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CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

The Standards Institution of Israel
Israeli Calibration Center

42 Chaim Levanon Street
Tel Aviv, 6997701 Israel

Fulfills the requirements of

ISO/IEC 17025:2017

In the fields of

CALIBRATION and **DIMENSIONAL MEASUREMENT**

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: 14 May 2026

Certificate Number: AC-2699

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

The Standards Institution of Israel
Israeli Calibration Center

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CALIBRATION AND DIMENSIONAL MEASUREMENT

ISO/IEC 17025 Accreditation Granted: **14 May 2024**

Certificate Number: **AC-2699** Certificate Expiry Date: **14 May 2026**

CALIBRATION

Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage, Measuring Instruments [1,2]	0 mV	904 nV	Short measurement
	(0.1 to 190] µV	$\sqrt{\left(8.1\ \frac{\mu V}{V}\cdot OR\right)^2+(904\ nV)^2}+0.93\ nV$	Comparison to Calibrator Datron 4708
	(0.19 to 1.9] mV	$\sqrt{\left(8.1\ \frac{\mu V}{V}\cdot OR\right)^2+(904\ nV)^2}+9.76\ nV$	
	(1.9 to 19] mV	$\sqrt{\left(8.1\ \frac{\mu V}{V}\cdot OR\right)^2+(905\ nV)^2}+92.3\ nV$	
	(19 to 190] mV	$\sqrt{\left(8.1\ \frac{\mu V}{V}\cdot OR\right)^2+(1.03\ \mu V)^2}+4.33\ nV$	
	(0.19 to 1.9] V	$\sqrt{\left(5.8\ \frac{\mu V}{V}\cdot OR\right)^2+(2.91\ \mu V)^2}+994\ nV$	
	(1.9 to 19] V	$\sqrt{\left(3.5\ \frac{\mu V}{V}\cdot OR\right)^2+(21.3\ \mu V)^2}+2.57\ \mu V$	
DC Voltage, Measuring Instruments [1,2]	(19 to 190] V	$\sqrt{\left(5.8\ \frac{\mu V}{V}\cdot OR\right)^2+(296\ \mu V)^2}+49.5\ \mu V$	Comparison to Calibrator Datron 4708
	(190 to 1 000] V	$\sqrt{\left(8.1\ \frac{\mu V}{V}\cdot OR\right)^2+(2.92\ mV)^2}+271\ \mu V$	

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Electrical – DC/Low Frequency

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DC Voltage, Measuring Instruments [1,2]	(1 000 to 2 000] V	$\sqrt{\left(463\frac{\mu V}{V}\cdot OR\right)^2+(1.15\ V)^2}+263\,mV$	Comparison to DC High Voltage Calibrator PINTEK HVC-801
DC Voltage, Measuring Instruments [1,2]	(2 000 to 20 000] V	$\sqrt{\left(463\frac{\mu V}{V}\cdot OR\right)^2+(11.5\ V)^2}+2.63\ V$	Comparison to Precision High Voltage Meter VITREK 4700A
DC Voltage, Measuring Instruments [1,2]	(20 to 40] kV	24 V/kV	Comparison to High Voltage Probe: FLUKE 80K-40
DC Voltage, Sources [1,2]	0 mV	1.7 µV	Comparison to Calibrator Datron 4708
	(0.1 µV to 190] µV (0.19 mV to 1.9] mV (1.9 mV to 19] mV (19 mV to 190] mV (0.19 V to 1.9] V (1.9 V to 19] V	$\sqrt{\left(8.1\frac{\mu V}{V}\cdot OR\right)^2+(905\,nV)^2}+1.34\,nV$ $\sqrt{\left(8.1\frac{\mu V}{V}\cdot OR\right)^2+(906\,nV)^2}+10.0\,nV$ $\sqrt{\left(8.1\frac{\mu V}{V}\cdot OR\right)^2+(1.03\,\mu V)^2}+86.7\,nV$ $\sqrt{\left(8.1\frac{\mu V}{V}\cdot OR\right)^2+(1.03\,\mu V)^2}+433\,nV$ $\sqrt{\left(5.8\frac{\mu V}{V}\cdot OR\right)^2+(2.91\,\mu V)^2}+994\,nV$ $\sqrt{\left(3.5\frac{\mu V}{V}\cdot OR\right)^2+(21.3\,\mu V)^2}+2.57\,\mu V$	Comparison to DMM Datron 1281
DC Voltage, Sources [1,2]	(19 to 190] V (190 to 1 000] V (1 000 to 2 000] V	$\sqrt{\left(5.8\frac{\mu V}{V}\cdot OR\right)^2+(296\,\mu V)^2}+49.5\,\mu V$ $\sqrt{\left(8.1\frac{\mu V}{V}\cdot OR\right)^2+(2.92\,mV)^2}+271\,\mu V$ $\sqrt{\left(463\frac{\mu V}{V}\cdot OR\right)^2+(1.15\,V)^2}+263\,mV$	Comparison to Precision High Voltage Meter VITREK 4700A
DC Voltage, Sources [1,2]	(2 000 to 20 000] V	$\sqrt{\left(463\frac{\mu V}{V}\cdot OR\right)^2+(11.5\,V)^2}+2.63\,V$	Comparison to High Voltage Probe: FLUKE 80K-40
	(20 to 30] kV	24 V/kV	
DC Current, Measuring Instruments [1,2]	0 pA	810 fA	Open measurement

