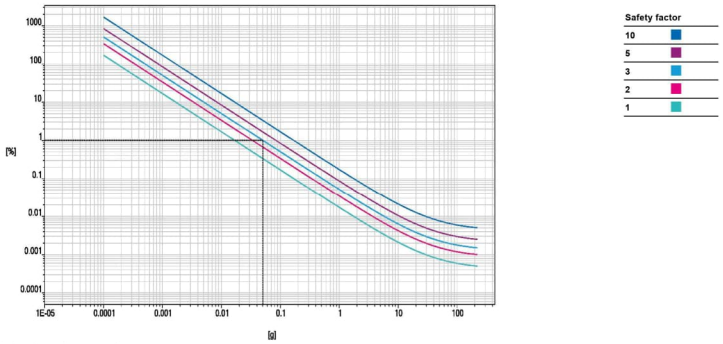
# Uncertainty of measurement in use

| | |
|---|---|
| Device adjusted before measurement | Yes |
| Temperature deviation considered | 1.5 K (isoCAL active) |
| Temperature coefficient considered | 1 · 10⁻⁶/K |
| **Uncertainty of the weighing result $U_{gl}(W)$** | $U_{gl}(W) = 0.00017\ g + 4.25 \cdot 10^{-6} \cdot R$ |

Reference note: The current uncertainty of measurement is calculated by entering of the reading $R$ into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

| Indication in % from max load | Net indication $R$ | Uncertainty $U_{gl}(W)$ | Uncertainty relative $U_{gl}(W)_{rel}$ |
|---|---|---|---|
| 1 % | 2.2000 g | 0.00018 g | 0.0082 % |
| 25 % | 55.0000 g | 0.00040 g | 0.00073 % |
| 50 % | 110.0000 g | 0.00064 g | 0.00058 % |
| 75 % | 165.0000 g | 0.00087 g | 0.00053 % |
| 100 % | 220.0000 g | 0.0011 g | 0.00050 % |

**Graphic realization of the relative uncertainty of measurement | process accuracy**




**Displayed example**

| | |
|---|---|
| Process accuracy | 1.00 % |
| Safety factor | 3 |
| Minimum sample weight | 0.0507 g |



SCG

**Metrology Center**
**SCI ECO Services Company Limited**
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Bangkok Tel : +668 9205 6851 , +669 81924 0059
Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

NSC-TISI-TIS 17025
CALIBRATION 0244



## Certificate of Calibration

**Equipment** : **Chamber ( Oven )**
**Manufacturer** : **MEMMERT**
**Model** : **UF 110**
**Serial No.** : **B416.2420**
**Customer Code** : **RYG_EN0012**
**ID No.** : **T6444A5**
**Customer** : **ALS Laboratory Group (Thailand) Co.,Ltd. ( Rayong Branch)**
**616/10 Moo 5 T.Maenamkoo,**
**A.Pluakdaeng, Rayong 21140**
**Customer Location** : **ENVIRONMENT LABORATORY**
**Date of Receipt** : **3 September 2025**
**Calibrated By** : **Sujjar Naknakred ( Site Calibration Manager )**
**Approved By** : **Boonchai Suriyawong (Site Calibration Manager)**
**Date of Issue** : 17 SEP 2025

REVIEW BY Thanitch.
APPROVED BY
NEXT CAL. DATE 10/02/27

**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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.**



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**Metrology Center**
**SCI ECO Services Company Limited**
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

NSC-TISI-TIS 17025
CALIBRATION 0244



## Calibration Report

**Equipment** : **Chamber ( Oven )**
**Date of Calibration** : **10 September 2025**
**Environment** : **Temperature : 35.7-36.6 °C**
**Line Voltage : 226.8-233.7 V**
**Relative Humidity : 55 - 65 %RH**

**Condition of this results of calibration :**

1. This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2019) and AS2853-1986 ).
   All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

| Instrument | Model | Instrument No. | Certificate No. | Due Date |
|---|---|---|---|---|
| RTD | 100 ohm | 30-(CH1-10) | T242203 | 9 November 2025 |
| DATA LOGGER | 34970A | T47 | T242203 | 9 November 2025 |

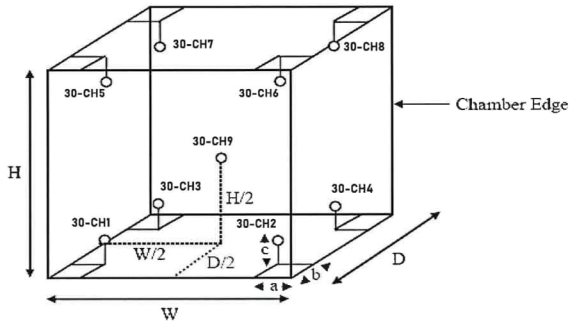
3. This certificate is traceable to :
   National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.
4. Condition of calibrated item : good
   Equipment Description :
   Time Constant 3 Hour 29 Minute At 104 °C
   Fresh Air Damper [X] Open [X] Min [ ] Medium [ ] Max
   [ ] Close
   [ ] Not Available
5. Adjustment :
   ( ) without adjustment ( X ) after adjustment

**Approved By.**

Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
NSC-TISI-TIS 17025 CALIBRATION 0244



## Calibration Report




**Remark :** Internal Dimensions of Chamber : W (Width) = 56 cm. , H (Height) = 48 cm. and D (Depth) = 40 cm.
Size of Installed Standard sensor number 30-CH1 to number 30-CH8 : a = 5 cm. ,b = 5 cm. and c = 5 cm.
Size of Installed Standard sensor number 30-CH9 : W/2 = 56 cm./2 , H/2 = 48 cm./2 and D/2 = 40cm./2

**Measurement Results**

| | Average Standard Reading at each position (°C) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Calibration Point | 30-CH1 | 30-CH2 | 30-CH3 | 30-CH4 | 30-CH5 | 30-CH6 | 30-CH7 | 30-CH8 | 30-CH9 |
| 104 | 104.02 | 103.70 | 104.01 | 104.16 | 104.11 | 104.08 | 104.01 | 104.33 | 103.61 |
| 180 | 180.67 | 178.78 | 180.38 | 179.85 | 179.16 | 180.27 | 180.98 | 181.04 | 179.49 |

| Chamber ( Oven ) | | | Temperature Distribution | | | | |
|---|---|---|---|---|---|---|---|
| Setting °C | Reading (°C) Min , Max | Reading (°C) Average | Average ( °C ) | Stability (± °C ) | Uniformity ( °C ) | Uncertainty (± °C ) | Coverage Factor *k* |
| 104.0 | 103.9 , 104.1 | 104.0 | 104.00 | 0.08 | 0.61 | 0.42 | 2.00 |
| 180.0 | 179.9 , 180.1 | 180.0 | 180.07 | 0.21 | 1.51 | 0.52 | 2.00 |

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

*End of Certificate.*

Approved By. _____

FM-TL.07 I02/27-03-68

**Equipment :** DO Meter with Sensor **Cert. No.:** 25LM10
**Condition As-Received :** Used Item **Page.:** 2 of 2
**Reference :** 2501-0600DSC-2

**Procedure Used :-**

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer ( IPRT ) into Temperature Bath.

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

| Instrument | Serial No. | Cert. No. | Traceable | Due Date |
|---|---|---|---|---|
| 1) Digital Thermometer | 2188080 | 24I1022 | TPA | 17 Sep 2025 |

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

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

**Result of Calibration :-** ( * ) Without Adjustment

**Function :** Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 15E100464

| Calibration Point ( °C ) | Immersion Depth ( mm ) | Standard Temperature ( °C ) | UUC* Reading ( °C ) | Error ( °C ) | Uncertainty ( ± °C ) | Coverage Factor *k* |
|---|---|---|---|---|---|---|
| 20.00 | 60 | 20.002 | 19.81 | -0.192 | 0.15 | 2.00 |

**UUC* :** Unit Under Calibration

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

-o0o-

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
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TEL.0-2717-3000-29 FAX.0-2719-9484
ilac-MRA NSC-TISI-TIS17025 CALIBRATION 0008

## Certificate of Calibration

**Cert. No.:** 25LM10
**Page.:** 1 of 2

**Equipment :** DO Meter with Sensor
**Manufacturer :** YSI
**Model :** 5000-115V
**Serial No. :** 15E102796
**ID No. :** RYG_EN0032

REVIEW BY Photchanna S.
APPROVED BY
NEXT CAL DATE 20/07/26

**Submitted by :** ALS Laboratory Group (Thailand) Co.,Ltd.
(Rayong Branch)
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng,
Rayong 21140 Thailand

**Location :** TPA On Site Calibration Laboratory

**Received Order :** 17 January 2025
**Calibrated Date :** 20 January 2025
**Ambient Temperature :** ( 26 ± 10 ) °C
**Relative Humidity :** ( 50 ± 30 ) %
**AC Line Voltage :** ( 220 ± 22 ) V

**Calibrated by :** Warakorn Lerngagtrakul

**Approved by :** _____
Approved Signatory

( ) Chakrit Waewwanjua
(✓) Suwit Imjai
( ) Kunchit Promprat

**Issue Date :** 23 January 2025

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

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

## Certificate of Testing

**Cert.No.:** 25TW15
**Page.:** 1 of 2

**Equipment :** DO Meter
**Manufacturer :** YSI
**Model :** 5000-115V
**Serial No. :** 15E102796
**ID No. :** RYG_EN0032
**Received Date :** 17 January 2025
**Test Date :** 20 January 2025
**Reference :** 2501-0600DSC-1
**Submitted by :** ALS Laboratory Group (Thailand) Co.,Ltd.
(Rayong Branch)
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand

**Laboratory Condition :** Temperature ( 25 ± 5 ) °C
Humidity ( 50 ± 20 ) %

**Test Procedure :** In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

**Tested by :** Walalak Sirithean

**Approved by :** Saithip
Approved Signatory

( ) Pornthippa Tameyakul
( ) Ponpan Paipim
(✓) Saithip Meangmai

**Issue Date :** 21 January 2025

**Condition of this result of calibration**

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

| Instruments | Serial No. | ID No. | Certificate No. | Due Date |
|---|---|---|---|---|
| 1. Burette | - | 130BU10 | 23CG1172 | 22 Mar 2025 |
| 2. Balance | 14233821 | 110RC001 | 24MM131 | 04 July 2025 |

2. Standard Material :-

| Material | Manufacturer | Lot.No. | Assay |
|---|---|---|---|
| Sodium Thiosulfate 5-Hydrate AR | KEMAUS | 2203162447 | 99.6% |

**Result :** **Dissolved Oxygen Meter Adjustment With Air 100 %**
**Dissolved Oxygen Probe No.:** 15E100464

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|---|---|---|
| 8.20 | 8.20 | 0.0084 |

This report was certified only for the instrument we tested.It is allowable to use for study Intend to use for advertising and referral purpose is prohibited.This report may not be reproduced other in full, without written approval of the laboratory

-o0o-



**Equipment :** Low Temp. Incubator
**Condition As-Received :** New Item
**Reference :** 2603-0502OC-2
**Procedure Used :-**
Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).
The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

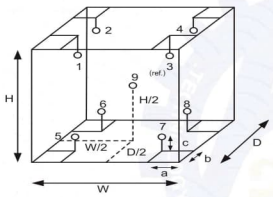
1. Reference standard instrument:-

| Instrument | Serial No. | Cert. No. | Traceable | Due Date |
|---|---|---|---|---|
| 1 ) Data Acquisition | MY49023932 | 25LM121 | TPA, | 27 Jul 2026 |

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This measurement result is traceable to the International System of Unit maintained through :
   **Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

**Result of Calibration :-** ( * ) Without Adjustment
**Function of UUC* :** Temperature Source
**Fresh air setting :** Not Available

| Environment during calibration | Beginning | Finished |
|---|---|---|
| Temp. ( °C ) | 23 | 21 |
| REL.Humid. ( % ) | 37 | 33 |
| AC Supply ( Volt ) | 220 | 221 |




| Position : | Ref. Std. ID No.: |
|---|---|
| 1 | 19-16RTD-01 |
| 2 | 19-16RTD-02 |
| 3 | 19-16RTD-03 |
| 4 | 23-16RTD-04 |
| 5 | 19-16RTD-05 |
| 6 | 19-14RTD-06 |
| 7 | 21-16RTD-07 |
| 8 | 19-16RTD-08 |
| 9 (ref.) | 19-16RTD-09 |

**Probe Installation Details :**
a = 10 cm
b = 10 cm
c = 10 cm

**Dimension of Chamber :**
D = 0.60 m
W = 1.0 m
H = 1.2 m
Capacity = 0.72 m³

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

ilac-MRA
NSC-TISI-TIS17025
CALIBRATION 0008

# Certificate of Calibration



REVIEW BY Thanitak.
APPROVED BY
NEXT CAL DATE 18/09/27

**Equipment :** Low Temp. Incubator
**Manufacturer :** Memmert
**Model :** IPP750
**Serial No. :** V818.0084
**ID No. :** RYG_EN0154
**Submitted by :** ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch
616/10 Moo 5, T.Maenamkoo, A.Pluakdaeng,
Rayong 21140, Thailand
**Location :** BOD Room
**Received Order :** 18 March 2026
**Calibration Date :** 18 March 2026
**Ambient Temperature :** ( 26 ± 10 ) °C
**Relative Humidity :** ( 50 ± 30 ) %
**AC Line Voltage :** ( 220 ± 22 ) V
**Calibrated by :** Preecha Hlahib
**Approved by :** Kunchit
Approved Signatory

( ) Chakrit Waewwanjua
( ) Suwit Imjai
(✓) Kunchit Promprat

**Issue Date :** 31 March 2026

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

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**Equipment :** Low Temp. Incubator
**Condition As-Received :** New Item
**Reference :** 2603-0502OC-2
**Result of Calibration :-** ( * ) Without Adjustment
**Function of UUC* :** Temperature Source
**Fresh air setting :** Not Available

| Calibration Point ( °C ) | UUC* Setting ( °C ) | UUC* Reading ( °C ) | Temperature stability ( ± °C ) | Temperature uniformity ( °C ) | Overall Variation ( °C ) | Coverage Factor *k* |
|---|---|---|---|---|---|---|
| 20.0 | 20.0 | 20.0 | 0.019 | 0.19 | 0.34 | 2 |

| Calibration Point ( °C ) | Measured Temperature ( °C ) Position | | | | | | | | | Uncertainty ( ±°C ) |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | |
| 20.0 | 20.185 | 20.132 | 20.303 | 20.160 | 20.001 | 20.054 | 19.983 | 20.060 | 20.163 | 0.30 |

**Average* :** The average of 30 values in each position.
**Temperature stability :** One-half of the greatest maximum difference of measured temperature at any one sensor.
**Temperature uniformity :** The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
**Overall Variation :** The Difference of the maximum and minimum measured temperatures throughout observation.
**UUC* :** Unit Under Calibration
Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

-o0o-

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

NSC-TISI-TIS17025 CALIBRATION 0008

# Certificate of Calibration

Cert.No.: 25CG3668
Page.: 1 of 2

| | |
|---|---|
| **Equipment :** | Burette |
| **Capacity :** | 50 mL |
| **Serial No. :** | - |
| **ID. No. :** | RYG_EN0216 |
| **Manufacturer :** | Witeg |
| **Made in :** | Germany |
| **Submitted by :** | ALS Laboratory Group (Thailand) Co.,Ltd.<br>Rayong Branch<br>616/10 Moo 5 T.MaenamKoo, A.Pluakdaeng<br>Rayong 21140, Thailand |
| **Ambient Temperature :** | (20 ± 2.5) °C |
| **Relative Humidity :** | (50 ± 10) % |
| **Barometric Pressure :** | 753 mmHg |
| **Calibration Procedure :** | ASTM E 542 - 01 |
| **Calibrated by :** | Srisuda Khamtha |
| **Approved by :** | Approved Signatory |

REVIEW BY Thanitak.
APPROVED BY
NEXT CAL DATE 18/09/26

( ) Ponpan Paipim
(✓) Chakrit Waewwanjua

**Issue Date :** 19 September 2025

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

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SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
Bangkok Tel : +668 9205 6851 , +669 81924 0059
Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

NSC-TISI-TIS 17025 CALIBRATION 0244

**Certificate No. T252167** **Page 1 of 4**

# Certificate of Calibration

| | | |
|---|---|---|
| **Equipment** | : | **Chamber ( Cold Room )** |
| **Manufacturer** | : | **MODULAR** |
| **Model** | : | **IREVCOHCOO** |
| **Serial No.** | : | **C00351459** |
| **Customer Code** | : | **RYG_EN0184** |
| **ID No.** | : | **T1939A5** |
| **Customer** | : | **ALS Laboratory Group (Thailand) Co.,Ltd. ( Rayong Branch)**<br>**616/10 Moo 5 T.Maenamkoo,**<br>**A.Pluakdaeng, Rayong 21140** |
| **Customer Location** | : | **ENVIRONMENT LABORATORY** |
| **Date of Receipt** | : | **19 November 2025** |
| **Calibrated By** | : | **Sujjar Naknakred ( Site Calibration Manager )** |
| **Approved By** | : | **/ Boonchai Suriyawong (Site Calibration Manager)** |
| **Date of Issue** | : | 01 DEC 2025 |

REVIEW BY Thanitak.
APPROVED BY
NEXT CAL. DATE 27/05/27

**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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.**



| | | | |
|---|---|---|---|
| **Equipment :** | Burette | **Cert.No.:** | 25CG3668 |
| **Received Date :** | 16 September 2025 | **Page.:** | 2 of 2 |
| **Condition As-Received :** | Used Item | | |
| **Calibration Date :** | 18 September 2025 | | |
| **Reference :** | 2509-0564DSC-3 | | |

**Condition of this result of calibration**

1. Reference Standard Instruments :

| Instruments | Model | Serial No. | ID. No. | Certificate No. | Traceability | Due date |
|---|---|---|---|---|---|---|
| 1) Balance | XP205 | B134206712 | 140RC007 | 25MM296 | TPA | 16 July 2026 |
| 2) Humidity/Baro/Temp | MHB-382SD | AM.42259 | 140EC016 | 25H1616 | TPA | 14 Aug 2026 |
| 3) Digital Thermometer | HH376 | 230806555 | 140EC013 | 25I1740 | TPA | 17 Jan 2026 |

   This measurement result is traceable to SI Unit
2. The certificate is valid only to the item calibrated on date and place of calibration.
3. True value is converted to true volume at the standard temperature of 20 °C

**Calibration result :**

| Nominal capacity ( mL ) | Reading ( mL ) | Uncertainty ( ± mL ) | *k* Factor |
|---|---|---|---|
| 10 | 10.0264 | 0.0082 | 2.00 |
| 25 | 25.0141 | 0.0087 | 2.00 |
| 50 | 49.9952 | 0.010 | 2.00 |

**Remark** mL = $cm^3$

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

-o0o-

SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

NSC-TISI-TIS 17025 CALIBRATION 0244

**Certificate No. T252167** **Page 2 of 4**

# Calibration Report

| | | |
|---|---|---|
| **Equipment** | : | **Chamber ( Cold Room )** |
| **Date of Calibration** | : | **27 November 2025** |
| **Environment** | : | **Temperature : 24.7-25.6 °C** |
| | | **Line Voltage : 222.3-226.3 V** |
| | | **Relative Humidity : 55 - 65 %RH** |

**Condition of this results of calibration :**

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2019) and AS2853-1986 ).
   All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

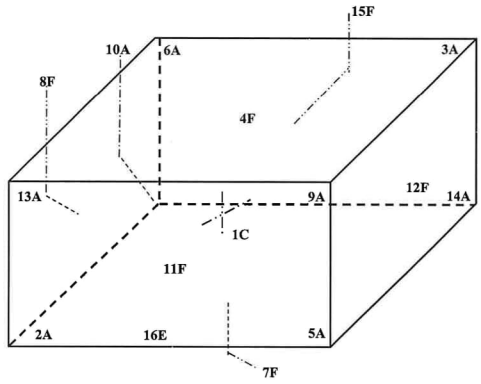
| Instrument | Model | Instrument No. | Certificate No. | Due Date |
|---|---|---|---|---|
| TC | TYPE T | TN161-TN170 | T251760 | 17 October 2026 |
| TC | TYPE T | TN171-TN180 | T251760 | 17 October 2026 |
| DATA LOGGER | 34970A | T261 | T251760 | 17 October 2026 |

3. This certificate is traceable to :
   National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)
4. Condition of calibrated item : good
   Equipment Description :
   Time Constant 1 Hour 12 Minute At 3 °C
   Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
   ☐ Close
   ☒ Not Available
5. Adjustment :
   ( ) without adjustment ( X ) after adjustment

**Approved By.**

**Certificate No. T252167** 

## Calibration Report




C = Centre , F = Centre of Face , A = Corner , E = Centre of Edge

| | | | | | |
|---|---|---|---|---|---|
| 1C | = | TN161 | 11F | = | TN171 |
| 2A | = | TN162 | 12F | = | TN172 |
| 3A | = | TN163 | 13A | = | TN173 |
| 4F | = | TN164 | 14A | = | TN174 |
| 5A | = | TN165 | 15F | = | TN175 |
| 6A | = | TN166 | 16E | = | TN176 |
| 7F | = | TN167 | | | |
| 8F | = | TN168 | | | |
| 9A | = | TN169 | | | |
| 10A | = | TN170 | | | |

**Approved By.**



DKSH

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NSC-TISI-TIS 17025
Calibration 0087

# Certificate of Calibration

| | | | |
|---|---|---|---|
| **Equipment:** | SPECTROPHOTOMETER | Certificate No.: | C06250108 |
| Model: | DR6000 | Issued Date: | 18 March 2025 |
| Serial No. (or ID.): | 1627845 (RYG_EN0037) | Job No.: | WO-00064379 |
| Manufacturer: | HACH | Page: | 1 of 3 |
| Condition: | In Condition | | |

REVIEW BY Photchanas.
APPROVED BY
NEXT CAL. DATE 18/09/26

**Customer:** ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand.

**Environment Condition:**

| | | | | | |
|---|---|---|---|---|---|
| Temperature | 24.4 | °C | ± | 0.3 | °C |
| Humidity | 60.8 | %RH | ± | 3.5 | %RH |

**Calibration Place:** ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
( Wet Chemistry Lab )
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand.

