ACCREDITED CALIBRATION LABORATORY

SERVICES FROM JIRANATEE ASSOCIATES CO., LTD.

J-NAC was established on May 1st, 2002. We are in the business of sales and engineering, in the field of Measuring instruments and Environmental quality measurement systems. Covering the Occupational Health and Safety, Meteorological measurement system, Maritime communication system.

We provide calibration, maintenance, engineering design and integration. Currently we had approximately 65 employees in our team combining Accountant, Sales & Marketing, Engineering and Scientist. Therefore, We have continuously expanded and stepped into full-scale business operations under international standards (ISO 9001 Certified and ISO/IEC: 17025(2017) Accredited Company)

NSC-TISI-TIS17025
CALIBRATION 0367

Our calibration laboratories operate under an ISO/IEC 17025(2017) quality management system and have NIMT-traceable measurement systems. This accreditation guarantees the technical competence of our people and the integrity of our systems.

J-NAC Quality Policy

- ✓ Quality must follow to world standard
- ✓ Customer satisfaction as a must
- ✓ Continuous improvement in term of service and knowledge

J-NAC Vision

- ✓ To be Experts and leading in Our Business fields
- ✓ To be Sustainable growth in Ours Area
- ✓ Traceable to the World Standard

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WHY IS CALIBRATION IMPORTANT?

COST-SAVING

Calibration helps cut costs by reducing production errors and recalls. Calibration of equipment can help save money by avoiding false acceptance and rejection of product and by extending the life of manufacturing equipment.

IMPROVED QUALITY

Calibration for measuring equipment ensures that your quality control processes are accurate, and that you're not accepting parts that should be rejected.

RELIABILITY

Making sure that the instrument is making consistent measurements and displaying the correct reading

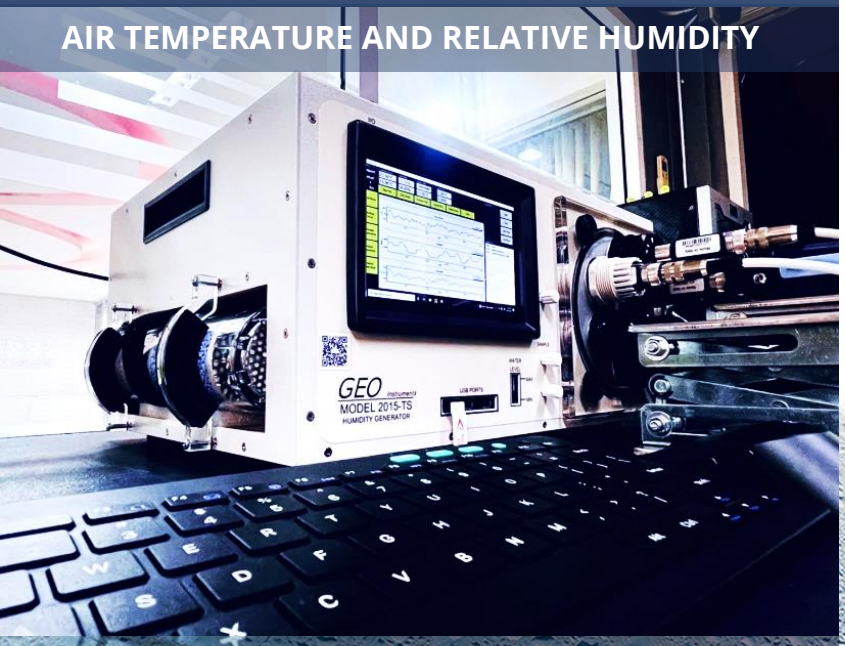
AIR TEMPERATURE AND RELATIVE HUMIDITY CALIBRATION LABORATORY

In our air temperature and relative humidity calibration laboratory is carried out by comparison between the customer instrument and our reference standard in accordance with DKD R 5-7 guidelines.

Our equipment, which includes humidity generators, portable humidity generator, chilled mirror hygrometers and thermometers, allow us to execute humidity, dewpoint and air temperature measurements.

