CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

ADVANCED POWER-TECH CENTER CO. LTD.

167/9 Dechudom 14/11, Nai Muang,
Muang, Nakhonratchasima
Thailand 30000

Fulfills the requirements of

ISO/IEC 17025:2017

In the field of

CALIBRATION

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

Jason Stine, Vice President

Expiry Date: 21 October 2026

Certificate Number: AC-3318

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

ADVANCED POWER-TECH CENTER CO. LTD.

167/9 Dechudom 14/11, Nai Muang,
Muang, Nakhonratchasima
Thailand 30000

Atsada Bhuddhapawaranggoon (Co-CEO) +66633516298

CALIBRATION

Valid to: **October 21, 2026** Certificate Number: **AC-3318**

Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sound Level Meters	94 dB @ 1kHz 114 dB @ 1kHz	0.12 dB 0.12 dB	Sound Level Calibrator IEC 62585/OIML R58 In-House Method APT-SOP-Misc01

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gas Analyzer/Gas Detector – Concentration: Oxygen in Nitrogen O_2 Methane in Nitrogen CH_4 Hydrogen Sulfide in Nitrogen H_2S	 18 cmol/mol 25 cmol/mol 2.5 cmol/mol 50 cmol/mol	 0.15 cmol/mol 0.18 cmol/mol 0.11 cmol/mol 1.1 cmol/mol	Standard Gasses, IEC 60079-29 In-house method APT-SOP-Misc02 LEL = Lower explosive limit
pH Meter [2]	4 pH 7 pH 10 pH	0.023 pH 0.023 pH 0.035 pH	Ref. CRMs USP 791 In-House Method APT-SOP-Misc03
Conductivity Meter @ 25 +/-3 °C	25 µS/cm 84 µS/cm 147 µS/cm 1 413 µS/cm 12 880 µS/cm 111.3 mS/cm	0.31 µS/cm 1 µS/cm 0.94 µS/cm 8 µS/cm 0.075 mS/cm 0.64 mS/cm	Ref. CRMs USP 644/USP 645 In-House Method APT-SOP-Misc04

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
TDS	30 mg/l 300 mg/l 1 000 mg/l 3 000 mg/l	0.11 mg/l 0.98 mg/l 4.2 mg/l 7.7 mg/l	Ref. CRMs USP 645 In-House Method APT-SOP-Misc05
Salt and Salinity Meter	491 mg/l as NaCl 1 000 mg/l as NaCl 85.47 g/l as NaCl	1.3 mg/l 2.5 mg/l 0.3 g/l	Ref. CRMs USP 645 In-House Method APT-SOP-Misc06
Refractometer - Refractive Index	5%Brix 10 %Brix 20 %Brix 30 %Brix 40 %Brix 50 %Brix 60 %Brix	0.012 %Brix 0.012 %Brix 0.012 %Brix 0.035 %Brix 0.035 %Brix 0.046 %Brix 0.058 %Brix	Sucrose Standard Solution OIML/TC17/SC2/N3 In-House Method APT-SOP-Misc08

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Generate Mode	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1 000) V	2 mV 0.02 mV 0.95 mV 1.2 mV 6.7 mV	Multi-function calibrator Method consistent with Euramet cg-15 In-House Method APT-SOP-Elec01
DC Voltage direct (pH mV Calibration)	-414.12 mV -177.48 mV 0 mV 177.48 mV 414.12 mV	0.19 mV 0.19 mV 0.19 mV 0.19 mV 0.19 mV	Multi-function calibrator/DPC In-House Method APT-SOP-Elec01
DC Voltage – Measure Mode	20 V (20 to 60) V (60 to 100) V (100 to 180) V (180 to 300) V (300 to 500) V (500 to 900) V	0.86 mV 1.1 mV 1.2 mV 2.5 mV 3.4 mV 4.2 mV 15 mV	Precision multimeter Method consistent with Euramet cg-15 In-House Method APT-SOP-Elec09