**Calibration By:** Mr.Preecha Phooarsai
**Calibration Date:** 18 March 2025
**The Method used:** In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04
**Traceability:** This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.
The standard for Wavelength Certificate No. 111583 and 111584
The standard for Photometric Certificate No. 9114984 and 111588
The standard for Stray light Certificate No. 111586 and 111585
The standard for Spectral resolution Certificate No. 111587

(Mr. Preecha Phooarsai)
Person in charge

(Miss Kaewkan Suradech)
Authorized signatory

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

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2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand



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Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
NSC-TISI-TIS 17025
CALIBRATION 0244

**Certificate No. T252167** 

## Calibration Report

**Measurement Results:**

| Calibration Point | Average Standard Reading at each position (°C) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1C TN161 | 2A TN162 | 3A TN163 | 4F TN164 | 5A TN165 | 6A TN166 | 7F TN167 | 8F TN168 | 9A TN169 | 10A TN170 |
| 3 | 2.59 | 2.80 | 2.94 | 2.86 | 3.05 | 3.44 | 3.11 | 3.30 | 3.29 | 3.66 |
| | 11F TN171 | 12F TN172 | 13A TN173 | 14A TN174 | 15F TN175 | 16E TN176 | | | | |
| | 3.41 | 3.56 | 3.38 | 3.54 | 3.36 | 3.16 | | | | |

| Chamber ( Cold Room ) | | | Temperature Distribution | | | | |
|---|---|---|---|---|---|---|---|
| Setting (°C ) | Reading (°C ) | | Average (°C) | Stability(±°C) | Uniformity(°C) | Uncertainty(±°C) | Coverage Factor *k* |
| | Min , Max | Average | | | | | |
| 3.0 | 2.9 , 4.1 | 3.7 | 3.21 | 1.25 | 1.92 | 1.85 | 2.00 |

* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .

*End of Certificate.*

**Approved By.**



DKSH



**Calibration Results:**
**Without Adjustment**

**Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm**

| Standard Wavelength | Unit Under Calibration | Correction | Uncertainty |
|---|---|---|---|
| 418.61 | 418.5 | 0.11 | 0.13 |
| 536.66 | 536.7 | -0.04 | 0.13 |
| 637.98 | 638.3 | -0.32 | 0.13 |
| 748.48 | 748.8 | -0.32 | 0.13 |
| 807.03 | 807.5 | -0.47 | 0.13 |

**Photometric Accuracy (Absorbance)**

| Wavelength | Standard absorbance | Unit Under Calibration | Correction | Uncertainty |
|---|---|---|---|---|
| 420 nm | 0.0000 | 0.000 | 0.0000 | 0.0045 |
| | 0.2930 | 0.291 | 0.0020 | 0.0045 |
| | 0.5168 | 0.518 | -0.0012 | 0.0045 |
| | 1.0298 | 1.031 | -0.0012 | 0.0045 |
| 440 nm | 0.0000 | 0.000 | 0.0000 | 0.0045 |
| | 0.2867 | 0.285 | 0.0017 | 0.0045 |
| | 0.5073 | 0.508 | -0.0007 | 0.0045 |
| | 1.0083 | 1.009 | -0.0007 | 0.0045 |
| 465 nm | 0.0000 | 0.000 | 0.0000 | 0.0045 |
| | 0.2516 | 0.250 | 0.0016 | 0.0045 |
| | 0.4595 | 0.461 | -0.0015 | 0.0045 |
| | 0.9334 | 0.935 | -0.0016 | 0.0045 |
| 546.1 nm | 0.0000 | 0.000 | 0.0000 | 0.0045 |
| | 0.2461 | 0.246 | 0.0001 | 0.0045 |
| | 0.4652 | 0.466 | -0.0008 | 0.0045 |
| | 0.9468 | 0.948 | -0.0012 | 0.0045 |
| 590 nm | 0.0000 | 0.000 | 0.0000 | 0.0045 |
| | 0.2594 | 0.259 | 0.0004 | 0.0045 |
| | 0.5040 | 0.505 | -0.0010 | 0.0045 |
| | 1.0032 | 1.004 | -0.0008 | 0.0045 |
| 635 nm | 0.0000 | 0.000 | 0.0000 | 0.0045 |
| | 0.2579 | 0.258 | -0.0001 | 0.0045 |
| | 0.4971 | 0.497 | 0.0001 | 0.0045 |
| | 0.9720 | 0.973 | -0.0010 | 0.0045 |

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DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

## Calibration Results:

**Without Adjustment**

**Photometric Accuracy (Absorbance)**

| Wavelength | Standard absorbance | Unit Under Calibration | Correction | Uncertainty |
|---|---|---|---|---|
| 235 nm | 0.0000 | 0.000 | 0.0000 | 0.0080 |
| | 0.7355 | 0.738 | -0.0025 | 0.0080 |
| 257 nm | 0.0000 | 0.000 | 0.0000 | 0.0080 |
| | 0.8574 | 0.857 | 0.0004 | 0.0080 |
| 313 nm | 0.0000 | 0.000 | 0.0000 | 0.0080 |
| | 0.2864 | 0.290 | -0.0036 | 0.0080 |
| 350 nm | 0.0000 | 0.000 | 0.0000 | 0.0080 |
| | 0.6374 | 0.637 | 0.0004 | 0.0080 |

**Stray light ***

| Standard: cut-off | UUC: Wavelength (nm) | UUC: Transmission (%T) | Absorbance ( A) |
|---|---|---|---|
| 260.62 +/- 0.11 nm | 260.6 | 1.7 | 1.770 |
| 391.44 +/- 0.11 nm | 391.4 | 1.4 | 1.854 |

**Spectral Resolution ***

| Nominal Concentration 0.02 % v/v | Peak | Trough | Ratio | SBW |
|---|---|---|---|---|
| Standard Wavelength ( nm ) | 268.66 | 266.69 | 1.38 | 2.00 |
| UUC: Wavelength (nm) | 268.2 | 266.2 | | |
| Std Absorbance ( A) | 0.4566 | 0.2780 | | |
| UUC: Absorbance ( A) | 0.413 | 0.299 | | |

* Calibration Marked " Not TISI Accredited " in this Certificate have been included for completeness.

**The End of Certificate**

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand



Accredited by

NSC-TISI-TIS 17025
Calibration 0426

NSC-TISI-TIS 17025
CALIBRATION 0426

## Calibration certificate

Calibration Certificate No. 26BCI0066

| | |
|---|---|
| Object | Electronic non-automatic weighing instrument |
| Manufacturer | Sartorius |
| Type | MSU224S-100-DU |
| Serial \| QM Ident. no. | 31709552 \| RYG_EN0003 |
| Customer | ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) |
| | 616/10 Moo 5 T.Maenamkoo, A.Pluak Daeng, Rayong 21140, Thailand. |
| Order no. | 278579 |
| Number of pages | 4 |
| Date of calibration | 03 Feb 2026 |

This calibration certificate documents the traceability to national standards.

Uncertainties of measurements are taken into account when only statements of compliance are made.

This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.

This certificate relate and apply this equipment only.

REVIEW BY ThanitaK.

APPROVED BY

NEXT CAL DATE 03/02/27

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TISI-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

| Date of issue | Approval of the Calibration Certificate | Person in charge |
|---|---|---|
| 03 Feb 2026 | Mr. Chonchai Inthana | Chonchai Inthana |





## Calibration object

**Single range instrument**

| | |
|---|---|
| Model | MSU224S-100-DU |
| Serial Number | 31709552 |
| QM Ident. no \| Inventory no. | RYG_EN0003 \| --- |
| Maximum capacity (Max. load) | 220.0000 g |
| Measured up to | 220.0000 g |
| Scale interval | 0.0001 g |

## Place of calibration

| | |
|---|---|
| Address | According to page 1 |
| Department \| Cost center | Laboratory Department. \| --- |
| Building \| Floor | --- \| 1st Floor. |
| Room | Balance Room. |
| Maximum temperature variation at place of calibration | 5 K |

## Calibration procedure

EURAMET Calibration Guide No. 18, Version 4.0 (11/2015) - Guidelines on the Calibration of Non-Automatic Weighing Instruments

## Test equipment

| Test equipment type | Test equipment ID | Valid until |
|---|---|---|
| Thermometer | Testo 174H H/T250743 (Traceable to Si unit through ENTECH) | 18 Nov 2026 |
| Test weight set OIML R111 E2 | Certificate No.M2508149S ,E2(Traceable to SI unit through TCS) | 19 Aug 2027 |



## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00064379

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR6000 หมายเลขเครื่อง: 1627845

| ตรวจสอบ (รับ) 18 Mar 2025 ปกติ | ตรวจสอบ (รับ) 18 Mar 2025 ไม่ปกติ | รายการตรวจเช็ค | ตรวจสอบ (ส่ง) 18 Mar 2025 ปกติ | ตรวจสอบ (ส่ง) 18 Mar 2025 ไม่ปกติ | หมายเหตุ |
|---|---|---|---|---|---|
| | | *General* | | | |
| ☑ | ☐ | 1. ความสมบูรณ์เครื่อง | ☑ | ☐ | |
| ☑ | ☐ | 2. ความสะอาด ( ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง) | ☑ | ☐ | |
| ☑ | ☐ | 3. สวิทช์ ปิด – เปิด เครื่อง (On-Off Swicth) | ☑ | ☐ | |
| ☑ | ☐ | 4. ปุ่มกด (Keypad) | ☑ | ☐ | |
| ☑ | ☐ | 5. หน้าจอ (Display, Screen Contrast) | ☑ | ☐ | |
| | | *Spectrophotometer* | | | |
| ☐ | ☐ | 6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC | ☐ | ☐ | |
| ☐ | ☐ | 7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control) | ☐ | ☐ | |
| ☑ | ☐ | 8. ความยาวคลื่น (Wavelength Check) | ☑ | ☐ | * |
| ☑ | ☐ | 9. แหล่งกำเนิดแสง (UV < 3,000 hour) | ☑ | ☐ | 13.5 Hours |
| ☑ | ☐ | 10. แหล่งกำเนิดแสง (Visible < 5,000 hour) | ☑ | ☐ | 893.0 Hours |
| ☑ | ☐ | 11. ช่องวัดหลายตัวอย่าง (Carousel Module) | ☑ | ☐ | |
| | | *pH Meter and Conductivity Meter* | | | |
| ☐ | ☐ | 12. อิเล็คโทรด ( Electrode and Connection Cable ) | ☐ | ☐ | |
| ☐ | ☐ | 13. ระดับสารละลายใน Electrode (Level KCl ) | ☐ | ☐ | |
| ☐ | ☐ | 14. ฝาปิดกันปลาย Electrode (Dust Protection Hood) | ☐ | ☐ | |
| ☐ | ☐ | 15. ขาจับอิเล็คโทรด (Stand) | ☐ | ☐ | |
| | | *Turbidimeter* | | | |
| ☐ | ☐ | 16. ค่าความขุ่นที่ต่ำสุด (No Sample) | ☐ | ☐ | |
| ☐ | ☐ | 17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่เกิน 3.0) | ☐ | ☐ | |
| | | *Automatic titrator* | | | |
| ☐ | ☐ | 18. สภาพ Piston Burettes | ☐ | ☐ | |
| ☐ | ☐ | 19. Function Rinsing and Dosing | ☐ | ☐ | |
| ☐ | ☐ | 20. ระบบท่อสายยางและอุปกรณ์ประกอบ | ☐ | ☐ | |

เพิ่มเติม/ข้อแนะนำ : * 656.1nm = 656.1nm

* 486.0nm = 485.7nm

Mr.Preecha Phooarsai

Service Engineer

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth – in Asia and Beyond.

Calibration certificate No.: **26BCI0066**

Calibration Certificate

## Adjustment Status

The measuring device was internally adjusted before the calibration.

## Environmental and measuring conditions

| | |
|---|---|
| Date of calibration | 03 Feb 2026 |
| Temperature at place of calibration \| Temp. diff. $T_{weights}$ - $T_{place}$ | 24.5 °C \| 0.5 K |
| Measuring conditions | The installation site is suitable. The device is level. Balance was loaded up to Max before test. |
| Comments | Humidity 52.0 %RH. |

## Measurement results | Measurement uncertainties

Repeatability

| Test load (nominal): 10 g \| 200 g | | |
|---|---|---|
| | 10 g | 200 g |
| 1 | 10.0000 g | 200.0000 g |
| 2 | 10.0000 g | 200.0001 g |
| 3 | 10.0000 g | 200.0001 g |
| 4 | 10.0001 g | 200.0001 g |
| 5 | 10.0000 g | 200.0001 g |
| 6 | 10.0000 g | 200.0000 g |
| 7 | 10.0000 g | 200.0000 g |
| 8 | 10.0000 g | 200.0000 g |
| 9 | 10.0000 g | 200.0000 g |
| 10 | 10.0000 g | 200.0000 g |
| | $s$ = 0.00003 g | $s$ = 0.00005 g |

Eccentricity

| Test load (nominal): | 100 g |
|---|---|
| Center | 100.0000 g |
| Front left | 100.0000 g |
| Back left | 99.9999 g |
| Back right | 100.0000 g |
| Front right | 100.0000 g |

Maximum deviation from centric loading indication
$|\Delta I_{ecc}|_{max}$ = 0.0001 g

Error of indication

| Testload $L$ | Indication $I$ | Error $E$ | Expansion factor $k$ | Uncertainty $U(E)$ | Uncertainty relative $U_{rel}(E)$ |
|---|---|---|---|---|---|
| 0.0100 g | 0.0100 g | 0.0000 g | 2.00 | 0.00010 g | 1.0 % |
| 0.1000 g | 0.1000 g | 0.0000 g | 2.00 | 0.00013 g | 0.13 % |
| 0.5000 g | 0.5000 g | 0.0000 g | 2.00 | 0.00013 g | 0.027 % |
| 1.0000 g | 1.0000 g | 0.0000 g | 2.00 | 0.00013 g | 0.013 % |
| 5.0000 g | 5.0000 g | 0.0000 g | 2.00 | 0.00014 g | 0.0027 % |
| 10.0000 g | 10.0000 g | 0.0000 g | 2.00 | 0.00014 g | 0.0014 % |
| 20.0000 g | 20.0000 g | 0.0000 g | 2.00 | 0.00014 g | 0.00071 % |
| 50.0000 g | 50.0001 g | 0.0001 g | 2.00 | 0.00015 g | 0.00030 % |
| 100.0000 g | 100.0000 g | 0.0000 g | 2.00 | 0.00018 g | 0.00018 % |
| 200.0000 g | 200.0000 g | 0.0000 g | 2.00 | 0.00028 g | 0.00014 % |
| 220.0000 g | 220.0000 g | 0.0000 g | 2.00 | 0.00032 g | 0.00015 % |
| Maximum error of indication | | $\lvert E\rvert_{max}$ = 0.0001 g | | | |

$U_{rel}(E)$ is the quotient of $U(E)$ and test load $L$. The uncertainty of measurement $U(E)$ is valid only if error $E$ is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

**End of calibration certificate**



Interpretation of measurement results | Appendix to the calibration certificate

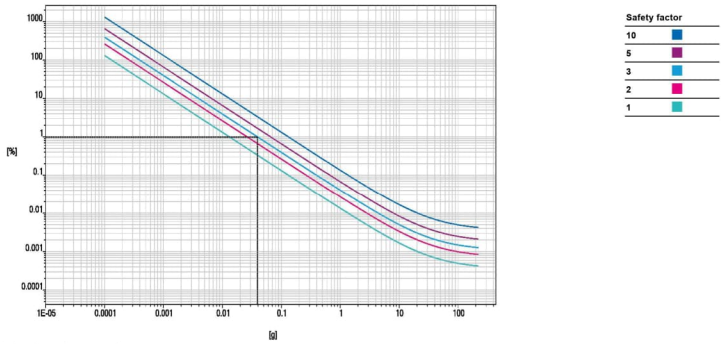
# Uncertainty of measurement in use

| | |
|---|---|
| Device adjusted before measurement | Yes |
| Temperature deviation considered | 1.5 K (isoCAL active) |
| Temperature coefficient considered | 1 · $10^{-6}$/K |
| **Uncertainty of the weighing result $U_{gl}(W)$** | $U_{gl}(W) = 0.00013\ g + 3.65 \cdot 10^{-6} \cdot R$ |

Reference note: The current uncertainty of measurement is calculated by entering of the reading $R$ into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

| Indication in % from max load | Net indication $R$ | Uncertainty $U_{gl}(W)$ | Uncertainty relative $U_{gl}(W)_{rel}$ |
|---|---|---|---|
| 1 % | 2.2000 g | 0.00014 g | 0.0063 % |
| 25 % | 55.0000 g | 0.00033 g | 0.00060 % |
| 50 % | 110.0000 g | 0.00053 g | 0.00048 % |
| 75 % | 165.0000 g | 0.00073 g | 0.00044 % |
| 100 % | 220.0000 g | 0.00093 g | 0.00042 % |

