Accredited Laboratory

A2LA has accredited

AL HOTY CALIBRATION SERVICES

Al Khobar, SAUDI ARABIA

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets R205 – Specific Requirements: Calibration Laboratory Accreditation Program. 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*).

Presented this 17th day of August 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3467.01
Valid to August 31, 2025

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: August 31, 2025 Certificate Number: 3467.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 8]:

I. Acoustic

Parameter/Equipment	Range	CMC[2] (±)	Comments
Sound Level Meter[3]	114 dB @ 1 kHz	1.3 dB	In comparison with Dawe (acoustic calibrator)
	94 dB, 104, 114 dB @ 1 kHz	0.6 dB	CEL Inst. (digital sound level meter)
Acoustic Level Calibrator[3]	94 dB, 104, 114 dB @ 1 kHz	0.6 dB	CEL Inst. (digital sound level meter)

II. Chemical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Conductivity Meter[3]	180 µS/cm 980 µS/cm 1416 µS/cm 1992 µS/cm	11 µS/cm 16 µS/cm 36 µS/cm 26 µS/cm	Comparison to standard solution

Parameter/Equipment	Range	CMC[2] (±)	Comments
TDS Meter[3]	90 mg/L 490 mg/L 996 mg/L	5.0 mg/L 5.0 mg/L 9.0 mg/L	Comparison to standard solution
pH Meter[3]	4.02 pH 6.98 pH 9.99 pH	0.026 pH 0.039 pH 0.052 pH	Comparison to standard solution

III. Dimensional

Parameter/Equipment	Range	CMC[2] (±)	Comments
Micrometer[3] (Inside & Outside)	Up to 25 mm (>25 to 75) mm (>75 to 100) mm	1.1 µm 1.1 µm 1.1 µm	Gage blocks (Mitutoyo M103)
Calipers[3] (All Types)	Up to 300 mm Up to 100 mm (>100 to 600) mm	12 µm 6.4 µm 12 µm/m + 3.5 µm	Gage blocks (Mitutoyo M103) Caliper checker
Ring Gages	Up to 100 mm (>100 to 400) mm (>400 to 600) mm Up to 4 in (>4 to 8) in (8 to 11) in	1.6 µm 3.6 µm 4.5 µm 62 µin 100 µin 140 µin	UMM instruments (Trimos)
Setting Rods	(25 to 125) mm (150 to 200) mm (225 to 275) mm (300 to 425) mm (2 to 5) in (6 to 8) in (9 to 11) in (12 to 16) in	1.2 µm 2.4 µm 3.4 µm 4.0 µm 41 µin 74 µin 130 µin 170 µin	UMM instruments (Trimos)

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Dial Indicators[3]	Up to 25 mm Up to 1 in	6.1 µm 110 µin	Dial indicator calibrator
Height Gauge/Vertical Instrument/Single Axis Dimensional Measurements[3]	(5 to 100) mm (>100 to 600) mm (0.5 to 4) in (>4 to 16) in	1.2 µm + 2.0 µm/m 0.3 µm + 10 µm/m 50 µin + 1.5 µin/in 100 µin + 3.0 µin/in	Gage blocks, setting rods (Mitutoyo)
Extensometer[3]	Up to 50 mm Up to 2 in	1.1 µm + 20*($L_{(mm)}$/1000) 55µin	Extensometer calibrator /gauge blocks
Gauge Block	Up to 100 mm	0.12µm + 7.3*($L_{(mm)}$/1000)	Gauge block set / gauge block comparator
Measuring Tape / Rule	Up to 1000 mm (>1000 to 10 000) mm	10 µm + 0.1*($L_{(mm)}$ / 1000) 10 µm + 10*($L_{(mm)}$ / 1000)	Scale & tape measuring machine
Caliper Checker/Dimensional Measurement	(20 to 100) mm (>100 to 350) mm (>350 to 600) mm	1.9 µm + 4.0 µm/m 1.9 µm + 4.0 µm/m 1.9 µm + 4.0 µm/m	Vertical instrument (Trimos)