Our standards equipment, calibrated by the National Institute Metrology of (Thailand) NIMT to guarantee the metrological traceability of our measurements.

Our chamber can generate relative humidity and compare with customer instrument in the range of 5 %R.H. to 95 %R.H. and temperature 5 °C to 55°C



AIR TEMPERATURE AND RELATIVE HUMIDITY

OUR REFERENCE STANDARD CHILLED MIRROR HYGROMETER

CUSTOMER INSTRUMENT

- Thermo-Hygrometer
- Temperature and Humidity datalogger
- Air temperature and Relative humidity probe
- Relative humidity probe
- Air temperature probe
- Heat Stress Monitor

TEMPERATURE CALIBRATION LABORATORY

In our laboratory calibration is carried out by comparison between the customer instrument and our reference standard, by immersion of the probes.

Our equipment includes refrigerated calibration baths, dry block calibrator, digital multimeter, and reference standard (platinum resistance thermometers).

All of standard equipment are calibrated by the National Metrological Institute of Thailand (NIMT) to guarantee the metrological traceability of our measurements.

What we calibrate?

1. Digital thermometer with RTD sensor
2. Digital thermometer with thermocouple sensor type J, K, T
3. Thermocouple sensor type J, K, T
4. Liquid in glass thermometer

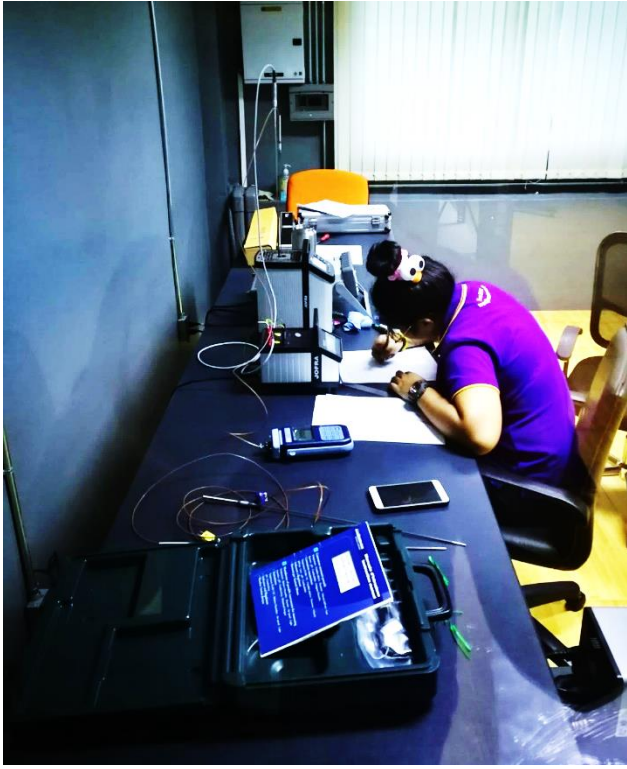
All calibration was performed in the range of -30 to 350 ˚C