**Graphic realization of the relative uncertainty of measurement | process accuracy**




**Displayed example**

| | |
|---|---|
| Process accuracy | 1.00 % |
| Safety factor | 3 |
| Minimum sample weight | 0.0395 g |




SCG

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Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

NSC-TISI-TIS 17025
CALIBRATION 0244


**Certificate No. T252169**



## Certificate of Calibration

**Equipment** : **Liquid Bath ( Water )**
**Manufacturer** : **Memmert**
**Model** : **WNE29**
**Serial No.** : **L623.0105**
**Customer Code** : **RYG_EN0220**
**ID No.** : **T5650A5**
**Customer** : **ALS Laboratory Group (Thailand) Co.,Ltd. ( Rayong Branch)**
**616/10 Moo 5 T.Maenamkoo,**
**A.Pluakdaeng, Rayong 21140**
**Customer Location** : **Wet Chemistry Lab**
**Date of Receipt** : **19 November 2025**
**Calibrated By** : **Sujjar Naknakred ( Site Calibration Manager )**
**Approved By** : _____ / **Boonchai Suriyawong (Site Calibration Manager)**
**Date of Issue** : 01 DEC 2025

REVIEW BY Thanitall.
APPROVED BY D. Kha.
NEXT CAL. DATE 27/11/26

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

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NSC-TISI-TIS 17025
CALIBRATION 0244


**Certificate No. T252169**



## Calibration Report

**Equipment** : **Liquid Bath ( Water )**
**Date of Calibration** : **27 November 2025**
**Environment** : **Temperature : 25.5-25.7 °C**
**Line Voltage : 221.8-225.5 V**
**Relative Humidity : 55 - 65 %RH**

**Condition of this results of calibration :**

1. This equipment was calibrated by insert five resistance thermometer detectors into its water bath , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T36 ( based on ASTM E715-80 ( Reapproved 2022 )).
   All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

| Instrument | Model | Instrument No. | Certificate No. | Due Date |
|---|---|---|---|---|
| RTD | 100 OHM | M18 (CH1-CH5) | T251758 | 17 October 2026 |
| DATA LOGGER | 34970A | T261 | T251758 | 17 October 2026 |

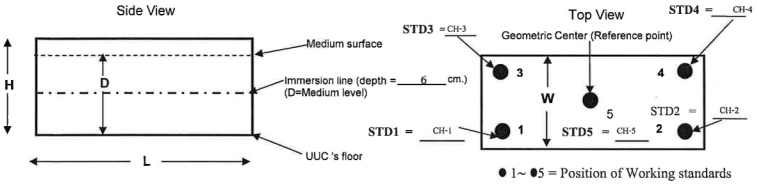
3. This certificate is traceable to :
   National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)
4. Condition of calibrated item : good
   Equipment Description :
   Time Constant 1 Hour 3 Minute At 63 °C
5. Adjustment :
   ( X ) without adjustment ( ) after adjustment

**Approved By.** _____

**Certificate No. T252169**

# Calibration Report






● 1~ ●5 = Position of Working standards

- D = Medium level : 12 cm. Working space dimension : 59 × 35 × 14 (WxLxH)
- UUC 's medium : Water
- Working standards are located at 2.5 cm. away from each coner and walls.

**Measurement Results:**

| | Average Standard Reading at each position (°C) | | | | |
|---|---|---|---|---|---|
| **Calibration Point** | **CH-1** | **CH-2** | **CH-3** | **CH-4** | **CH-5** |
| 63 | 62.93 | 63.13 | 62.94 | 63.10 | 63.09 |
| 85 | 85.15 | 85.33 | 85.21 | 85.43 | 85.20 |

| Liquid Bath ( Water ) | | | Temperature Distribution | | | | |
|---|---|---|---|---|---|---|---|
| Setting (°C) | Reading (°C) | | Average | Stability | Uniformity | Uncertainty | Coverage |
| | Min , Max | Average | (°C) | (±°C) | (±°C) | (±°C) | Factor *k* |
| 63.0 | 62.9 , 63.1 | 63.0 | 63.04 | 0.08 | 0.17 | 0.27 | 2.06 |
| 85.0 | 84.8 , 85.2 | 85.0 | 85.26 | 0.13 | 0.24 | 0.43 | 2.23 |

*** The quoted uncertainty exclude "uniformity"**
**The calibration result apply only the above calibrated item.**
**The result of test was found accurate as shown on date and place of test only.**
**The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .**

***End of Certificate.***

**Approved By.**



RYG_EN0224

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## Certificate of System Qualification

ES-IQ

| | |
|---|---|
| System ID: | MY2530CQ06 |
| Organization Name: | ALS Laboratory Group (Thailand) Co,Ltd. |
| Organization Location: | 616/10 Moo 5, T. Mae Nam Khu, A. Pluak Daeng, Rayong. 21140 |
| Date: | August 22, 2025 3:25:12 PM |
| EQP Name: | AgilentRecommended |
| EQP Revision: | ES.02.50 |
| Overall Qualification Status: | Pass |

REVIEW BY Thanitoll.
APPROVED BY
NEXT CAL. DATE 22 Aug 2026

**Purchase Order Details**
**Overall Test Status** Completed

**Preparation and Installation Details**
**Overall Test Status** Completed

**Documentation**
**Overall Test Status** Completed

**Product Quality Assurance Details**
**Overall Test Status** Completed

**Startup**
**Overall Test Status** Pass



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## Instrument Details

Purpose

This section describes the as found system configuration.

Details

| | |
|---|---|
| Spectrometer 1 | |
| Manufacturer | Agilent Technologies |
| Name | 5800 VDV |
| Model Number | G8018A |
| Sample Introduction | Double pass glass cyclonic spraychamber and seaspray nebulizer |
| Serial Number | MY2530CQ06 |
| Firmware Revision | 6599 |
| Chiller 1 | |
| Manufacturer | Agilent Technologies |
| Name | Other Unspecified |
| Other Unspecified Name | Recirculating Chiller |
| Model Number | Other Unspecified |
| Other Unspecified Model Number | G8496A |
| Serial Number | 2506-00251 |
| Autosampler 1 | |
| Manufacturer | Agilent Technologies |
| Name | SPS4 |
| Model Number | G8410A |
| Serial Number | AU252321415 |
| Switching Valve Accessory 1 | |
| Manufacturer | Agilent Technologies |
| Name | AVS 7 |
| Model Number | G8495 |
| Serial Number | MY2530MR06 |



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## Electronic Signature

Purpose

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Details

| | |
|---|---|
| Full Name of Signer: | Panthep Kurasathain |
| Logged On User Name: | panthep_kurasathain@agilent.com |
| Signature Creation Date: | August 22, 2025 |
| Reason for Signature: | Executed protocol and published this original version of document |

ACE Self Qualification Status

The installed version of ACE used to deliver this service passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder location SDS\ClearStore\AceSelfQualification.

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User Name: panthep_kurasathain
Report Generated by Hostname: AG-5CG31654RX

System Id: MY2530CQ06
Print Date: August 22, 2025 3:25:14 PM

**IQHW ALS 5800 22Aug25 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| August 22, 2025 3:05:31 PM | Audit | SessionCreated | Session | Host Name: AG-5CG31654RX, Drive Serial Number: ECF6A48D |
| August 22, 2025 3:05:31 PM | start | Configuration | Session | None |
| August 22, 2025 3:05:31 PM | Audit | Entitlement | Licensing | User is FieldEngineer and does not require an unlock code |
| August 22, 2025 3:12:40 PM | Audit | EqpLoaded | Session | EQP details for primary technique [Es] - File path: [ProtocolPacks/Es/Configurations/02.50/Es.02.50.eqp], EQP File Name: [Es.02.50.eqp], EQP Name: [AgilentRecommended],Protocol Revision :[Es.02.50] |
| August 22, 2025 3:12:43 PM | End | Configuration | Session | None |
| August 22, 2025 3:12:54 PM | start | Qualification | Session | IQ |
| August 22, 2025 3:12:55 PM | start | Execution | Purchase Order Details : Purchase Order | None |
| August 22, 2025 3:13:54 PM | start | Execution | Preparation and Installation Details : Preparation | None |
| August 22, 2025 3:13:55 PM | End | Execution | Purchase Order Details : Purchase Order | Run Count : 1 |
| August 22, 2025 3:14:22 PM | start | Execution | Documentation : Documentation | None |
| August 22, 2025 3:14:23 PM | End | Execution | Preparation and Installation Details : Preparation | Run Count : 1 |

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**Date:** August 22, 2025 3:25:12 PM
**System ID:** MY2530CQ06



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Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

**Certificate No. T251980**

# Certificate of Calibration



REVIEW BY Thanitall.
APPROVED BY
NEXT CAL. DATE 04/11/26

**Equipment** : **Hot Block**
**Manufacturer** : **environmental express**
**Model** : **SC196**
**Serial No.** : **2025CECW6557**
**Customer Code** : **RYG_EN0227**
**ID No.** : **T6795A5**
**Customer** : **ALS Laboratory Group (Thailand) Co.,Ltd. ( Rayong Branch)**
**616/10 Moo 5, T.Maenamkoo, A.Pluakdaeng,**
**Rayong 21140**
**Customer Location** : **Laboratory**
**Date of Receipt** : **29 October 2025**
**Calibrated By** : **Boonchai Suriyawong ( Site Calibration Manager )**
**Approved By** : _____ / **Sujjar Naknakred (Site Calibration Manager)**
**Date of Issue** : 14 NOV 2025

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

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User Name: panthep_kurasathain
Report Generated by Hostname: AG-5CG31654RX

System Id: MY2530CQ06
Print Date: August 22, 2025 3:25:14 PM

**IQHW ALS 5800 22Aug25 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| August 22, 2025 3:14:44 PM | start | Execution | Product Quality Assurance Details : Quality Assurance | None |
| August 22, 2025 3:14:44 PM | End | Execution | Documentation : Documentation | Run Count : 1 |
| August 22, 2025 3:14:56 PM | start | Execution | Startup : Startup | None |
| August 22, 2025 3:14:57 PM | End | Execution | Product Quality Assurance Details : Quality Assurance | Run Count : 1 |
| August 22, 2025 3:15:04 PM | End | Execution | Startup : Startup | Run Count : 1 |
| August 22, 2025 3:15:10 PM | End | Qualification | Session | IQ |
| August 22, 2025 3:15:10 PM | start | Reporting | Session | None |
| August 22, 2025 3:23:41 PM | Audit | Reporting | Session | Report Generated : Certificate |
| August 22, 2025 3:24:10 PM | Audit | Reporting | Session | Report Generated : Report |

Page 2 / 2

**Date:** August 22, 2025 3:25:12 PM
**System ID:** MY2530CQ06



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Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

**Certificate No. T251980**



## Calibration Report

**Equipment** : **Hot Block**
**Date of Calibration** : **4-5 November 2025**
**Environment** : **Temperature : 24.4-25.9 °C**
**Line Voltage : 221.4-225.2 V**
**Relative Humidity : 55 - 65 %RH**

**Condition of this results of calibration :**

1. Thisequipment was calibrated by insert 20 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20. All data show below were final values and the initial data from customer request .
   The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

| Instrument | Model | Instrument No. | Certificate No. | Due Date |
|---|---|---|---|---|
| TC | TYPE T | TN91-TN100 | T242036 | 3 December 2025 |
| TC | TYPE T | TN101-TN110 | T242036 | 3 December 2025 |
| DATA LOGGER | 34970A | T121 | T242036 | 3 December 2025 |

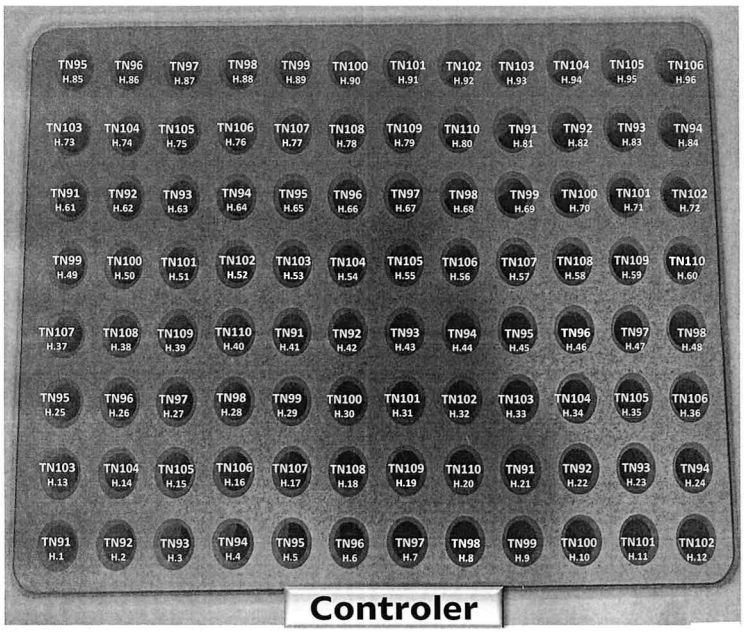
3. This certificate is traceable to :
   National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)
4. Condition of calibrated item : good
   Equipment Description :
   Time Constant - Hour 40 Minute At 95 °C
   Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
   ☐ Close
   ☒ Not Available
5. Adjustment :
   ( X ) without adjustment ( ) after adjustment

**Approved By.** _____

Certificate No. T251980



## Calibration Report




** H = Hole

Approved By.



SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Certificate No. T251980



## Calibration Report

**Measurement Results**

| Calibration Point | Average Standard Reading at each position (°C) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 95 | TN91 H.1 | TN92 H.2 | TN93 H.3 | TN94 H.4 | TN95 H.5 | TN96 H.6 | TN97 H.7 | TN98 H.8 | TN99 H.9 | TN100 H.10 |
| | 95.48 | 95.56 | 95.43 | 95.48 | 95.33 | 95.15 | 95.70 | 95.28 | 95.31 | 95.21 |
| | TN101 H.11 | TN102 H.12 | TN103 H.13 | TN104 H.14 | TN105 H.15 | TN106 H.16 | TN107 H.17 | TN108 H.18 | TN109 H.19 | TN110 H.20 |
| | 95.36 | 95.58 | 95.24 | 94.92 | 95.08 | 94.77 | 94.93 | 95.63 | 95.54 | 95.75 |
| | TN91 H.21 | TN92 H.22 | TN93 H.23 | TN94 H.24 | TN95 H.25 | TN96 H.26 | TN97 H.27 | TN98 H.28 | TN99 H.29 | TN100 H.30 |
| | 95.12 | 95.85 | 95.18 | 95.58 | 95.44 | 95.12 | 95.52 | 94.80 | 95.38 | 94.66 |
| | TN101 H.31 | TN102 H.32 | TN103 H.33 | TN104 H.34 | TN105 H.35 | TN106 H.36 | TN107 H.37 | TN108 H.38 | TN109 H.39 | TN110 H.40 |
| | 95.92 | 96.01 | 95.96 | 94.05 | 94.32 | 94.13 | 95.40 | 95.95 | 95.91 | 95.69 |
| | TN91 H.41 | TN92 H.42 | TN93 H.43 | TN94 H.44 | TN95 H.45 | TN96 H.46 | TN97 H.47 | TN98 H.48 | TN99 H.49 | TN100 H.50 |
| | 95.42 | 95.55 | 95.72 | 95.43 | 95.27 | 96.04 | 94.04 | 95.17 | 95.50 | 94.36 |
| | TN101 H.51 | TN102 H.52 | TN103 H.53 | TN104 H.54 | TN105 H.55 | TN106 H.56 | TN107 H.57 | TN108 H.58 | TN109 H.59 | TN110 H.60 |
| | 95.77 | 96.03 | 95.87 | 94.24 | 94.09 | 94.18 | 94.23 | 94.49 | 94.37 | 94.11 |
| | TN91 H.61 | TN92 H.62 | TN93 H.63 | TN94 H.64 | TN95 H.65 | TN96 H.66 | TN97 H.67 | TN98 H.68 | TN99 H.69 | TN100 H.70 |
| | 95.38 | 95.58 | 95.51 | 95.68 | 95.40 | 96.00 | 94.40 | 95.33 | 94.93 | 94.17 |
| | TN101 H.71 | TN102 H.72 | TN103 H.73 | TN104 H.74 | TN105 H.75 | TN106 H.76 | TN107 H.77 | TN108 H.78 | TN109 H.79 | TN110 H.80 |
| | 95.00 | 94.83 | 95.74 | 94.45 | 94.56 | 94.26 | 94.31 | 94.94 | 94.66 | 94.26 |
| | TN91 H.81 | TN92 H.82 | TN93 H.83 | TN94 H.84 | TN95 H.85 | TN96 H.86 | TN97 H.87 | TN98 H.88 | TN99 H.89 | TN100 H.90 |
| | 95.10 | 95.00 | 94.72 | 94.84 | 95.06 | 96.01 | 94.29 | 95.61 | 95.06 | 95.06 |
| | TN101 H.91 | TN102 H.92 | TN103 H.93 | TN104 H.94 | TN105 H.95 | TN106 H.96 | | | | |
| | 95.86 | 95.91 | 95.71 | 94.35 | 94.36 | 95.79 | | | | |

Approved By.



SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Certificate No. T251980



## Calibration Report

**Measurement Results**

| Calibration Point | Average Standard Reading at each position (°C) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 105 | TN91 H.1 | TN92 H.2 | TN93 H.3 | TN94 H.4 | TN95 H.5 | TN96 H.6 | TN97 H.7 | TN98 H.8 | TN99 H.9 | TN100 H.10 |
| | 105.58 | 105.67 | 105.62 | 105.52 | 105.37 | 105.69 | 104.52 | 105.19 | 104.69 | 104.78 |
| | TN101 H.11 | TN102 H.12 | TN103 H.13 | TN104 H.14 | TN105 H.15 | TN106 H.16 | TN107 H.17 | TN108 H.18 | TN109 H.19 | TN110 H.20 |
| | 104.99 | 104.68 | 104.31 | 104.54 | 104.98 | 104.86 | 104.97 | 105.65 | 105.43 | 105.18 |
| | TN91 H.21 | TN92 H.22 | TN93 H.23 | TN94 H.24 | TN95 H.25 | TN96 H.26 | TN97 H.27 | TN98 H.28 | TN99 H.29 | TN100 H.30 |
| | 105.58 | 105.67 | 105.62 | 105.52 | 105.37 | 105.69 | 104.52 | 105.19 | 104.69 | 104.78 |
| | TN101 H.31 | TN102 H.32 | TN103 H.33 | TN104 H.34 | TN105 H.35 | TN106 H.36 | TN107 H.37 | TN108 H.38 | TN109 H.39 | TN110 H.40 |
| | 104.99 | 104.68 | 104.31 | 104.54 | 104.98 | 104.86 | 104.97 | 105.65 | 105.43 | 105.18 |
| | TN91 H.41 | TN92 H.42 | TN93 H.43 | TN94 H.44 | TN95 H.45 | TN96 H.46 | TN97 H.47 | TN98 H.48 | TN99 H.49 | TN100 H.50 |
| | 105.78 | 105.77 | 105.61 | 105.55 | 105.13 | 105.88 | 104.59 | 105.91 | 105.75 | 104.49 |
| | TN101 H.51 | TN102 H.52 | TN103 H.53 | TN104 H.54 | TN105 H.55 | TN106 H.56 | TN107 H.57 | TN108 H.58 | TN109 H.59 | TN110 H.60 |
| | 105.33 | 105.53 | 105.68 | 104.33 | 104.61 | 104.24 | 104.44 | 104.76 | 104.48 | 104.18 |
| | TN91 H.61 | TN92 H.62 | TN93 H.63 | TN94 H.64 | TN95 H.65 | TN96 H.66 | TN97 H.67 | TN98 H.68 | TN99 H.69 | TN100 H.70 |
| | 105.60 | 105.62 | 105.53 | 105.80 | 105.27 | 105.85 | 104.31 | 105.58 | 104.75 | 104.23 |
| | TN101 H.71 | TN102 H.72 | TN103 H.73 | TN104 H.74 | TN105 H.75 | TN106 H.76 | TN107 H.77 | TN108 H.78 | TN109 H.79 | TN110 H.80 |
| | 104.89 | 105.25 | 105.83 | 104.33 | 104.58 | 104.41 | 104.76 | 105.29 | 104.95 | 104.55 |
| | TN91 H.81 | TN92 H.82 | TN93 H.83 | TN94 H.84 | TN95 H.85 | TN96 H.86 | TN97 H.87 | TN98 H.88 | TN99 H.89 | TN100 H.90 |
| | 105.00 | 105.03 | 104.49 | 104.77 | 105.08 | 105.69 | 104.12 | 105.53 | 105.06 | 104.13 |
| | TN101 H.91 | TN102 H.92 | TN103 H.93 | TN104 H.94 | TN105 H.95 | TN106 H.96 | | | | |
| | 105.71 | 105.71 | 105.67 | 104.99 | 105.15 | 104.52 | | | | |

Approved By.



SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Certificate No. T251980



## Calibration Report

**Measurement Results**

| Hot Block | | | Temperature Distribution | | | |
|---|---|---|---|---|---|---|
| Setting (°C) | Reading (°C) Min , Max | Reading (°C) Average | Average (°C) | Stability (±°C) | Uncertainty (±°C) | Coverage Factor *k* |
| 94.0 | - | 94.0 | 95.31 | 0.20 | 0.90 | 2.00 |
| 104.0 | - | 104.0 | 105.74 | 0.20 | 1.10 | 2.00 |

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .

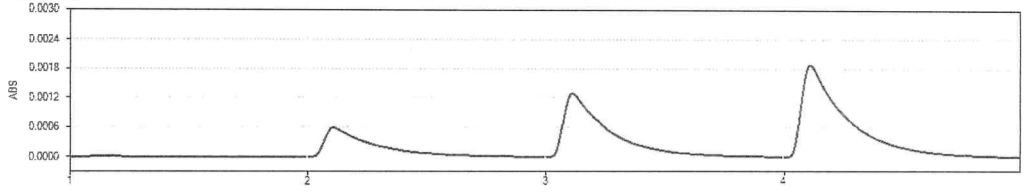
End of Certificate

Approved By.

## Inspection

| ITEMS | | SPECIFICATIONS | RESULT | JUDGE |
|---|---|---|---|---|
| 1. Quantity | - | Accessories are completed. | GOOD | OK |
| 2. Appearance | 2.1 Overall Appearance | No visible damage. | GOOD | OK |
| | 2.2 Parts / Cables | Correctly placed and connected. | GOOD | |
| 3. Indication | Nameplate / Label | Plate and Label are indicated. | GOOD | OK |
| 4. Self check | - | All items are "PASS" | GOOD | OK |
| 5. Calibration Curve | 5.1 LOW | 0-0.15 µg/L : Max.Dev. 5.0% | 3.00% | OK |
| 6. Repeatability | 0.05 µg/L (n=5) | Average: 0.05 ± 0.0025 µg/L | 0.0498 µg/L | OK |
| | | C.V. ≤ 3.0% | 1.69% | OK |
| 7. Blank | After 40ppb | Less than 0.02 (AREA) | 0.005 | OK |
| 7. Blank | MDL | 3 x S.D. < 0.5ppt | 0.40219 | OK |

STD PROFILE




SMP TABLE

| No. | SMP NO. | NAME | SVOL [mL] | CVOL [mL] | DVOL [mL] | AREA [ON] | MEAS [ng] | CONC [ug/L] | RECOVERY [%] | NOTE |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 38 | Check STD(0.050ug/L) | 5.000 | 5.000 | 5.000 | 0.160103 | 0.2472 | 0.049 | 98.0 | |
| 2 | 39 | Check STD(0.050ug/L) | 5.000 | 5.000 | 5.000 | 0.157533 | 0.2431 | 0.049 | 98.0 | |
| 3 | 40 | Check STD(0.050ug/L) | 5.000 | 5.000 | 5.000 | 0.162128 | 0.2504 | 0.050 | 100.0 | |
| 4 | 41 | Check STD(0.050ug/L) | 5.000 | 5.000 | 5.000 | 0.161676 | 0.2497 | 0.050 | 100.0 | |
| 5 | 43 | Check STD(0.050ug/L) | 5.000 | 5.000 | 5.000 | 0.165449 | 0.2556 | 0.051 | 102.0 | |

STATISTICS

| No. | NAME | DATA POINTS | AVE [ug/L] | SD [ug/L] | CV [%] |
|---|---|---|---|---|---|
| 1 | Check STD(0.050ug/L) | 5 | 0.0498 | 0.00084 | 1.69 |



Nippon Instruments Corporation

**ALS Laboratory Group (Thailand) Co., Ltd.**

**Automatic Mercury Analyzer**
**RA-7000A with SANPRA ™3**
**INSTALLATION REPORT**

SERIAL No. RA-7000A : 251040235
Soft version : Ver 1.5.0.0
ROM version : Ver 1.5.0.00
SERIAL No. SANPRA 3 : 241070094
ROM version : Ver 1.4.2.00

DATE : 21 JULY 2025
DUE DATE : 21 JULY 2026

INSPECTED BY : ( Chayanan T. )

APPROVED BY : ( Natthaphong P. )

REVIEW BY
APPROVED BY
NEXT CAL DATE 21 Jul 2026

**Kinetic Solutions Company Limited.**
2, Soi Lat Krabang 1, Lat Krabang Subdistrict,
Lat Krabang District, Bangkok 10520
Tel.(+66) 062-789-5221

บริษัท คิเนติก โซลูชั่นส์ จำกัด
KINETIC SOLUTIONS CO.,LTD.

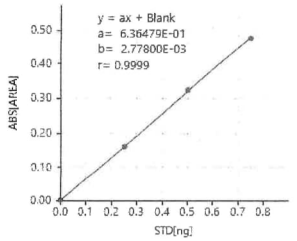
RYG_EN0223

TITLE 0-0.15ug/L
DATE 2025/07/18 14:07
UNIT RA-7000A[SN:251040235] + SANPRA 3 (UNIT A)[SN:241070094]
OPERATOR Kinetic Solutions

METHOD
Method Name : Method1
Pretreatment : No

P1: (1+1)H2SO4 : 0.9mL
P2: 10w/v% SnCl2 : 0.5mL

CALIBRATION




STD TABLE

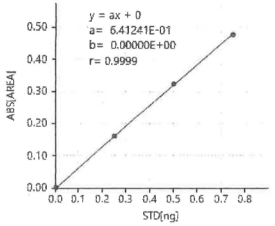
| No. | SMP NO. | STD [ug/L] | SVOL [mL] | CVOL [mL] | DVOL [mL] | STD [ng] | AREA [ON] | MEAS [ng] | DEV [%] | NOTE |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 14 | 10.000 | 0.000 | 5.000 | 5.000 | 0.000 | 0.002778 | 0.0000 | - | |
| 2 | 2 | 10.000 | 0.025 | 5.000 | 5.000 | 0.250 | 0.161649 | 0.2496 | 0.2 | |
| 3 | 11 | 10.000 | 0.050 | 5.000 | 5.000 | 0.500 | 0.324423 | 0.5054 | 1.1 | |
| 4 | 10 | 10.000 | 0.075 | 5.000 | 5.000 | 0.750 | 0.477950 | 0.7466 | 0.5 | |



Nippon Instruments Corporation

TITLE MDL
DATE 2025/07/22 09:05
UNIT RA-7000A[SN:251040235] + SANPRA 3 (UNIT A)[SN:241070094]
OPERATOR Kinetic Solutions

## CALIBRATION



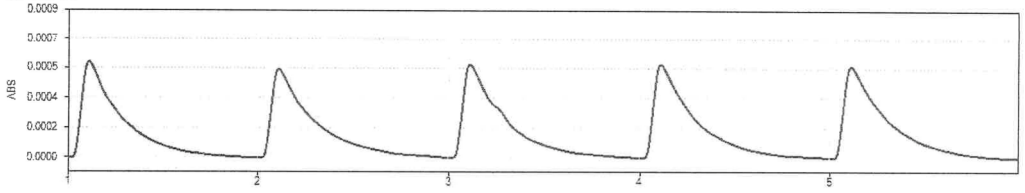

## STD TABLE

| No. | SMP NO. | STD [ug/L] | SVOL [mL] | CVOL [mL] | DVOL [mL] | STD [ng] | AREA [ON] | MEAS [ng] | DEV [%] | NOTE |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 14 | 10.000 | 0.000 | 5.000 | 5.000 | 0.000 | 0.002778 | 0.0043 | - | |
| 2 | 2 | 10.000 | 0.025 | 5.000 | 5.000 | 0.250 | 0.161649 | 0.2521 | 0.8 | |
| 3 | 11 | 10.000 | 0.050 | 5.000 | 5.000 | 0.500 | 0.324423 | 0.5059 | 1.2 | |
| 4 | 10 | 10.000 | 0.075 | 5.000 | 5.000 | 0.750 | 0.477950 | 0.7454 | 0.6 | |



Nippon Instruments Corporation

## SMP PROFILE




## SELF CHECK

Date : 2025/07/18 17:22:09

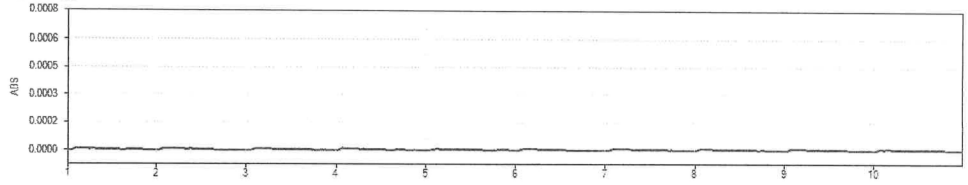
GLP Counter
Mercury Lamp(5000hr) : PASS 3hr (2025/05/09)
Membrane Filter(2000hr) : PASS 1hr (2025/05/09)
Air Pump(2000hr) : PASS 1hr (2025/05/09)
Drain Pump Tube(700hr) : PASS 0hr (2025/05/09)
No. of Measurements : 35
Adsorbed Hg(1000mg) : PASS 0.00004mg (2025/05/09)
P1 Tube(700hr) : PASS 0hr (2025/05/09)
P2 Tube(700hr) : PASS 0hr (2025/05/09)
P3 Tube(700hr) : PASS 0hr (2025/05/09)
P4 Tube(700hr) : PASS 0hr (2025/05/09)
P5 Tube(700hr) : PASS 0hr (2025/05/09)

Check/Test Result
Flow Rate Adjustment : PASS (FLOW=0.20L/min[DUTY= 50])
Sig/Ref : PASS (Sig:3.98V, Ref:4.02V)
Drift : PASS (DRIFT ABS= 0.0000162)
Sample Tube Sensor : PASS



Nippon Instruments Corporation

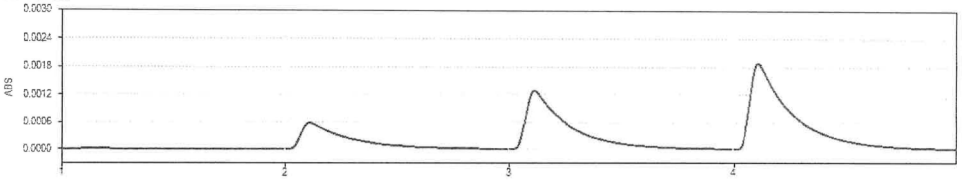
## SMP PROFILE






Nippon Instruments Corporation

## STD PROFILE




## SMP TABLE

| No. | SMP NO. | NAME | SVOL [mL] | CVOL [mL] | DVOL [mL] | AREA [ON] | MEAS [ng] | CONC [ppt] | NOTE |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 11 | MDL | 5.000 | 5.000 | 5.000 | 0.005288 | 0.0082 | 1.640000 | |
| 2 | 12 | MDL | 5.000 | 5.000 | 5.000 | 0.005637 | 0.0088 | 1.760000 | |
| 3 | 14 | MDL | 5.000 | 5.000 | 5.000 | 0.004926 | 0.0077 | 1.540000 | |
| 4 | 15 | MDL | 5.000 | 5.000 | 5.000 | 0.005025 | 0.0078 | 1.560000 | |
| 5 | 12 | MDL | 5.000 | 5.000 | 5.000 | 0.004222 | 0.0066 | 1.320000 | |
| 6 | 14 | MDL | 5.000 | 5.000 | 5.000 | 0.004279 | 0.0067 | 1.340000 | |
| 7 | 14 | MDL | 5.000 | 5.000 | 5.000 | 0.004938 | 0.0077 | 1.540000 | |
| 8 | 13 | MDL | 5.000 | 5.000 | 5.000 | 0.005120 | 0.0080 | 1.600000 | |
| 9 | 14 | MDL | 5.000 | 5.000 | 5.000 | 0.004594 | 0.0072 | 1.440000 | |
| 10 | 15 | MDL | 5.000 | 5.000 | 5.000 | 0.005055 | 0.0079 | 1.580000 | |

## STATISTICS

| No. | NAME | DATA POINTS | AVE [ppt] | SD [ppt] | CV [%] |
|---|---|---|---|---|---|
| 1 | MDL | 10 | 1.532000 | 0.1340647 | 8.75 |



Nippon Instruments Corporation

Metrology
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.
Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100
Bangkok Tel : +668 9205 6851 , +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.com

NSC-TISI-TIS 17025 CALIBRATION 0244



# Certificate of Calibration

**Equipment** : **Autoclave**

**Manufacturer** : **TOMY**

**Model** : **SX-700**

**Serial No.** : **48134190**

**Customer Code** : **BKK_ML0041**

**ID No.** : **T7725A3**

**Customer** : **ALS Laboratory Group (Thailand) Co.,Ltd.**
**104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,**
**Khet Suan Luang, Bangkok 10250**

**Customer Location** : **Washing Room**

**Date of Receipt** : **26 February 2025**

**Calibrated By** : **Boonchai Suriyawong ( Site Calibration Manager )**

**Approved By** : _____ **/ Sujjar Naknakred (Site Calibration Manager)**

**Date of Issue** : 10 MAR 2025

REVIEW BY Sithichok
APPROVED BY
NEXT CAL. DATE 04/09/26

**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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.**



Metrology
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

NSC-TISI-TIS 17025 CALIBRATION 0244



## Calibration Report

**Equipment** : **Autoclave**
**Date of Calibration** : **4 March 2025**
**Environment** : **Temperature : 22.2-25.4 °C**
**Line Voltage : 221.1-224.7 V**
**Relative Humidity : 55 - 65 %RH**

**Condition of this results of calibration :**

1. This equipment was calibrated by insert 3 standard temperature recorder into its chamber and test according to WI-T23 inhouse method.( based on BS 2646-1 : 2021)
   All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

| Instrument | Model | Standard No. | Certificate No. | Due Date |
|---|---|---|---|---|
| 1. Temperature recorder | RTD | T210 | T242028 | 11 December 2025 |
| 2. Temperature recorder | RTD | T211 | T242029 | 11 December 2025 |
| 3. Temperature recorder | RTD | T212 | T242030 | 11 December 2025 |

3. This certificate is traceable to :
   National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)
4. Condition of calibrated item : good
   Equipment Description :
   Pressure Indicator 0.11-0.12 MPa At 121 °C Holding time 20 minute
5. Adjustment :
   ( X ) without adjustment ( ) after adjustment

**Approved By.** _____

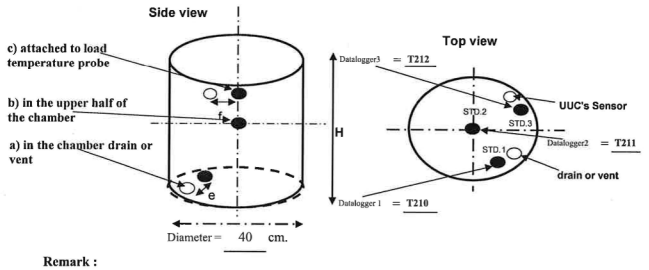


Metrology
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

NSC-TISI-TIS 17025 CALIBRATION 0244



## Calibration Report




**Remark :**
Size of Installed Standard sensor STD.1 : Distance the chamber drain or vent e ≤ 10 cm.(less than or be equal to 10 cm.)
Size of Installed Standard sensor STD.2 : Geometric Center (upper half of the chamber)
Size of Installed Standard sensor STD.3 : Distance UUC's Sensor f = 2 cm.

**Measurement Results :**

| | Average Standard Reading at each position (°C) | | |
|---|---|---|---|
| **Calibration Point** | **T210** | **T211** | **T212** |
| 121 | 121.2 | 121.1 | 121.1 |

| Autoclave | | | Temperature Distribution | | | | |
|---|---|---|---|---|---|---|---|
| Setting (°C) | Reading (°C) | | Average (°C) | Stability (±°C) | Uniformity (±°C) | Uncertainty (±°C) | Coverage Factor *k* |
| | Min , Max | Average | | | | | |
| 121 | - | 121 | 121.2 | 0.1 | 0.1 | 0.65 | 2.00 |

*** The quoted uncertainty exclude "uniformity"**
**The calibration result apply only the above calibrated item.**
**The result of test was found accurate as shown on date and place of test only.**
**The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .**

**End of Certificate**

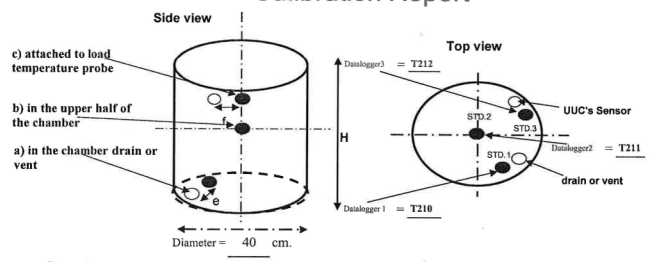
**Approved By.** _____



Metrological Center
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



## Calibration Report




**Remark :**
Size of Installed Standard sensor STD.1 : Distance the chamber drain or vent e ≤ 10 cm.(less than or be equal to 10 cm.)
Size of Installed Standard sensor STD.2 : Geometric Center (upper half of the chamber)
Size of Installed Standard sensor STD.3 : Distance UUC's Sensor f = 2 cm.