IV. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
DC Voltage – Generate[3]	(0 to 329.9999) mV (0.33 to 3.299 999) V (3.3 to 32.999 99) V (33 to 329.9999) V (330 to 1000) V	17 µV/V + 0.6 µV 9 µV/V + 2 µV 10 µV/V + 10 µV 13 µV/V + 0.5 mV 10 µV/V + 5 mV	Fluke 5520A, Fluke 5522A
DC Voltage – Generate[3]	(0 to 25) V (0 to 56) V	0.015 V + 0.1 % 0.020 V + 0.1 %	TTI QL 564 power supply

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
DC Voltage – Measure[3]	(0 to 100) mV (0 to 1) V (0 to 10) V (0 to 100) V (0 to 1000) V	45 µV/V + 4 µV 50 µV/V + 50 µV 26 µV/V + 80 µV 41 µV/V + 1 mV 47 µV/V + 12 mV	Fluke 8845A/8846A
DC Voltage – Measure[3]	(0 to 200) mV (0 to 2) V (0 to 20) V (0 to 200) V (0 to 1000) V	10 µV/V + 0.07 µV 5.0 µV/V + 1.4 µV 5.0 µV/V + 14 µV 8.0 µV/V + 36 µV 10 µV/V + 0.4 µV	Fluke 8508A
High Voltage Measure[3]	(1 to 5) kV dc (5 to 40) kV pulse	0.1 % + 0.0079 kV dc 0.2 % + 0.08 kV pulse	Pipeline Inspection Co. (high voltage meter)
DC Current – Generate[3]	(0 to 329.999) µA (0.33 to 3.299 99) mA (3.3 to 32.9999) mA (33 to 329.999) mA (0.33 to 2.999 99) A (3.0 to 10) A (>10 to 19) A (10 to 500) A (>500 to 1000) A	100 µA/A + 0.017µA 100 µA/A + 0.02 µA 80 µA/A + 0.2 µA 80 µA/A + 2 µA 0.3 mA/A + 40µA 0.4 mA/A + 0.4 mA 0.7 mA/A + 1.5mA (3 mA/A + 0.09) A (3.2 mA/A + 0.09) A	Fluke 5520A, Fluke 5522A Fluke 5520A, Fluke 5522A, Fluke 5500A (coil)
DC Current – Generate[3]	Up to 500 mA (0 to 2) A (0 to 4) A	0.5 mA + 0.30 % 6 mA + 0.23 % 5 mA + 0.30 %	TTI QL 564 power supply
DC Current – Measure[3]	(0 to 100) µA (0 to 1) mA (0 to 10) mA (0 to 100) mA (0 to 400) mA (0 to 1) A (0 to 3) A (0 to 10) A	0.55 mA/ A + 0.03 µA 0.54 mA/A + 0.1 µA 0.56 mA/A + 2.5 µA 0.54 mA/A + 10 µA 0.50 mA/A + 0.05 mA 0.65 mA/A + 0.2 mA 1.0 mA/A + 1.0 mA 1.6 mA/A + 2.0 mA	Fluke 8845A/8846A

Parameter/Equipment	Range	CMC[2, 4, 6] (±)	Comments
DC Current – Measure[3]	(0 to 200) µA (0 to 2) mA (0 to 20) mA (0 to 200) mA (0 to 2) A (0 to 20) A	42 µA/ A + 0.0023 µA 26 µA/A + 0.003 µA 28 µA/A + 0.03 µA 65 µA/A + 0.82 µA 220 µA/A + 0.02 µA 0.48 mA/A + 0.40 mA	Fluke 8508A
Resistance – Generate[3]	(0 to 32.9999) Ω (33 to 329.9999) Ω 330 Ω to 3.299 99 kΩ (3.3 to 32.9999) kΩ (33 to 329.9999) kΩ 330 kΩ to 3.299 999 MΩ (3.3 to 32.999 99) MΩ (33 to 100) MΩ	0.03 mΩ/Ω + 0.03 mΩ 0.02 mΩ/Ω + 0.5 mΩ 0.02 mΩ/Ω + 6.0 mΩ 0.02 mΩ/Ω + 60 mΩ 0.02 mΩ/Ω + 0.6 Ω 0.05 mΩ/Ω 0.2 mΩ/Ω 0.4 mΩ/Ω	Fluke 5520A, Fluke 5522A
Resistance – Generate[3] Fixed Points	1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ 10 GΩ 100 GΩ	0.000 08 kΩ 0.0008 kΩ 0.008 kΩ 0.008 kΩ 0.002 MΩ 0.05 MΩ 0.0005GΩ 0.01 GΩ 0.2 GΩ	High resistance decade box/Tinsley 4721
Resistance – Generate[3]	(0.1 to 1) Ω (1 to 10) Ω 10 Ω to 100 kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ	200 µΩ/Ω 30 µΩ/Ω 20 µΩ/Ω 25 µΩ/Ω 100 µΩ/Ω 20 µΩ/Ω	IET HARS series – high accuracy decade resistance substituter
Low-Resistance Meter[3]	1 mΩ 10 mΩ	0.15 mΩ 0.62 mΩ	Shunt resistor
Shunt Resistor[3]/ Electrical Continuity of Resistance[3]	Up to 1 Ω	5.3 %	Multiproduct calibrator, multimeter, micro ohmmeter

