CERTIFICATE OF ACCREDITATION

This is to attest that

CSA GROUP TESTING & CERTIFICATION INC. (POINTE-CLAIRE)

865 ELLINGHAM AVENUE
MONTREAL, QUEBEC H9R 5E8, CANADA

Calibration Laboratory CL-229

has met the requirements of AC204, *IAS Accreditation Criteria for Calibration Laboratories*, and has demonstrated compliance with ISO/IEC Standard 17025:2017, *General requirements for the competence of testing and calibration laboratories.* This organization is accredited to provide the services specified in the scope of accreditation.

Effective Date December 4, 2023

Expiration Date August 1, 2025

President

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CSA GROUP TESTING & CERTIFICATION INC. (POINTE-CLAIRE)

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Accredited to ISO/IEC 17025:2017 *Effective Date December 4, 2023*

CALIBRATION AND MEASUREMENT CAPABILITY (CMC)*

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Dimensional			
Calipers	Up to 152.3 mm	6.9 µm	Direct measurement method using: Gauge Blocks and Caliper Checker
Outside Micrometers	Up to 25 mm	0.95 µm	Direct measurement method using: Gauge Blocks
Height Gauge	Up to 600 mm	15 µm	Direct measurement method using: Caliper Checker
Length – 1 Dimension	Up to 25 mm	0.002 mm	Direct measurement method using: Outside Micrometers
	Up to 150 mm	0.02 mm	Direct measurement method using: Calipers
	Up to 400 mm	0.02 mm	Direct measurement method using: Electronic Height Gages
Length – 3 Dimensions	Up to 605 mm	0.058 mm	Direct measurement method using: Portable CMM Faro Arm Edge
Levels and Protractors	0° to 90°	0.057°	Indirect Measurement Method with Gauge Blocks and Sine Bar

** If information in this CMC is presented in non-SI units, the conversion factors stated in NIST Special Publication 811 "Guide for the Use of the International System of Units (SI)" apply.*

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Mechanical			
Pressure Measuring Devices	-12 psi to 300 psi	0.17 psi	Direct measurement method using: Pressure Calibrator Fluke 718 300G
	300 psi to 5000 psi	0.080 %	Direct measurement method using: Pressure Module Fluke 700P30 and Fluke 718 300G
Scales & Balances	Up to 1000 g 1000 g to 3000 g 3000 g to 6000 g	0.06 g 0.07 g 0.12 g	Direct measurement method using: Reference Weights ASTM Class 1
	Up to 5 kg 5 kg to 20 kg 20 kg to 30 kg	0.58 g 0.61 g 0.65 g	Direct measurement method using: Reference Weights ASTM Class 4
Weights	Up to 6000 g	0.2 g	Direct measurement method using: Ohaus SPX6201
	Up to 30 kg	2 g	Direct measurement method using: Ohaus RC31P30
Thermal			
Temperature - Simulate Type B Thermocouple	 600 °C to 800 °C 800 °C to 1000 °C 1000 °C to 1550 °C 1550 °C to 1820 °C	 0.44 °C 0.34 °C 0.30 °C 0.33 °C	Direct measurement method using: Multifunction Calibrator Fluke 5522A
Type C Thermocouple	0 °C to 150 °C 150 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1800 °C 1800 °C to 2316 °C	0.30 °C 0.26 °C 0.31 °C 0.50 °C 0.84 °C	
Type E Thermocouple	-250 °C to -100 °C -100 °C to -25 °C -25 °C to 350 °C 350 °C to 650 °C 650 °C to 1000 °C	0.50 °C 0.16 °C 0.14 °C 0.16 °C 0.21 °C	
Type J Thermocouple	-210 °C to -100 °C -100 °C to 30 °C 30 °C to 150 °C	0.27 °C 0.16 °C 0.14 °C	

