



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

**Isotech North America
158 Brentwood Drive, Unit 4
Colchester, VT 05446**

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: 17 July 2025

Certificate Number: AC-2691.01



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

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CALIBRATION

Valid to: **July 17, 2025**

Certificate Number: **AC-2691.01**

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source Fixed Values	1.018 V 10.000 V	2.6 μ V 25 μ V	Transmille 3000ZR Zener Voltage Standard
DC Voltage – Source	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1 000) V	6.6 μ V/V + 1.4 μ V 5.3 μ V/V + 1.6 μ V 4.8 μ V/V + 11 μ V 7.8 μ V/V + 15 μ V 8.3 μ V/V + 1.3 mV	Transmille 4010 Reference Calibrator
DC Voltage – Measure	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV	2.8 μ V/V + 0.8 μ V 4.7 μ V/V + 0.9 μ V 5.3 μ V/V + 7.5 μ V 7.3 μ V/V + 15 μ V 7.2 μ V/V + 0.14 mV	Transmille 8091 Multimeter
DC Current – Source	(0 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 10) A (10 to 30) A	5.6 μ A/A + 0.28 nA 5.9 μ A/A + 2.5 nA 6.3 μ A/A + 32 nA 18 μ A/A + 0.36 μ A 87 μ A/A + 7.0 μ A 210 μ A/A + 210 μ A 290 μ A/A + 510 μ A	Transmille 4010 Reference Calibrator
DC Current Source For Clamp Meters	(10 to 1 500) A	0.46 % of reading + 0.42 A	Transmille 4010 Reference Calibrator, Transmille EA002 Coil



ANSI National Accreditation Board

Electrical – DC/Low Frequency

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DC Current – Measure	1 pA to 10 nA	0.54 % of reading + 13 pA	Transmille 8091 Multimeter, AC-DC Current Shunts
	(10 to 100) nA	0.19 % of reading + 22 pA	
	100 nA to 1 μA	0.02 % of reading + 33 pA	
	(1 to 10) μA	38 μA/A + 120 pA	
	(10 to 100) μA	9.1 μA/A + 470 pA	
	(100 to 200) μA	9.1 μA/A + 4.7 nA	
	200 μA to 1 mA	14 μA/A	
	(1 to 2) mA	11 μA/A + 51 nA	
	(2 to 10) mA	13 μA/A	
	(10 to 20) mA	35 μA/A + 0.7 μA	
	20 to 100 mA	19 μA/A	
	(100 to 200) mA	19 μA/A	
	200 mA to 1 A	30 μA/A	
	(1 to 2) A	26 μA/A	
	2 to 5) A	20 μA/A	
(5 to 30) A	69 μA/A		
AC Voltage – Source	(0 to 100) mV		Transmille 4010 Reference Calibrator
	(10 to 45) Hz	640 μV/V + 12 μV	
	45 Hz to 1 kHz	130 μV/V + 12 μV	
	(1 to 20) kHz	170 μV/V + 18 μV	
	(20 to 50) kHz	980 μV/V + 25 μV	
	(50 to 100) kHz	1.3 mV/V + 25 μV	
	(100 to 300) kHz	4.6 mV/V + 59 μV	
	(300 to 500) kHz	12 mV/V + 65 μV	
	(100 to 300) mV		
	(10 to 23) Hz	780 μV/V + 89 μV	
	(23 to 45) Hz	480 μV/V + 100 μV	
	45 to 1 kHz	160 μV/V + 70 μV	
	(1 to 20) kHz	170 μV/V + 100 μV	
	(20 to 100) kHz	730 μV/V + 170 μV	
	(100 to 200) kHz	2.6 mV/V + 260 μV	
	(200 to 500) kHz	2.7 mV/V + 260 μV	
	300 mV to 1 V		
	(10 to 23) Hz	510 μV/V + 100 μV	
	(23 to 45) Hz	470 μV/V + 110 μV	
	45 Hz to 1 kHz	150 μV/V + 75 μV	
	(1 to 20) kHz	170 μV/V + 110 μV	
(20 to 100) kHz	620 μV/V + 170 μV		
(100 to 200) kHz	2.6 mV/V + 260 μV		
(200 to 500) kHz	2.7 mV/V + 260 μV		
500 kHz to 1 MHz	2.8 mV/V + 250 μV		