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Welders[3]			
DC Current	Up to 400 A	1.3 A	Fluke 376 clamp-on
DC Voltage	Up to 100 V	0.092 V	Fluke 287 DMM
Cycles	Up to 9000 rpm	1 rpm	Monarch PLT200
Resistance – Measure[3]	(0 to 10) Ω (0 to 100) Ω (0 to 1) kΩ (0 to 10) kΩ (0 to 100) kΩ (0 to 1) MΩ (0 to 10) MΩ (0 to 100) MΩ	0.11 mΩ/Ω + 4.2 mΩ 0.11 mΩ/Ω + 6.3 mΩ 0.13 mΩ/Ω + 0.012 Ω 0.13 mΩ/Ω + 0.12 Ω 0.13 mΩ/Ω + 1.3 Ω 0.16 mΩ/Ω + 9 Ω 0.55 mΩ/Ω + 3 kΩ 9 mΩ/Ω + 0.04 MΩ	Fluke 8845A/8846A
	0 to 2) Ω (0 to 20) Ω (0 to 200) Ω (0 to 2) kΩ (0 to 20) kΩ (0 to 200) kΩ (0 to 2) MΩ (0 to 20) MΩ (0 to 200) MΩ (0 to 2) GΩ	55 µΩ/Ω + 3 µΩ 23 µΩ/Ω + 8 µΩ 13 µΩ/Ω + 0.1 mΩ 11 µΩ/Ω + 0.5 mΩ 10 µΩ/Ω + 0.01 Ω 13 µΩ/Ω + 0.1 Ω 19 µΩ/Ω + 1.6 Ω 30 µΩ/Ω + 0.16 kΩ 240 µΩ/Ω + 0.008 MΩ 2 mΩ/Ω + 1 MΩ	Fluke 8508A

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
AC Voltage – Generate[3]			
(1 to 32.999) mV (33 to 329.999) mV (0.33 to 3.299 99) V (3.3 to 32.9999) V (33 to 329.999) V (330 to 1020) V	45 Hz to 10 kHz	200 µV/V + 4 µV 100 µV/V + 10 µV 200 µV/V + 40 µV 200 µV/V + 0.6 mV 150 µV/V + 2.0 mV 200 µV/V + 40 mV	Fluke 5520A, Fluke 5522A