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Type J Thermocouple continued	150 °C to 760 °C 760 °C to 1200 °C	0.17 °C 0.23 °C	Direct measurement method using: Multifunction Calibrator Fluke 5522A
Type K Thermocouple	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.40 °C	
Type L Thermocouple	-200 °C to -100 °C -100 °C to 800 °C 800 °C to 900 °C	0.37 °C 0.26 °C 0.17 °C	
Type N Thermocouple	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 410 °C 410 °C to 1300 °C	0.40 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C	
Type R Thermocouple	0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	0.57 °C 0.35 °C 0.33 °C 0.40 °C	
Type S Thermocouple	0 °C to 250 °C 250 °C to 1000 °C 1000 °C to 1400 °C 1400 °C to 1767 °C	0.47 °C 0.36 °C 0.37 °C 0.46 °C	
Type T Thermocouple	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C	
Type U Thermocouple	-200 °C to 0 °C 0 °C to 600 °C	0.56 °C 0.27 °C	
RTD - Pt 385, 100 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C 630 °C to 800 °C	0.05 °C 0.05 °C 0.07 °C 0.09 °C 0.10 °C 0.12 °C 0.23 °C	
RTD - Pt 3926, 100 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C	0.05 °C 0.05 °C 0.07 °C 0.09 °C	

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
RTD - Pt 3926, 100 Ω continued	300 °C to 400 °C	0.10 °C	Direct measurement method using: Multifunction Calibrator Fluke 5522A
	400 °C to 630 °C	0.12 °C	
RTD - Pt 3916, 100 Ω	-200 °C to -190 °C	0.25 °C	
	-190 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.06 °C	
	100 °C to 260 °C	0.07 °C	
	260 °C to 300 °C	0.08 °C	
	300 °C to 400 °C	0.09 °C	
	400 °C to 600 °C	0.10 °C	
	600 °C to 630 °C	0.23 °C	
RTD - Pt 385, 200 Ω	-200 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.04 °C	
	0 °C to 100 °C	0.04 °C	
	100 °C to 260 °C	0.05 °C	
	260 °C to 300 °C	0.12 °C	
	300 °C to 400 °C	0.13 °C	
	400 °C to 600 °C	0.14 °C	
	600 °C to 630 °C	0.16 °C	
RTD - Pt 385, 500 Ω	-200 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.05 °C	
	100 °C to 260 °C	0.06 °C	
	260 °C to 300 °C	0.08 °C	
	300 °C to 400 °C	0.08 °C	
	400 °C to 600 °C	0.09 °C	
	600 °C to 630 °C	0.11 °C	
RTD - Pt 385, 1000 Ω	-200 °C to -80 °C	0.03 °C	
	-80 °C to 0 °C	0.03 °C	
	0 °C to 100 °C	0.04 °C	
	100 °C to 260 °C	0.05 °C	
	260 °C to 300 °C	0.06 °C	
	300 °C to 400 °C	0.07 °C	
	400 °C to 600 °C	0.07 °C	
	600 °C to 630 °C	0.23 °C	
RTD - PtNi 385, 120 Ω (Ni120)	-80 °C to 0 °C	0.08 °C	
	0 °C to 100 °C	0.08 °C	
	100 °C to 260 °C	0.14 °C	
RTD - Cu 427, 10 Ω	-100 °C to 260 °C	0.3 °C	

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Temperature Measuring Devices	-25 °C to 25 °C 25 °C to 150 °C	0.024 °C 0.030 °C	Comparison method using: Fluke 1586A Super-DAQ, SPRT Fluke 5628 and temperature bath
Temperature/Refrigeration Chambers	-70 °C to 230 °C 50 °C to 230 °C	0.35 °C 0.35 °C	Direct measurement using Fluke 1586A Super-DAQ and SPRT Fluke 5628
Relative Humidity – Measure[4]	15 %RH to 30 %RH (5 °C to 40 °C) 30 %RH to 95 %RH (32 °C to 40 °C)	1.4 %RH 2.1 %RH	Direct measurement method using: Vaisala HMP76 and Vaisala MI70
Electrical – DC/LF			
DC Voltage – Measure[4]	10 mV to 100 mV 0.1 V to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	26 µV/V 5.2 µV/V 4.2 µV/V 6.3 µV/V 7.4 µV/V	Direct measurement method using: Reference DMM Fluke 8588A
DC High Voltage – Measure[4]	1 kV to 50 kV	0.58 %	Direct measurement method using: Reference DMM HP34401A and HV Divider ROSS VD-60
DC Voltage – Generate[3]	50 mV to 329.9999 mV 0.33 V to 3.299999 V 3.3 V to 32.99999 V 33 V to 329.9999 V 100 V to 1000.000 V	31 µV/V 12 µV/V 12 µV/V 16 µV/V 17 µV/V	Direct measurement method using: Multifunction Calibrator Fluke 5522A
	10 mV to 220 mV 0.22 V to 2.2 V 2.2 V to 11 V 11 V to 22 V 22 V to 220 V 220 V to 1100 V	69 µV/V 14 µV/V 7 µV/V 7 µV/V 9 µV/V 10 µV/V	Direct measurement method using: Multifunction Calibrator Fluke 5700A
DC Current – Measure[4]	1 µA to 10 µA 10 µA to 100 µA 100 µA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 1 A to 10 A 10 A to 20 A	730 µA/A 40 µA/A 40 µA/A 40 µA/A 89 µA/A 600 µA/A 860 µA/A	Direct measurement method using: Reference DMM Fluke 8588A
	20 A to 54 A	0.021 % + 1.2 mA	Indirect Measurements with Standard Resistor and DMM