ANSI National Accreditation Board

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Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source	(1 to 3) V		Transmille 4010 Reference Calibrator
	(10 to 23) Hz	490 $\mu\text{V/V}$ + 910 μV	
	(23 to 45) Hz	450 $\mu\text{V/V}$ + 930 μV	
	45 Hz to 1 kHz	140 $\mu\text{V/V}$ + 580 μV	
	(1 to 20) kHz	170 $\mu\text{V/V}$ + 0.93 mV	
	(20 to 100) kHz	550 $\mu\text{V/V}$ + 1.7 mV	
	(3 to 10) V		
	(10 to 23) Hz	500 $\mu\text{V/V}$ + 880 μV	
	(23 to 45) Hz	450 $\mu\text{V/V}$ + 920 μV	
	45 Hz to 1 kHz	140 $\mu\text{V/V}$ + 580 μV	
	(1 to 20) kHz	170 $\mu\text{V/V}$ + 920 μV	
	(20 to 100) kHz	560 $\mu\text{V/V}$ + 1.7 mV	
	(10 to 30) V		
	(30 to 45) Hz	450 $\mu\text{V/V}$ + 12 mV	
	45 Hz to 1 kHz	140 $\mu\text{V/V}$ + 7 mV	
	(1 to 10) kHz	170 $\mu\text{V/V}$ + 9.3 mV	
	(10 to 20) kHz	250 $\mu\text{V/V}$ + 17 mV	
	(20 to 40) kHz	260 $\mu\text{V/V}$ + 17 mV	
	(40 to 100) kHz	2.1 mV/V + 29 mV	
	(30 to 100) V		
	(30 to 45) Hz	450 $\mu\text{V/V}$ + 12 mV	
	45 Hz to 1 kHz	140 $\mu\text{V/V}$ + 7.9 mV	
	(1 to 10) kHz	170 $\mu\text{V/V}$ + 10 mV	
	(10 to 20) kHz	250 $\mu\text{V/V}$ + 18 mV	
	(20 to 40) kHz	280 $\mu\text{V/V}$ + 17 mV	
	(40 to 100) kHz	2.1 mV/V + 29 mV	
	(100 to 300) V		
	(30 to 45) Hz	520 $\mu\text{V/V}$ + 120 mV	
45 Hz to 1 kHz	160 $\mu\text{V/V}$ + 36 mV		
(1 to 10) kHz	210 $\mu\text{V/V}$ + 70 mV		
300 V to 1 kV			
(30 to 45) Hz	520 $\mu\text{V/V}$ + 120 mV		
45 Hz to 1 kHz	170 $\mu\text{V/V}$ + 35 mV		
(1 to 10) kHz	220 $\mu\text{V/V}$ + 70 mV		
(10 to 20) kHz	270 $\mu\text{V/V}$ + 120 mV		