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
AC Voltage – Measure[3]			
(0 to 100) mV	(10 to 20) kHz	0.075 % + 0.048 mV	Fluke 8845A/8846A
(0 to 1) V		0.075 % + 0.35 mV	
(0 to 10) V		0.075 % + 3.4 mV	
(0 to 100) V		0.075 % + 34 mV	
(0 to 1000) V		0.075 % + 260 mV	
(0 to 200) mV	10 Hz to 20 kHz	0.022 % + 0.004 mV	Fluke 8508A
(0 to 2) V		0.011 % + 0.03 mV	
(0 to 20) V		0.012 % + 0.28 mV	
(0 to 200) V		0.012 % + 3.5 mV	
(0 to 1000) V		0.018 % + 23 mV	
AC Current – Generate[3]			
(29 to 329.99) µA	45 Hz to 1 kHz	1.0 mA/A + 0.08 µA	Fluke 5520A, Fluke 5522A, Fluke 5500A (coil)
(0.33 to 3.2999) mA		0.8 mA/A + 0.10 µA	
(3.3 to 32.999) mA		0.35 mA/A + 0.7 µA	
(33 to 329.99) mA		0.37 mA/A + 9 µA	
(0.33 to 1.099 99) A		0.4 mA/A + 0.08 mA	
(1.1 to 10.9999) A	(45 to 100) Hz	0.6 mA/A + 0.7 mA	
(11 to 20.5) A		1.7 mA/A + 2 mA	
(10 to 50) A		0.3 % + 0.15 A	
(>50 to 100) A		0.27 % + 0.2 A	
(>100 to 500) A		0.32 % + 0.2 A	
(>500 to 1000) A		0.36 % + 0.2 A	
AC Current – Measure[3]			
100 µA	10 Hz to 5 kHz	0.25 % + 0.07 µA	Fluke 8845A/8846A
1 mA		0.16 % + 0.47 µA	
(0 to 10) mA		0.2 % + 6.8 µA	
(0 to 100) mA		0.13 % + 52 µA	
(0 to 400) mA		0.13 % + 0.46 mA	
(0 to 1) A		0.13 % + 0.5 mA	
(0 to 3) A		0.25 % + 2 mA	
(0 to 10) A		0.2 % + 7 mA	
AC Current – Measure[3]			
(0 to 200) µA	10 Hz to 5 kHz	0.038 % + 0.022 µA	Fluke 8508A
(0 to 2) mA		0.035 % + 0.26 µA	
(0 to 20) mA		0.038 % + 0.002 µA	
(0 to 200) mA		0.038 % + 0.02 µA	
(0 to 2) A		0.070 % + 0.30 mA	
(0 to 20) A		0.29 % + 0.0023 A	

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Electrical Calibration of Thermocouples – Generate & Measure[3]			
Type B	(600 to 800) °C (>800 to 1820) °C	0.38 °C 0.30 °C	Fluke 5520A, Fluke 5522A
Type E	(-250 to -100) °C (>-100 to -25) °C (>-25 to 350) °C (>350 to 650) °C (>650 to 1000) °C	0.40 °C 0.22 °C 0.20 °C 0.13 °C 0.17 °C	
Type J	(-210 to -100) °C (>-100 to -30) °C (>-30 to 150) °C (>150 to 760) °C (760 to 1200) °C	0.21 °C 0.22 °C 0.20 °C 0.13 °C 0.18 °C	
Type K	(-200 to -100) °C (>-100 to -25) °C (>-25 to 120) °C (>120 to 1000) °C (>1000 to 1372) °C	0.26 °C 0.24 °C 0.22 °C 0.20 °C 0.31 °C	
Type N	(-200 to 0) °C (>0 to 1300) °C	0.31 °C 0.25 °C	
Type R	(0 to 250) °C (>250 to 400) °C (>400 to 1000) °C (>1000 to 1767) °C	0.46 °C 0.32 °C 0.26 °C 0.32 °C	
Type S	(0 to 250) °C (>250 to 1000) °C (>1000 to 1767) °C	0.38 °C 0.31 °C 0.36 °C	
Type T	(-250 to -150) °C (>-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.50 °C 0.20 °C 0.16 °C 0.12 °C	

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Electrical Calibration of Thermocouples – Generate & Measure[3]			
Type B	(600 to 1800) °C (600 to 1800) °C	1.4 °C + 0.05 % 2.0°C	Martel MC-1200
Type E	(-100 to 0) °C (>0 to 100) °C (-200 to 0) °C (>0 to 980) °C	0.34 °C + 0.3 % 0.3 °C + 0.01 % 0.4 °C + 0.3 % 0.3 °C + 0.01 %	
Type J	(-100 to 0) °C (>0 to 100) °C (>100 to 1100) °C (-150 to 0) °C (>0 to 500) °C (>500 to 1100) °C	0.32 °C + 0.15 % 0.32 °C + 0.025 % 0.2 °C + 0.03 % 0.33 °C + 0.18 % 0.34°C 0.3 °C + 0.016 %	
Type K	(-190 to 0) °C (>0 to 1300) °C	0.42 °C + 0.21 % 0.4 °C + 0.05 %	
Type N	(-190 to 0) °C (>0 to 1400) °C (-190 to 0) °C (>0 to 1280) °C	0.54 °C + 0.3 % 0.54 °C + 0.01 % 0.53 °C + 0.3 % 0.58 °C	
Type R	(>0 to 100) °C (>100 to 1500) °C (>0 to 1700) °C	2.2 °C 1.6 °C + 0.015 % 1.8 °C	
Type S	(>0 to 1500) °C (>100 to 1600) °C (>0 to 1700) °C	1.7°C 1.7 °C + 0.032 % 1.8 °C	
Type T	(-200 to 0) °C (>0 to 390) °C (-200 to 0) °C (>0 to 380) °C	0.36 °C + 0.05 % 0.30 °C + 0.01 % 0.4 °C + 0.3 % 0.3 °C + 0.01 %	