Thermocouple sensor type J, K, T

Digital thermometer with RTD

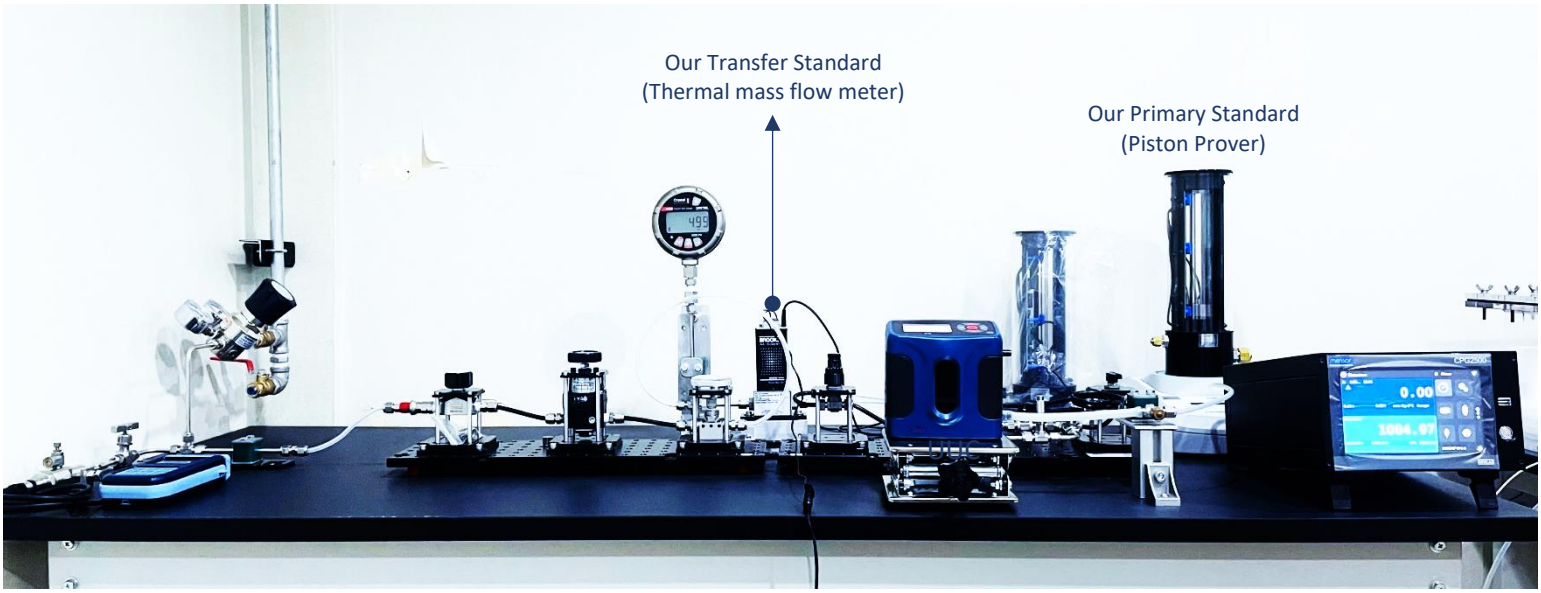
Digital thermometer with thermocouple

Liquid in glass thermometer

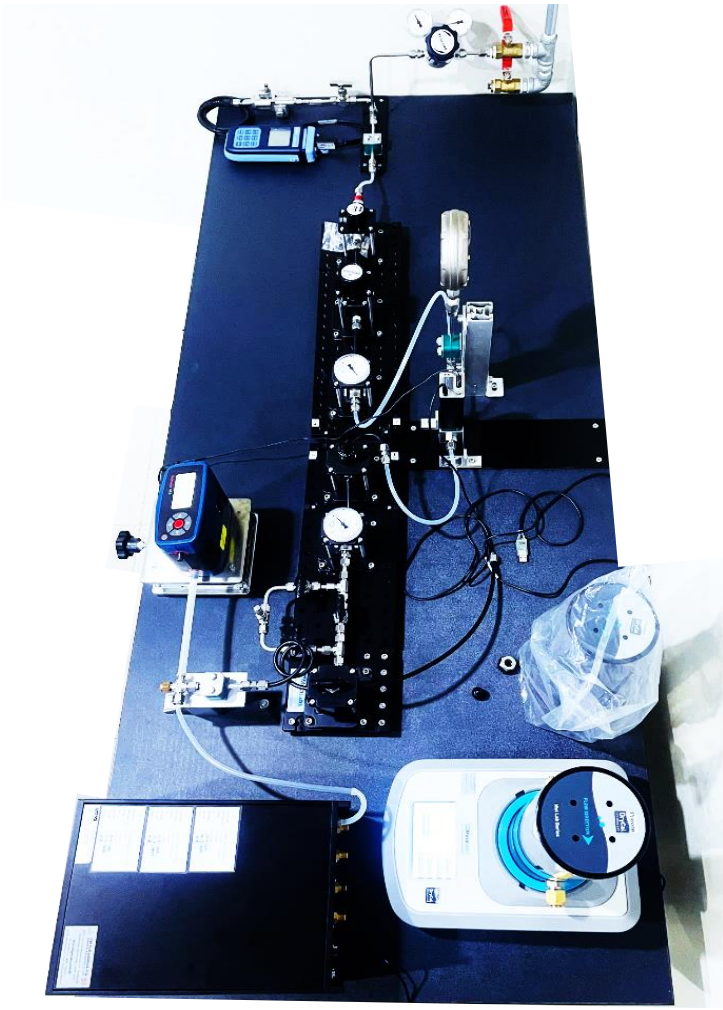


Our temperature source, dry block calibrators and refrigerated calibration bath, give the most precise accuracy, uniformity and stability.

GAS FLOW CALIBRATION LABORATORY



We perform a gas flow calibration in the range of 5 cc/min to 50 l/min for both standard and actual flow rates conditions. This calibration are NIST and VSL traceable through MESALABS® and BROOKS Instruments® and is performed in our ISO/IEC 17025:2017 accredited laboratory.