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	(0 to 100) mV		Transmille 8091 Multimeter
	(10 to 40) Hz	360 $\mu\text{V}/\text{V}$ + 11 μV	
	40 Hz to 1 kHz	110 $\mu\text{V}/\text{V}$ + 10 μV	
	(1 to 20) kHz	140 $\mu\text{V}/\text{V}$ + 14 μV	
	(20 to 50) kHz	510 $\mu\text{V}/\text{V}$ + 18 μV	
	(50 to 100) kHz	940 $\mu\text{V}/\text{V}$ + 18 μV	
	(100 to 300) kHz	3.8 mV/V + 48 μV	
	(300 to 500) kHz	12 mV/V + 55 μV	
	(100 to 300) mV		
	(10 to 23) Hz	760 $\mu\text{V}/\text{V}$ + 4.6 μV	
	(23 to 40) Hz	320 $\mu\text{V}/\text{V}$ + 6.7 μV	
	40 Hz to 1 kHz	98 $\mu\text{V}/\text{V}$ + 7.2 μV	
	(1 to 20) kHz	110 $\mu\text{V}/\text{V}$ + 12 μV	
	(20 to 100) kHz	640 $\mu\text{V}/\text{V}$ + 13 μV	
	100 kHz to 1 MHz	2 mV/V + 43 μV	
	300 mV to 1 V		
	(10 to 23) Hz	280 $\mu\text{V}/\text{V}$ + 62 μV	
	(23 to 40) Hz	190 $\mu\text{V}/\text{V}$ + 73 μV	
	40 kHz to 1 kHz	72 $\mu\text{V}/\text{V}$ + 53 μV	
	(1 to 20) kHz	88 $\mu\text{V}/\text{V}$ + 74 μV	
	(20 to 100) kHz	290 $\mu\text{V}/\text{V}$ + 110 μV	
	100 kHz to 1 MHz	1.6 mV/V + 140 μV	
	(1 to 3) V		
	(10 to 23) Hz	290 $\mu\text{V}/\text{V}$ + 51 μV	
	(23 to 40) Hz	200 $\mu\text{V}/\text{V}$ + 69 μV	
	40 Hz to 1 kHz	85 $\mu\text{V}/\text{V}$ + 45 μV	
	(1 to 20) kHz	120 $\mu\text{V}/\text{V}$ + 82 μV	
	(20 to 100) kHz	290 $\mu\text{V}/\text{V}$ + 110 μV	
	100 kHz to 1 MHz	1.6 mV/V + 130 μV	
	(3 to 10) V		
(10 to 23) Hz	290 $\mu\text{V}/\text{V}$ + 500 μV		
(23 to 40) Hz	200 $\mu\text{V}/\text{V}$ + 600 μV		
40 Hz to 1 kHz	79 $\mu\text{V}/\text{V}$ + 390 μV		
(1 to 20) kHz	93 $\mu\text{V}/\text{V}$ + 610 μV		
(20 to 100) kHz	280 $\mu\text{V}/\text{V}$ + 1.1 mV		
(100 to 200) kHz	1.2 mV/V + 1.7 mV		



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	(10 to 30) V		Transmille 8091 Multimeter
	(10 to 23) Hz	290 μ V/V + 430 μ V	
	(23 to 40) Hz	200 μ V/V + 580 μ V	
	40 Hz to 1 kHz	80 μ V/V + 370 μ V	
	(1 to 20) kHz	94 μ V/V + 580 μ V	
	(20 to 100) kHz	260 μ V/V + 1.1 mV	
	(30 to 100) V		
	(10 to 40) Hz	190 μ V/V + 8.3 mV	
	40 Hz to 1 kHz	67 μ V/V + 5.9 mV	
	(1 to 20) kHz	77 μ V/V + 7.4 mV	
	(20 to 50) kHz	170 μ V/V + 11 mV	
	(50 to 100) kHz	710 μ V/V + 19 mV	
	(100 to 300) V		
	(10 to 40) Hz	190 μ V/V + 7.8 mV	
40 Hz to 1 kHz	76 μ V/V + 5.0 mV		
(1 to 10) kHz	76 μ V/V + 63 mV		
(10 to 40) kHz	140 μ V/V + 110 mV		
AC Voltage – Measure	300 V to 1 kV		5790B AC Measurement Standard
	40 Hz to 1 kHz	93 μ V/V + 21 mV	
	(1 to 10) kHz	110 μ V/V + 44 mV	
	(2.2 to 7) mV		
	(10 to 20) Hz	1.8 mV/V + 1.9 μ V	
	(20 to 40) Hz	430 μ V/V + 1.9 μ V	
	40 Hz to 20 kHz	430 μ V/V + 1.9 μ V	
	(20 to 50) kHz	910 μ V/V + 2.6 μ V	
	(50 to 100) kHz	1.3 mV/V + 3.1 μ V	
	(100 to 300) kHz	2.6 mV/V + 4.8 μ V	
	(300 to 500) kHz	3 mV/V + 9.3 μ V	
	(500 to 1 000) kHz	5.8 mV/V + 9.3 μ V	
	(2.2 to 7) mV		
	(10 to 20) Hz	964 μ V/V + 1.7 μ V	
(20 to 40) Hz	409 μ V/V + 1.8 μ V		
40 Hz to 20 kHz	229 μ V/V + 1.8 μ V		
(20 to 50) kHz	462 μ V/V + 2.5 μ V		
(50 to 100) kHz	695 μ V/V + 3.1 μ V		
(100 to 300) kHz	1.4 mV/V + 4.7 μ V		
(300 to 500) kHz	1.6 mV/V + 9.3 μ V		
(500 to 1 000) kHz	4.2 mV/V + 9.3 μ V		