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
DC Current – Generate[3]	100 µA to 329.999 µA 0.33 mA to 3.299999 mA 3.3 mA to 32.9999 mA 33 mA to 329.9999 mA 0.33 A to 1.09999 A 1.1 A to 2.99999 A 3 A to 10.9999 A 11 A to 20.5 A	270 µA/A 160 µA/A 120 µA/A 120 µA/A 220 µA/A 320 µA/A 470 µA/A 820 µA/A	Direct measurement method using: Multifunction Calibrator Fluke 5522A[4]
	50 µA to 220 µA 0.22 mA to 2.2 mA 2.2 mA to 22 mA 22 mA to 220 mA 0.22 A to 2.2 A	200 µA/A 62 µA/A 62 µA/A 70 µA/A 120 µA/A	Direct measurement method using: Multifunction Calibrator Fluke 5700A
	20 A to 54 A	0.021 % + 1.2 mA	Indirect Measurements with Standard resistor, DMM and DC Power Supply
Clamp Meter Calibration	10 A to 16.4999 A 16.5 A to 149.999 A 150 A to 1025 A	0.5 % + 20 mA 0.5 % + 140 mA 0.5 % + 500 mA	Direct measurement method using: Multifunction Calibrator Fluke 5522A + Fluke 5500A/COIL 50-Turn
AC Voltage – Measure[4]	1 mV to 10 mV (20 Hz to 50 Hz) (60 Hz to 2 kHz) (2 kHz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz) 10 mV to 100 mV (20 Hz to 2 kHz) (2 kHz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz) 0.1 V to 1 V (20 Hz to 2 kHz) (2 kHz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz)	 0.34 % 0.14 % 0.14 % 0.13 % 0.32 % 1.1 % 1.2 % 760 µV/V 110 µV/V 200 µV/V 590 µV/V 0.27 % 1.2 % 130 µV/V 110 µV/V 0.23 % 0.53 % 0.59 % 1.2 %	Direct measurement method using: Reference DMM Fluke 8588A

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
AC Voltage – Measure[4] continued	1 V to 10 V (20 Hz to 2 kHz) (2 kHz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz) (100 kHz to 1 MHz) 10 V to 100 V (20 Hz to 2 kHz) (2 kHz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz) 15 V (100 kHz to 1 MHz) 22 V (100 kHz to 1 MHz) 100 V to 1000 V (45 Hz to 2 kHz) (2 kHz to 10 kHz)	 100 µV/V 110 µV/V 200 µV/V 590 µV/V 1.2 % 100 µV/V 94 µV/V 200 µV/V 590 µV/V 3.4 % 2.6 % 170 µV/V 170 µV/V	Direct measurement method using: Reference DMM Fluke 8588A
AC High Voltage – Measure[4] (60 Hz)	1 kV to 42 kV	0.84 %	Direct measurement method using: Reference DMM HP34401A and HV Divider ROSS VD-60
AC Voltage – Generate[3] (Sine Wave)	1.0 mV to 32.999 mV (10 Hz to 45 Hz) (45 Hz to 10 kHz) (10 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 500 kHz) 33 mV to 329.999 mV (10 Hz to 45 Hz) (45 Hz to 10 kHz) (10 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 500 kHz) 0.33 V to 3.29999 V (10 Hz to 45 Hz) (45 Hz to 10 kHz) (10 kHz to 20 kHz) (20 kHz to 50 kHz)	 0.11 % 580 µV/V 620 µV/V 0.12 % 0.36 % 1.0 % 300 µV/V 180 µV/V 190 µV/V 330 µV/V 870 µV/V 0.21 % 270 µV/V 160 µV/V 190 µV/V 270 µV/V	Direct measurement method using: Multifunction Calibrator Fluke 5522A Normal Output