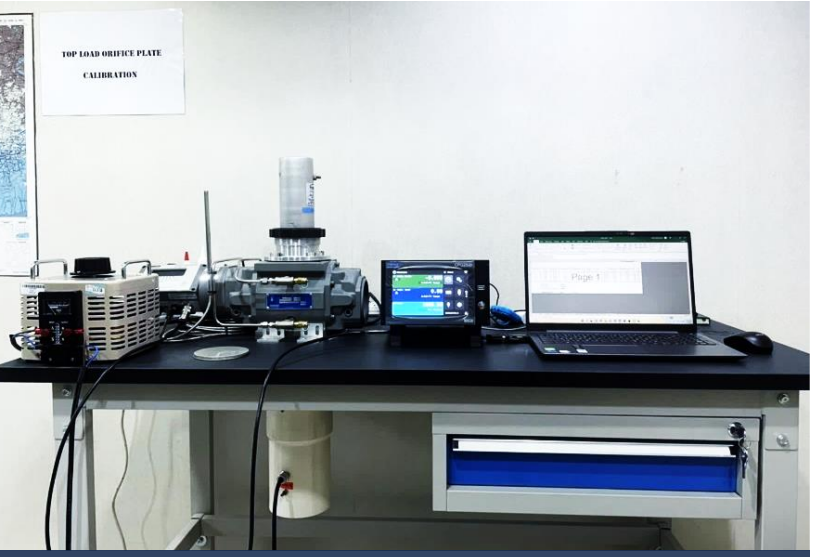
CUSTOMER INSTRUMENT (UUC: Unit Under Calibration)

- Mass flow meter

- Variable area flow meter (Rota meter)

- Flow calibrators

- Diaphragm gas meter (Dry gas meter), Venturi orifice flow (Deltacal) for low volume air sampler.

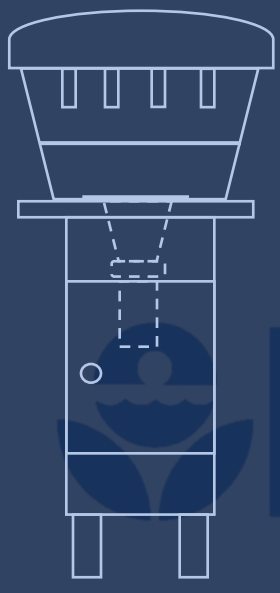


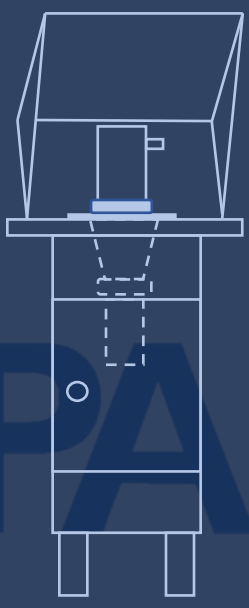
TOP LOAD ORIFICE CALIBRATION LABORATORY

The high volume air sampler calibrators used for flow rate calibration on high volume TSP, PM10, and PM2.5 samplers. Therefore. Calibrators must be calibrated on a regular basis, to keeping your calibration device up to the date.