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Electrical Calibration of RTD – Generate[3]			
Pt 385, 100 Ω	(-200 to -80) °C (-80 to 0) °C (>0 to 100) °C (>100 to 300) °C (>300 to 400) °C (>400 to 630) °C (>630 to 800) °C	0.061 °C 0.061 °C 0.083 °C 0.11 °C 0.12 °C 0.14 °C 0.27 °C	Fluke 5520A, Fluke 5522A
Pt 385, 200 Ω	(-200 to -80) °C (>-80 to 0) °C (>0 to 100) °C (>100 to 260) °C (>260 to 300) °C (>300 to 400) °C (>400 to 600) °C (>600 to 630) °C	0.05 °C 0.05 °C 0.05 °C 0.061 °C 0.14 °C 0.16 °C 0.17 °C 0.19 °C	
Pt 385, 500 Ω	(-200 to -80) °C (>-80 to 0) °C (>0 to 100) °C (>100 to 260) °C (>260 to 300) °C (>300 to 400) °C (>400 to 600) °C (>600 to 630) °C	0.050 °C 0.061 °C 0.061 °C 0.072 °C 0.094 °C 0.094 °C 0.11 °C 0.13 °C	
Pt 385, 1000 Ω	(-200 to -80) °C (>-80 to 0) °C (0 to 100) °C (>100 to 260) °C	0.040 °C 0.040 °C 0.050 °C 0.061 °C	

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Electrical Calibration of RTD – Measure[3]			
Pt 385, 100 Ω	(-180 to 0) °C (>0 to 550) °C	0.08 % + 0.1 °C 0.038 % + 0.1 °C	Fluke 8846A
Pt 385, 200 Ω	(-180 to 100) °C (>100 to 500) °C	0.1 % + 0.08 °C 0.038 % + 0.1 °C	
Pt 385, 500 Ω	< 0 °C (0 to550) °C	0.10 % + 0.083 °C 0.038 % + 0.1 °C	
Pt 385, 1000 Ω	(-180 to 0) °C (>-100 to 550) °C	0.11 % + 0.072 °C 0.35 % + 0.1 °C	
Pt 385, 100 Ω	(-190 to 0) °C (>0 to 780) °C	0.26 °C + 0.012 % 0.18 °C + 0.1 %	Martel MC-1200
Pt 385, 200 Ω	(-190 to 0) °C (>0 to 620) °C	0.93°C 0.93 °C + 0.06 %	
Pt 385, 500 Ω	(-190 to 0) °C (>0 to 620) °C	0.48 °C 0.48 °C + 0.06 %	
Pt 385, 1000 Ω	(-190 to 0) °C (>0 to 620) °C	0.25 °C 0.30°C + 0.04 %	

V. Fluid Quantities

Parameter/Equipment	Range	CMC[2, 5, 9] (±)	Comments
Anemometer/Airflow Meter[3]	Up to 5 m/s >5 to 10 m/s >10 to 15 m/s	0.15 m/s 0.30 m/s 0.55 m/s	Airflow calibrator, digital anemometer