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
AC Voltage – Generate[3] (Sine Wave) (continued)	0.33 V to 3.29999 V (50 kHz to 100 kHz) (100 kHz to 500 kHz) 3.3 V to 32.9999 V (10 Hz to 45 Hz) (45 Hz to 10 kHz) (10 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) 33 V to 329.999 V (45 Hz to 1 kHz) (1 kHz to 10 kHz) (10 kHz to 20 kHz) 33 V to 329.999 V (20 kHz to 50 kHz) (50 kHz to 100 kHz) 330 V to 1020.00 V (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz)	 640 µV/V 0.23 % 280 µV/V 160 µV/V 230 µV/V 320 µV/V 820 µV/V 160 µV/V 160 µV/V 240 µV/V 280 µV/V 0.19 % 240 µV/V 240 µV/V 240 µV/V	Direct measurement method using: Multifunction Calibrator Fluke 5522A Normal Output
	22 mV to 220 mV (10 Hz to 20 Hz) (20 Hz to 40 Hz) (40 Hz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 500 kHz) (500 kHz to 1 MHz) 0.22 V to 2.2 V (10 Hz to 20 Hz) (20 Hz to 40 Hz) (40 Hz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 500 kHz) (500 kHz to 1 MHz) 2.2 V to 22 V (10 Hz to 20 Hz) (20 Hz to 40 Hz)	 0.17 % 540 µV/V 440 µV/V 630 µV/V 0.18 % 0.19 % 0.28 % 0.63 % 0.15 % 160 µV/V 71 µV/V 120 µV/V 280 µV/V 490 µV/V 0.12 % 0.26 % 900 µV/V 160 µV/V	Direct Measurement with Multifunction Calibrator Fluke 5700A

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
AC Voltage – Generate[3] (Sine Wave) (continued)	2.2 V to 22 V (40 Hz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 500 kHz) (500 kHz to 1 MHz) 22 V to 220 V (10 Hz to 20 Hz) (20 Hz to 40 Hz) (40 Hz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) 220 V to 1100 V (15 Hz to 50 Hz) (50 Hz to 1 kHz)	 71 µV/V 120 µV/V 250 µV/V 600 µV/V 0.15 % 0.30 % 0.11 % 160 µV/V 78 µV/V 230 µV/V 540 µV/V 0.21 % 73 µV/V 73 µV/V	Direct Measurement with Multifunction Calibrator Fluke 5700A
AC Current – Measure[4]	30 µA to 100 µA (1 Hz to 2 kHz) (2 kHz to 10 kHz) 100 µA to 1 mA (1 Hz to 2 kHz) (2 kHz to 10 kHz) 1 mA to 10 mA (1 Hz to 2 kHz) (2 kHz to 10 kHz) 10 mA to 100 mA (1 Hz to 2 kHz) (2 kHz to 10 kHz) 100 mA to 1 A (1 Hz to 2 kHz) (2 kHz to 10 kHz) 1 A to 10 A (10 Hz to 2 kHz) (2 kHz to 10 kHz) 10 A to 20 A (10 Hz to 2 kHz) (2 kHz to 10 kHz)	 0.96 % 700 µA/A 0.10 % 760 µA/A 530 µA/A 760 µA/A 510 µA/A 750 µA/A 760 µA/A 760 µA/A 970 µA/A 970 µA/A 0.18 % 0.22 %	Direct Measurement with Reference DMM Fluke 8588A
	20 A to 50 A (50/60 Hz)	0.16 %	Indirect Measurements with Standard Resistor and DMM