ANSI National Accreditation Board

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Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	(7 to 22) mV		5790B AC Measurement Standard
	(10 to 20) Hz	330 $\mu\text{V/V} + 1.7 \mu\text{V}$	
	(20 to 40) Hz	220 $\mu\text{V/V} + 1.8 \mu\text{V}$	
	40 Hz to 20 kHz	120 $\mu\text{V/V} + 1.8 \mu\text{V}$	
	(20 to 50) kHz	240 $\mu\text{V/V} + 2.5 \mu\text{V}$	
	(50 to 100) kHz	360 $\mu\text{V/V} + 3 \mu\text{V}$	
	(100 to 300) kHz	960 $\mu\text{V/V} + 4.6 \mu\text{V}$	
	(300 to 500) kHz	1.2 mV/V + 9.2 μV	
	(500 to 1 000) kHz	3 mV/V + 9.2 μV	
	(22 to 70) mV		
	(10 to 20) Hz	290 $\mu\text{V/V} + 1.8 \mu\text{V}$	
	(20 to 40) Hz	150 $\mu\text{V/V} + 1.9 \mu\text{V}$	
	40 Hz to 20 kHz	80 $\mu\text{V/V} + 1.9 \mu\text{V}$	
	(20 to 50) kHz	160 $\mu\text{V/V} + 2.4 \mu\text{V}$	
	(50 to 100) kHz	310 $\mu\text{V/V} + 2.9 \mu\text{V}$	
	(100 to 300) kHz	630 $\mu\text{V/V} + 4.6 \mu\text{V}$	
	(300 to 500) kHz	820 $\mu\text{V/V} + 9 \mu\text{V}$	
	(500 to 1 000) kHz	1.5 mV/V + 9.1 μV	
	(70 to 220) mV		
	(10 to 20) Hz	250 $\mu\text{V/V} + 1.8 \mu\text{V}$	
	(20 to 40) Hz	100 $\mu\text{V/V} + 1.8 \mu\text{V}$	
	40 Hz to 20 kHz	50 $\mu\text{V/V} + 1.9 \mu\text{V}$	
	(20 to 50) kHz	90 $\mu\text{V/V} + 2.4 \mu\text{V}$	
	(50 to 100) kHz	190 $\mu\text{V/V} + 2.9 \mu\text{V}$	
(100 to 300) kHz	330 $\mu\text{V/V} + 4.5 \mu\text{V}$		
(300 to 500) kHz	480 $\mu\text{V/V} + 9.0 \mu\text{V}$		
(500 to 1 000) kHz	1.4 mV/V + 9.1 μV		
(220 to 700) mV			
(10Hz to 20) Hz	240 $\mu\text{V/V} + 2.1 \mu\text{V}$		
(20Hz to 40) Hz	90 $\mu\text{V/V} + 2.7 \mu\text{V}$		
40 Hz to 20 kHz	40 $\mu\text{V/V} + 3.5 \mu\text{V}$		
(20z to 50) kHz	60 $\mu\text{V/V} + 3.6 \mu\text{V}$		
(50 to 100) kHz	100 $\mu\text{V/V} + 3.7 \mu\text{V}$		
(100 to 300) kHz	250 $\mu\text{V/V} + 4.9 \mu\text{V}$		
(300 to 500) kHz	400 $\mu\text{V/V} + 9.4 \mu\text{V}$		
(500 to 1 000) kHz	1.4 mV/V + 9.3 μV		