Electrical – DC/Low Frequency

Parameter/Equipment	**Range** [5] [including end point] (does not include end point)	**Expanded Uncertainty of Measurement (+/-)**	**Reference Standard, Method, and/or Equipment**
DC Current, Measuring Instruments [1,2]	(0 to 2] pA (2 to 20] pA (20 to 200] pA	$\sqrt{(0.49\ \% \cdot OR)^2 + (810\ fA)^2} + 1.58\ fA$ $\sqrt{(0.43\ \% \cdot OR)^2 + (810\ fA)^2} + 12.4\ fA$ $\sqrt{(0.29\ \% \cdot OR)^2 + (8.02\ pA)^2} + 9.81\ fA$	Comparison to Calibrator KEITHLEY 263
DC Current Measuring Instruments [1,2]	(0.2 to 2] nA (2 to 20] nA (20 to 200] nA (0.2 to 2] µA	$\sqrt{\left(752\ \frac{\mu A}{A} \cdot OR\right)^2 + (20\ pA)^2} + 65.1\ fA$ $\sqrt{\left(752\ \frac{\mu A}{A} \cdot OR\right)^2 + (200\ pA)^2} + 554\ fA$ $\sqrt{\left(405\ \frac{\mu A}{A} \cdot OR\right)^2 + (2.0\ nA)^2} + 5.12\ pA$ $\sqrt{\left(289\ \frac{\mu A}{A} \cdot OR\right)^2 + (117\ pA)^2} + 104\ pA$	Comparison to Calibrator KEITHLEY 263
DC Current Measuring Instruments [1,2]	(2 to 19] µA (19 to 190] µA (0.19 to 1.9] mA (1.9 to 19] mA (19 to 190] mA (0.19 to 1.9] A	$\sqrt{\left(116\ \frac{\mu A}{A} \cdot OR\right)^2 + (3.06\ nA)^2} + 1.12\ nA$ $\sqrt{\left(116\ \frac{\mu A}{A} \cdot OR\right)^2 + (3.06\ nA)^2} + 2.09\ nA$ $\sqrt{\left(46.3\ \frac{\mu A}{A} \cdot OR\right)^2 + (167\ nA)^2} + 45.5\ nA$ $\sqrt{\left(46.3\ \frac{\mu A}{A} \cdot OR\right)^2 + (1.96\ \mu A)^2} + 412\ nA$ $\sqrt{\left(46.3\ \frac{\mu A}{A} \cdot OR\right)^2 + (1.96\ \mu A)^2} + 1.02\ \mu A$ $\sqrt{\left(116\ \frac{\mu A}{A} \cdot OR\right)^2 + (36\ \mu A)^2} + 20.8\ \mu A$	Comparison to Calibrator DATRON 4708

Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current, Measuring Instruments [1,2]	(1.9 to 3] A (3 to 10] A (10 to 20] A (20 to 32] A (32 to 105] A (105 to 160] A (160 to 525] A (525 to 1 000] A	$\sqrt{\left(440\ \frac{\mu A}{A}\cdot OR\right)^2+\left(783\ \mu A\right)^2}+39.4\ \mu A$ $\sqrt{\left(579\ \frac{\mu A}{A}\cdot OR\right)^2+\left(3.56\ mA\right)^2}+474\ \mu A$ $\sqrt{\left(637\ \frac{\mu A}{A}\cdot OR\right)^2+\left(8.74\ mA\right)^2}+3.82\ mA$ $\sqrt{\left(0.30\ \%\cdot OR\right)^2+\left(7.94\ mA\right)^2}+57.3\ mA$ $\sqrt{\left(0.30\ \%\cdot OR\right)^2+\left(27\ mA\right)^2}+194\ mA$ $\sqrt{\left(0.30\ \%\cdot OR\right)^2+\left(39.9\ mA\right)^2}+350\ mA$ $\sqrt{\left(0.30\ \%\cdot OR\right)^2+\left(134\ mA\right)^2}+1.18\ A$ $\sqrt{\left(0.30\ \%\cdot OR\right)^2+\left(350\ mA\right)^2}+2.33\ A$	Comparison to Calibrator FLUKE 5520A
DC Current Sources [1,2]	0 nA	2 nA	Open measurement
DC Current Sources [1,2]	(0 to 120] nA	$\sqrt{\left(34.7\ \frac{\mu A}{A}\cdot OR\right)^2+\left(2.01\ nA\right)^2}-4.44\ pA$	Comparison to DMM HP 3458A
DC Current Sources [1,2]	(0.12 to 1.2] µA (1.2 to 12] µA (12 to 120] µA (0.12 to 1.2] mA (1.2 to 12] mA (12 to 120] mA	$\sqrt{\left(23.1\ \frac{\mu A}{A}\cdot OR\right)^2+\left(411\ pA\right)^2}+80.5\ fA$ $\sqrt{\left(23.1\ \frac{\mu A}{A}\cdot OR\right)^2+\left(4.11\ nA\right)^2}-406\ fA$ $\sqrt{\left(23.1\ \frac{\mu A}{A}\cdot OR\right)^2+\left(14.0\ nA\right)^2}+33.4\ pA$ $\sqrt{\left(23.1\ \frac{\mu A}{A}\cdot OR\right)^2+\left(591\ nA\right)^2}+460\ pA$ $\sqrt{\left(23.1\ \frac{\mu A}{A}\cdot OR\right)^2+\left(591\ nA\right)^2}+658\ pA$ $\sqrt{\left(40.5\ \frac{\mu A}{A}\cdot OR\right)^2+\left(6.01\ \mu A\right)^2}+4.38\ nA$	Comparison to DMM HP 3458A
DC Current Sources [1,2]	(0.12 to 1.05] A (1.05 to 20] A	$\sqrt{\left(127\ \frac{\mu A}{A}\cdot OR\right)^2+\left(141\ \mu A\right)^2}+8.1\ \mu A$ 230 µA/A	Comparison to Shunt: FLUKE A40A-20A

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Electrical – DC/Low Frequency