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
AC Current – Generate[3]	29 µA to 329.99 µA		Direct Measurement with Multifunction Calibrator Fluke 5522A Inductive Compensation Off
	(10 Hz to 20 Hz)	0.25 %	
	(20 Hz to 45 Hz)	0.19 %	
	(45 Hz to 1 kHz)	0.17 %	
	(1 kHz to 5 kHz)	0.35 %	
	(5 kHz to 10 kHz)	0.78 %	
	(10 kHz to 30 kHz)	1.55 %	
	0.33 mA to 3.29999 mA		
	(10 Hz to 20 Hz)	0.22 %	
	(20 Hz to 45 Hz)	0.11 %	
	(45 Hz to 1 kHz)	0.09 %	
	(1 kHz to 5 kHz)	0.17 %	
	(5 kHz to 10 kHz)	0.41 %	
	(10 kHz to 30 kHz)	0.82 %	
	3.3 mA to 32.9999 mA		
	(10 Hz to 20 Hz)	0.20 %	
	(20 Hz to 45 Hz)	0.09 %	
	(45 Hz to 1 kHz)	0.05 %	
	(1 kHz to 5 kHz)	0.08 %	
	(5 kHz to 10 kHz)	0.18 %	
	(10 kHz to 30 kHz)	0.34 %	
	33 mA to 329.999 mA		
	(10 Hz to 20 Hz)	0.18 %	
	(20 Hz to 45 Hz)	0.09 %	
	(45 Hz to 1 kHz)	0.05 %	
	(1 kHz to 5 kHz)	0.12 %	
	(5 kHz to 10 kHz)	0.23 %	
	(10 kHz to 30 kHz)	0.47 %	
	0.33 A to 1.09999 A		
	(10 H to 45 Hz)	0.15 %	
	(45 Hz to 1 kHz)	0.05 %	
	(1 kHz to 5 kHz)	0.54 %	
	(5 kHz to 10 kHz)	2.3 %	
	1.1 A to 2.99999 A		
	(10 Hz to 45 Hz)	0.14 %	
	(45 Hz to 1 kHz)	0.05 %	
	(1 kHz to 5 kHz)	0.50 %	
	(5 kHz to 10 kHz)	2.1 %	
	3 A to 10.9999 A		
	(45 Hz to 100 Hz)	0.06 %	
	(100 Hz to 1 kHz)	0.09 %	
	(1 kHz to 5 kHz)	2.3 %	

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
AC Current – Generate[3] continued	11 A to 20.5 A (45 Hz to 100 Hz) (100 Hz to 1 kHz) (1 kHz to 5 kHz)	 0.11 % 0.14 % 2.4 %	Direct Measurement with Multifunction Calibrator Fluke 5522A Inductive Compensation Of
	100 µA to 220 µA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) 0.22 mA to 22 mA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) 22 mA to 220 mA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) 0.22 A to 2.2 A (20 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz)	 0.10 % 520 µA/A 280 µA/A 930 µA/A 0.22 % 0.11 % 360 µA/A 160 µA/A 930 µA/A 0.22 % 0.15 % 360 µA/A 170 µA/A 930 µA/A 0.22 % 610 µA/A 740 µA/A 0.79 %	Direct Measurement with Multifunction Calibrator Fluke 5700A
	20 A to 50 A (60 Hz/50 Hz)	 0.21 %	Indirect Measurement with Standard Resistor, DMM and Rotek High Current Adapter
Clamp Meter Calibration (Torroidal and Non-Torroidal)	10 A to 16.499 A (45 Hz to 65 Hz) (65 Hz to 440 Hz) 16.5 A to 149.999 A (45 Hz to 65 Hz) (65 Hz to 440 Hz) 150 A to 1025 A (45 Hz to 65 Hz) (65 Hz to 440 Hz)	 0.56 % + 30 mA 1.0 % + 30 mA 0.56 % + 250 mA 0.79 % + 27 mA 0.56 % + 900 mA 1.0 % + 900 mA	Direct Measurement with Multifunction Calibrator Fluke 5522A + Fluke 5500A/COIL 50-Turn
DC Resistance – Measure[4]	0.1 Ω to 1 Ω 1 Ω to 10 Ω	580 µΩ/Ω 120 µΩ/Ω	Direct Measurement with Reference DMM Fluke 8588A 4 W Ohms Function