US.EPA recommends annual recertification per 1998 40 code of federal regulations part 50 to 51. Appendix B to Part 50, Reference method for the determinations of suspended particulate matter in the atmosphere, 9.2.17, page 30.

Our standard equipment are traceable to the National Institute of Standards and Technology (NIST) and National Metrology Institute of Netherlands (VSL) to ensure dependable and accurate results.





HIGH VOLUME AIR SAMPLER CALIBRATORS

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3910	3.2	2.00
2	3	4	1	0.9880	6.4	4.00
3	5	6	1	0.8820	7.9	5.00
4	7	8	1	0.8390	8.8	5.50
5	9	10	1	0.6940	12.7	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H\left(Ta/Pa\right)}$ (y-axis)
0.9900	0.7117	1.4102	0.9957	0.7158	0.8881
0.9858	0.9978	1.9943	0.9915	1.0035	1.2560
0.9838	1.1154	2.2296	0.9895	1.1219	1.4042
0.9826	1.1712	2.3385	0.9883	1.1779	1.4728
0.9774	1.4084	2.8203	0.9831	1.4165	1.7762
QSTD	m=	2.02221	QA	m=	1.26627
	b=	-0.02724		b=	-0.01716
	r=	0.99999		r=	0.99999

Calculations

Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va=	ΔVol((Pa-ΔP)/Pa)
Qstd=	Vstd/ΔTime	Qa=	Va/ΔTime

For subsequent flow rate calculations:

Qstd= $1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$

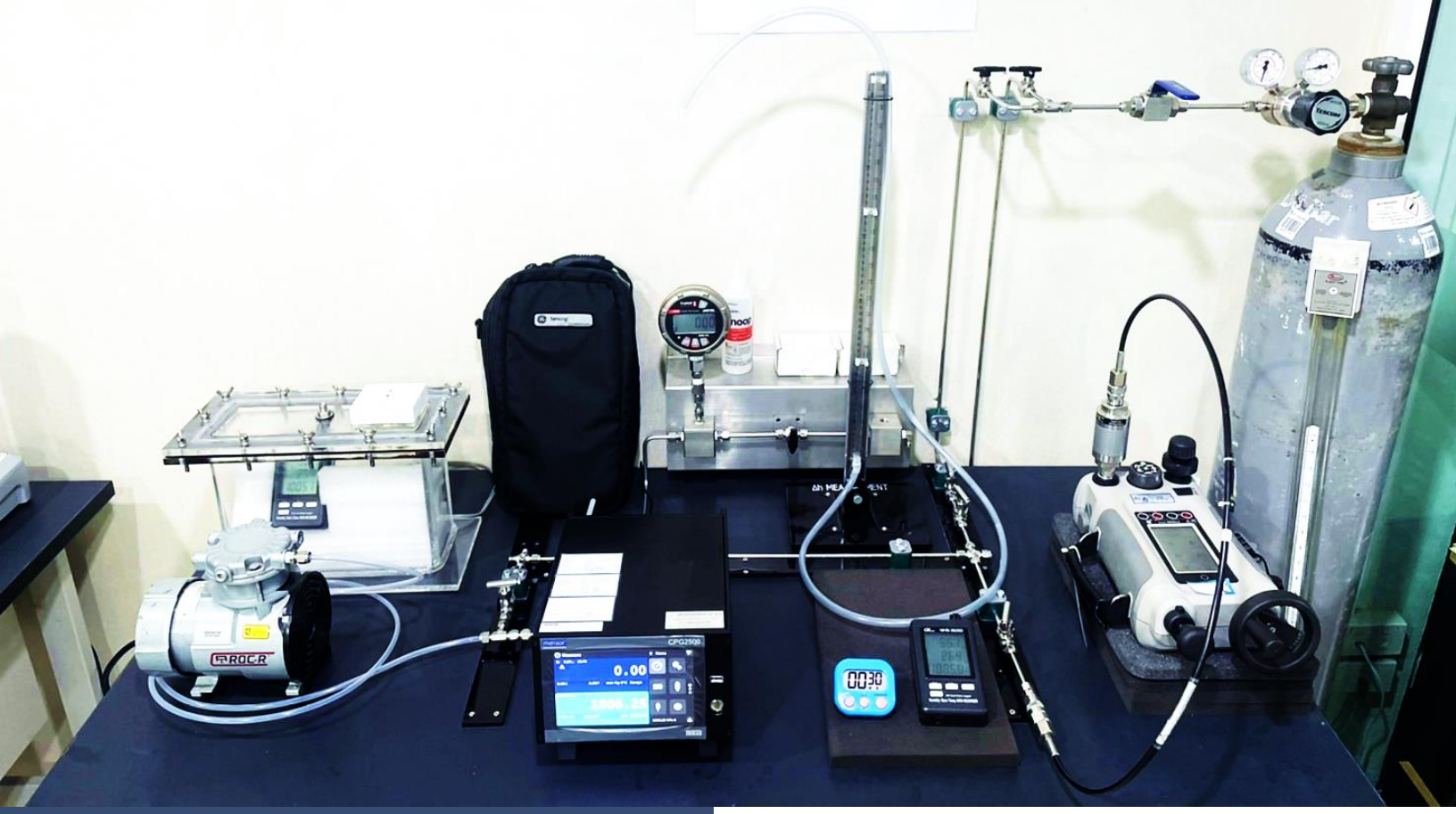
Qa= $1/m\left(\left(\sqrt{\Delta H\left(Ta/Pa\right)}\right)-b\right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg

Key
ΔH: calibrator manometer reading (in H2O)
ΔP: rootsmeter manometer reading (mm Hg)
Ta: actual absolute temperature (°K)
Pa: actual barometric pressure (mm Hg)
b: intercept
m: slope

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30



PRESSURE MEASURING INSTRUMENT CALIBRATION LABORATORY

In our calibration laboratory was done by In-house calibration method WI-CL-003 by comparison between the customer instrument (Unit Under Calibration) and our reference standard based on DKD-R 6-1 which is the worldwide acceptable standard. Our reference standard equipment, calibrated by the National Institute Metrology of (Thailand) to guarantee the metrological traceability of our measurements.

We are able to calibrate any type of pressure measurement devices including:

1. Bourdon tube pressure gauge (0 to 10000 kPa)
2. Electronic pressure gauge (0 to 10000 kPa)
3. Pressure transmitter (0 to 10000 kPa)
4. Differential pressure meter ΔP (0 to 15 kPa)
5. Barometer (80 to 110 kPa)

AIR SPEED CALIBRATION LABORATORY

Regular calibration of your flow speed measurement device at Jiranatee Associates Co.,Ltd. ISO/IEC: 17025(2017) accredited laboratory is the best way to ensure the longevity and accuracy of your instruments.

We can perform a calibration of most common anemometers such as: Pitot tube anemometer, Hot-wire anemometer, vane anemometer, propeller anemometer, cup anemometer, ultra-sonic anemometer, pitot tubes S & L.

Customer of JNAC calibration services include:

- Environmental protection authorities.
- HVAC industry.
- Wind energy companies.
- Mining and construction companies.
- Environmental research and Consultants.

EURAMET IEC ASTM INTERNATIONAL

AIR SPEED CALIBRATION LABORATORY

Our Air speed calibration was calibrated in the close test section of Eiffel-type wind tunnel in the range of 0.5 m/sec to 30 m/sec. The standard air velocity in the test section was calculated by pitot tube with precision differential pressure meter and Air velocity transducer.
Our standard equipment provides a traceability of the measurement to recognize the national standards, and to the realization of the International of System Units (SI) through National Institute Metrology of Thailand (NIMT).