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DC Current Sources [1,2]	(20 to 1 000] A	8 mA/A	Comparison to Calibrator, FLUKE 5520A +DC Clamp meter used as Transfer Standard
AC Voltage, Measuring Instruments [1,2]	[0.1 to 1.9] mV		IEC 60051-9; IEC 60044 Calibrator Datron 4709
	[10 to 31] Hz	$\sqrt{\left(139\,\frac{\mu V}{V}\cdot OR\right)^2+(6.26\,\mu V)^2}+244\ nV$	
	(31 to 330] Hz	$\sqrt{\left(81\,\frac{\mu V}{V}\cdot OR\right)^2+(6.26\,\mu V)^2}+137\ nV$	
	(0.33 to 10] kHz	$\sqrt{\left(69.4\,\frac{\mu V}{V}\cdot OR\right)^2+(6.26\,\mu V)^2}+124\ nV$	
	(10 to 33] kHz	$\sqrt{\left(81\,\frac{\mu V}{V}\cdot OR\right)^2+(6.30\,\mu V)^2}+143\ nV$	
	(33 to 100] kHz	$\sqrt{\left(347\,\frac{\mu V}{V}\cdot OR\right)^2+(6.39\,\mu V)^2}+578\ nV$	
	(100 to 330] kHz	$\sqrt{(0.12\,\%\cdot OR)^2+(12.0\,\mu V)^2}+1.95\ \mu V$	
	(033 to 1] MHz	$\sqrt{(0.23\,\%\cdot OR)^2+(24.3\,\mu V)^2}+3.96\ \mu V$	
AC Voltage, Measuring Instruments [1,2]	(1.9 to 19] mV		IEC 60051-9; IEC 60044 Calibrator Datron 4709
	[10 to 31] Hz	$\sqrt{\left(139\,\frac{\mu V}{V}\cdot OR\right)^2+(7.18\,\mu V)^2}+1.91\ \mu V$	
	(31 to 330] Hz	$\sqrt{\left(81\,\frac{\mu V}{V}\cdot OR\right)^2+(7.09\,\mu V)^2}+1.22\ \mu V$	
	(0.33 to 10] kHz	$\sqrt{\left(69.4\,\frac{\mu V}{V}\cdot OR\right)^2+(7.18\,\mu V)^2}+1.05\ \mu V$	
	(10 to 33] kHz	$\sqrt{\left(81\,\frac{\mu V}{V}\cdot OR\right)^2+(7.63\,\mu V)^2}+1.15\ \mu V$	
	(33 to 100] kHz	$\sqrt{\left(347\,\frac{\mu V}{V}\cdot OR\right)^2+(8.70\,\mu V)^2}+3.27\ \mu V$	
	(100 to 330] kHz	$\sqrt{(0.12\,\%\cdot OR)^2+(14.9\,\mu V)^2}+8.99\ \mu V$	
	(0.33 to 1] MHz	$\sqrt{(0.23\,\%\cdot OR)^2+(36.2\,\mu V)^2}+22.1\ \mu V$	

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AC Voltage, Measuring Instruments [1,2]	[19 to 190] mV		IEC 60051-9; IEC 60044 Calibrator Datron 4709
	[10 to 31] Hz	$\sqrt{\left(139\ \frac{\mu V}{V}\cdot OR\right)^2+(17.3\ \mu V)^2}+7.58\ \mu V$	
	(31 to 330] Hz	$\sqrt{\left(81\ \frac{\mu V}{V}\cdot OR\right)^2+(15.1\ \mu V)^2}+6.33\ \mu V$	
	(0.33 to 10] kHz	$\sqrt{\left(69.4\ \frac{\mu V}{V}\cdot OR\right)^2+(16.1\ \mu V)^2}+5.71\ \mu V$	
	(10 to 33] kHz	$\sqrt{\left(81\ \frac{\mu V}{V}\cdot OR\right)^2+(23.5\ \mu V)^2}+5.10\ \mu V$	
	(33 to 100] kHz	$\sqrt{\left(347\ \frac{\mu V}{V}\cdot OR\right)^2+(39.3\ \mu V)^2}+8.32\ \mu V$	
	(100 to 330] kHz	$\sqrt{(0.12\ \%\cdot OR)^2+(65.1\ \mu V)^2}+20.7\ \mu V$	
	(0.33 to 1] MHz	$\sqrt{(0.23\ \%\cdot OR)^2+(167\ \mu V)^2}+111\ \mu V$	
AC Voltage, Measuring Instruments [1,2]	(190 mV to 1.90 V]		IEC 60051-9; IEC 60044 Calibrator Datron 4709
	[10 to 31] Hz	$\sqrt{\left(104\ \frac{\mu V}{V}\cdot OR\right)^2+(50.4\ \mu V)^2}+29.7\ \mu V$	
	(31 to 330] Hz	$\sqrt{\left(57.9\ \frac{\mu V}{V}\cdot OR\right)^2+(34.1\ \mu V)^2}+19.3\ \mu V$	
	(0.33 to 33] kHz	$\sqrt{\left(46.3\ \frac{\mu V}{V}\cdot OR\right)^2+(28.3\ \mu V)^2}+9.92\ \mu V$	
	(33 to 100] kHz	$\sqrt{\left(92.6\ \frac{\mu V}{V}\cdot OR\right)^2+(52.0\ \mu V)^2}+20.0\ \mu V$	
	(100 to 330] kHz	$\sqrt{\left(289\ \frac{\mu V}{V}\cdot OR\right)^2+(162\ \mu V)^2}+97.4\ \mu V$	
	(0.33 to 1] MHz	$\sqrt{(0.17\ \%\cdot OR)^2+(738\ \mu V)^2}+405\ \mu V$	

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AC Voltage, Measuring Instruments [1,2]	(1.9 to 19] V		IEC 60051-9; IEC 60044 Calibrator Datron 4709
	[10 to 31] Hz	$\sqrt{\left(104\ \frac{\mu V}{V}\cdot OR\right)^2+(504\ \mu V)^2}+297\ \mu V$	
	(31 to 330] Hz	$\sqrt{\left(57.9\ \frac{\mu V}{V}\cdot OR\right)^2+(341\ \mu V)^2}+193\ \mu V$	
	(0.33 to 10] kHz	$\sqrt{\left(46.3\ \frac{\mu V}{V}\cdot OR\right)^2+(283\ \mu V)^2}+992\ \mu V$	
	(10 to 33] kHz	$\sqrt{\left(46.3\ \frac{\mu V}{V}\cdot OR\right)^2+(301\ \mu V)^2}+988\ \mu V$	
	(33 to 100] kHz	$\sqrt{\left(92.6\ \frac{\mu V}{V}\cdot OR\right)^2+(457\ \mu V)^2}+202\ \mu V$	
	(33 to 100] kHz	$\sqrt{\left(92.6\ \frac{\mu V}{V}\cdot OR\right)^2+(457\ \mu V)^2}+202\ \mu V$	
	(100 to 330] kHz	$\sqrt{\left(289\ \frac{\mu V}{V}\cdot OR\right)^2+(1.55\ mV)^2}+976\ \mu V$	
	(0.33 to 1] MHz	$\sqrt{(0.17\ \%\cdot OR)^2+(7.14\ mV)^2}+4.05\ mV$	
AC Voltage, Measuring Instruments [1,2]	(19 to 190] V		IEC 60051-9; IEC 60044 Calibrator Datron 4709
	[10 to 31] Hz	$\sqrt{\left(116\ \frac{\mu V}{V}\cdot OR\right)^2+(5.35\ mV)^2}+3.01\ mV$	
	(31 to 330] Hz	$\sqrt{\left(69.4\ \frac{\mu V}{V}\cdot OR\right)^2+(3.57\ mV)^2}+1.99\ mV$	
	(0.33 to 10] kHz	$\sqrt{\left(57.9\ \frac{\mu V}{V}\cdot OR\right)^2+(3.01\ mV)^2}+1.0\ mV$	
	(10 to 33] kHz	$\sqrt{\left(69.4\ \frac{\mu V}{V}\cdot OR\right)^2+(3.81\ mV)^2}+1.98\ mV$	
	(33 to 100] kHz	$\sqrt{\left(139\ \frac{\mu V}{V}\cdot OR\right)^2+(7.84\ mV)^2}+3.00\ mV$	
	(100 to 200] kHz	$\sqrt{\left(463\ \frac{\mu V}{V}\cdot OR\right)^2+(26.8\ mV)^2}+9.97\ mV$	