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Generate @ 50 Hz	100mV 100 mV to 1V (1 to 10) V (10 to 100) V	0.035 V 0.011 V 0.003 6 V 0.028 V	Multi process calibrator Method consistent with Euramet cg-15 In-House Method APT-SOP-Elec04
AC Voltage – Measure @ 50 Hz	20V (20 to 60) V (60 to 100) V (100 to 140) V (140 to 180) V (180 to 300) V (300 to 500) V (500 to 700) V (700 to 900) V	0.013 V 0.019 V 0.022 V 0.37 V 0.4 V 0.51 V 0.7 V 0.89 V 1.1 V	Precision multimeter Method consistent with Euramet cg-15 In-House Method APT-SOP-Elec10
DC Current - Generate	Up to 10 mA (10 to 100) mA 100 mA to 1 A (1 to 2) A	0.97 mA 9.7 mA 0.000 2 A 0.000 78 A	Multi process calibrator Method consistent with Euramet cg-15 In-House Method APT-SOP-Elec02
AC Current – Generate 45 Hz to 1 kHz	(0 to 0.2) mA (0.2 to 0.6) mA (0.6 to 1) mA (1.0 to 1.4) mA (1.4 to 1.8) mA (1.8 to 2.0) mA (2.0 to 6.0) mA (6 to 10) mA (10 to 14) mA (14 to18) mA (18 to 20) mA (20 to 60) mA (60 to 100) mA (100 to 140) mA (140 to 180) mA (0 to 0.2) A (0.2 to 0.6) A (0.6 to 1.0) A (1.0 to 1.6) A	0.000 33 mA 0.000 5 mA 0.000 63 mA 0.000 74 mA 0.000 87 mA 0.003 12 mA 0.004 53 mA 0.006 1 mA 0.007 2 mA 0.008 6 mA 0.037 mA 0.058 mA 0.08 mA 0.11 mA 0.13 mA 0.38 mA 0.67 mA 0.95 mA 1.4 mA	Multi process calibrator Method consistent with Euramet cg-15 In-House Method APT-SOP-Elec05

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Generate 45 Hz to 1 kHz	(1.6 to 1.8) A (1.8 to 3) A (3 to 5) A (5 to 7) A (7 to 10) A	1.6 mA 6 mA 0.012 A 0.016 A 0.017 A	Multi process calibrator Method consistent with Euramet cg-15 In-House Method APT-SOP-Elec05
DC Current – Measure	Up to 10 mA (10 to 100) mA 100 mA to 1 A (1 to 2) A	0.97 mA 9.7 mA 0.000 2 A 0.000 78 A	Precision multimeter Method consistent with Euramet cg-15 In-House Method APT-SOP-Elec12
AC Current – Measure @ 50 Hz	Up to 0.2 mA (0.6 to 1) mA (1 to 1.4) mA (1.4 to 1.8) mA (1.8 to 2) mA (2 to 6) mA (6 to 10) mA (10 to 14) mA (14 to 18) mA (18 to 20) mA (20 to 60) mA (60 to 100) mA (100 to 140) mA (140 to 180) mA 180 mA to 0.2 A (0.2 to 0.6) A (0.6 to 1) A (1 to 1.6) A (1.6 to 1.8) A (1.8 to 3) A (3 to 5) A (5 to 7) A (7 to 10) A	0.000 33 mA 0.000 5 mA 0.000 63 mA 0.000 74 mA 0.000 87 mA 0.003 1 mA 0.004 5 mA 0.006 1 mA 0.008 6 mA 0.037 mA 0.058 mA 0.081 mA 0.11 mA 0.13 mA 0.000 38 A 0.000 67 A 0.000 95 A 0.001 4A 0.001 6 A 0.006 A 0.012 A 0.017 A 0.017 A	Precision multimeter Method consistent with Euramet cg-15 In-House Method APT-SOP-Elec13
Resistance –Generate Fixed Points	100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ	0.014 Ω 0.000 04 kΩ 0.000 29 kΩ 0.003 3 kΩ 0.000 03 MΩ 0.001 3 MΩ 0.081 MΩ	Multi process calibrator Method consistent with Euramet cg-15 In-House Method APT-SOP-Elec03

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Measure (4-wire)	10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ	0.018 Ω 0.019 Ω 0.000 03 kΩ 0.000 16 kΩ 0.006 3 kΩ 0.021 kΩ	Precision multimeter Method consistent with Euramet cg-15 In-House Method APT-SOP-Elec11
Resistance Simulation of PT 100 (385)	(-200 to 800) °C	0.4 °C	Multi-function calibrator Method consistent with Euramet cg-11 In-House Method APT-SOP-Elec08
Thermocouple (TC) Simulation Devices	Type J (-210 to 1 200) °C Type K (-200 to 1 372) °C Type R (0 to 1 768) °C Type S (0 to 1 768) °C Type T (-240 to 400) °C	 1 °C 0.95 °C 1.7 °C 1.7 °C 1.2 °C	Multi-function calibrator Method consistent with Euramet cg-11 In-House Method APT-SOP-Elec08
Magnetic Field – Gauss Magnetic Bars	1 000 G 5 000 G 10 000 G 20 000 G	7 % of reading 14 % of reading 7 % of reading 3.9 % of reading	Gauss/Tesla Meter Model TM-801 IEC 61786-2 In-House Method APT-SOP-Elec16
Magnetic Field – Tesla Meter	3 mT 50 mT 300 mT 1 000 mT	0.12 % of reading 0.21 % of reading 0.9 % of reading 3.1 % of reading	Reference Magnets IEC 61786-2 In-House Method APT-SOP-Elec16