Calibration procedure was carried out based on:

- EURAMET Calibration Guide No. 25 Version 1.0 (02/2021) Guidelines on the Calibration of Solid Anemometers Part 2: Thermal Anemometers.
- EURAMET Calibration Guide No. 24 Version 3.0 (09/2021) Guidelines on the Calibration of Solid Anemometers Part 1: Pitot Static Tubes.
- IEC 61400-12-1:2017 Part 12-1: Power performance measurements of electricity producing wind turbines, Annex F: Wind tunnel calibration procedure for anemometers
- ASTM D3796 − 09 (Reapproved 2016) Standard Practice for Calibration of Type S Pitot Tubes

Cup anemometer

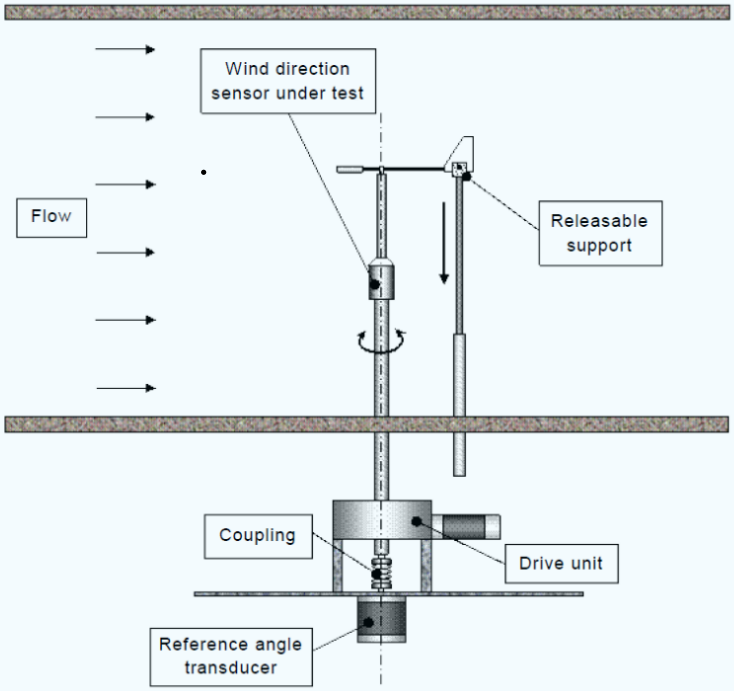
Pitot tube anemometer

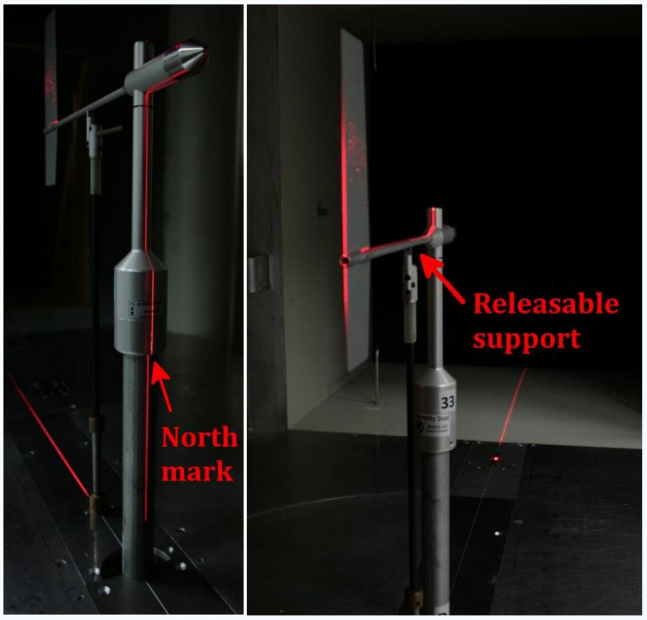
Pitot tube type S and L

Ultrasonic anemometer

Hot-wire anemometer

Propeller anemometer





IEC

WORLD METEOROLOGICAL ORGANIZATION

WIND DIRECTION CALIBRATION LABORATORY

The standard calibration of a wind direction sensor at Jiranatee Associates Co., Ltd. is performed on the basis of the IEC 61400-12-1: 2017 Edition 2.0 Wind energy generation systems – Power performance measurements of electricity producing wind turbines, to ensure the correct evaluation of measurement data.
To calibrate a wind direction sensor the flow speed (usually 8 m/s) is kept constant while the sensor is rotated around its vertical axis. The rotation is induced by a drive unit and the reference angle is measured with a rotary encoder.