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AC Voltage, Measuring Instruments [1,2]	(190 to 1 000] V [50 to 330] Hz (0.33 to 10] kHz (10 to 33] kHz (33 to 100] kHz	$\sqrt{\left(162\,\frac{\mu V}{V}\cdot OR\right)^2+(41.7\ mV)^2}+10.9\ mV$ $\sqrt{\left(116\,\frac{\mu V}{V}\cdot OR\right)^2+(45.6\ mV)^2}+10.4\ mV$ $\sqrt{\left(162\,\frac{\mu V}{V}\cdot OR\right)^2+(76.1\ mV)^2}+10.2\ mV$ $\sqrt{(0.12\ \%\cdot OR)^2+(350\ mV)^2}+21.8\ mV$	IEC 60051-9; IEC 60044 Calibrator Datron 4709
AC Voltage, Measuring Instruments [1,2]	(1 to 1.5) kV [40 to 60] Hz	$\sqrt{\left(810\,\frac{\mu V}{V}\cdot OR\right)^2+(2.1\ V)^2}+7.54\ V$	Comparison to Potential Transformer TETTEX 7823, Precision High Voltage Meter
AC Voltage, Measuring Instruments [1,2]	(1.5 to 10] kV [40 to 60] Hz	$\sqrt{(0.23\ \%\cdot OR)^2+(23.0\ V)^2}+10.6\ V$	Comparison to VITREK 4600A High Voltage Meter
AC Voltage, Sources [1,2]	[1 to 3] mV [10 to 100] Hz (100 Hz to 30 kHz] (30 to 200] kHz (200 to 500] kHz (500 to 1 000] kHz	$\sqrt{(0.15\ \%\cdot OR)^2+(1.06\ \mu V)^2}+38.5\ nV$ $\sqrt{(0.13\ \%\cdot OR)^2+(1.06\ \mu V)^2}+37.1\ nV$ $\sqrt{(0.19\ \%\cdot OR)^2+(1.11\ \mu V)^2}-8.6\ nV$ $\sqrt{(0.36\ \%\cdot OR)^2+(1.11\ \mu V)^2}+45.4\ nV$ $\sqrt{(0.75\ \%\cdot OR)^2+(1.31\ \mu V)^2}+50.0\ nV$	Comparison to AC Measurement Standard, Datron 4920
AC Voltage, Sources [1,2]	(3 to 10] mV [10 to 100] Hz (100 Hz to 30 kHz] (30 to 200] kHz (200 to 500] kHz (500 kHz to 1 MHz]	$\sqrt{\left(509\,\frac{\mu V}{V}\cdot OR\right)^2+(1.12\ \mu V)^2}-10.9\ nV$ $\sqrt{\left(312\,\frac{\mu V}{V}\cdot OR\right)^2+(1.12\ \mu V)^2}-16.5\ nV$ $\sqrt{\left(729\,\frac{\mu V}{V}\cdot OR\right)^2+(1.56\ \mu V)^2}-641\ pV$ $\sqrt{\left(2.1\,\frac{mV}{V}\cdot OR\right)^2+(1.56\ \mu V)^2}+49.8\ nV$ $\sqrt{\left(5.2\,\frac{mV}{V}\cdot OR\right)^2+(3.00\ \mu V)^2}+50.4\ nV$	Comparison to AC Measurement Standard, Datron 4920