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	700 mV to 2.2 V		5790B AC Measurement Standard
	(10 to 20) Hz	230 μ V/V	
	(20 to 40) Hz	80 μ V/V	
	40 Hz to 20 kHz	34 μ V/V	
	(20 to 50) kHz	61 μ V/V	
	(50 to 100) kHz	91 μ V/V	
	(100 to 300) kHz	240 μ V/V	
	(300 to 500) kHz	360 μ V/V	
	(500 to 1 000) kHz	1.4 mV/V	
	(2.2 to 7) V		
	(10 to 20) Hz	230 μ V/V	
	(20 to 40) Hz	80 μ V/V	
	40 Hz to 20 kHz	32 μ V/V	
	(20 to 50) kHz	61 μ V/V	
	(50 to 100) kHz	100 μ V/V	
	(100 to 300) kHz	260 μ V/V	
	(300 to 500) kHz	540 μ V/V	
	(500 to 1 000) kHz	1.7 mV/V	
	(7 to 22) V		
	(10 to 20) Hz	230 μ V/V	
	(20 to 40) Hz	81 μ V/V	
	40 Hz to 20 kHz	36 μ V/V	
	(20 to 50) kHz	62 μ V/V	
	(50 to 100) kHz	99 μ V/V	
	(100 to 300) kHz	260 μ V/V	
	(300 to 500) kHz	540 μ V/V	
	(500 to 1 000) kHz	1.7 mV/V	
	(22 to 70) V		
(10 to 20) Hz	230 μ V/V		
(20 to 40) Hz	81 μ V/V		
40 Hz to 20 kHz	43 μ V/V		
(20 to 50) kHz	71 μ V/V		
(50 to 100) kHz	130 μ V/V		
(100 to 300) kHz	260 μ V/V		
(300 to 500) kHz	590 μ V/V		
(500 to 1 000) kHz	1.7 mV/V		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	(70 to 220) V (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (220 to 700) V (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (700 to 1 000) V (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	230 μ V/V 85 μ V/V 45 μ V/V 90 μ V/V 130 μ V/V 300 μ V/V 810 μ V/V 230 μ V/V 130 μ V/V 55 μ V/V 170 μ V/V 980 μ V/V 230 μ V/V 130 μ V/V 53 μ V/V 170 μ V/V 980 μ V/V	5790B AC Measurement Standard
AC Current – Source	(1 to 100) μ A 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 10 kHz 100 μ A to 1 mA 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 30 kHz 1 mA to 10 mA 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 30 kHz 10 mA to 100 mA 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 30 kHz	1.7 mA/A + 0.15 μ A 520 μ A/A + 0.09 μ A 8.4 mA/A + 0.12 μ A 1.6 mA/A + 0.15 μ A 430 μ A/A + 0.12 μ A 4.3 mA/A + 0.17 μ A 8.4 mA/A + 0.35 μ A 1.6 mA/A + 1.8 μ A 380 μ A/A + 1.2 μ A 2.3 mA/A + 1.7 μ A 4.3 mA/A + 2.3 μ A 1.6 mA/A + 18 μ A 380 μ A/A + 12 μ A 4.2 mA/A + 23 μ A 5.2 mA/A + 120 μ A	Transmille 4010 Reference Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source	100 mA to 1 A 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz (1 to 30) A 10 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	1.6 mA/A + 180 μ A 420 μ A/A + 130 μ A 4.2 mA/A + 230 μ A 15 mA/A + 580 μ A 25 mA/A + 2.9 mA 1.6 mA/A + 2.3 mA 410 μ A/A + 2.1 mA 4.2 mA/A + 2.6 mA 5.2 mA/A + 2.6 mA 29 mA/A + 3 mA	Transmille 4010 Reference Calibrator
AC Current Source For Clamp Meters	(10 to 1500) A @60 Hz	0.46 % of reading + 0.42 A	Transmille 4010 Reference Calibrator, Transmille EA002 Coil
AC Current – Measure	(0 to 100) μ A (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz (100 to 200) μ A (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz 10 kHz to 30 kHz 200 μ A to 1 mA (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz (1 to 2) mA (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz 10 kHz to 30 kHz (2 to 10) mA (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz	490 μ A/A + 0.16 μ A 97 μ A/A + 0.13 μ A 190 μ A/A + 0.2 μ A 580 μ A/A + 0.16 μ A 140 μ A/A + 0.13 μ A 2.9 mA/A + 0.15 μ A 1.6 mA/A + 120 μ A 270 μ A/A 140 μ A/A 140 μ A/A 690 μ A/A 600 μ A/A + 0.2 μ A 170 μ A/A + 0.24 μ A 1.5 mA/A + 0.28 μ A 3 mA/A + 0.37 μ A 270 μ A/A 130 μ A/A 130 μ A/A 560 μ A/A	Transmille 8091 Multimeter, AC-DC Current Shunts