Parameter/Equipment	Range	CMC[2, 5, 9] (±)	Comments
Gas Flow/LPG & Gas Regulators[3]	(1 to 20) cc/m (>20 to 50) cc/m (>50 to 150) cc/m (>150 to 240) cc/m (20 to 250) cc/m (>250 to 1500) cc/m (>1500 to 3500) cc/m (>3500 to 5500) cc/m (2 to 5) LPM (>5 to 12) LPM (>12 to 20) LPM (>20 to 29) LPM	0.5 % + 0.013 cc/m 0.7 % + 0.012 cc/m 0.5 % + 0.06 cc/m 0.4 % + 0.21 cc/m 0.8 % + 0.3 cc/m 0.25 % + 0.7 cc/m 0.12 % + 0.5 cc/m 0.12 % + 1.0 cc/m 0.5 % + 0.001 LPM 0.1 % + 0.01 LPM 0.22 % + 0.01 LPM 0.7 % + 0.01 LPM	Airflow calibrator with low flow cell
Kinematic & Dynamic Viscosity Oil Std.[3] (15 to 45) °C	<10 mm²/s (10 to 100) mm²/s (100 to 1000) mm²/s (1000 to 10 000) mm²/s (10 000 to 100 000) mm²/s	0.21 % + 0.6*R* 0.29 % + 0.6*R* 0.38 % + 0.6*R* 0.60 % + 0.6*R* 0.70 % + 0.6*R*	Comparison to certified viscosity reference standard
Volume Measurements Gravimetric Method[3]	(1 to 10) µl (>10 to 100) µl (>100 to 500) µl (>0.5 to 5) ml (>5 to 20) ml 100 µl (>100 to 1000) µl (>1 to 5) ml (>5 to 50) ml (>50 to 200) ml	0.0045 µl 0.0022 % + 0.0045 µl 0.0008 % + 0.0055 µl 0.2 % + 0.009 µl 0.1 % + 0.01 µl 0.05 µl 0.002 % + 0.02 µl 0.6 % + 0.02 µl 0.1 % + 0.035 µl 0.1 % + 0.1 µl	Mettler Toledo, XP26 Mettler Toledo, AG285

Parameter/Equipment	Range	CMC[2, 4, 9] (±)	Comments
Volume Measurements Gravimetric Method[3] (cont)	(2 to 50) ml (>50 to 100) ml (>100 to 500) ml (>500 to 1000) ml (1000 to 4000) ml 50 ml (>50 to 100) ml (>100 to 500) ml (>500 to 1000) ml (>1000 to 2000) ml (>2 to 10) L (>10 to 30) L (4 to 20) L (>20 to 100) L (>100 to 200) L (>200 to 300) L (>300 to 400) L (>400 to 500) L	0.01 % + 0.008 ml 0.0002 % + 0.008 ml 0.0001 % + 0.008 ml 0.0006 % + 0.008 ml 0.000 01 % + 0.008 ml 0.1 % + 0.03 ml 0.05 % + 0.03 ml 0.01 % + 0.05 ml 0.004 % + 0.04 ml 0.002 % + 0.04 ml 1 % + 0.04 ml 0.3 % + 0.04 ml 0.04 % + 0.01 L 0.05 % + 0.01 L 0.004 % + 0.1 L 0.009 % + 0.1 L 0.001 % + 0.1 L 0.007 % + 0.1 L	Mettler Toledo, GC4002-S Mettler Toledo, PBK989-AB30 Mettler Toledo, IND 221 / XP640032l
Volume – Liquid as Medium[3]	Up to 10 000 ml Up to 500 Liters	0.40 % 0.32 %	Graduated volumetric cylinder, volumetric container
Ultrasonic Flow Meter[3]	Up to 20 m³/hr Up to 330 LPM	0.03 %	Digital platform balance, stop watch
Flow Meter – Water as a Medium[3]	Up to 6000 m³/hr Up to 100 000 LPM	0.057 %	Comparison to ultrasonic flow meter
Hydrometers[3]	(0.700 to 0.950) SP.G (>0.950 to 1.070) SP.G (>1.070 to 1.370) SP.G (1.480 to 1.550) SP.G	0.000 73 SP.G 0.000 32 SP.G 0.000 57 SP.G 0.000 73 SP.G	Comparison with certified hydrometers