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dial/Digital/Vernier Calipers (ID/OD/Depth)	(Up to 200) mm (> 200 to 400) mm (> 400 to 600) mm (> 600 to 1 000) mm	0.015 mm. 0.017 mm. 0.021 mm. 0.03 mm.	Gauge Block and Caliper Checker, ASME B89.1.14 In-House Method APT-SOP-Dim 01

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Offset Centerline Caliper	Up to 300 mm	7 µm	Profile Projector w/ Gauge Blocks In-House Method APT-SOP-Dim01
Caliper Gauge External	Up to 25 mm (25 to 50) mm	13 µm 14 µm	Gauge Blocks In-House Method APT-SOP-Dim01
Micrometers	Up to 25 mm (> 25 to 50) mm (> 50 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 500) mm (> 500 to 1 000) mm	0.96 µm 1.6 µm 2.7 µm 3.4 µm 0.9 µm 3.9 µm 5.2 µm	Gauge Block Set & Measuring Rod or Long Gauge Block Missing Optical Flats BS EN ISO 3611, In-House Method APT-SOP-Dim 02
Depth Micrometers	(0 to 300) mm	2.5 µm	Gauge Block Set, JIS: B7544 In-House Method APT-SOP-Dim 06
Micrometer Setting Rod Gauge Length	Up to 25 mm (25 to 50) mm (50 to 100) mm (100 to 200) mm (200 to 300) mm (300 to 500) mm	0.6 µm 0.6 µm 0.7 µm 1.5 µm 1.8 µm 3.2 µm	ULM, Gauge Blocks In-House Method APT-SOP-Dim02
Point Micrometer	(0 to 25) mm	0.96 µm	Gauge Block Set In-House Method APT-SOP-Dim02
Gear Micrometer	(0 to 25) mm (>25 to 50) mm (>50 to 75) mm (>75 to 100) mm	0.96 µm 1.5 µm 2.1 µm 2.8 µm	Gauge Block Set APT-SOP-Dim 02
Snap Indicating Micrometer	(0 to 100) mm	2.8 µm	Gauge Block Set In-House Method APT-SOP-Dim02
Stick/ Inside Micrometers	(0 to 100) mm	2.8 µm	Universal Length Measuring Machine (ULM) DMS 680, B.S 959, In-House Method APT-SOP-Dim 15

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dial/Digital Indicator/ Dial Gauge	Up to 10 mm (> 10 to 20) mm (> 20 to 30) mm (> 30 to 40) mm (> 40 to 50) mm	2.9 µm 2.8 µm 2.7 µm 3 µm 3 µm	Dial Gauge Tester, ASME B89.1.10M In-House Method APT-SOP-Dim 03
Dial Test Indicator/ Lever Dial Gauge	Up to 2 mm	1.6 µm	Dial Gauge Calibrator, ASME B89.1.10M, In-House Method APT-SOP-Dim 18
Digital/Dial Thickness Gauges	(0 to 12) mm	0.7 µm	Gauge Block Set DIN EN ISO 5084 In-House Method APT-SOP-Dim 24
Bore Gauge / Cylinder Gauge	(0 to 2) mm	6 µm	Universal Length Measuring Machine (ULM), JIS B 7515 In-House Method APT-SOP-Dim 17
Dial/Digital Height Gauge	Up to 200 mm (> 200 to 300) mm (> 300 to 450) mm (> 450 to 600) mm (> 600 to 1 000) mm	1.5 µm 1.6 µm 1.8 µm 2.1 µm 3 µm	Gauge Block Set & Caliper Checker, JIS B 7517 In-House Method APT-SOP-Dim 19
Cylindrical Plug/Pin Gauge	Up to 100 mm	0.6 mm	Gauge Block (or Universal Length Measuring Machine (ULM), ISO 286 Part (I & II), In-House Method APT-SOP-Dim 04
Plain Ring Gauge	(3 to 50) mm (50 to 100) mm	0.7 µm 0.75 µm	ULM, Master Ring, ISO 3670-1 In-House Method APT-SOP-Dim 09
Universal Length Measuring Machines (ULM)	Up to 100 mm (100 to 500) mm	0.5 µm 1.7 µm	Gauge Block Set, B89.4.10360.2 In-House Method APT-SOP-Dim 12