ANSI National Accreditation Board

Electrical – DC/Low Frequency

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AC Current – Measure	(10 to 30) mA (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz	600 $\mu\text{A}/\text{A}$ + 3.3 μA 160 $\mu\text{A}/\text{A}$ + 2.1 μA 710 $\mu\text{A}/\text{A}$ + 2.1 μA 1.5 mA/A + 2.2 μA	Transmille 8091 Multimeter, AC-DC Current Shunts
AC Current – Measure	(20 to 100) mA (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz (100 to 200) mA (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz 200 mA to 1 A (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz (1 to 2) A (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz (2 to 5) A (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz (5 to 30) A (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz (10 to 100) kHz	510 $\mu\text{A}/\text{A}$ 130 $\mu\text{A}/\text{A}$ 140 $\mu\text{A}/\text{A}$ 140 $\mu\text{A}/\text{A}$ 170 $\mu\text{A}/\text{A}$ 170 $\mu\text{A}/\text{A}$ 170 $\mu\text{A}/\text{A}$ 170 $\mu\text{A}/\text{A}$ 540 $\mu\text{A}/\text{A}$ 250 $\mu\text{A}/\text{A}$ 290 $\mu\text{A}/\text{A}$ 410 $\mu\text{A}/\text{A}$ 500 $\mu\text{A}/\text{A}$ 139 $\mu\text{A}/\text{A}$ 220 $\mu\text{A}/\text{A}$ 416 $\mu\text{A}/\text{A}$ 450 $\mu\text{A}/\text{A}$ 151 $\mu\text{A}/\text{A}$ 138 $\mu\text{A}/\text{A}$ 175 $\mu\text{A}/\text{A}$ 516 $\mu\text{A}/\text{A}$ 160 $\mu\text{A}/\text{A}$ 216 $\mu\text{A}/\text{A}$ 446 $\mu\text{A}/\text{A}$	Transmille 8091 Multimeter, AC-DC Current Shunts
Resistance – Source Fixed Values	1 Ω 5 Ω 10 Ω 15 Ω 25 Ω	2.4 $\mu\Omega/\Omega$ 0.76 $\mu\Omega/\Omega$ 1.2 $\mu\Omega/\Omega$ 1.2 $\mu\Omega/\Omega$ 1.2 $\mu\Omega/\Omega$	Transmille 3000RS Transmille 3000HR & Fixed Temp Controlled Resistors