VI. Mechanical

Parameter/Equipment	Range	CMC[2, 4, 5, 9] (±)	Comments
Pressure – Measuring Instruments[3]	(150 to 1000) mmH_2O (>1000 to 10 000) mmH_2O (1 to 100) psi (10 to 1000) psi (1 to 700) bar (10 to 10 000) psi (>10 000 to 20 000) psi (>20 000 to 36 000) psi	0.046 % 0.023 % 0.046 % 0.032 % 0.026 % 0.037 % 0.048 %	Dead weight tester, Budenberg 551 Dead weight tester, Budenberg 350 Dead-weight tester, Budenberg 580DX Dead-weight tester, Budenberg 580EHX
Pressure Valves / Hydrostatic Pressure Testing[3] / LPG & Gas Regulators	(20 to 6000) psi	0.10 % of F.S	Test gauges
Pressure Gauge/Pressure Measurements[3]	Up to 5000 psi	0.12 % rdg psi	Pressure calibrator, digital gauges (Crystal XP2i)
Tachometer (Non-Contact Type) / RPM Measurement[3]	(100 to 900) RPM (>900 to 10 000) RPM (>10 000 to 150 000) RPM	0.11 RPM 1.1 RPM 2.5 RPM	Solex (digital stroboscope & signal multi-product calibrator), digital tachometer
Torque – Measuring Instruments, Clockwise & Counterclockwise	Up to 20 Nm (>20 to 50) Nm (>50 to 200) Nm (>200 to 400) Nm (>400 to 1000) Nm (>1000 to 1200) Nm (>1200 to 1800) Nm (>1800 to 2400) Nm (>2400 to 3000) Nm	0.26 % of rdg 0.37 % of rdg 0.24 % of rdg 0.21 % of rdg 0.18 % of rdg 0.13 % of rdg 0.12 % of rdg 0.12 % of rdg 0.12 % of rdg	Torque transducers

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Force – Universal Testing Machine[3]			
Tension & Compression	(10 to 100) kN (>100 to 500) kN (100 to 1000) kN	0.93 % 0.58 % 1.3 kN	Load cell dynamometer field calibration using a universal strain gauge & load cell
Compression	Up to 10 kN (>10 to 30) kN (>30 to 50) kN (>50 to 300) kN (>300 to 1000) kN (>1000 to 3000) kN	0.068 % 0.043 % 0.026 % 0.07 % 0.031 % 0.011 %	
Tension[3]	Up to 1000 kgf	0.21 % + 1 kgf + 0.6*R*	Load cell
	Up to 50 000 kgf	0.028 % of F.S. + 0.6*R*	Dillon dynamometer
Weights	(1 to 10) mg (>10 to 100) mg (>100 to 500) mg (>500 to 5000) mg (>5 to 20) g	4.5 µg 2.2 % + 4.5 µg 0.8 % + 5.5 µg 0.2 % + 9 µg 0.1 % + 0.01 mg	Digital comparator Mettler Toledo, XP26, Class E2 weights
	(10 to 500 g (>50 to 500) g	0.048 mg 0.07 mg + 0.04 %	Mettler Toledo XPE505C, Class E2 weights
	Up to 500 g (>500 to 2000) g	1.2 mg 1.0 mg + 0.03 %	Mettler Toledo XPE2004SC, Class E2 weights
	5 kg 10 kg 20 kg	8.1 mg 8.6 mg 9.1 mg	Mettler Toledo XPR26003LC, Class E2 weights
	5 kg 1, 2 kg	14 mg 12 mg	Mettler Toledo, GG40002-S, Class E2 weights
	5 kg 10 kg 20 kg	0.10 g 0.15 g 0.25 g	Mettler Toledo, XPR26003LC / PBK989-AB30, Class E2 & F1 weights
	500 kg	0.032 kg	Mettler Toledo, IND221