**Measurement Results :**

| | Average Standard Reading at each position (°C) | | |
|---|---|---|---|
| **Calibration Point** | **T210** | **T211** | **T212** |
| 121 | 121.18 | 121.12 | 121.13 |

| Autoclave | | | Temperature Distribution | | | | |
|---|---|---|---|---|---|---|---|
| Setting (°C) | Reading (°C) | | Average (°C) | Stability (±°C) | Uniformity (±°C) | Uncertainty (±°C) | Coverage Factor *k* |
| | Min , Max | Average | | | | | |
| 121 | - | 121 | 121.16 | 0.10 | 0.10 | 0.65 | 2.00 |

*** The quoted uncertainty exclude "uniformity"**
**The calibration result apply only the above calibrated item.**
**The result of test was found accurate as shown on date and place of test only.**
**The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .**

**End of Certificate**

**Approved By.** _____

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

NSC-TISI-TIS17025 CALIBRATION 0008

# Certificate of Calibration

**Cert. No.:** 25TM1235
**Page :** 1 of 3

**Equipment :** Incubator
**Manufacturer :** Memmert
**Model :** IPP750eco
**Serial No. :** V821.0172
**ID No. :** BKK_ML0231

REVIEW BY ..... Sithichok T.
APPROVED BY.....
NEXT CAL DATE..... 21/08/26

**Submitted by :** ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang ,
Bangkok 10250 Thailand

**Location :** Incubation & Microbiological Reading

**Received Order :** 21 August 2025
**Calibration Date :** 21 August 2025
**Ambient Temperature :** ( 26 ± 10 ) °C
**Relative Humidity :** ( 50 ± 30 ) %
**AC Line Voltage :** ( 220 ± 22 ) V

**Calibrated by :** Khit Ruttanaprapachai

**Approved by :** Kunchit
Approved Signatory

( ) Chakrit Waewwanjua
( ) Suwit Imjai
(✓) Kunchit Promprat

**Issue Date :** 25 August 2025

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

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| Calibration Point ( °C ) | UUC* Setting ( °C ) | UUC* Reading ( °C ) | Temperature stability ( ± °C ) | Temperature uniformity ( °C ) | Overall Variation ( °C ) | Coverage Factor *k* |
|---|---|---|---|---|---|---|
| 35.0 | 35.0 | 35.0 | 0.12 | 0.37 | 0.43 | 2 |
| 37.0 | 37.0 | 37.0 | 0.15 | 0.47 | 0.49 | 2 |
| 41.5 | 41.5 | 41.5 | 0.13 | 0.79 | 0.84 | 2 |

| Calibration Point ( °C ) | Measured Temperature ( °C ) Position | | | | | | | | | Uncertainty |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | ( ±°C ) |
| 35.0 | 34.834 | 34.929 | 34.924 | 34.849 | 34.856 | 34.954 | 35.002 | 35.002 | 35.127 | 0.30 |
| 37.0 | 36.940 | 37.065 | 37.010 | 36.921 | 36.883 | 36.973 | 37.043 | 37.045 | 37.235 | 0.31 |
| 41.5 | 41.641 | 41.838 | 41.742 | 41.484 | 41.249 | 41.427 | 41.466 | 41.495 | 41.926 | 0.34 |

**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 %.

-o0o-



**Procedure Used :-**

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

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

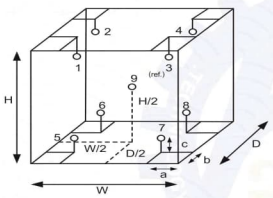
| Instrument | Serial No. | Cert. No. | Traceable | Due Date |
|---|---|---|---|---|
| 1 ) Data Acquisition | MY44073381 | 25LM82 | TPA | 17 May 2026 |

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This measurement result is traceable to the International System of Unit maintained through :

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

**Result of Calibration :-** ( * ) Without Adjustment
**Function of UUC* :** Temperature Source
**Fresh air setting :** Not Available

| Environment during calibration | Beginning | Finished |
|---|---|---|
| Temp. ( °C ) | 21 | 20 |
| REL.Humid. ( % ) | 62 | 65 |
| AC Supply ( Volt ) | 222 | 221 |




| Position : | Ref. Std. ID No.: |
|---|---|
| 1 | 25-01RTD-01 |
| 2 | 25-01RTD-02 |
| 3 | 25-01RTD-03 |
| 4 | 25-01RTD-04 |
| 5 | 25-01RTD-05 |
| 6 | 25-01RTD-06 |
| 7 | 25-01RTD-07 |
| 8 | 25-01RTD-08 |
| 9 (ref.) | 25-01RTD-09 |

**Probe Installation Details :**

| | | |
|---|---|---|
| a = | 10 | cm |
| b = | 10 | cm |
| c = | 10 | cm |

**Dimension of Chamber :**

| | | |
|---|---|---|
| D = | 0.60 | m |
| W = | 1.0 | m |
| H = | 1.2 | m |
| Capacity = | 0.75 | m³ |

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NSC-TISI-TIS17025 CALIBRATION 0008

# Certificate of Calibration

**Cert. No.:** 25TM525
**Page :** 1 of 3

**Equipment :** Hot Air Oven
**Manufacturer :** Binder
**Model :** ED 240/E2
**Serial No. :** 00-15533
**ID No. :** BKK_ML0013

REVIEW BY ..... Sithichok T.
APPROVED BY.....
NEXT CAL DATE..... 09/04/27

**Submitted by :** ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

**Location :** Media Preparation Room

**Received Order :** 08 October 2025
**Calibration Date :** 09 October 2025
**Ambient Temperature :** ( 26 ± 10 ) °C
**Relative Humidity :** ( 50 ± 30 ) %
**AC Line Voltage :** ( 220 ± 22 ) V

**Calibrated by :** Uthen Kankawi

**Approved by :** Kunchit
Approved Signatory

( ) Chakrit Waewwanjua
( ) Suwit Imjai
(✓) Kunchit Promprat

**Issue Date :** 16 October 2025

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

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**Equipment :** Hot Air Oven
**Condition As-Received :** Used Item
**Reference :** 2510-0042OC-3

**Cert. No.:** 25TM525
**Page :** 2 of 3

**Procedure Used :-**

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 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:-

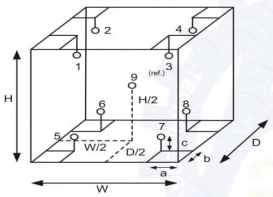
| Instrument | Serial No. | Cert. No. | Traceable | Due Date |
|---|---|---|---|---|
| 1 ) Data Acquisition | MY59003411 | 24LM192 | TPA | 24 Dec 2025 |

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This measurement result is traceable to the International System of Unit maintained through :

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

**Result of Calibration :-** ( * ) Without Adjustment
**Function of UUC* :** Temperature Source
**Fresh air setting :** Close

| Environment during calibration | | |
|---|---|---|
| | Beginning | Finished |
| Temp. ( °C ) | 23 | 24 |
| REL.Humid. ( % ) | 54 | 56 |
| AC Supply ( Volt ) | 220 | 221 |




| Position : | Ref. Std. ID No.: |
|---|---|
| 1 | 23-20TC-01 |
| 2 | 23-20TC-02 |
| 3 | 23-20TC-03 |
| 4 | 23-20TC-04 |
| 5 | 23-20TC-05 |
| 6 | 23-20TC-06 |
| 7 | 23-20TC-07 |
| 8 | 23-20TC-08 |
| 9 (ref.) | 23-20TC-09 |

**Probe Installation Details :**

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

**Dimension of Chamber :**

D = 0.50 m
W = 0.80 m
H = 0.60 m
Capacity = 0.24 m³

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

ilac-MRA
NSC-TISI-TIS17025
CALIBRATION 0008

# Certificate of Calibration

**Cert. No.:** 26TM111
**Page :** 1 of 3

REVIEW BY ..... Sithichok T.
APPROVED BY.....
NEXT CAL DATE..... 04/02/27

**Equipment :** Water Bath
**Manufacturer :** Memmert
**Model :** WNE 45
**Serial No. :** L712.0429
**ID No. :** BKK_ML0056

**Submitted by :** ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

**Location :** Incubation & Microbiological Reading

**Received Order :** 04 February 2026
**Calibration Date :** 04 - 05 February 2026
**Ambient Temperature :** ( 26 ± 10 ) °C
**Relative Humidity :** ( 50 ± 30 ) %
**AC Line Voltage :** ( 220 ± 22 ) V

**Calibrated by :** Preecha Hlahib

**Approved by :**

Approved Signatory

( ) Chakrit Waewwanjua
(✓) Suwit Imjai
( ) Kunchit Promprat

**Issue Date :** 16 February 2026

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

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**Equipment :** Hot Air Oven
**Condition As-Received :** Used Item
**Reference :** 2510-0042OC-3
**Result of Calibration :-** ( * ) Without Adjustment
**Function of UUC* :** Temperature Source
**Fresh air setting :** Close

**Cert. No.:** 25TM525
**Page :** 3 of 3

| Calibration Point ( °C ) | UUC* Setting ( °C ) | UUC* Reading ( °C ) | Temperature stability ( ± °C ) | Temperature uniformity ( °C ) | Overall Variation ( °C ) | Coverage Factor *k* |
|---|---|---|---|---|---|---|
| 170 | 170 | 170 | 0.45 | 1.3 | 2.3 | 2 |

| Calibration Point | Measured Temperature ( °C ) Position | | | | | | | | | Uncertainty |
|---|---|---|---|---|---|---|---|---|---|---|
| ( °C ) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | ( ±°C ) |
| 170 | 169.588 | 170.427 | 168.486 | 168.900 | 169.725 | 169.499 | 168.946 | 169.327 | 169.529 | 1.3 |

**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 %.

-o0o-

**Equipment :** Water Bath
**Condition As-Received :** Used Item
**Reference :** 2602-0026OC-1

**Cert. No.:** 26TM111
**Page :** 2 of 3

**Procedure Used :-**

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer ( IPRT ).

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

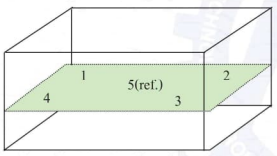
| Instrument | Serial No. | Cert. No. | Traceable | Due Date |
|---|---|---|---|---|
| 1 ) Data Acquisition | MY59003411 | 25LM177 | TPA | 26 Dec 2026 |

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This measurement result is traceable to the International System of Unit maintained through :

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

**Result of Calibration :-** ( * ) Without Adjustment
**Function of UUC* :** Temperature Source
**Heat transfer medium used :** Water

| | Environmental | | AC Voltage Supply |
|---|---|---|---|
| | ( °C ) | ( %R.H. ) | ( Volt ) |
| **Beginning of Calibration** | 25 | 55 | 220 |
| **Finished of Calibration** | 20 | 69 | 220 |




Front

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

**Equipment :** Water Bath
**Condition As-Received :** Used Item
**Reference :** 2602-0026OC-1
**Result of Calibration :-** ( * ) Without Adjustment
**Function of UUC* :** Temperature Source

**Cert. No.:** 26TM111
**Page :** 3 of 3

| Calibration point ( °C ) | UUC* Setting ( °C ) | UUC* Reading ( °C ) | Average* Standard Reading ( °C ) Position 1 | 2 | 3 | 4 | 5 (ref.) | Uncertainty ( ± °C ) |
|---|---|---|---|---|---|---|---|---|
| 44.5 | 44.4 | 44.4 | 44.462 | 44.470 | 44.480 | 44.460 | 44.457 | 0.15 |
| 45.0 | 44.9 | 44.9 | 44.958 | 44.971 | 44.983 | 44.965 | 44.966 | 0.15 |

| Calibration point ( °C ) | Uniformity ( °C ) | Stability ( ± °C ) | Coverage Factor *k* |
|---|---|---|---|
| 44.5 | 0.051 | 0.025 | 2 |
| 45.0 | 0.047 | 0.032 | 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 %.

**-o0o-**

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# Certificate of System Qualification

GC-OQ + GCMS-OQ

| | |
|---|---|
| System ID: | GM-10 |
| Organization Name: | ALS Laboratory Group (Thailand) Co., Ltd. |
| Organization Location: | 104 Patthanakarn 40, Patthanakarn Rd., Kwang Suan Luang, Khet Suan Luang, Bangkok 10250 |
| Date: | November 21, 2025 4:19:13 PM |
| EQP Name: | AgilentRecommended , AgilentRecommended |
| EQP Revision: | GC.02.55, GCMS.02.56 |
| Overall Qualification Status: | Pass |

REVIEW BY Suchada T.
APPROVED BY Nant Sont
NEXT CAL. DATE 21-May-27

## CDS Logon Verification - GC

Logon: asbkk.env03

**Overall CDS Logon Verification Test 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 Pressure Accuracy

Name: 7890
Front MMI

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

| | Setpoint | | Actual | |
|---|---|---|---|---|
| Inlet Pressure: | 25.0 | psi | 25.0 | psi |
| Accuracy: | | | 0.0 | psi |
| Agilent Recommended: | | <= | 1.2 | |



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**Overall Inlet Pressure Accuracy Test Status**

Pass

## GC Oven Temperature Accuracy

Name: 7890

**Setpoint Status:** **Pass**
Zone: Oven

| | Setpoint | Actual | | | |
|---|---|---|---|---|---|
| Temperature: | 230.0 | 228.9 | °C | | |
| Accuracy: | | -1.1 | °C | | |
| Agilent Recommended: | >= -1.0 | % setpoint in K | ( -5.0 | °C ) | |
| | <= 1.0 | % setpoint in K | ( 5.0 | °C ) | |

**Setpoint Status:** **Pass**
Zone: Oven

| | Setpoint | Actual | | | |
|---|---|---|---|---|---|
| Temperature: | 100.0 | 101.0 | °C | | |
| Accuracy: | | 1.0 | °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

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

| | Setpoint | Average | |
|---|---|---|---|
| Temperature: | 100.0 | 101.0 | °C |
| Stability: | | 0.0 | °C |
| Agilent Recommended: | <= | 0.5 | |

**Overall GC Oven Temperature Stability Test Status**

Pass



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## Tune EI

Tested Combination1 Front MMI / External TQ
Name: 7000D

**Setpoint Status:** **Pass**
Filament: 1

**Setpoint Status:** **Pass**
Filament: 2

**Overall Tune EI Test Status**

Pass

## Scouting Run

Tested Combination1 Front MMI / External TQ
Injection Tower
Name: 7693A
Source: EI - Extractor

**Setpoint Status:** **Completed**
Injection Volume on Column: 1.0 uL

**Overall Scouting Run Status**

Completed

## Instrument Detection Limit

Tested Combination1 Front MMI / External TQ
Injection Tower
Name: 7693A
Source: EI - Extractor

| | | |
|---|---|---|
| **Setpoint Status:** | **Pass** | |
| Injection Volume on Column: | 1.0 uL | |
| | Area | Retention Time |
| Minimum RSD: | 6.27 % | 0.01 % |
| Agilent Recommended: | <= 12.00 | <= 1.00 |
| Status: | Pass | Pass |
| Instrument Detection Limit: | 2.11008 fg | |
| Agilent Recommended: | <= 4.03800 | |
| Status: | Pass | |

**Overall Instrument Detection Limit Test Status**

Pass

**Mass Ratio Precision**

Tested Combination1 Front MMI / External TQ

Injection Tower

| | | |
|---|---|---|
| Name: | 7693A | |
| Source: | EI - Extractor | |
| **Setpoint Status:** | **Pass** | |
| Injection Volume on Column: | 0.5 uL | |
| | Area Mass 1 Abundance*s | Mass Ratio |
| RSD: | 4.35 % | 0.26 % |
| Agilent Recommended: | <= 5.00 | <= 5.00 |
| | Pass | Pass |

**Overall Mass Ratio Precision Test Status**

Pass

NOTE: This test's 0 comment(s) and 3 deviation(s) are available in the Attachments section.





# Instrument Details

**Purpose**

This section describes the as found system configuration.

**Details**

| | |
|---|---|
| System | |
| System ID | GM-10 |
| 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 | External |
| LTM Included? | No |
| Sampler 1 | |
| Manufacturer | Agilent Technologies |
| Type | Injection Tower |
| Name | 7693A |
| Model Number | G4513A |
| Serial Number | CN18180003 |
| Firmware Revision | A.11.02 |
| Usage | Sample Injection |
| Location | Front |
| Syringe Volume (µL) | 10 |





| | |
|---|---|
| Sampler 2 | |
| Manufacturer | Agilent Technologies |
| Type | Tray |
| Name | 7693A |
| Model Number | G4514A |
| Serial Number | CN18170137 |
| Firmware Revision | A.11.03 |
| Vial Heater | Not installed |
| Mainframe 1 | |
| Manufacturer | Agilent Technologies |
| Name | 7890 |
| Model Number | G3442B |
| Serial Number | CN18153080 |
| Firmware Revision | B.02.05 |
| Oven Type | Standard |
| Inlet 1 | |
| Manufacturer | Agilent Technologies |
| Name | 7890 |
| Type | MMI |
| Location | Front |
| Carrier Gas | Helium |
| Control Type | Electronic Pressure Control (EPC) |
| Purged Inlet | Yes |
| Inlet 2 | |
| Manufacturer | Agilent Technologies |
| Name | 7890 |
| Type | SSL |
| Location | Back |
| Carrier Gas | Helium |
| Control Type | Electronic Pressure Control (EPC) |
| Purged Inlet | Yes |





| | |
|---|---|
| Detector 1 | |
| Manufacturer | Agilent Technologies |
| Name | Mass Spectrometer |
| Type | Mass Spectrometer |
| Location | External |
| Mass Spectrometer 1 | |
| Manufacturer | Agilent Technologies |
| Type | TQ |
| Name | 7000D |
| Model Number | G7000D |
| Serial Number | US1826U108 |
| Firmware Revision | G.7000.085A |
| High Vacuum System | Turbo Pump |
| Liquid Injection Scouting Run Standard | OFN Std |
| MS EI Source 1 | |
| Manufacturer | Agilent Technologies |
| Source Type | EI - Extractor |
| Number of filaments | 2 |

# 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 logon 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.)

### Details

| | |
|---|---|
| Full Name of Signer: | Supasak Nimsongtham |
| Logged On User Name: | supasak.nimsongtham@agilent.com |
| Signature Creation Date: | November 21, 2025 |
| Reason for Signature: | Executed protocol and published this original version of document |

### ACE Self Qualification Status

The installed version of ACE used to deliver this service passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder location SDS\ClearStore\AceSelfQualification.

### Regulatory Disclaimer

This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation 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 program.