ANSI National Accreditation Board

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Resistance – Source Fixed Values	30 Ω	1.2 μΩ/Ω	Transmille 3000RS Transmille 3000HR & Fixed Temp Controlled Resistors
	50 Ω	1.8 μΩ/Ω	
	62.5 Ω	0.65 μΩ/Ω	
	75 Ω	0.65 μΩ/Ω	
	100 Ω	0.65 μΩ/Ω	
	150 Ω	0.65 μΩ/Ω	
	200 Ω	0.65 μΩ/Ω	
	250 Ω	0.65 μΩ/Ω	
	300 Ω	0.65 μΩ/Ω	
	350 Ω	0.65 μΩ/Ω	
	400 Ω	0.65 μΩ/Ω	
	500 Ω	3.5 μΩ/Ω	
	1 kΩ	2.9 μΩ/Ω	
	10 kΩ	1.7 μΩ/Ω	
	20 kΩ	1.4 μΩ/Ω	
	100 kΩ	1.9 μΩ/Ω	
	300 kΩ	3.1 μΩ/Ω	
	400 kΩ	2 μΩ/Ω	
	1 MΩ	1.9 μΩ/Ω	
10 MΩ	5.6 μΩ/Ω		
100 MΩ	120 μΩ/Ω		
1 GΩ	250 μΩ/Ω		
10 GΩ	580 μΩ/Ω		
100 GΩ	5.2 mΩ/Ω		
Resistance – Source Variable Ranges	(0 to 100) Ω	110 μΩ/Ω + 59 mΩ	Transmille 4010 Reference Calibrator
	(100 to 330) Ω	120 μΩ/Ω + 59 mΩ	
	0.33 Ω to 1 kΩ	87 μΩ/Ω + 120 mΩ	
	(1 to 3.3) kΩ	110 μΩ/Ω + 100 mΩ	
	(3.3 to 10) kΩ	66 μΩ/Ω + 1 Ω	
	(10 to 33) kΩ	100 μΩ/Ω + 640 mΩ	
	(33 to 100) kΩ	63 μΩ/Ω + 10 Ω	
	(100 to 330) kΩ	110 μΩ/Ω + 6.0 Ω	
	330 kΩ to 1 MΩ	64 μΩ/Ω + 100 Ω	
	(1 to 3.3) MΩ	160 μΩ/Ω + 47 Ω	
(3.3 to 10) MΩ	82 μΩ/Ω + 1 kΩ		
(10 to 33) MΩ	690 μΩ/Ω + 1.3 kΩ		
Resistance – Source Variable Ranges	(33 to 100) MΩ	710 μΩ/Ω + 110 kΩ	Transmille 4010 Reference Calibrator
	(100 to 330) MΩ	13 mΩ/Ω + 100 kΩ	
	330 MΩ to 1 GΩ	24 mΩ/Ω + 560 kΩ	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Measure	(0 to 1) Ω (1 to 10) Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω	16 $\mu\Omega/\Omega$ + 9.0 $\mu\Omega$ 9.9 $\mu\Omega/\Omega$ + 64 $\mu\Omega$ 11 $\mu\Omega/\Omega$ + 540 $\mu\Omega$ 6.3 $\mu\Omega/\Omega$ + 5.4 m Ω 7.9 $\mu\Omega/\Omega$ + 53 m Ω 8.8 $\mu\Omega/\Omega$ + 530 m Ω	Transmille 8091 Multimeter
Resistance – Measure	100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω (1 to 10) G Ω 10 G Ω to 100 G Ω 100 G Ω to 1 T Ω	11 $\mu\Omega/\Omega$ + 5.7 Ω 19 $\mu\Omega/\Omega$ + 110 Ω 130 $\mu\Omega/\Omega$ + 4.7 k Ω 460 $\mu\Omega/\Omega$ + 29 k Ω 5 m Ω/Ω + 37 k Ω 27 m Ω/Ω + 68 k Ω 27 m Ω/Ω + 0.68 M Ω	Transmille 8091 Multimeter
Resistance – Ratio Measure	(1 to 10) Ω 10 Ω to 1 k Ω (1 to 500) k Ω	0.67 $\mu\Omega/\Omega$ 0.4 $\mu\Omega/\Omega$ 1.3 $\mu\Omega/\Omega$	Isotech Microk with standard resistors
Capacitance – Source Fixed Values	1 nF 2 nF 5 nF 10 nF 100 nF 1 μ F 10 μ F	0.06 % of reading	Transmille 4010 Reference Calibrator w/ GW Instek LCR 6002 Meter
Capacitance – Source	0.95 μ F to 100 mF	0.7 % of reading	Transmille 4010 Reference Calibrator
Capacitance-Measure	100 pF to 1 nF 1 nF to 100 μ F 100 μ F to 10 mF (10 to 100) mF	0.1 % of reading 0.06 % of reading 0.1 % of reading 0.92 % of reading	GW Instek LCR 6002 Meter
Inductance – Source Fixed Values	1 mH 10 mH 19 mH 29 mH 50 mH 100 mH 1 H 10 H	0.06 % of reading	Transmille 4010 Reference Calibrator w/ GW Instek LCR 6002 Meter
Inductance Measure	1 mH to 10 H	0.06 % of reading	GW Instek LCR 6002 Meter



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Phase – Measure	(-180 to 180)° (0 to 360)° 10 mV to 630 V 5 Hz to 2 kHz (2 to 5) kHz (5 to 10) kHz (10 to 50) kHz	0.03° 0.03° 0.04° 0.05°	Clark Hess 6000A Phase Meter
Electrical Simulation of Thermocouple Indicating Devices	Type J (-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (120 to 760) °C (760 to 1 200) °C Type K (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1 000) °C (1 000 to 1 372) °C Type T (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C Type R (0 to 250) °C (250 to 1 000) °C (1 000 to 1 760) °C Type S (0 to 250) °C (250 to 1 000) °C (1 000 to 1 760) °C Type B (600 to 800) °C (800 to 1 000) °C (1 000 to 1 550) °C (1 550 to 1 820) °C	0.31 °C 0.23 °C 0.22 °C 0.25 °C 0.28 °C 0.34 °C 0.25 °C 0.23 °C 0.29 °C 0.33 °C 0.64 °C 0.23 °C 0.22 °C 0.23 °C 0.83 °C 0.49 °C 0.55 °C 0.83 °C 0.49 °C 0.55 °C 0.76 °C 0.69 °C 0.58 °C 0.59 °C	Transmille 4010 Reference Calibrator W/ EA001A