Parameter/Equipment	Range	CMC [2, 4, 5] (±)	Comments
Scales & Balances[3]			
Accuracy Class I	(1 to 10) mg (>10 to 100) mg (>100 to 500) mg (0.5 to 5) g (>5 to 50) g (>50 to 200) g (>200 to 500) g	0.002 mg 0.003 % + 0.002 mg 0.002 % + 0.002 mg 0.12 % + 0.01 mg 0.02 % + 0.02 mg 0.02 % + 0.05 mg 0.03 % + 0.10 mg	Class E2 weights
Accuracy Class II	(20 to 100) mg (>100 to 500) mg (>0.5 to 5) g (>5 to 50) g (>50 to 300) g (>0.3 to 2) kg (>2 to 10) kg (>10 to 120) kg	0.003 % + 0.002 mg 0.002 % + 0.002 mg 0.12 % + 0.01 mg 0.02 % + 0.02 mg 0.02 % + 0.05 mg 0.1 % + 0.012 g 0.002 % + 0.012 g 0.07 % + 0.012 g	Class E2, F1 & F2 weights
Accuracy Class III & Class IV	500 g to 2 kg (>2 to 20) kg (>20 to 500) kg	0.1 % + 0.01 g 0.1 % + 0.2 g 1.3 % + 0.2 g	Class M1 weights
Weighing, Plant & Batching Plant Scales (Build-up)[3]	(5 to 500) kg (>500 to 5000) kg (>5000 to 50 000) kg	1.3 % + 0.2 g 0.012 % 0.08 % of F.S. + 0.6*R*	Class M1 weights Class M1 & M2 weights Loadcell dynamometer
Nuclear Moisture/Density Gauge[3]	Up to 3200 kg/m³ Position 0 Position 2 Position 4 Position 6 Position 8 Position 10 Position 12 Moisture	 1.1 % + 0.6*R* 0.48 % + 0.6*R* 0.43 % + 0.6*R* 0.43 % + 0.6*R* 0.47 % + 0.6*R* 0.55 % + 0.6*R* 0.72 % + 0.6*R* 2.7 % + 0.6*R*	NDG validator

VII. Thermodynamics

Parameter/Equipment	Range	CMC[2, 4, 9] (±)	Comments
Temperature – Measure Equipment[3]	(-15 to 200) °C Ambient to 300 °C (>300 to 600) °C	0.11 °C 0.13 °C 0.16 °C	Calibration bath Dry-well calibrator
Temperature – Measure[3]	(-80 to 200) °C (>200 to 600) °C (0 to 60) °C	0.052 °C 0.090 °C 0.13 °C	Standard platinum resistance thermometer, reference multi-meter RTD thermometer, humidity chamber
Humidity Measuring Instruments[3]	(20 to 80) % RH	0.75 % RH	High accuracy thermo-hygrometer, humidity chamber
Humidity Chamber[3]	(20 to 70) % RH	0.53 % RH	High accuracy thermo-hygrometer
Ovens – Direct Verification[3] Chiller & Incubator[3] (Direct Verification)	Up to 200 °C (-15 to 100) °C (>100 to 600) °C	0.77 °C 0.50 °C 0.2 % + 0.3 °C	Multifunction calibrator (probe) Multifunction calibrator thermocouple probe

VIII. Specialized Instrumentation Calibration

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
HPLC & GC Hardware Calibration[3] –			Process calibrator with temperature probe, flow meter
Oven Temperature	Up to 200 °C	0.77 °C	
Air Flow Rate	Up to 400 cc/m	(0.25 % + 0.7) cc/m	
Liquid Flow Rate	Up to 2 ml/min	0.0017 ml/min	

IX. Time & Frequency

Parameter/Equipment	Range	CMC[2] (±)	Comments
Timers & Stopwatches[3]	(60 to 32 400) s	2.5 s	Stopwatch

MECHANICAL

Test	Test Method
Destruction/ Deflection	NEMA VE-1; IEC 61537; 24-TMSS-01; BS EN 50085-2
Electrical Continuity of Connections	NEMA VE-1; IEC 61537; 24-TMSS-01; BS EN 50085-1
Screw Thread Test Repeatability	IEC 61537; 24-TMSS-01; BS EN 50085-1
Reusable Mechanical Connection Repeatability	IEC 61537; 24-TMSS-01; BS EN 50085-1
Test Impact for Resistance (metallic only)	IEC 61537; 24-TMSS-01; BS EN 50085-2

[1] This laboratory offers commercial calibration service and field calibration service.

[2] Calibration and Measurement Capability (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. Calibration and Measurement Capabilities represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

[3] Field calibration service is available for this calibration. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

[4] In Statement of CMC, percentages are percentage of reading, unless otherwise indicated.

[5] In Statement of CMC, R is the resolution of the unit under test, FS is full scale and L is the numerical value of the nominal length of the device measured in millimeters.

[6] The stated measured values are determined using the indicated instrument (see comments). The capability is suitable for the calibration of the devices intended to measure of generated the measured value in the ranges indicated, CMC's are expressed as either a specific value that covers the full range or as a fraction /percentage of the reading plus a fixed floor specification.

[7] The contribution from the "best existing device" are not included in the CMC claim.

[8] This scope meets A2LA's *P112 Flexible Scope Policy*.

[9] The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.