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User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 9:58:15 AM | start | Execution | System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated | None |
| November 21, 2025 9:58:23 AM | End | Execution | System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated | Run Count : 1 |
| November 21, 2025 9:58:54 AM | start | Execution | Inlet Pressure Accuracy - Front MMI: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi | None |
| November 21, 2025 9:59:07 AM | End | Execution | Inlet Pressure Accuracy - Front MMI: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi | Run Count : 1 |
| November 21, 2025 9:59:08 AM | start | Execution | GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | None |
| November 21, 2025 10:06:29 AM | Audit | Data | GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | Manual Data Entry |
| November 21, 2025 10:06:31 AM | End | Execution | GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | Run Count : 1 |
| November 21, 2025 10:07:15 AM | start | Execution | GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | None |
| November 21, 2025 10:10:33 AM | start | Execution | GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | None |

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User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 9:34:45 AM | Audit | SessionCreated | Session | Host Name: 5CG1115HKC, Drive Serial Number: C2031778 |
| November 21, 2025 9:34:46 AM | start | Configuration | Session | None |
| November 21, 2025 9:34:46 AM | Audit | Entitlement | Licensing | User is Nonpaying and does not require an unlock code |
| November 21, 2025 9:35:07 AM | Audit | EqpLoaded | Session | EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.55/Gc.02.55.eqp], EQP File Name: [Gc.02.55.eqp], EQP Name: [AgilentRecommended],Protocol Revision :[Gc.02.55] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.56/GcMs.02.56.eqp], EQP File Name: [GcMs.02.56.eqp], EQP Name: [AgilentRecommended] |
| November 21, 2025 9:35:11 AM | End | Configuration | Session | None |
| November 21, 2025 9:35:16 AM | start | Qualification | Session | OQ |
| November 21, 2025 9:35:16 AM | start | Execution | CDS Logon Verification - GC - 7890: - Qualitative test | None |
| November 21, 2025 9:58:13 AM | End | Execution | CDS Logon Verification - GC - 7890: - Qualitative test | Run Count : 1 |

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User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 10:10:44 AM | Audit | Data | GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | Manual Data Entry |
| November 21, 2025 10:10:47 AM | End | Execution | GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | Run Count : 1 |
| November 21, 2025 10:10:48 AM | start | Execution | GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C | None |
| November 21, 2025 10:37:01 AM | Audit | Data | GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C | Manual Data Entry |
| November 21, 2025 10:37:03 AM | End | Execution | GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C | Run Count : 1 |
| November 21, 2025 10:37:06 AM | start | Execution | Tune EI - 7000D TQ: - Source: - EI - Extractor Filament 1 (Qualitative - No setpoints associated) | None |
| November 21, 2025 10:37:32 AM | End | Execution | Tune EI - 7000D TQ: - Source: - EI - Extractor Filament 1 (Qualitative - No setpoints associated) | Run Count : 1 |
| November 21, 2025 10:38:12 AM | start | Execution | Tune EI - 7000D TQ: - Source: - EI - Extractor Filament 2 (Qualitative - No setpoints associated) | None |
| November 21, 2025 10:38:35 AM | End | Execution | Tune EI - 7000D TQ: - Source: - EI - Extractor Filament 2 (Qualitative - No setpoints associated) | Run Count : 1 |

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System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 10:50:13 AM | Audit | AceClosed | Session | None |
| November 21, 2025 12:43:22 PM | Audit | AceRestarted | Session | Host Name: 5CG1115HKC, Drive Serial Number: C2031778 |
| November 21, 2025 12:43:24 PM | Audit | SessionReloaded | Session | None |
| November 21, 2025 12:43:56 PM | start | Qualification | Session | OQ |
| November 21, 2025 12:47:36 PM | start | Execution | Scouting Run - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor- Part of GCMS System Preparation | None |
| November 21, 2025 12:47:39 PM | Audit | AceClosed | Session | None |
| November 21, 2025 12:58:52 PM | Audit | AceRestarted | Session | Host Name: 5CG1115HKC, Drive Serial Number: C2031778 |
| November 21, 2025 12:58:53 PM | Audit | SessionReloaded | Session | None |
| November 21, 2025 12:59:22 PM | start | Qualification | Session | OQ |
| November 21, 2025 12:59:22 PM | start | Execution | Scouting Run - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor- Part of GCMS System Preparation | None |
| November 21, 2025 1:01:06 PM | Audit | Data | Scouting Run - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor- Part of GCMS System Preparation | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM -11 OQ2025\data id\data id\ScoutingRun001.D |

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System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 1:02:12 PM | Audit | Data | Instrument Detection Limit - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM -11 OQ2025\data id\data id\IDL_002.D |
| November 21, 2025 1:02:12 PM | Audit | Data | Instrument Detection Limit - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM -11 OQ2025\data id\data id\IDL_003.D |
| November 21, 2025 1:02:12 PM | Audit | Data | Instrument Detection Limit - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM -11 OQ2025\data id\data id\IDL_004.D |
| November 21, 2025 1:02:12 PM | Audit | Data | Instrument Detection Limit - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM -11 OQ2025\data id\data id\IDL_005.D |
| November 21, 2025 1:02:12 PM | Audit | Data | Instrument Detection Limit - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM -11 OQ2025\data id\data id\IDL_006.D |
| November 21, 2025 1:02:12 PM | Audit | Data | Instrument Detection Limit - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM -11 OQ2025\data id\data id\IDL_007.D |

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System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 1:01:16 PM | Audit | Reporting | Reintegration | Reintegration Count: 1 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 500;Integration: Off at 0;Integration: On at 4 ] |
| November 21, 2025 1:01:22 PM | Audit | Reporting | Reintegration | Reintegration Count: 2 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 200;Integration: Off at 0;Integration: On at 4 ] |
| November 21, 2025 1:01:26 PM | End | Execution | Scouting Run - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor- Part of GCMS System Preparation | Run Count : 1 |
| November 21, 2025 1:01:29 PM | start | Execution | Instrument Detection Limit - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Rel. Time): <= 1.00% | None |
| November 21, 2025 1:02:12 PM | Audit | Data | Instrument Detection Limit - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM -11 OQ2025\data id\data id\IDL_001.D |

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System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 1:02:12 PM | Audit | Data | Instrument Detection Limit - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM -11 OQ2025\data id\data id\IDL_008.D |
| November 21, 2025 1:02:12 PM | Audit | Data | Instrument Detection Limit - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM -11 OQ2025\data id\data id\IDL_009.D |
| November 21, 2025 1:02:12 PM | Audit | Data | Instrument Detection Limit - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM -11 OQ2025\data id\data id\IDL_010.D |
| November 21, 2025 1:02:37 PM | End | Execution | Instrument Detection Limit - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00% | Run Count : 1 |
| November 21, 2025 1:02:47 PM | start | Execution | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | None |
| November 21, 2025 1:04:01 PM | Audit | AceClosed | Session | None |
| November 21, 2025 2:06:08 PM | Audit | AceRestarted | Session | Host Name: 5CG1115HKC, Drive Serial Number: C2031778 |
| November 21, 2025 2:06:08 PM | Audit | SessionReloaded | Session | None |

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User Name: supasak.nimsongtham
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System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 2:06:38 PM | start | Qualification | Session | OQ |
| November 21, 2025 2:06:38 PM | start | Execution | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | None |
| November 21, 2025 2:09:29 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_001.D |
| November 21, 2025 2:09:29 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_002.D |
| November 21, 2025 2:09:29 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_003.D |
| November 21, 2025 2:09:29 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_004.D |







User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC
System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 2:13:04 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_001.D |
| November 21, 2025 2:13:04 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_002.D |
| November 21, 2025 2:13:04 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_003.D |
| November 21, 2025 2:13:04 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_004.D |
| November 21, 2025 2:13:04 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_005.D |
| November 21, 2025 2:13:04 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_007.D |







User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC
System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 2:09:29 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_005.D |
| November 21, 2025 2:09:29 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_006.D |
| November 21, 2025 2:09:56 PM | Audit | Reporting | Reintegration | Reintegration Count: 1 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 5000;Integration: Off at 0;Integration: On at 6 ] |
| November 21, 2025 2:11:25 PM | End | Execution | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Run Count : 1 |
| November 21, 2025 2:12:24 PM | Audit | TestUnlocked | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Deviation filed for Run Count : 1 |
| November 21, 2025 2:12:24 PM | start | Execution | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | None |







User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC
System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 2:13:14 PM | Audit | Reporting | Reintegration | Reintegration Count: 1 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 5000;Integration: OFF at 0;Integration: ON at 6 ] |
| November 21, 2025 2:13:24 PM | End | Execution | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Run Count : 2 |
| November 21, 2025 2:14:33 PM | Audit | TestUnlocked | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Deviation filed for Run Count : 2 |
| November 21, 2025 2:14:33 PM | start | Execution | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | None |
| November 21, 2025 2:15:55 PM | Audit | AceClosed | Session | None |
| November 21, 2025 2:16:38 PM | Audit | AceRestarted | Session | Host Name: 5CG1115HKC, Drive Serial Number: C2031778 |
| November 21, 2025 2:16:39 PM | Audit | SessionReloaded | Session | None |
| November 21, 2025 2:17:00 PM | start | Qualification | Session | OQ |
| November 21, 2025 2:17:00 PM | start | Execution | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | None |

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System Id: GM-10
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**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 2:17:46 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_001.D |
| November 21, 2025 2:17:46 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_002.D |
| November 21, 2025 2:17:46 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_003.D |
| November 21, 2025 2:17:46 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_004.D |
| November 21, 2025 2:17:46 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_005.D |
| November 21, 2025 2:17:46 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\data mrp\data mrp\MRP_007.D |





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**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 2:18:36 PM | Audit | Reporting | Reintegration | Reintegration Count: 5 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 100;Initial Peak Width: 0.001;Initial Area Reject: 0;Initial Height Reject: 5000;Integration: Off at 0;Integration: On at 6 ] |
| November 21, 2025 2:18:59 PM | Audit | Reporting | Reintegration | Reintegration Count: 6 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 100;Initial Peak Width: 0.001;Initial Area Reject: 0;Initial Height Reject: 5000;Integration: Off at 0;Integration: On at 6;Integration: Off at 6.5 ] |
| November 21, 2025 2:19:08 PM | Audit | Reporting | Reintegration | Reintegration Count: 7 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 100;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 5000;Integration: Off at 0;Integration: On at 6;Integration: Off at 6.5 ] |





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**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 2:18:01 PM | Audit | Reporting | Reintegration | Reintegration Count: 1 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 5000;Integration: Off at 0;Integration: On at 6 ] |
| November 21, 2025 2:18:09 PM | Audit | Reporting | Reintegration | Reintegration Count: 2 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.05;Initial Area Reject: 0;Initial Height Reject: 5000;Integration: Off at 0;Integration: On at 6 ] |
| November 21, 2025 2:18:18 PM | Audit | Reporting | Reintegration | Reintegration Count: 3 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 50;Initial Peak Width: 0.05;Initial Area Reject: 0;Initial Height Reject: 5000;Integration: Off at 0;Integration: On at 6 ] |
| November 21, 2025 2:18:24 PM | Audit | Reporting | Reintegration | Reintegration Count: 4 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 100;Initial Peak Width: 0.05;Initial Area Reject: 0;Initial Height Reject: 5000;Integration: Off at 0;Integration: On at 6 ] |





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**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 2:19:28 PM | Audit | Reporting | Reintegration | Reintegration Count: 8 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 100;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 5000;Integration: Off at 0;Integration: On at 6;Integration: Off at 6.4 ] |
| November 21, 2025 2:19:47 PM | End | Execution | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Run Count : 3 |
| November 21, 2025 2:21:48 PM | Audit | TestUnlocked | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Deviation filed for Run Count : 3 |
| November 21, 2025 2:21:48 PM | start | Execution | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | None |
| November 21, 2025 4:03:34 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\mrp2\mrp2\MRP001.D |
| November 21, 2025 4:03:34 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\mrp2\mrp2\MRP002.D |

User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 4:03:34 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\mrp2\mrp2\MRP003.D |
| November 21, 2025 4:03:34 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\mrp2\mrp2\MRP004.D |
| November 21, 2025 4:03:34 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\mrp2\mrp2\MRP005.D |
| November 21, 2025 4:03:34 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : C:\Users\imsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\mrp2\mrp2\MRP006.D |
| November 21, 2025 4:03:46 PM | Audit | AceClosed | Session | None |
| November 21, 2025 4:05:37 PM | Audit | AceRestarted | Session | Host Name: 5CG1115HKC, Drive Serial Number: C2031778 |
| November 21, 2025 4:05:38 PM | Audit | SessionReloaded | Session | None |



**Date:** November 21, 2025 4:19:13 PM
**System ID:** GM-10





User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 4:07:34 PM | Audit | Reporting | Reintegration | Reintegration Count: 1 -- [ Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 5000;Integration: Off at 0;Integration: On at 6 ] |
| November 21, 2025 4:07:45 PM | End | Execution | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Run Count : 4 |
| November 21, 2025 4:07:56 PM | End | Qualification | Session | OQ |
| November 21, 2025 4:07:56 PM | start | Reporting | Session | None |
| November 21, 2025 4:15:31 PM | Audit | Reporting | Session | Report Generated : Certificate |
| November 21, 2025 4:18:48 PM | Audit | Reporting | Session | Report Generated : Report |



**Date:** November 21, 2025 4:19:13 PM
**System ID:** GM-10



BKK_EL0037



User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

**GM-10 2025 Transaction log :**

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---|---|---|---|---|
| November 21, 2025 4:06:03 PM | start | Qualification | Session | OQ |
| November 21, 2025 4:06:03 PM | start | Execution | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | None |
| November 21, 2025 4:06:14 PM | Audit | Data | DataManager | DataManager was in a data verification state but the user chose to start over |
| November 21, 2025 4:07:14 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : E:\mrp2\mrp2\MRP001.D |
| November 21, 2025 4:07:14 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : E:\mrp2\mrp2\MRP002.D |
| November 21, 2025 4:07:14 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : E:\mrp2\mrp2\MRP003.D |
| November 21, 2025 4:07:14 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : E:\mrp2\mrp2\MRP004.D |
| November 21, 2025 4:07:14 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : E:\mrp2\mrp2\MRP005.D |
| November 21, 2025 4:07:14 PM | Audit | Data | Mass Ratio Precision - Injection Tower, Front MMI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00% | Data files Path : E:\mrp2\mrp2\MRP006.D |



**Date:** November 21, 2025 4:19:13 PM
**System ID:** GM-10



**Agilent Technologies**

Agilent Technologies (Thailand) Limited
U CHU LIANG BLDG. 22/F UNIT A,D
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Tel. +662 637 6363
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Email: ccc-smt@agilent.com
Website: www.agilent.com/chem

**Customer Contact:**
ALS Laboratory Group (Thailand) Co Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd Khwaeng Phatthanakan Khet Suan

TAX ID : 0105540004859

supakwan.mak@alsglobal.com
087-622-7264

**Invoice To:**
ALS Laboratory Group (Thailand) Co Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd Khwaeng Phatthanakan Khet Suan

**Delivery Site:**
ALS Laboratory Group (Thailand) Co Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd Khwaeng Phatthanakan Khet Suan

**Location:**
**Room**
**Bldg**
**Lab**
**Dept**

## SERVICE REPORT

| | |
|---|---|
| **Customer Purchase Order Number:** | **Customer Number:** 70371013 |
| **Service Request:** | **Service Request Date:** |
| **Service Order:** 6008258477 | **Service Confirmation:** 6906892140 |

REVIEW BY Pienphen C.
APPROVED BY Saowtr N.
NEXT CAL. DATE 22 Feb 2027

**Direct Inquiries to:**
Contact Name: Customer Contact Center
Contact E-mail: ccc-smt@agilent.com
Contact Telephone: +662 637 6363
Contact Fax: +662 632 4334

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Bangkok 10500 Thailand
Tax ID : 0105542068218

Citibank N.A. Bangkok Branch
399 Interchange 21 Building, Sukhumvit Road, Klongtoey Nau Sub-district, Wattana District, Bangkok 10110 Thailand
Acc. No: 012-4452-007 ,
THB:Krung Thai Bank PCL
Siam Square Br.,416/1-2 Rama I Rd.,Pathumwan, BKK 10330 Thailand

ORIGINAL

**Service Confirmation Number:** 6906892140
**Service Confirmation Date:** 23.02.2026

**Service Instrument:**

| Model Number | Model Description | Serial Number | System Handle | Parent Asset |
|---|---|---|---|---|
| SYS-IO-5100 | ICP-OES 5100/5110 System | | | |
| G8010A | Agilent 5100 SVDV ICP-OES Spectrometer | MY16010005 | ICP OES 5100 | SYS-IO-5100 |
| G8410A | SPS 4 Autosampler | AU15440764 | ICP OES 5100 | SYS-IO-5100 |

**Service Items:**

| Item | Service/Part # | Description | Qty | Entitlement | Service Start | Service End |
|---|---|---|---|---|---|---|
| 1000 | EOQ | Enterprise Operational Qualification | 1.00 | Agreement Entitlement - 100 % covered | 23.02.2026 | 23.02.2026 |
| 1010 | 6610030100 | Bottle ICP-OES Wavecal soln 500mL 5 ppm | 1.00 | Agreement Entitlement - 100 % covered | | |
| 1020 | 5190-7001 | Calibration blank solution 5pct HNO3 | 1.00 | Agreement Entitlement - 100 % covered | | |

**Additional Information:**




SCG CEMENT-BUILDING MATERIALS

Metrological Center
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th


**Certificate No. T250355** 

# Certificate of Calibration

**Equipment** : HEATING BLOCK
**Manufacturer** : Environmental Express
**Model** : SC 196
**Serial No.** : 6974CECW3285
**Customer Code** : BKK_EL0054
**ID No.** : T5306A3
**Customer** : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250
**Customer Location** : Acid Digestion Lab
**Date of Receipt** : 26 February 2025
**Calibrated By** : Atiphong Rongrat ( Technician )
**Approved By** : _____ / Boonchai Suriyawong (Site Calibration Manager)
**Date of Issue** : 17 MAR 2025

REVIEW BY Tattaporn C.
APPROVED BY Boonchai N.
NEXT CAL. DATE 04/09/25

**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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.**



**Service Confirmation Number:** 6906892140
**Service Confirmation Date:** 23.02.2026

**Service Information:**

**Problem Description:**
TT-EOQ-IO-5100-5001541158

```
-Perform OQ Hardware completed.
-Instrument ID: ICPOES-BKK_EL0037.
-Instrument Tests are all Passed.
```

**Service Overview Code:**
Reason Code: Scheduled Service
Diagnosis Code: Scheduled Service
Resolution Code: Scheduled Service

| Reported Hours: | Travel Hours: | |
|---|---|---|
| 2.5 | 1.5 | |
| **Customer Field Service Representative Name:** Uthai Ngamlertsirichai | **Customer Field Service Representative Signature:** Uthai Ng | **Date:** 23 Feb 2026 |
| **Customer Name:** Pronphen Chobson | **Customer Signature:** Pronphen C. | **Date:** 23 Feb 2026 |

**Additional Comments:**



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Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

**Certificate No. T250355** 

# Calibration Report

**Equipment** : **HEATING BLOCK**
**Date of Calibration** : **4 March 2025**
**Environment** : **Temperature : 24.4-24.9 °C**
**Line Voltage : 221.6-226.3 V**
**Relative Humidity : 55 - 65 %RH**

**Condition of this results of calibration :**

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20.
   All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

| Instrument | Model | Instrument No. | Certificate No. | Due Date |
|---|---|---|---|---|
| TC | TYPE T | TN221-TN230 | T240712 | 19 April 2025 |
| TC | TYPE T | TN231-TN240 | T240712 | 19 April 2025 |
| TC | TYPE T | TN241-TN250 | T240401 | 16 March 2025 |
| TC | TYPE T | TN251-TN260 | T240401 | 16 March 2025 |
| DATA LOGGER | 34970A | T193 | T240401 | 16 March 2025 |

3. This certificate is traceable to :
   National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)
4. Condition of calibrated item : good
   Equipment Description :
   Time Constant 2 Hour 40 Minute At 95 °C
   Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
   ☐ Close
   ☒ Not Available
5. Adjustment :
   ( ) without adjustment ( X ) after adjustment

**Approved By,** _____

# Metrological Center

SCI ECO Services Company Limited

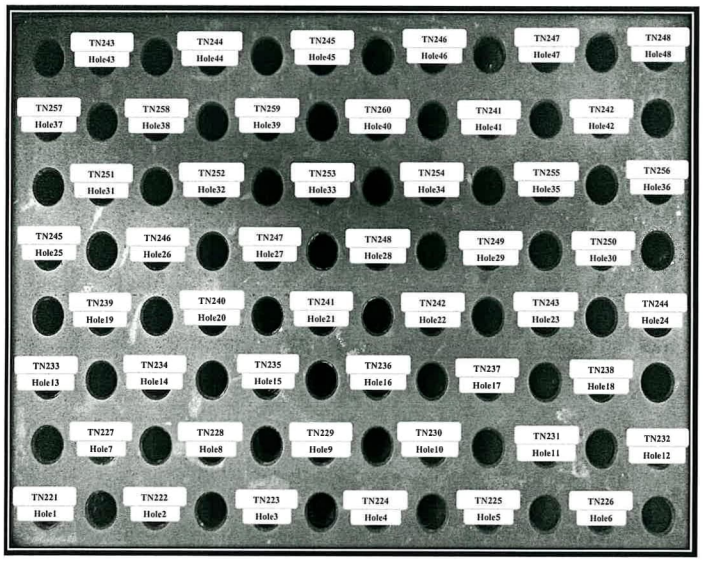
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110

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## Calibration Report




FRONT CONTROL

Approved By.