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
DC Resistance – Measure[4] continued	10 Ω to 100 Ω 100 Ω to 1 kΩ 1 kΩ to 10 kΩ 10 kΩ to 100 kΩ	10 µΩ/Ω 9.9 µΩ/Ω 9.6 µΩ/Ω 10 µΩ/Ω	Direct Measurement with Reference DMM Fluke 8588A 4 W Ohms Function
	0.2 MΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ 100 MΩ to 1000 MΩ	30 µΩ/Ω 180 µΩ/Ω 0.18 % 0.63 %	Direct Measurement with Reference DMM Fluke 8588A 2 Wire Ohms Function
DC Power – Generate[3]	33 mV to 1020 V (0.33 mA to 329.99 mA) (0.33 A to 2.9999 A) (3 A to 20.5 A)	(relative to output in Watts) 0.023 % 0.022 % 0.07 %	Direct Measurement with Multifunction Calibrator Fluke 5522A
AC Power – Generate[3]	33 mV to 329.999 mV (3.3 mA to 8.999 mA) (9 mA to 32.999 mA) 33 mV to 329.999 mV (33 mA to 89.99 mA) (90 mA to 329.99 mA) 330 mV to 1020 V (3.3 mA to 8.999 mA) (9 mA to 32.999 mA) (33 mA to 89.99 mA) (90 mA to 329.99 mA) 33 mV to 329.999 mV (0.33 A to 0.8999 A) (0.9 A to 2.1999 A) (2.2 A to 4.4999 A) (4.5 A to 20.5 A) 330 mV to 1020 V (0.33 A to 0.8999 A) (0.9 A to 2.1999 A) (2.2 A to 4.4999 A) (4.5 A to 20.5 A)	(relative to output in Watts) 0.14 % 0.10 % 0.14 % 0.10 % 0.12 % 0.08 % 0.12 % 0.08 % 0.13 % 0.11 % 0.13 % 0.11 % 0.11 % 0.09 % 0.12 % 0.10 %	Direct Measurement with Multifunction Calibrator Fluke 5522A 45 Hz to 65 Hz, PF=1
Phase – Generate[3]	0° to 90° (10 Hz to 65 Hz) (65 Hz to 500 Hz) (500 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) (10 kHz to 30 kHz)	0.1° 0.25° 0.5° 2.5° 5° 10°	Direct Measurement with Multifunction Calibrator Fluke 5522A

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
DC Resistance – Generate[3]	1 Ω to 10.9999 Ω 11 Ω to 32.9999 Ω 33 Ω to 109.9999 Ω 110 Ω to 329.9999 Ω 330 Ω to 1.099999 kΩ 1.1 kΩ to 3.299999 kΩ 3.3 kΩ to 10.99999 kΩ 11 kΩ to 32.99999 kΩ 33 kΩ to 109.9999 kΩ	0.16 % 100 µΩ/Ω 43 µΩ/Ω 32 µΩ/Ω 25 µΩ/Ω 32 µΩ/Ω 25 µΩ/Ω 32 µΩ/Ω 26 µΩ/Ω	Direct Measurement with Multifunction Calibrator Fluke 5522A 4-WIRE Compensation 12 hrs zero cal
	110 kΩ to 329.99999 kΩ 330 kΩ to 1.099999 MΩ 1.1 MΩ to 3.299999 MΩ 3.3 MΩ to 10.99999 MΩ 11 MΩ to 32.99999 MΩ 33 MΩ to 109.9999 MΩ 110 MΩ to 329.9999 MΩ 330 MΩ to 1100 MΩ	35 µΩ/Ω 30 µΩ/Ω 64 µΩ/Ω 110 µΩ/Ω 330 µΩ/Ω 430 µΩ/Ω 0.29 % 1.20 %	Direct Measurement with Multifunction Calibrator Fluke 5522A 2-WIRE Compensation 12 hrs zero cal
	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	85 µΩ/Ω 85 µΩ/Ω 26 µΩ/Ω 24 µΩ/Ω 16 µΩ/Ω 16 µΩ/Ω 12 µΩ/Ω 12 µΩ/Ω 11 µΩ/Ω 11 µΩ/Ω 12 µΩ/Ω 14 µΩ/Ω 18 µΩ/Ω 26 µΩ/Ω 37 µΩ/Ω 100 µΩ/Ω 100 µΩ/Ω	Direct Measurement with Multifunction Calibrator Fluke 5700A 4-WIRE Compensation
	1 mΩ 10 mΩ 1 Ω 10 Ω 100 Ω	0.02 % 0.10 % 0.05 % 0.03 % 0.015 %	Direct Measurement with Yokogawa 2792 Standard Resistors
Capacitance – Generate[3,5]	3.3 nF to 10.9999 nF 11 nF to 32.9999 nF 33 nF to 109.999 nF 110 nF to 329.999 nF 0.33 µF to 1.09999 µF 1.1 µF to 3.29999 µF 3.3 µF to 10.9999 µF 11 µF to 32.9999 µF	0.27 % 0.45 % 0.27 % 0.27 % 0.27 % 0.27 % 0.27 % 0.39 %	Direct Measurement with Multifunction Calibrator Fluke 5522A[3] 2-WIRE Compensation 12 hrs zero cal