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Measuring Microscope (X,Y) Axis Z Axis	Up to 50 mm (> 50 to 150) mm (> 150 to 250) mm (> 250 to 500) mm Up to 50 mm (> 50 to 100) mm (> 100 to 150) mm (> 150 to 200) mm	0.57 µm 0.85 µm 1.3 µm 1.5 µm 0.57 µm 0.67 µm 0.85 µm 1.8 µm	Standard Glass Scale/Gauge Block ASTM E1951-02 In-House Method APT-SOP-Dim 16
Measuring Scale/Steel Scale	(0 to 1 000) mm	0.6 mm	Scale and Tape calibrator, IS 4181 In-House Method APT-SOP-Dim 20
Tape Measure Steel Tape Measure	Up to 1 000 mm	0.6 mm	Scale and Tape Calibrator. IS 1269 Part-1 In-House Method APT-SOP-Dim 21
Granite Surface Plate [1,2] Deviations from flatness Overall	(0 to 500) µm/m Up to 2 000 mm*D*	2.6 µm/m	Partial Calibration per JIS B 7513-1992, ISO 8512-2 with Electronic level meter/inclinometer In-House Method APT-SOP-Dim22
Radius Gauge (Concave and Convex)	(0.1 to 10) mm	3.5 µm	Direct Measurement; Profile Projector In-House Method APT-SOP-Dim37
Sphere and Precision Balls - Diameter	Up to 100 mm	0.6 µm	Universal Length Measuring Machine In-House Method APT-SOP-Dim39
Gauge Blocks	Up to 10 mm (>10 to 25) mm (>25 to 50) mm (>50 to 75) mm (>75 to 100) mm (>100 to 200) mm (>200 to 500) mm	0.37 µm 0.38 µm 0.45 µm 0.52 µm 0.61 µm 1.4 µm 2.5 µm	ULM, ISO Grade 0 Gauge Blocks & ISO 3650 In-House Method APT-SOP-Dim 41

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Three-Point Micrometer Internal Diameter	(2 to 75) mm	2.1 µm	Master Ring Gauges In-House Method APT-SOP-Dim 42
Test Sieve	75 µm to 4 mm (4 to 125) mm	3.5 mm. 4.2 mm.	Profile Projector, ASTM E-11 In-House Method APT-SOP-Dim 43
Optical Flat (Diameter: Up to 60 mm)	Up to 10 µm (12 to 25.37) µm	0.2 µm 0.42 µm	Master Optical Flat In-House Method APT-SOP-Dim 46
Coating Thickness Gauge	25.3 mm 52.2 mm 128.30 mm 252.40 mm 479.00 mm 976.00 mm 2083.00 mm 2933.00 mm	1 mm 1 mm 1 mm 1.1 mm 1.1 mm 1.2 mm 1.2 mm 1.2 mm	Precision Foil Set Standard, ASTM B499-09 In-House Method APT-SOP-Dim 05

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Weighing Balance/Scale	50 mg to 20 g (>20 to 40) g (>40 to 60) g (>60 to 100) g (>100 to 200) g (>200 to 300) g (>300 to 400) g (>400 to 500) g (>500 to 600) g (>600 to 700) g (>700 to 800) g (>800 to 900) g >900 g to 1 kg	0.83 mg 0.84 mg 0.85 mg 0.87 mg 1 mg 1.2 mg 1.3 mg 2.5 mg 2.7 mg 3 mg 3.2 mg 3.4 mg 2.3 mg	OIML R 76-1 Class E2 Standard Weights & Euramet cg-18 In-House Method APT-SOP-Mech 01