# Metrological Center

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Website : www.scieco.co.th E-Mail : calibrate@scg.co.th




## Calibration Report

**Measurement Results**

| Calibration Point | | Average Standard Reading at each position (°C) | | | | | |
|---|---|---|---|---|---|---|---|
| R1 Hole1-Hole6 | | TN221 | TN222 | TN223 | TN224 | TN225 | TN226 |
| CAL POINT | Max | 94.85 | 95.37 | 95.03 | 95.25 | 95.52 | 94.75 |
| 95 | Min | 94.17 | 94.66 | 94.38 | 94.63 | 94.87 | 94.12 |
| | Average | 94.51 | 95.02 | 94.70 | 94.94 | 95.20 | 94.43 |
| R2 Hole7-Hole12 | | TN227 | TN228 | TN229 | TN230 | TN231 | TN232 |
| | Max | 94.71 | 94.56 | 94.79 | 95.32 | 95.44 | 95.06 |
| | Min | 94.05 | 93.88 | 94.10 | 94.65 | 94.90 | 94.65 |
| | Average | 94.38 | 94.22 | 94.44 | 94.99 | 95.17 | 94.85 |
| R3 Hole13-Hole18 | | TN233 | TN234 | TN235 | TN236 | TN237 | TN238 |
| | Max | 95.26 | 95.43 | 95.40 | 95.71 | 95.41 | 95.06 |
| | Min | 94.54 | 94.64 | 94.71 | 95.10 | 94.86 | 94.42 |
| | Average | 94.90 | 95.03 | 95.06 | 95.41 | 95.13 | 94.74 |
| R4 Hole19-Hole24 | | TN239 | TN240 | TN241 | TN242 | TN243 | TN244 |
| | Max | 95.13 | 95.06 | 95.68 | 96.16 | 95.35 | 95.80 |
| | Min | 94.39 | 94.43 | 94.86 | 95.51 | 94.88 | 95.12 |
| | Average | 94.76 | 94.75 | 95.27 | 95.83 | 95.12 | 95.46 |
| R5 Hole25-Hole30 | | TN245 | TN246 | TN247 | TN248 | TN249 | TN250 |
| | Max | 94.95 | 95.81 | 95.39 | 95.82 | 95.66 | 95.66 |
| | Min | 94.47 | 95.03 | 94.67 | 94.99 | 94.84 | 94.87 |
| | Average | 94.71 | 95.42 | 95.03 | 95.41 | 95.25 | 95.27 |
| R6 Hole31-Hole36 | | TN251 | TN252 | TN253 | TN254 | TN255 | TN256 |
| | Max | 96.07 | 95.34 | 96.28 | 95.39 | 94.95 | 95.12 |
| | Min | 95.28 | 94.55 | 95.51 | 94.62 | 94.13 | 94.35 |
| | Average | 95.67 | 94.95 | 95.90 | 95.00 | 94.54 | 94.73 |
| R7 Hole37-Hole42 | | TN257 | TN258 | TN259 | TN260 | TN241 | TN242 |
| | Max | 95.15 | 95.63 | 96.11 | 95.09 | 95.34 | 95.51 |
| | Min | 94.38 | 94.88 | 95.32 | 94.28 | 94.54 | 94.72 |
| | Average | 94.76 | 95.25 | 95.71 | 94.69 | 94.94 | 95.11 |
| R8 Hole43-Hole48 | | TN243 | TN244 | TN245 | TN246 | TN247 | TN248 |
| | Max | 95.84 | 95.87 | 95.44 | 95.72 | 95.65 | 95.75 |
| | Min | 95.06 | 95.10 | 94.60 | 94.95 | 94.87 | 94.98 |
| | Average | 95.45 | 95.48 | 95.02 | 95.34 | 95.26 | 95.36 |

Approved By.




# Metrological Center

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Website : www.scieco.co.th E-Mail : calibrate@scg.co.th




## Calibration Report

**Measurement Results**

| Calibration Point | | Average Standard Reading at each position (°C) | | | | | |
|---|---|---|---|---|---|---|---|
| R1 Hole1-Hole6 | | TN221 | TN222 | TN223 | TN224 | TN225 | TN226 |
| CAL POINT | Max | 104.48 | 104.40 | 104.60 | 105.27 | 105.24 | 105.19 |
| 105 | Min | 104.15 | 104.02 | 104.25 | 104.94 | 104.91 | 104.93 |
| | Average | 104.32 | 104.21 | 104.42 | 105.10 | 105.08 | 105.06 |
| R2 Hole7-Hole12 | | TN227 | TN228 | TN229 | TN230 | TN231 | TN232 |
| | Max | 105.20 | 105.45 | 105.58 | 105.96 | 105.81 | 106.03 |
| | Min | 104.92 | 105.14 | 105.29 | 105.64 | 105.53 | 105.79 |
| | Average | 105.06 | 105.29 | 105.43 | 105.80 | 105.67 | 105.91 |
| R3 Hole13-Hole18 | | TN233 | TN234 | TN235 | TN236 | TN237 | TN238 |
| | Max | 106.09 | 106.14 | 105.83 | 106.25 | 105.97 | 105.88 |
| | Min | 105.80 | 105.89 | 105.57 | 106.00 | 105.69 | 105.65 |
| | Average | 105.94 | 106.01 | 105.70 | 106.13 | 105.83 | 105.77 |
| R4 Hole19-Hole24 | | TN239 | TN240 | TN241 | TN242 | TN243 | TN244 |
| | Max | 105.87 | 105.75 | 105.30 | 105.07 | 105.22 | 105.66 |
| | Min | 105.62 | 105.52 | 105.13 | 104.90 | 105.05 | 105.49 |
| | Average | 105.74 | 105.63 | 105.21 | 104.98 | 105.14 | 105.57 |
| R5 Hole25-Hole30 | | TN245 | TN246 | TN247 | TN248 | TN249 | TN250 |
| | Max | 105.62 | 105.54 | 105.52 | 105.75 | 105.97 | 105.69 |
| | Min | 105.45 | 105.35 | 105.31 | 105.57 | 105.81 | 105.49 |
| | Average | 105.53 | 105.44 | 105.41 | 105.66 | 105.89 | 105.59 |
| R6 Hole31-Hole36 | | TN251 | TN252 | TN253 | TN254 | TN255 | TN256 |
| | Max | 106.19 | 106.34 | 106.47 | 105.96 | 105.76 | 105.35 |
| | Min | 106.02 | 106.16 | 106.31 | 105.77 | 105.58 | 105.18 |
| | Average | 106.10 | 106.25 | 106.39 | 105.87 | 105.67 | 105.27 |
| R7 Hole37-Hole42 | | TN257 | TN258 | TN259 | TN260 | TN241 | TN242 |
| | Max | 106.21 | 105.59 | 105.45 | 105.36 | 106.08 | 106.09 |
| | Min | 106.04 | 105.42 | 105.28 | 105.20 | 105.90 | 105.92 |
| | Average | 106.12 | 105.51 | 105.37 | 105.28 | 105.99 | 106.00 |
| R8 Hole43-Hole48 | | TN243 | TN244 | TN245 | TN246 | TN247 | TN248 |
| | Max | 106.54 | 106.33 | 105.78 | 105.38 | 105.42 | 105.69 |
| | Min | 106.38 | 106.16 | 105.60 | 105.20 | 105.25 | 105.52 |
| | Average | 106.46 | 106.25 | 105.69 | 105.29 | 105.33 | 105.61 |

Approved By.




# Metrological Center

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Website : www.scieco.co.th E-Mail : calibrate@scg.co.th




## Calibration Report

**Measurement Results:**

| HEATING BLOCK | | | Temperature Distribution | |
|---|---|---|---|---|
| Setting (°C) | Reading (°C) | | Stability (±°C) | Uncertainty (±°C) |
| | Min , Max | Average | | |
| 102.0 | - | 102.0 | 0.43 | 0.83 |
| 107.0 | - | 107.0 | 0.20 | 0.70 |

* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By.

SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
Bangkok Tel : +668 9205 6851 , +669 81924 0059
Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th
NSC-TISI-TIS 17025 CALIBRATION 0244

**Certificate No. T250873** 

# Certificate of Calibration

| | | |
|---|---|---|
| **Equipment** | : | Chamber ( Cooling Room ) |
| **Manufacturer** | : | KOLDTECH |
| **Model** | : | KM 320 |
| **Serial No.** | : | TBN-1012061/05 |
| **Customer Code** | : | BKK_EN0167 |
| **ID No.** | : | T2463A3 |
| **Customer** | : | ALS Laboratory Group (Thailand) Co.,Ltd.<br>104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,<br>Khet Suan Luang, Bangkok 10250 |
| **Customer Location** | : | Laboratory Room |
| **Date of Receipt** | : | 28 May 2025 |
| **Calibrated By** | : | Atiphong Rongrat ( Technician ) |
| **Approved By** | : | / Boonchai Suriyawong (Site Calibration Manager) |
| **Date of Issue** | : | 19 JUN 2025 |

REVIEW BY Jinda K.
APPROVED BY Sirijuk P.
NEXT CAL DATE 04/12/26

**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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.



SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
NSC-TISI-TIS 17025 CALIBRATION 0244

**Certificate No. T250873** 

# Calibration Report

| | | |
|---|---|---|
| **Equipment** | : | **Chamber ( Cooling Room )** |
| **Date of Calibration** | : | **4 June 2025** |
| **Environment** | : | **Temperature : 23.4-24.9 °C** |
| | | **Line Voltage : 221.4-230.2 V** |
| | | **Relative Humidity : 55 - 65 %RH** |

**Condition of this results of calibration :**

1. Thisequipment was calibrated by insert 16 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001) and AS2853-1986 ).
   All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

| Instrument | Model | Instrument No. | Certificate No. | Due Date |
|---|---|---|---|---|
| TC | TYPE T | TN91-TN100 | T242036 | 3 December 2025 |
| TC | TYPE T | TN101-TN110 | T242036 | 3 December 2025 |
| DATA LOGGER | 34970A | T121 | T242036 | 3 December 2025 |

3. This certificate is traceable to :
   National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)
4. Condition of calibrated item : good
   Equipment Description :
   Time Constant 2 Hour 20 Minute At 3 °C
   Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
   ☐ Close
   ☒ Not Available
5. Adjustment :
   ( X ) without adjustment ( ) after adjustment

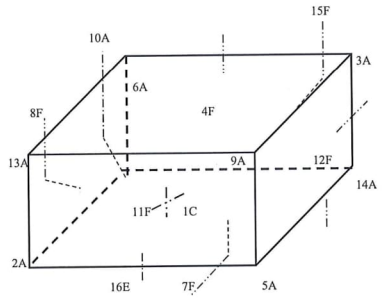
Approved By.



SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
NSC-TISI-TIS 17025 CALIBRATION 0244

**Certificate No. T250873** 

# Calibration Report




C = Centre , F = Centre of Face , A = Corner , E = Centre of Edge

| | | | |
|---|---|---|---|
| 1C | = TN91 | 12F | = TN102 |
| 2A | = TN92 | 13A | = TN103 |
| 3A | = TN93 | 14A | = TN104 |
| 4F | = TN94 | 15F | = TN105 |
| 5A | = TN95 | 16E | = TN106 |
| 6A | = TN96 | | |
| 7F | = TN97 | | |
| 8F | = TN98 | | |
| 9A | = TN99 | | |
| 10A | = TN100 | | |
| 11F | = TN101 | | |

Approved By.



SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
NSC-TISI-TIS 17025 CALIBRATION 0244

**Certificate No. T250873** 

# Calibration Report

**Measurement Results**

| Calibration Point | Average Standard Reading at each position (°C) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | TN91 | TN92 | TN93 | TN94 | TN95 | TN96 | TN97 | TN98 | TN99 | TN100 | TN101 | TN102 |
| 3.0 | 2.95 | 2.92 | 3.09 | 2.92 | 3.16 | 3.50 | 3.40 | 3.03 | 3.14 | 2.98 | 3.44 | 3.13 |
| | TN103 | TN104 | TN105 | TN106 | | | | | | | | |
| | 3.19 | 3.06 | 3.46 | 2.92 | | | | | | | | |

| Chamber ( Cooling Room ) | | | Temperature Distribution | | | |
|---|---|---|---|---|---|---|
| Setting (°C) | Reading (°C) | | Average (°C) | Stability (±°C) | Uniformity (°C) | Uncertainty (±°C) | Coverage Factor *k* |
| | Min , Max | Average | | | | | |
| **3.0** | 2.8 , 3.9 | **3.4** | 3.14 | 1.20 | 1.30 | 1.90 | 2.04 |

**The calibration result apply only the above calibrated item.**
**The result of test was found accurate as shown on date and place of test only.**
**The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .**

Approved By.

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

NSC-TISI-TIS17025
CALIBRATION 0008

# Certificate of Calibration

Cert.No.: 25CHO537
Page.: 1 of 3

| | |
|---|---|
| **Equipment :** | Spectrophotometer |
| **Manufacturer :** | HACH |
| **Model :** | DR3900 |
| **Serial No. :** | 2021559 |
| **ID No. :** | BKK_EN0356 |
| **Condition As-Received:** | Used Item |
| **Received Date :** | 08 October 2025 |
| **Calibration Date :** | 08 October 2025 |
| **Reference :** | 2510-0042OC-11 |
| **Submitted by :** | ALS Laboratory Group (Thailand) Co.,Ltd.<br>104 Phatthanakan 40, Phatthanakan Rd.,<br>Khwaeng Phatthanakan, Khet Suan Luang,<br>Bangkok 10250 Thailand |
| **Calibration Place :** | Wet Chemistry Lab 2 |
| **Ambient Temperature :** | ( 21.9 to 21.9 ) °C (On-Site) |
| **Relative Humidity :** | ( 62 to 65 ) % (On-Site) |
| **Calibration Procedure :** | In - house method :<br>CP-OCH4 based on ASTM E 275-08 |
| **Calibrated by :** | Uthen Kankawi |
| **Approved by :** | Saithip<br>Approved Signatory |

REVIEW BY Jinda K.
APPROVED BY Sirilak P.
NEXT CAL DATE 08/10/26

( ) Chakrit Waewwanjua
( ) Ponpan Paipim
(✓) Saithip Meangmai

**Issue Date :** 9 October 2025

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

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



**Calibration Results : without adjustment**

**Photometric Accuracy**

| Wavelength (nm) | Certified Values of Reference Material ( Abs ) | UUC Reading ( Abs ) | Uncertainty of Measurement ( ±Abs ) | Coverage Factor *k* |
|---|---|---|---|---|
| 420.0 | Zero | 0.000 | 0.0028 | 2.00 |
| | 0.5750 | 0.573 | 0.0028 | 2.00 |
| | 0.7156 | 0.713 | 0.0028 | 2.00 |
| | 1.0176 | 1.014 | 0.0028 | 2.00 |
| 440.0 | Zero | 0.000 | 0.0028 | 2.00 |
| | 0.5598 | 0.557 | 0.0028 | 2.00 |
| | 0.7037 | 0.700 | 0.0028 | 2.00 |
| | 1.0013 | 0.997 | 0.0028 | 2.00 |
| 465.0 | Zero | 0.000 | 0.0028 | 2.00 |
| | 0.5222 | 0.522 | 0.0028 | 2.00 |
| | 0.6646 | 0.664 | 0.0028 | 2.00 |
| | 0.9444 | 0.945 | 0.0028 | 2.00 |
| 546.1 | Zero | 0.000 | 0.0028 | 2.00 |
| | 0.5234 | 0.523 | 0.0028 | 2.00 |
| | 0.7007 | 0.700 | 0.0028 | 2.00 |
| | 0.9992 | 0.999 | 0.0028 | 2.00 |
| 590.0 | Zero | 0.000 | 0.0028 | 2.00 |
| | 0.5573 | 0.556 | 0.0028 | 2.00 |
| | 0.7760 | 0.773 | 0.0028 | 2.00 |
| | 1.1104 | 1.108 | 0.0028 | 2.00 |
| 635.0 | Zero | 0.000 | 0.0028 | 2.00 |
| | 0.5648 | 0.565 | 0.0028 | 2.00 |
| | 0.7654 | 0.765 | 0.0028 | 2.00 |
| | 1.0961 | 1.096 | 0.0028 | 2.00 |

**Remark**

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- 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 %.

-o0o-



**Condition of calibration result**

1. Reference Standard Material :

| Material | Serial No. | Certificate No. | Due date |
|---|---|---|---|
| 1. Absorbance Standard set | 44487 | 122584 | 31 May 2026 |
| 2. Wavelength Standard set | 36730 | 118120 | 15 Jan 2026 |
| 3. Wavelength Standard set | 36730 | 118121 | 15 Jan 2026 |

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 maintained through :
   - Starna Scientific Ltd.
4. Spectral BandWidth : 5 nm
   Scan Speed : - nm/min

**Calibration Results : without adjustment**

**Wavelength Accuracy**

| Certified Values of Reference Material ( nm ) | UUC Reading ( nm ) | Uncertainty of Measurement ( ± nm ) | Coverage Factor *k* |
|---|---|---|---|
| 418.40 | 418 | 0.59 | 2.00 |
| 479.88 | 480 | 0.59 | 2.00 |
| 513.75 | 513 | 0.59 | 2.00 |
| 537.00 | 536 | 0.59 | 2.00 |
| 638.00 | 638 | 0.59 | 2.00 |
| 747.61 | 748 | 0.59 | 2.00 |
| 807.04 | 807 | 0.59 | 2.00 |

BKK_EL0128

REVIEW BY Orawan T.
APPROVED BY Sarin V.
NEXT CAL. DATE 27/11/2026

Scientist Instrument

# Performance Verification Certificate
## for Mercury Analyzer

| | |
|---|---|
| **PRODUCT ID** | ***Quicktrace M-8000 , Teledyne Leeman Labs*** |
| **Equipment ID** | **BKK_EL0128 Mercury Analyzer**<br>**S/N: US22133002**<br>**BKK_EL0129 Autosampler**<br>**S/N : 052222A560** |
| **Customer Name** | ALS Laboratory Group (Thailand) Co., Ltd. |
| **Address** | 104 Soi Pattana 40, Pattana Rd. Suan Luang, Suan Luang<br>Bangkok 10250 Thailand |

**Date of Qualified** **November 27, 2025**
**Next Due date** **November 27, 2026**

This certifies for products which was performed in acceptable criteria specifications

| | |
|---|---|
| **Autosampler & Sample Introduction** | **PASSED** |
| **Analyzer** | **PASSED** |
| **Gas Liquid Separator & Dryer** | **PASSED** |
| **CVAFS Detector** | **PASSED** |
| **Electronics/Mechanical** | **PASSED** |
| **Data station/PC** | **PASSED** |
| **Analytical test** | **PASSED** |

**Provided by**

**Scientist Instrument Co.,Ltd.**
113 Soi Ekachai 44, Ekachai Road
Khlong Bang Phran, Bangbon
Bangkok 10150 Thailand

**Certified by** .....
**Thunraphol Sakdayos**
***Service Engineer***

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

NSC-TISI-TIS17025
CALIBRATION 0008

# Certificate of Calibration

Cert.No.: 24CH1295
Page.: 1 of 3

| | |
|---|---|
| **Equipment :** | pH Meter |
| **Manufacturer :** | Hach |
| **Model :** | HQ411d |
| **Serial No. :** | 200100031163 |
| **ID No. :** | BKK_EN0342 |
| **Condition As-Received:** | Used Item |
| **Received Date :** | 16 October 2024 |
| **Calibration Date :** | 17 October 2024 |
| **Reference :** | 2410-0548DSC-5 |
| **Submitted by :** | ALS Laboratory Group (Thailand) Co.,Ltd.<br>104 Phatthanakan 40, Phatthanakan Rd.,<br>Khwaeng Phatthanakan, Khet Suan Luang,<br>Bangkok 10250 Thailand |
| **Ambient Temperature :** | (25 ± 2.5) °C |
| **Relative Humidity :** | (50 ± 15) % |
| **Calibration Procedure :** | In - house method :<br>- CP-CH5 by direct measurement with certified reference material (CRM)<br>- CP-CH8 by comparison with temperature standard |
| **Calibrated by :** | Warakorn Lerngagtrakul |
| **Approved by :** | Saithip<br>Approved Signatory |

REVIEW BY linda K
APPROVED BY Siriluk P
NEXT CAL DATE 17/10/25

( ) Unnopphol Harachai
( ) Ponpan Paipim
(✓) Saithip Meangmai

**Issue Date :** 21 October 2024

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

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



**Calibration Results**

**Function : Temperature Measurement**

**( * ) Without adjustment**

This equipment was connected with Temperature Probe;

- Model : PHC281
- Serial No. : 230473042902

Dimension of probe

- Length : 103 mm.
- Diameter : 12 mm.
- Immersion Depth : 90 mm.

| Calibration Point ( °C ) | Standard Temperature ( °C ) | UUC* Reading ( °C ) | Error ( °C ) | Uncertainty of measurement ( ± °C ) | Coverage factor *k* |
|---|---|---|---|---|---|
| 25.0 | 25.002 | 25.0 | -0.002 | 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 %.