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AC Voltage, Sources [1,2]	(10 to 30] mV [10 to 100] Hz (100 Hz to 30 kHz] (30 to 200] kHz (200 to 500] kHz (500 to 1 000] kHz	 $\sqrt{\left(405\,\frac{\mu V}{V}\cdot OR\right)^2+\left(1.16\ \mu V\right)^2}+45.1\ nV$ $\sqrt{\left(243\,\frac{\mu V}{V}\cdot OR\right)^2+\left(1.16\ \mu V\right)^2}+41.1\ nV$ $\sqrt{\left(521\,\frac{\mu V}{V}\cdot OR\right)^2+\left(1.52\ \mu V\right)^2}+50.7\ nV$ $\sqrt{\left(1.6\,\frac{mV}{V}\cdot OR\right)^2+\left(2.94\ \mu V\right)^2}+51.4\ nV$ $\sqrt{\left(3.9\,\frac{mV}{V}\cdot OR\right)^2+\left(8.54\ \mu V\right)^2}+50.5\ nV$	Comparison to AC Measurement Standard, Datron 4920
AC Voltage, Sources [1,2]	(30 to 100] mV [10 to 100] Hz (100 Hz to 30 kHz] (30 to 200] kHz (200 to 500] kHz (500 to 1 000] kHz	 $\sqrt{\left(301\,\frac{\mu V}{V}\cdot OR\right)^2+\left(1.89\ \mu V\right)^2}+52.2\ nV$ $\sqrt{\left(150\,\frac{\mu V}{V}\cdot OR\right)^2+\left(1.89\ \mu V\right)^2}+46.2\ nV$ $\sqrt{\left(289\,\frac{\mu V}{V}\cdot OR\right)^2+\left(3.94\ \mu V\right)^2}+4.51\ nV$ $\sqrt{\left(868\,\frac{\mu V}{V}\cdot OR\right)^2+\left(9.28\ \mu V\right)^2}+53.6\ nV$ $\sqrt{\left(2.3\,\frac{mV}{V}\cdot OR\right)^2+\left(24.1\ \mu V\right)^2}+45.2\ nV$	Comparison to Standard, Datron 4920
AC Voltage, Sources [1,2]	(100 to 300] mV [1 to 2] Hz (2 to 10] Hz (10 to 40] Hz (40 Hz to 30 kHz] (30 to 200] kHz (200 to 500] kHz (500 to 1 000] kHz	 $\sqrt{\left(428\,\frac{\mu V}{V}\cdot OR\right)^2+\left(30.1\ \mu V\right)^2}+2.94\ nV$ $\sqrt{\left(197\,\frac{\mu V}{V}\cdot OR\right)^2+\left(10.5\ \mu V\right)^2}-8.65\ nV$ $\sqrt{\left(40.5\,\frac{\mu V}{V}\cdot OR\right)^2+\left(6.62\ \mu V\right)^2}+404\ pV$ $\sqrt{\left(40.5\,\frac{\mu V}{V}\cdot OR\right)^2+\left(11.1\ \mu V\right)^2}+19.6\ nV$ $\sqrt{\left(98.4\,\frac{\mu V}{V}\cdot OR\right)^2+\left(35.8\ \mu V\right)^2}-17.1\ nV$ $\sqrt{\left(405\,\frac{\mu V}{V}\cdot OR\right)^2+\left(35.8\ \mu V\right)^2}-8.85\ nV$ $\sqrt{\left(1.1\,\frac{mV}{V}\cdot OR\right)^2+\left(84.8\ \mu V\right)^2}+4.59\ nV$	Comparison to Standard, Datron 4920

Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage, Sources [1,2]	(0.3 to 1] V [1 to 2] Hz (2 to 10] Hz (10 to 40] Hz (40 Hz to 30 kHz] (30 to 200] kHz (200 to 500] kHz (500 to 1 000] kHz	 $\sqrt{\left(428\ \frac{\mu V}{V}\cdot OR\right)^2+(50.1\ \mu V)^2}+86.3\ nV$ $\sqrt{\left(197\ \frac{\mu V}{V}\cdot OR\right)^2+(27.1\ \mu V)^2}+3.80\ nV$ $\sqrt{\left(40.5\ \frac{\mu V}{V}\cdot OR\right)^2+(16.1\ \mu V)^2}-3.61\ nV$ $\sqrt{\left(40.5\ \frac{\mu V}{V}\cdot OR\right)^2+(18.1\ \mu V)^2}-4.48\ nV$ $\sqrt{\left(98.4\ \frac{\mu V}{V}\cdot OR\right)^2+(41.1\ \mu V)^2}-17.4\ nV$ $\sqrt{\left(405\ \frac{\mu V}{V}\cdot OR\right)^2+(118\ \mu V)^2}+64.4\ nV$ $\sqrt{(0.11\ \%\cdot OR)^2+(283\ \mu V)^2}-67.4\ nV$	Comparison to Standard, Datron 4920
AC Voltage, Sources [1,2]	(1 to 3] V [1 to 2] Hz (2 to 10] Hz (10 to 40] Hz (40 Hz to 30 kHz] (30 to 200] kHz (200 to 500] kHz (500 to 1 000] kHz	 $\sqrt{\left(428\ \frac{\mu V}{V}\cdot OR\right)^2+(160\ \mu V)^2}+196\ nV$ $\sqrt{\left(197\ \frac{\mu V}{V}\cdot OR\right)^2+(81.2\ \mu V)^2}-81.7\ nV$ $\sqrt{\left(40.5\ \frac{\mu V}{V}\cdot OR\right)^2+(42.1\ \mu V)^2}+27.5\ nV$ $\sqrt{\left(40.5\ \frac{\mu V}{V}\cdot OR\right)^2+(48.1\ \mu V)^2}+32.1\ nV$ $\sqrt{\left(98.4\ \frac{\mu V}{V}\cdot OR\right)^2+(114\ \mu V)^2}+35.6\ nV$ $\sqrt{\left(405\ \frac{\mu V}{V}\cdot OR\right)^2+(277\ \mu V)^2}-121\ nV$ $\sqrt{\left(1.1\ \frac{mV}{V}\cdot OR\right)^2+(722\ \mu V)^2}-15.3\ nV$	Comparison to Standard, Datron 4920