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Weighing Balance/Scale	(>1 to 5) kg (>5 to 10) kg. (>10 to 50) kg (>50 to 100) kg (>100 to 300) kg (>300 to 500) kg (>500 to 600) kg (>600 to 900) kg (>900 to 1 000) kg (>1 000 to 1 200) kg (>1 200 to 1 500) kg (>1 500 to 1 800) kg (>1 800 to 2 100) kg (>2 100 to 2 400) kg (>2 400 to 2 700) kg (>2 700 to 3 000) kg	0.82 g 0.96 g 8.3 g 8.5 g 82 g 83 g 83 g 85 g 86 g 0.082 kg 0.082 kg 0.082 kg 0.082 kg 0.082 kg 0.082 kg 0.082 kg	OIML R 76-1 Class F1 Standard Weights & Euramet cg-18 In-House Method APT-SOP-Mech 01
Moisture Balance (Moisture Analyzer) Mass Temperature	 Up to 100 g Up to 50 ºC (>50 to 100) ºC (>100 to 200) ºC	 0.000 84 g 0.3 °C 0.32 °C 0.51 °C	Weight set and Temperature sensor and process calibrator In-House Method APT-SOP-Mech01 APT-SOP-Ther01
Conventional Mass – OIML Class F1	50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg	0.017 mg 0.02 mg 0.027 mg 0.053 mg 0.039 mg 0.062 mg 0.055 mg 0.084 mg 0.14 mg 0.15 mg 0.2 mg 0.4 mg 1.6 mg 2.2 mg 4.5 mg	OIML E2 Class Weight, Mass Comparator/Balance, OIML R111:2004 (ABBA Method In-House Method APT-SOP-Mech03

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conventional Mass – OIML Class F2	1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg	0.039 mg 0.062 mg 0.055 mg 0.084 mg 0.14 mg 0.15 mg 0.2 mg 0.4 mg 1.6 mg 2.2 mg 4.5 mg	OIML F1 Class Weight, Mass Comparator/Balance, OIML R111:2004 (ABBA Method) In-House Method APT-SOP-Mech03
Conventional Mass – OIML Class M1	1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg	0.039 mg 0.062 mg 0.055 mg 0.084 mg 0.14 mg 0.15 mg 0.2 mg 0.4 mg 1.6 mg 2.2 mg 4.5 mg 13 mg 25 mg 43 mg	OIML F1 Class Weight, Mass Comparator/Balance, OIML R111:2004 (ABBA Method) In-House Method APT-SOP-Mech03

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conventional Mass – Non OIML Class	50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg	0.017 mg 0.02 mg 0.027 mg 0.053 mg 0.039 mg 0.062 mg 0.055 mg 0.084 mg 0.14 mg 0.15 mg 0.2 mg 0.4 mg 1.6 mg 2.2 mg 4.5 mg 13 mg 25 mg 43 mg	OIML E2, F1 & M1 Class Weights and Mass Comparator/Balance OIML R111:2004 (ABBA Method) (For Non- OIML Class weights) In-House Method APT-SOP-Mech03
Force Gauge (Push Mode)	Up to 50 N	0.06 N	Standard Weights, VDI/VDE 2624 Part 2.1 In-House Method APT-SOP-Mech06
Manual/Electronic Torque Tools	(0 to 25) N m (25 to 200) N m (200 to 500) N m (500 to 1 400) N m	1.7 N m 3.6 N m 9.3 N m 25 N m	Torque Transducer with display, ISO 6789:2003 In-House Method APT-SOP-Mech13
Analog/Digital Vacuum Gauges	(-0.8 to 0) bar	0.003 2 bar	DPI 104 Calibrator, D2 & 681 DPG DKD R 6-1 In-House Method APT-SOP-Mech14
Volume Flow – Liquid Flowmeter [1] (On site calibration only)	(1 to 25) m³/h (>25 to 50) m³/h (>50 to 100) m³/h	2.7 % of reading 2.7 % of reading 2.7 % of reading	Ultrasonic Flowmeter (4 “ only) In-House Method APT-SOP-Mech 17 Medium: Water flow
Air Velocity Meter, Hot-wire Anemometer	Up to 5 m/s (5 to 10) m/s (10 to 15) m/s (15 to 20) m/s (20 to 25) m/s	0.21 m/s 0.25 m/s 0.33 m/s 0.42 m/s 0.51 m/s	Reference Anemometer In-House Method APT-SOP-Mech18

Photometry and Radiometry

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Lux Meter	(1 to 100) lux (100 to 500) lux (500 to 1 000) lux (1 000 to 2 000) lux (2000 to 4 000) lux (4 000 to 6 000) lux	3.7 % of reading 3.8 % of reading 3.7 % of reading 3.7 % of reading 3.9 % of reading 3.9 % of reading	Light Meter, Halogen Light In-House Method APT-SOP-Opt01