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices	Type N		Transmille 4010 Reference Calibrator W/ EA001A
	(-200 to -100) °C	0.47 °C	
	(-100 to -25) °C	0.29 °C	
	(-25 to 120) °C	0.26 °C	
	(120 to 410) °C	0.26 °C	
	(410 to 1 300) °C	0.32 °C	
	Type E		
	(-250 to -100) °C	0.54 °C	
	(-100 to -25) °C	0.23 °C	
	(-25 to 350) °C	0.22 °C	
	(350 to 650) °C	0.24 °C	
	(650 to 1 000) °C	0.26 °C	
	Type L		
	(-200 to -100) °C	0.4 °C	
	(-100 to 800) °C	0.39 °C	
(800 to 900) °C	0.4 °C		
Type U			
(-200 to 0) °C	0.47 °C		
(0 to 600) °C	0.37 °C		
Type C			
(0 to 150) °C	0.37 °C		
(150 to 650) °C	0.34 °C		
(650 to 1 000) °C	0.38 °C		
(1 000 to 18 00) °C	0.51 °C		
(1 800 to 2 316) °C	0.71 °C		
Electrical Simulation of RTD/PRT Indicating Devices (Fixed Values)	Pt 100 Sensors		Transmille 4010 Reference Calibrator
	-100 °C	0.023 °C	
	0 °C	0.02 °C	
	30 °C	0.021 °C	
	60 °C	0.021 °C	
	100 °C	0.023 °C	
	200 °C	0.029 °C	
400 °C	0.045 °C		
800 °C	0.083 °C		
Electrical Simulation of RTD/PRT Indicating Devices (Variable Ranges)	Pt 100 Sensors		Transmille 4010 Reference Calibrator
	(-200 to 100) °C	0.03 °C	
	(400 to 630) °C	0.19 °C	
(630 to 800) °C	0.26 °C		



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Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature – Measure	(-200 °C to 156) °C (156 to 660) °C (660 to 1 100) °C (1 100 to 1 300) °C	5 mK 8 mK 0.4 °C 0.6 °C	Precision Thermometers with SPRT and Primary TC
Temperature - Thermometers and Probes by comparison	(-80 to 30) °C 0 °C (30 to 300) °C (300 to 650) °C (650 to 1 100) °C (1 100 to 1 200) °C	7.6 mK 5 mK 14 mK 61 mK 0.53 °C 0.6 °C	Comparison in liquid baths & dry wells with Reference measurement systems
Temperature – SPRT/PRT Calibration by Fixed Points	-195.798 °C -38.8344 °C 0.01 °C 29.7646 °C 156.598 °C 231.928 °C 419.527 °C 660.323 °C	3.7 mK 1.8 mK 0.7 mK 1.3 mK 2.7 mK 2.7 mK 2.9 mK 6.5 mK	Liquid N ₂ comparison Mercury cell Water triple point cell Gallium cell Indium cell Tin cell Zinc cell Aluminum cell
Infrared (IR) Thermometers / Pyrometers	50 °C 150 °C 300 °C 450 °C 550 °C 600 °C 700 °C 800 °C 900 °C 1 000 °C 1 100 °C 1 200 °C	0.30° C 0.64 °C 1.1 °C 2 °C 2.2 °C 2.7 °C 3.2 °C 3.3 °C 3.3 °C 3.9 °C 4.5 °C 4.9 °C	Blackbody Sources (Cavity) $\epsilon = (0.95 \text{ to } 1.0)$, $\lambda = (8 \text{ to } 14) \text{ um}$

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure	(1 to 100) Hz 100 Hz to 1 GHz	0.015 μ Hz/Hz+ 1.2 μ Hz 0.026 μ Hz/Hz	Transmille 8600 GPS Frequency Standard


Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Source	(1 to 100) Hz 100 Hz to 1 GHz	0.015 $\mu\text{Hz}/\text{Hz}$ + 1.2 μHz 0.026 $\mu\text{Hz}/\text{Hz}$	Transmille 8600 GPS Frequency Standard

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. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2691.01.



Jason Stine, Vice President