Our standard equipment provides a traceability of the measurement to recognize the national standards, and to the realization of the International of System Units (SI) through National Institute Metrology of Thailand (NIMT).

Our standard Precision rotary encoder
Used for reference angle measurement

Line laser used for axis control

UNIT UNDER CALIBRATION

Ultrasonic
Wind direction

Wind vane direction

Propeller
Wind direction

NIMT

National Institute of Metrology (Thailand)

Ministry of Higher Education, Science, Research and Innovation

TRM Thailand Reference Material

Certificate of Analysis

Carbon Monoxide, Methane, Oxygen and Hydrogen sulfide in Nitrogen

TRM CODE : TRM-E-3130 **Certificate No. : CG-0005-22**

This certified gas reference material (CGRM), was produced based on NIMT's quality system in compliance with ISO 17034. This is intended use for the assignment of mole fraction of carbon monoxide, methane, oxygen and hydrogen sulfide in nitrogen and the calibration of precised equipment. Its volume in aluminum cylinder is equivalent to a water volume of 10 L. The CGRM has a nominal pressure of approximately 10.0 MPa.

Determination of Certified Value

The mole fraction of carbon monoxide was determined by Non-Dispersive Infrared (NDIR) Analyzer. The mole fraction of methane was determined by Gas Chromatograph with Flame Ionization Detector. The mole fraction of oxygen was determined by Paramagnetic Oxygen Analyzer. The mole fraction of hydrogen sulfide was determined by using Gas Chromatograph with Pulsed Discharged Helium Ionization Detector (PDHID). Calibrated by using one of the primary gas reference material (PGRM). This CGRM was measured against PGRM of NIMT for traceable measurement results. The certified value applies to only this cylinder, and the uncertainty is expressed as an expanded uncertainty obtained by multiplying the standard uncertainty at 95% confidence interval by the coverage factor $k = 2$.

Cylinder No. : SGS10143

Description	Mole Fraction	Expanded Uncertainty (%relative)
Carbon Monoxide	100.1 µmol/mol	1.0
Methane	22.03 mmol/mol	1.0
Oxygen	17.96 cmol/mol	1.0
Hydrogen Sulfide	25.15 µmol/mol	5.0

(50 %LEL of methane is 22 mmol/mol in accordance with ISO 10156.2017)

Metrological Traceability

This certificate provides traceability of measurement to recognized national standards, and to the realization of the International System of Units (SI).

Homogeneity

The homogeneity of gas mixture in this cylinder was not assessed statistically because this cylinder was produced in single unit. The homogeneity of the gas mixture has been performed by rolling the cylinder for at least an overnight.

Expiration of Certification

This certificate of this CGRM is valid until 20 Dec 2022, provided that the CGRM is handled in accordance with the instructions given in this certificate.

Precautions for Storage

Since the stability of representative CGRM is measured continuously throughout one year after the production and evaluated using a linear decay model, this CGRM should be kept at 20 oC to 28 oC being away from direct sunlight. The cylinder should be protected from physical

GAS DETECTOR CALIBRATION LABORATORY

To ensure your gas detector can accurately detect gas levels. You need to calibrate your gas detector regularly because sensors can drift over time and poisons and inhibitors can affect gas readings.

Standard gas is crucial to ensure the proper performance of your gas monitors, letting you know that your gas detector is functioning and responding to gas exposures as expected.

In our laboratory used the Certified Gas Reference Material (CGRM) to provides a traceability of the measurement to recognize the national standards, and to the realization of the International of System Units (SI) through National Institute Metrology of Thailand (NIMT).

WHAT SENSORS WE CAN CALIBRATED?

- 50% LEL (methane)
- CO (100 PPM)
- H_2S (25 PPM)
- Oxygen (18%)

PARTNER THAT YOU CAN THRUST