-o0o-



**Condition of this calibration result**

1. Reference Standard Instrument

| Instrument | Serial No. | ID No. | Cert. No. | Due Date |
|---|---|---|---|---|
| 1)Ref. Standard Thermometer | 2188080 | 130RC044 | 24I1022 | 16 Sep 2025 |

- This Certification is traceable to SI Throught Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :The measurement results are traceable to SI through Hach Lenge GmbH Ltd. Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00
:The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

| Buffer Solution | Manufacturer | Lot No. | Exp. date |
|---|---|---|---|
| pH 4.008 | CPA chem | 1034203 | 27 Sep 2026 |
| pH 6.999 | Hach Lenge GmbH | C03145 | 28 Feb 2026 |
| pH 10.010 | CPA chem | 1034205 | 27 Sep 2025 |

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

**Calibration Results**

**Function : pH Measurement**

**Performing three buffers standard curve by using buffer nominal pH (4,7,10)**

| Unit Under Calibration | Standard pH Buffer Solution | Actual pH Reading | Actual mV Reading (mV) | Uncertainty of pH Measurement (±) | Coverage factor *k* |
|---|---|---|---|---|---|
| pH Electrode | 4.008 | 4.028 | 174.6 | 0.0044 | 2.00 |
| S/N.: 230473042902 | 6.999 | 7.014 | 1.4 | 0.0084 | 2.05 |
| | 10.010 | 10.018 | -172.8 | 0.0066 | 2.00 |

**Remark** - Can not connect the BNC because the plug does not match with the socket.

Bara Scientific
Solution of Success

**Bara Scientific Co., Ltd.**
968 U Chu Liang Building Floor7 Rama4 Road
Silom Bangrak Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com

NSC-TISI-TIS 17025
CALIBRATION 0229

# Certificate of Calibration

Number of Page(s) 1 of 3

| | |
|---|---|
| **Certificate No.** | BSCC-UV-374/24 |
| **Equipment** | UV/Vis Spectrophotometer |
| **Model** | UV-1800 |
| **Manufacturer** | Shimadzu |
| **Serial No.** | A11454908533 CD |
| **ID No.** | BKK_EN0018 |
| **Date of receipt** | 13 September 2024 |
| **Date of calibration** | 13 September 2024 |
| **Date of issue** | 13 SEP 2024 |

REVIEW BY linda K
APPROVED BY Siriluk P
NEXT CAL DATE 13/09/2025

| | |
|---|---|
| **Customer name** | ALS Laboratory Group (Thailand) Co., Ltd. |
| **Address** | 104 Soi Phattanakan 40, Phattanakan Road, Phattanakan, Suan Luang, Bangkok 10250 |
| **Temperature** | (25.3 - 26.7) °C (On site) |
| **Humidity** | (50.4 - 55.9) %RH (On site) |
| **Equipment condition** | Good Operation |
| **Calibration Location** | Organic Preparation Lab |
| **Calibration Procedure** | In-house method WI-UV-702-01 based on ASTM E275-01 |
| **Traceability** | Wavelength Accuracy is traceable to certificate No. 106372 and 106371<br>Photometric Accuracy is traceable to certificate No. 106364 and 111398<br>Stray Light is traceable to certificate No. 106377<br>The above certificate are traceble to SI unit through Starna Scientific Ltd.<br>(UKAS accredited calibration laboratory NO. 0659) |
| **Calibrated by** | Mr.Wanchana Janloey |

Approved by

Sonthi

**Mr.Sonthi Temboonsakdi**
Service Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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**Bara Scientific Co., Ltd.**
968 U Chu Liang Building Floor7 Rama4 Road
Silom Bangrak Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com

NSC-TISI-TIS 17025 CALIBRATION 0209

# Certificate of Calibration

**Certificate No.** BSCC-UV-374/24 Number of Page(s) 2 of 3

**Calibration Results:**

**1.Wavelength Accuracy**

| Certified Wavelength (nm) | UUC (nm) | Error (nm) | Uncertainty (±nm) |
|---|---|---|---|
| 241.70 | 241.55 | -0.15 | 0.18 |
| 334.02 | 333.85 | -0.17 | 0.18 |
| 418.53 | 418.57 | 0.04 | 0.18 |
| 572.99 | 572.97 | -0.02 | 0.18 |
| 879.41 | 879.17 | -0.24 | 0.18 |

**2.Photometric Accuracy (UV)**

| Wavelength (nm) | Certified Absorbance (A) | UUC (A) | Error (A) | Uncertainty (±A) |
|---|---|---|---|---|
| 235 | 0.0000 | 0.0000 | 0.0000 | 0.0075 |
| | 0.7171 | 0.7169 | -0.0002 | 0.0075 |
| 257 | 0.0000 | 0.0000 | 0.0000 | 0.0075 |
| | 0.8354 | 0.8345 | -0.0009 | 0.0075 |
| 313 | 0.0000 | 0.0000 | 0.0000 | 0.0075 |
| | 0.2786 | 0.2781 | -0.0005 | 0.0075 |
| 350 | 0.0000 | 0.0000 | 0.0000 | 0.0075 |
| | 0.6199 | 0.6194 | -0.0005 | 0.0075 |

*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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Agilent Technologies

Agilent Technologies (Thailand) Limited
U CHU LIANG BLDG. 22/F UNIT A,D
968 RAMA 4 ROAD, SILOM, BANGRAK
Bangkok 10500 Thailand

Tel. +662 637 6363
Fax: +662 632 4334
Email: ccc-smt@agilent.com
Website: www.agilent.com/chem

**Customer Contact:**
ALS Laboratory Group (Thailand) Co Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd Khwaeng Phatthanakan Khet Suan

TAX ID : 0105540004859

Chanattagarn.lmchom@alsglobal.com
27603068

**Invoice To:**
ALS Laboratory Group (Thailand) Co Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd Khwaeng Phatthanakan Khet Suan

## SERVICE REPORT

| Customer Purchase Order Number: | Customer Number: 70371013 |
|---|---|
| Service Request: | Service Request Date: |
| Service Order: 6006676091 | Service Confirmation: 6905876103 |

REVIEW BY Phonphen C.
APPROVED BY Saun t. N.
NEXT CAL. DATE 29 Mar 2026

**Delivery Site:**
ALS Laboratory Group (Thailand) Co Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd Khwaeng Phatthanakan Khet Suan

**Location:**
**Room**
**Bldg**
**Lab**
**Dept**

**Direct Inquiries to:**
Contact Name: Customer Contact Center
Contact E-mail: ccc-smt@agilent.com
Contact Telephone: +662 637 6363
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THB:Krung Thai Bank PCL
Siam Square Br.,416/1-2 Rama I Rd.,Pathumwan, BKK 10330 Thailand

ORIGINAL



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NSC-TISI-TIS 17025 CALIBRATION 0209

# Certificate of Calibration

**Certificate No.** BSCC-UV-374/24 Number of Page(s) 3 of 3

**Calibration Results:**

**3.Photometric Accuracy (Visible)**

| Wavelength (nm) | Certified Absorbance (A) | UUC (A) | Error (A) | Uncertainty (±A) |
|---|---|---|---|---|
| 420.0 | 0.0000 | 0.0000 | 0.0000 | 0.0042 |
| | 0.5761 | 0.5765 | 0.0004 | 0.0042 |
| | 0.7119 | 0.7105 | -0.0014 | 0.0042 |
| | 1.0189 | 1.0174 | -0.0015 | 0.0042 |
| 440.0 | 0.0000 | 0.0000 | 0.0000 | 0.0042 |
| | 0.5610 | 0.5613 | 0.0003 | 0.0042 |
| | 0.7001 | 0.6984 | -0.0017 | 0.0042 |
| | 1.0026 | 1.0011 | -0.0015 | 0.0042 |
| 465.0 | 0.0000 | 0.0000 | 0.0000 | 0.0042 |
| | 0.5235 | 0.5232 | -0.0003 | 0.0042 |
| | 0.6614 | 0.6598 | -0.0016 | 0.0042 |
| | 0.9456 | 0.9444 | -0.0012 | 0.0042 |
| 546.1 | 0.0000 | 0.0000 | 0.0000 | 0.0042 |
| | 0.5249 | 0.5245 | -0.0004 | 0.0042 |
| | 0.6975 | 0.6956 | -0.0019 | 0.0042 |
| | 1.0009 | 0.9994 | -0.0015 | 0.0042 |
| 590.0 | 0.0000 | 0.0000 | 0.0000 | 0.0042 |
| | 0.5590 | 0.5586 | -0.0004 | 0.0042 |
| | 0.7725 | 0.7708 | -0.0017 | 0.0042 |
| | 1.1125 | 1.1114 | -0.0011 | 0.0042 |
| 635.0 | 0.0000 | 0.0000 | 0.0000 | 0.0042 |
| | 0.5666 | 0.5666 | 0.0000 | 0.0042 |
| | 0.7620 | 0.7604 | -0.0016 | 0.0042 |
| | 1.0982 | 1.0971 | -0.0011 | 0.0042 |

*CNR = Customer not request

**4.Stray Light***

| Standard cut-off wavelenght (nm) | Unit Under Calibration(UUC) | | |
|---|---|---|---|
| | Wavelength (nm) | Transmission (%T) | Absorbance (A) |
| 200.85±0.11nm | 199.58 | 0.9520 | 2.0217 |

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A
***Stray Light not NSC-ONSC Accredited.**

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

***End of Certificate***

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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**Service Confirmation Number:** 6905876103
**Service Confirmation Date:** 23.09.2024

**Service Instrument:**

| Model Number | Model Description | Serial Number | System Handle | Parent Asset |
|---|---|---|---|---|
| SYS-IO-5100 | ICP-OES 5100/5110 System | | | |
| G8010A | Agilent 5100 SVDV ICP-OES Spectrometer | MY16010005 | ICP OES 5100 | SYS-IO-5100 |
| G8410A | SPS 4 Autosampler | AU15440764 | ICP OES 5100 | SYS-IO-5100 |

**Service Items:**

| Item | Service/Part # | Description | Qty | Entitlement | Service Start | Service End |
|---|---|---|---|---|---|---|
| 1000 | EOQ | Enterprise Operational Qualification | 1.00 | Agreement Entitlement - 100 % covered | 22.09.2024 | 23.09.2024 |
| 1010 | 6610030100 | Bottle ICP-OES Wavecal soln 500mL 5 ppm | 1.00 | Agreement Entitlement - 100 % covered | | |
| 1020 | 5190-7001 | Calibration blank solution 5pct HNO3 | 1.00 | Agreement Entitlement - 100 % covered | | |

**Additional Information:**

**Service Confirmation Number:** 6905876103
**Service Confirmation Date:** 23.09.2024

**Service Information:**

| | | |
|---|---|---|
| **Problem Description:**<br>WU-OQ-IO-5100-5001253655 | | |
| **Service Provided:**<br>Complete OQHW 5100ICPOES<br>Equipment ID: BKK_EL0037, all test passed | | |
| **Service Overview Code:**<br>Reason Code: Scheduled Service<br>Diagnosis Code: Scheduled Service<br>Resolution Code: Scheduled Service | | |
| **Reported Hours:**<br>4.0 | **Travel Hours:**<br>2.0 | |
| **Customer Field Service Representative Name:**<br>Suwan Onkhom | **Customer Field Service Representative Signature:**<br>Suwan O. | **Date:**<br>23 Sep 2024 |
| **Customer Name:**<br>CHANATTAGARN IMCHOM | **Customer Signature:**<br>Pronphen C. | **Date:**<br>23 Sep 2024 |
| **Additional Comments:** | | |





**Certificate No. T232160** 

## Calibration Report

**Equipment** : **Chamber ( Cooling Room )**
**Date of Calibration** : **6 December 2023**
**Environment** : **Temperature : 23.4-24.9 °C**
**Line Voltage : 221.4-230.2 V**
**Relative Humidity : 55 - 65 %RH**

**Condition of this results of calibration :**

1. Thisequipment was calibrated by insert 16 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001) and AS2853-1986 ).
   All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

| Instrument | Model | Instrument No. | Certificate No. | Due Date |
|---|---|---|---|---|
| TC | TYPE T | TN161-TN170 | T230773 | 10 April 2024 |
| TC | TYPE T | TN171-TN180 | T230773 | 10 April 2024 |
| DATA LOGGER | 34970A | T149 | T230773 | 10 April 2024 |

3. This certificate is traceable to :
   National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)
4. Condition of calibrated item : good
   Equipment Description :
   Time Constant 1 Hour 30 Minute At 3 °C
   Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
   ☐ Close
   ☒ Not Available
5. Adjustment :
   ( X ) without adjustment ( ) after adjustment

**Approved By.** _____



SCG Metrology
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.
NSC-TISI-TIS 17025 CALIBRATION 0244
Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100
Bangkok Tel : +668 9205 6851 , +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.com

**Certificate No. T232160** 

## Certificate of Calibration

**Equipment** : Chamber ( Cooling Room )
**Manufacturer** : KOLDTECH
**Model** : KM 320
**Serial No.** : TBN-1012061/05
**Customer Code** : BKK_EN0167
**ID No.** : T2463A3
**Customer** : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250
**Customer Location** : Laboratory
**Date of Receipt** : 29 November 2023
**Calibrated By** : Atiphong Rongrat ( Technician )
**Approved By** : _____ / Boonchai Suriyawong (Site Calibration Manager)
**Date of Issue** : 09 JAN 2024

REVIEW BY
APPROVED BY
NEXT CAL. DATE 06/06/25

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

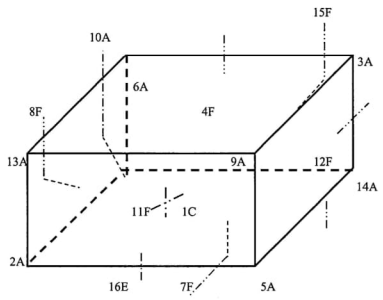
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding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



SCG Metrology
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.
NSC-TISI-TIS 17025 CALIBRATION 0244

**Certificate No. T232160** 

## Calibration Report




C = Centre , F = Centre of Face , A = Corner , E = Centre of Edge

| | | | |
|---|---|---|---|
| 1C | = TN161 | 12F | = TN172 |
| 2A | = TN162 | 13A | = TN173 |
| 3A | = TN163 | 14A | = TN174 |
| 4F | = TN164 | 15F | = TN175 |
| 5A | = TN165 | 16E | = TN176 |
| 6A | = TN166 | | |
| 7F | = TN167 | | |
| 8F | = TN168 | | |
| 9A | = TN169 | | |
| 10A | = TN170 | | |
| 11F | = TN171 | | |

**Approved By.** _____

**Certificate No. T232160**



# Calibration Report

**Measurement Results**

| | Average Standard Reading at each position (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Calibration Point** | **TN161** | **TN162** | **TN163** | **TN164** | **TN165** | **TN166** | **TN167** | **TN168** | **TN169** | **TN170** | **TN171** | **TN172** |
| 3.0 | 2.83 | 3.34 | 2.95 | 3.46 | 3.45 | 3.76 | 3.25 | 3.46 | 3.39 | 3.50 | 3.58 | 3.42 |
| | **TN173** | **TN174** | **TN175** | **TN176** | | | | | | | | |
| | 3.33 | 3.39 | 3.15 | 3.43 | | | | | | | | |

| Chamber ( Cooling Room ) | | | Temperature Distribution | | | | |
|---|---|---|---|---|---|---|---|
| Setting (°C) | Reading (°C) | | Average (°C) | Stability (±°C) | Uniformity (°C) | Uncertainty (±°C) | Coverage Factor *k* |
| | Min , Max | Average | | | | | |
| **3.0** | 2.8 , 4.1 | **3.5** | 3.36 | 1.10 | 2.00 | 1.90 | 2.09 |

**The calibration result apply only the above calibrated item.**
**The result of test was found accurate as shown on date and place of test only.**
**The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .**

**Approved By.** _____

FM-L15 I18/18-08-66

BKK_EL0128

Scientist Instrument

REVIEW BY Orawan T.
APPROVED BY Sawit N.
NEXT CAL DATE 06/12/25

# Performance Verification Certificate
## for Mercury Analyzer

**PRODUCT ID** ***Quicktrace M-8000 , Teledyne Leeman Labs***

**Equipment ID**
**BKK_EL0128 Mercury Analyzer**
**S/N: US22133002**

**BKK_EL0129 Autosampler**
**S/N: 052222A560**

**Customer Name** ALS Laboratory Group (Thailand) Co., Ltd.
**Address** 104 Soi Pattana 40, Pattana Rd. Suan Luang, Suan Luang
Bangkok 10250 Thailand

**Date of Qualified** **December 6, 2024**
**Next Due date** **December 6, 2025**

This certifies for products which was performed in acceptable criteria specifications

| | |
|---|---|
| **Autosampler & Sample Introduction** | **PASSED** |
| **Analyzer** | **PASSED** |
| **Gas Liquid Separator & Dryer** | **PASSED** |
| **CVAFS Detector** | **PASSED** |
| **Electronics/Mechanical** | **PASSED** |
| **Data station/PC** | **PASSED** |
| **Analytical test** | **PASSED** |

**Provided by**

**Scientist Instrument Co.,Ltd.**
113 Soi Ekachai 44, Ekachai Road
Khlong Bang Phran, Bangbon
Bangkok 10150 Thailand

**Certified by** _____
**Thunraphol Sakdayos**
***Service Engineer***