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Capacitance – Generate[3,5] continued	33 µF to 109.999 µF 110 µF to 329.999 µF 0.33 mF to 1.09999 mF 1.1 mF to 3.29999 mF 3.3 mF to 10.9999 mF 11 mF to 32.9999 mF 33 mF to 110 mF	0.43 % 0.43 % 0.43 % 0.43 % 0.43 % 0.66 % 0.93 %	Direct Measurement with Multifunction Calibrator Fluke 5522A[3] 2-WIRE Compensation 12 hrs zero cal
Impedance (Capacitance & Inductance) – Measure[4]	(20 Hz to 1 kHz) 100 Ω to 1 MΩ (20 Hz to 10 kHz) 0.01 mΩ to 2.5 Ω 2.5 Ω to 100 Ω 1 MΩ to 4 MΩ 4 MΩ to 100 MΩ (1 kHz to 10 kHz) 100 Ω to 1 MΩ (10 kHz to 100 kHz) 0.01 mΩ to 2.5 Ω 2.5 Ω to 100 Ω 100 Ω to 25 kΩ 25 kΩ to 100 MΩ	 0.05 % + |Z|/ 2 GΩ 0.3 % + 1 mΩ /|Z| 0.1 % + 1 mΩ /|Z| 0.1 % + |Z|/ 1.5 GΩ 0.2 % + |Z|/ 1.5 GΩ 0.1 % + |Z|/ 1.5 GΩ 0.5 % + 2 mΩ/|Z| 0.2 % + 2 mΩ/|Z| 0.2 % + |Z|/ 100 MΩ 0.5 % + |Z|/ 100 MΩ	Direct Measurement with LCR-Bridge R&S HM8118
Electric Energy	300 W·h	0.07 %	Direct Measurement with Fluke 5522A and “Internal Clock” from Yokogawa Digital Power Meter
Electric Charge	1 A·h	0.065 %	Direct Measurement with Fluke 5522A and “Internal Clock” from Yokogawa Digital Power Meter
Time and Frequency			
Frequency – Generate[3]	10 Hz 45 Hz 1 kHz 10 kHz 100 kHz 300 kHz 500 kHz	580 µHz/Hz 130 µHz/Hz 58 µHz/Hz 58 µHz/Hz 58 µHz/Hz 190 µHz/Hz 120 µHz/Hz	Direct Measurement with Multifunction Calibrator Fluke 5522A[3]
Frequency – Measure[4]	10 Hz 45 Hz 1 kHz 10 kHz 100 kHz	580 µHz/Hz 130 µHz/Hz 58 µHz/Hz 58 µHz/Hz 58 µHz/Hz	Direct Measurement with Reference DMM Fluke 8588A

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Frequency – Measure[4] continued	300 kHz 500 kHz 1 MHz	190 µHz/Hz 120 µHz/Hz 58 µHz/Hz	Direct Measurement with Reference DMM Fluke 8588A
Time – Measure[4]	100 s to 24 h	0.55 s	Direct Measurements NIST Special Publication 960-12
	5 s to 29 minutes	7.1 ms	Direct Measurement with Universal Counter Agilent 53131A and Fluke 5522A NIST Special Publication 960-12

[1]The uncertainty covered by the Calibration and Measurement Capability (CMC) is expressed as the expanded uncertainty having a coverage probability of approximately 95 %. It is the smallest measurement uncertainty that a laboratory can achieve within its scope of accreditation when performing calibrations of a best existing device. The measurement uncertainty reported on a calibration certificate may be greater than that provided in the CMC due to the behavior of the calibration item and other factors that may contribute to the uncertainty of a specific calibration.

[2]When uncertainty is stated in relative terms (such as percent, a multiplier expressed as a decimal fraction or in scientific notation), it is in relation to instrument reading or instrument output, as appropriate, unless otherwise indicated.

[3]Capability is suitable for the calibration of measuring devices in the stated ranges.

[4]Capability is suitable for the calibration of devices intended to generate the indicated quantity in the stated ranges.

[5]The actual frequency applied by the calibrator cannot be selected and may be dependent on the measurement device under calibration. Approximate frequency ranges for a given capacitance or capacitance range may be found in the Fluke 552xA's published specifications.