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Liquid-in-Glass Thermometer (Partial/Total Immersion)	(-30 to 120) °C (120 to 300) °C	0.12 °C 0.24 °C	Thermometer with Probe (PRT) with Micro Bath In-House Method APT-SOP-Ther 01
MIG Thermometer	(-30 to 120) °C (120 to 300) °C	0.12 °C 0.24 °C	Thermometer with Probe (PRT) with Micro Bath In-House Method APT-SOP-Ther01
Temperature Measuring Equipment- RTD/Digital Thermometer	(-55 to -30) °C (-30 to 120) °C (120 to 300) °C (300 to 600) °C	0.06 °C 0.1 °C 0.24 °C 0.45 °C	Thermometer with Probe (PRT) DKD R 5-1/ASTM E77 In-House Method APT-SOP-Ther 02
Dial thermometer (Temperature gauge)	(- 55 to -30) °C (> -30 to 120) °C (> 120 to 300) °C (> 300 to 600) °C	0.6 °C 0.6 °C 0.62 °C 0.73 °C	Thermometer with Probe (PRT) In-House Method APT-SOP-Ther02
Digital Thermometer with Sensor (NTC / PTC)	(- 50 to -30) °C (> -30 to 130) °C	0.06 °C 0.1 °C	Thermometer with Probe (PRT) In-House Method APT-SOP-Ther02

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Digital Thermometer with Thermocouple Sensor and Temperature Transmitter	Type J, K (-20 to 200) ºC (> 200 to 300) ºC (> 300 to 400) ºC (> 400 to 500) ºC Type T (-20 to 150) ºC (> 150 to 200) ºC (> 200 to 250) ºC (> 250 to 350) ºC (> 350 to 400) ºC	 0.66 ºC 0.77 ºC 1.8 ºC 2.3 ºC 0.44 ºC 0.47 ºC 0.67 ºC 0.79 ºC 0.86 ºC	Thermometer with Probe (Type S TC) In-House Method APT-SOP-Ther03
Temperature Generating Equipment- Dry Block Calibrators	(-55 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 600) °C	0.07 °C 0.1 °C 0.1 °C 0.15 °C	Thermometer with Probe (PRT) Euramet cg-13/ASTM E3186-19 In-House Method APT-SOP-Ther04
Temperature Chamber (Oven, Incubator, Refrigerator, Freezer) [1]	(-80 to -40) °C (>-40 to 0) °C (>0 to50) °C (>50 to 150) °C (>150 to 250) °C	0.63 °C 0.25 °C 0.36 °C 0.47 °C 0.65 °C	LXI Data Acquisition/Switch Unit with Sensor DKD R 5-7 In-House Method APT-SOP-Ther05
Furnace [1]	(200 to 400) °C (> 400 to 600) °C (> 600 to 800) °C (> 800 to 1 000) °C (> 1 000 to 1 200) °C	0.9 °C 1 °C 2.4 °C 2.4 °C 2.7 °C	Data Acquisition Unit with S type Thermocouple Probe In-House Method APT-SOP-Ther05
Thermo-Hygrograph Temperature Humidity	 (-40 to 100) °C (30 to 50) %RH (50 to 60) %RH (60 to 80) %RH	 0.4 °C 1.5 %RH 1.6 %RH 1.7 %RH	Ref Thermo-Hygrometer and Humidity Chamber BPS-100CB Bluepard AS 2895 In-House Method APT-SOP-Ther 09
Infrared thermometer (IR)	(50 to 100) °C (> 100 to 600) °C	2 °C 7.7 °C	Black Body Source ε = 0.05, λ = (8 to 14) µm In-House Method APT-SOP-Ther11

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Time – Stopwatch/Timer Resolution (0.01s/0.1s/1s)	Up to 21600 s (6 h)	0.46 s	Digital Stopwatch NIST 960-12 In-House Method APT-SOP-Ele15
Stopwatch – Quartz Frequency	32 768 Hz (nominal)	0.82 Hz	Precision Multimeter NIST 960-12 In-House Method APT-SOP-Elec15
Photo tachometers	Up to 600 rpm (600 to 3 000) rpm (3 000 to 30 000) rpm (30 000 to 60 000) rpm	0.54 rpm 8.3 rpm 9 rpm 11 rpm	Fluke 754 & Photo Emitter In-House Method APT-SOP-Elec06

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 (k=2), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope
2. D = diagonal length.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-3318.

Jason Stine, Vice President