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Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage, Sources [1,2]	(3 to 10] V [1 to 2] Hz (2 to 10] Hz (10 to 40] Hz (40 Hz to 30 kHz] (30 to 200] kHz (200 to 500] kHz (500 to 1 000] kHz	 $\sqrt{\left(428\ \frac{\mu V}{V}\cdot OR\right)^2+(53.1\ \mu V)^2}+835\ nV$ $\sqrt{\left(197\ \frac{\mu V}{V}\cdot OR\right)^2+(271\ \mu V)^2}+38.0\ nV$ $\sqrt{\left(40.5\ \frac{\mu V}{V}\cdot OR\right)^2+(141\ \mu V)^2}-22.6\ nV$ $\sqrt{\left(40.5\ \frac{\mu V}{V}\cdot OR\right)^2+(161\ \mu V)^2}-36.1\ nV$ $\sqrt{\left(98.4\ \frac{\mu V}{V}\cdot OR\right)^2+(381\ \mu V)^2}-199\ nV$ $\sqrt{\left(405\ \frac{\mu V}{V}\cdot OR\right)^2+(922\ \mu V)^2}-95.7\ nV$ $\sqrt{\left(1.1\ \frac{mV}{V}\cdot OR\right)^2+(2.83\ mV)^2}-674\ nV$	Comparison to Standard, Datron 4920
AC Voltage, Sources [1,2]	(10 to 30] V [1 to 2] Hz (2 to 10] Hz (10 to 40] Hz (40 Hz to 30 kHz] (30 to 200] kHz (200 to 500] kHz (500 to 1 000] kHz	 $\sqrt{\left(428\ \frac{\mu V}{V}\cdot OR\right)^2+(1.60\ mV)^2}+1.96\ \mu V$ $\sqrt{\left(197\ \frac{\mu V}{V}\cdot OR\right)^2+(812\ \mu V)^2}-817\ nV$ $\sqrt{\left(40.5\ \frac{\mu V}{V}\cdot OR\right)^2+(812\ \mu V)^2}+184\ nV$ $\sqrt{\left(40.5\ \frac{\mu V}{V}\cdot OR\right)^2+(481\ \mu V)^2}+321\ nV$ $\sqrt{\left(98.4\ \frac{\mu V}{V}\cdot OR\right)^2+(1.14\ mV)^2}+356\ nV$ $\sqrt{\left(405\ \frac{\mu V}{V}\cdot OR\right)^2+(2.77\ mV)^2}-1.21\ \mu V$ $\sqrt{\left(1.1\ \frac{mV}{V}\cdot OR\right)^2+(7.22\ mV)^2}-153\ nV$	Comparison to Standard, Datron 4920
AC Voltage, Sources [1,2]	(30 to 100] V [1 to 2] Hz (2 to 10] Hz (10 to 40] Hz (40 Hz to 30 kHz] (30 to 200] kHz	 $\sqrt{\left(428\ \frac{\mu V}{V}\cdot OR\right)^2+(5.81\ mV)^2}+8.90\ \mu V$ $\sqrt{\left(197\ \frac{\mu V}{V}\cdot OR\right)^2+(2.91\ mV)^2}-4.58\ \mu V$ $\sqrt{\left(40.5\ \frac{\mu V}{V}\cdot OR\right)^2+(2.91\ mV)^2}-189\ nV$ $\sqrt{\left(40.5\ \frac{\mu V}{V}\cdot OR\right)^2+(1.61\ mV)^2}-361\ nV$ $\sqrt{\left(98.4\ \frac{\mu V}{V}\cdot OR\right)^2+(5.01\ mV)^2}-765\ nV$	Comparison to Standard, Datron 4920

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Electrical – DC/Low Frequency

Parameter/Equipment	**Range** [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage, Sources [1,2]	(100 to 300] V [1 to 2] Hz (2 to 10] Hz (10 to 40] Hz (40 Hz to 20 kHz] (20 to 100] kHz	$\sqrt{\left(475\ \frac{\mu V}{V}\cdot OR\right)^2+(69.2\ mV)^2}-9.38\ \mu V$ $\sqrt{\left(243\ \frac{\mu V}{V}\cdot OR\right)^2+(10.0\ mV)^2}-6.20\ \mu V$ $\sqrt{\left(57.9\ \frac{\mu V}{V}\cdot OR\right)^2+(6.92\ mV)^2}-9.72\ \mu V$ $\sqrt{\left(57.9\ \frac{\mu V}{V}\cdot OR\right)^2+(7.22\ mV)^2}-9.46\ \mu V$ $\sqrt{\left(151\ \frac{\mu V}{V}\cdot OR\right)^2+(39.7\ mV)^2}-14.0\ \mu V$	Comparison to Standard, Datron 4920
AC Voltage, Sources [1,2]	(300 to 1 000] V [1 to 2] Hz (2 to 10] Hz (10 to 40] Hz (40 Hz to 20 kHz] (20 to 100] kHz	$\sqrt{\left(475\ \frac{\mu V}{V}\cdot OR\right)^2+(301\ mV)^2}-136\ \mu V$ $\sqrt{\left(243\ \frac{\mu V}{V}\cdot OR\right)^2+(27.1\ mV)^2}-326\ nV$ $\sqrt{\left(57.9\ \frac{\mu V}{V}\cdot OR\right)^2+(27.1\ mV)^2}-35.6\ \mu V$ $\sqrt{\left(57.9\ \frac{\mu V}{V}\cdot OR\right)^2+(52.1\ mV)^2}-2.22\ \mu V$ $\sqrt{\left(151\ \frac{\mu V}{V}\cdot OR\right)^2+(132\ mV)^2}+175\ \mu V$	Comparison to Standard, Datron 4920
AC Voltage, Sources [1,2]	(1 000 to 1 500] V [50 to 60] Hz (1.5 to 15] kV [50 to 60] Hz	$\sqrt{\left(810\ \frac{\mu V}{V}\cdot OR\right)^2+(2.10\ V)^2}+754\ mV$ $\sqrt{\left(2.3\ \frac{mV}{V}\cdot OR\right)^2+(23\ V)^2}+12.6\ V$	Comparison to Precision High Voltage Meter VITREK 4700A
AC Voltage, Sources [1,2]	(15 to 28] kV [50 to 60] Hz	58 V/kV	Comparison to High Voltage Probe FLUKE 80K-40
AC Current, Measuring Instruments	(0 to 190] µA (0.01 to 1] kHz (1 to 5] kHz	$\sqrt{(174\ \frac{\mu A}{A}OR)^2+(17nA)^2}+3.1nA$ $\sqrt{(347\ \frac{\mu A}{A}OR)^2+(22nA)^2}+2.6nA$	IEC 60051-9; IEC 60044 Calibrator DATRON 4708
AC Current, Measuring Instruments	(0 to 330] µA (0.01 to 10] kHz (10 to 30] kHz	$\sqrt{(0.93\%OR)^2+239nA^2}-22nA$ $\sqrt{(1.85\%OR)^2+467nA^2}-435nA$	Comparison to Calibrator FLUKE 5520A

Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current, Measuring Instruments	(0.33 to 3.3] mA (0.01 to 10] kHz (10 to 30] kHz	$\sqrt{(0.85\%OR)^2 + 688\mu A^2} - 2.3\mu A$ $\sqrt{(1.16\%OR)^2 + 91.3\mu A^2} - 4.5\mu A$	Comparison to Calibrator FLUKE 5520A
AC Current, Measuring Instruments	(1.9 to 19 mA] (0.01 to 1] kHz (1 to 5] kHz	$\sqrt{(0.02\%OR)^2 + 1.7\mu A^2} + 2.2\mu A$ $\sqrt{(116\frac{\mu A}{A}OR)^2 + (16nA)^2} + 15nA$	Comparison to Calibrator DATRON 4708
AC Current, Measuring Instruments	(3.3 to 33 mA] (0.01 to 10] kHz (10 to 30] kHz	$\sqrt{(0.23\%OR)^2 + 6.9\mu A^2} - 7.3\mu A$ $\sqrt{(0.46\%OR)^2 + 7.5\mu A^2} - 16.5\mu A$	Comparison to Calibrator FLUKE 5520A
AC Current, Measuring Instruments	(19 to 190 mA] (0.01 to 1] kHz (1 to 5] kHz	$\sqrt{(116\frac{\mu A}{A}OR)^2 + (16nA)^2} + 3.6nA$ $\sqrt{(232\frac{\mu A}{A}OR)^2 + (17nA)^2} + 2.2nA$	Comparison to Calibrator DATRON 4708
AC Current, Measuring Instruments	(33 to 330 mA] (0.01 to 10] kHz (10 to 30] kHz	$\sqrt{(0.23\frac{\mu A}{A}OR)^2 + (130nA)^2} + 12nA$ $\sqrt{(0.46\%OR)^2 + 239\mu A^2} - 22\mu A$	Comparison to Calibrator FLUKE 5520A
AC Current, Measuring Instruments	(0.5 to 1] A [44 to 65] Hz (65 to 850] Hz	$\sqrt{(151\frac{\mu A}{A}OR)^2 + (38.1\mu A)^2} + 1.3\mu A$ $\sqrt{(161\frac{\mu A}{A}OR)^2 + (38.8nA)^2} + 97nA$	Comparison to Calibrator FLUKE 6100B
AC Current, Measuring Instruments	(1.1to 1.9] A (0.85 to 1] kHz (1 to 5] kHz	$\sqrt{(347\frac{\mu A}{A}OR)^2 + (203\mu A)^2} - 2.2\mu A$ $\sqrt{(521\frac{\mu A}{A}OR)^2 + (271\mu A)^2} - 11\mu A$	Comparison to Calibrator DATRON 4708
AC Current, Measuring Instruments	(1.9 to 2] A [44 to 65] Hz (65 to 850] Hz	$\sqrt{(151\frac{\mu A}{A}OR)^2 + (76.2\mu A)^2} + 2.6\mu A$ $\sqrt{(161\frac{\mu A}{A}OR)^2 + (77.6\mu A)^2} + 19.6\mu A$	Comparison to Calibrator FLUKE 6100B

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Electrical – DC/Low Frequency

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AC Current, Measuring Instruments	(2 to 3] A [44 to 65] Hz (0.65 to 5] kHz (5 to 10] kHz	$\sqrt{(161\frac{\mu A}{A}OR)^2+(216\mu A)^2}+34.3\mu A$ $\sqrt{(0.12\%OR)^2+4.0mA^2}+683\mu A$ $\sqrt{(3.47\%OR)^2+4.0mA^2}-12mA$	Comparison to Calibrator FLUKE 6100B Calibrator FLUKE 5520A Calibrator FLUKE 5520A
AC Current, Measuring Instruments	(3 to 5] A [44 to 65] Hz (65 to 850] Hz	$\sqrt{(151\frac{\mu A}{A}OR)^2+(21\mu A)^2}+6.5\mu A$ $\sqrt{(161\frac{\mu A}{A}OR)^2+(22\mu A)^2}+486nA$	Comparison to Calibrator FLUKE 6100B
AC Current, Measuring Instruments	(5 to 10] A [44 to 65] Hz (65 to 850] Hz	$\sqrt{(190\frac{\mu A}{A}OR)^2+(43.2mA)^2}-33\mu A$ $\sqrt{(221\frac{\mu A}{A}OR)^2+(45.5mA)^2}-73\mu A$	Comparison to Calibrator FLUKE 6100B
AC Current, Measuring Instruments	(3 to 11] A (65 to100] Hz (0.85 to 1] kHz (1 to 5] kHz	$\sqrt{(0.07\%OR)^2+9mA^2}+4.4mA$ $\sqrt{(0.12\%OR)^2+9mA^2}+750\mu A$ $\sqrt{(3.47\%OR)^2+9mA^2}-4.9mA$	Comparison to Calibrator FLUKE 5520A
AC Current, Measuring Instruments	(10 to 20] A [44 to 850] Hz	$\sqrt{(247\frac{\mu A}{A}OR)^2+(1.2mA)^2}-8.2\mu A$	Comparison to Calibrator FLUKE 6100B
AC Current, Measuring Instruments	(11 to 20.5] A (0.1 to 1] kHz (1 to 5] kHz	$\sqrt{(0.17\%OR)^2+17mA^2}-21mA$ $\sqrt{(3.47\%OR)^2+17mA^2}-9mA$	Comparison to Calibrator FLUKE 5520A
AC Current, Measuring Instruments	(80 to 205] A (0.65 to 100] Hz (100 to 440] Hz	$\sqrt{(0.16\%OR)^2+170mA^2}+559mA$ $\sqrt{(3.47\%OR)^2+170mA^2}-903mA$	Comparison to Calibrator FLUKE 5520A
AC Current, Measuring Instruments	(205 to 1000] A (0.65 to 100] Hz	$\sqrt{(0.16\%OR)^2+852mA^2}+7.2mA$	Comparison to Calibrator FLUKE 5520A
AC Current, Sources [1,2]	(0 to 120] µA (10 to 20] Hz (20 to 45] Hz (45 to 1 000] Hz	$\sqrt{(0.46\ \%\cdot OR)^2+(31\ nA)^2}+44\ pA$ $\sqrt{(0.17\ \%\cdot OR)^2+(42\ nA)^2}+26\ nA$ $\sqrt{\left(694\ \frac{\mu A}{A}\cdot OR\right)^2+(42\ nA)^2}+22\ nA$	Comparison to DMM HP 3458A

Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current, Sources [1,2]	(120 µA to 1.2 mA] (10 to 20] Hz (20 to 45] Hz (45 to 100] Hz (100 Hz to 5 kHz] (5 to 20] kHz (20 to 50] kHz (50 to 100] kHz	 $\sqrt{(0.46\ \% \cdot \mathrm{OR})^2 + (381\ \mathrm{nA})^2} + 271\ \mathrm{nA}$ $\sqrt{(0.17\ \% \cdot \mathrm{OR})^2 + (381\ \mathrm{nA})^2} + 258\ \mathrm{nA}$ $\sqrt{\left(694\ \frac{\mu\mathrm{A}}{\mathrm{A}} \cdot \mathrm{OR}\right)^2 + (381\ \mathrm{nA})^2} + 225\ \mathrm{nA}$ $\sqrt{\left(347\ \frac{\mu\mathrm{A}}{\mathrm{A}} \cdot \mathrm{OR}\right)^2 + (371\ \mathrm{nA})^2} + 13\ \mathrm{pA}$ $\sqrt{\left(694\ \frac{\mu\mathrm{A}}{\mathrm{A}} \cdot \mathrm{OR}\right)^2 + (521\ \mathrm{nA})^2} + 196\ \mathrm{pA}$ $\sqrt{(0.46\ \% \cdot \mathrm{OR})^2 + (1.3\ \mu\mathrm{A})^2} + 642\ \mathrm{pA}$ $\sqrt{(0.64\ \% \cdot \mathrm{OR})^2 + (5.4\ \mu\mathrm{A})^2} + 1.5\ \mathrm{nA}$	Comparison to DMM HP 3458A
AC Current, Sources [1,2]	(1.2 to 12] mA (10 to 20] Hz (20 to 45] Hz (45 to 100] Hz (100 Hz to 5 kHz] (5 to 20] kHz (20 to 50] kHz (50 to 100] kHz	 $\sqrt{(0.46\ \% \cdot \mathrm{OR})^2 + (3.8\ \mu\mathrm{A})^2} + 2.7\ \mu\mathrm{A}$ $\sqrt{(0.17\ \% \cdot \mathrm{OR})^2 + (3.8\ \mu\mathrm{A})^2} + 2.6\ \mu\mathrm{A}$ $\sqrt{\left(694\ \frac{\mu\mathrm{A}}{\mathrm{A}} \cdot \mathrm{OR}\right)^2 + (3.8\ \mu\mathrm{A})^2} + 2.3\ \mu\mathrm{A}$ $\sqrt{\left(347\ \frac{\mu\mathrm{A}}{\mathrm{A}} \cdot \mathrm{OR}\right)^2 + (3.7\ \mu\mathrm{A})^2} + 126\ \mathrm{pA}$ $\sqrt{\left(694\ \frac{\mu\mathrm{A}}{\mathrm{A}} \cdot \mathrm{OR}\right)^2 + (5.2\ \mu\mathrm{A})^2} + 2.0\ \mathrm{nA}$ $\sqrt{(0.46\ \% \cdot \mathrm{OR})^2 + (14\ \mu\mathrm{A})^2} + 5.1\ \mu\mathrm{A}$ $\sqrt{(0.64\ \% \cdot \mathrm{OR})^2 + (58\ \mu\mathrm{A})^2} + 15\ \mu\mathrm{A}$	Comparison to DMM HP 3458A
AC Current, Sources [1,2]	(12 to 120] mA (10 to 20] Hz (20 to 45] Hz (45 to 100] Hz (100 Hz to 5 kHz] (5 to 20] kHz (20 to 50] kHz (50 to 100] kHz	 $\sqrt{(0.46\ \% \cdot \mathrm{OR})^2 + (38\ \mu\mathrm{A})^2} + 27\ \mu\mathrm{A}$ $\sqrt{(0.17\ \% \cdot \mathrm{OR})^2 + (38\ \mu\mathrm{A})^2} + 26\ \mu\mathrm{A}$ $\sqrt{\left(694\ \frac{\mu\mathrm{A}}{\mathrm{A}} \cdot \mathrm{OR}\right)^2 + (38\ \mu\mathrm{A})^2} + 23\ \mu\mathrm{A}$ $\sqrt{\left(347\ \frac{\mu\mathrm{A}}{\mathrm{A}} \cdot \mathrm{OR}\right)^2 + (37\ \mu\mathrm{A})^2} + 1.3\ \mathrm{nA}$ $\sqrt{\left(694\ \frac{\mu\mathrm{A}}{\mathrm{A}} \cdot \mathrm{OR}\right)^2 + (52\ \mu\mathrm{A})^2} + 20\ \mathrm{nA}$ $\sqrt{(0.46\ \% \cdot \mathrm{OR})^2 + (142\ \mu\mathrm{A})^2} + 51\ \mu\mathrm{A}$ $\sqrt{(0.64\ \% \cdot \mathrm{OR})^2 + (541\ \mu\mathrm{A})^2} + 152\ \mathrm{nA}$	Comparison to DMM HP 3458A

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Electrical – DC/Low Frequency

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AC Current, Sources [1,2]	(120 mA to 1.05 A] (10 to 20] Hz (20 to 45] Hz (45 to 100] Hz (100 Hz to 5 kHz] (5 to 20] kHz (20 to 50] kHz	 $\sqrt{(0.46\ \% \cdot OR)^2 + (548\ \mu A)^2} + 236\ \mu A$ $\sqrt{(0.19\ \% \cdot OR)^2 + (548\ \mu A)^2} + 222\ \mu A$ $\sqrt{\left(926\ \frac{\mu A}{A} \cdot OR\right)^2 + (491\ \mu A)^2} + 119\ nA$ $\sqrt{(0.12\ \% \cdot OR)^2 + (752\ \mu A)^2} + 194\ \mu A$ $\sqrt{(0.35\ \% \cdot OR)^2 + (1.0\ mA)^2} + 228\ \mu A$ $\sqrt{(1.16\ \% \cdot OR)^2 + (3.5\ mA)^2} + 459\ \mu A$	Comparison to DMM HP 3458A
AC Current, Sources [1,2]	(1.05 to 20] A (10 to 1 000] Hz (1 000 Hz to 5 kHz]	 690 µA/A 870 µA/A	Comparison to Shunt FLUKE A40A-20A
AC Current, Sources [1,2]	(20 to 100] A (10 to 100] Hz (100 to 400] Hz	 8.4 mA/A OR 15 mA/A OR	Comparison to Calibrator FLUKE 5520A, AC Clamp meter used as transfer standard
AC Current, Sources [1,2]	(100 to 1 000] A (10 to 50] Hz (50 to 100] Hz	 8.0 mA/A OR 7.9 mA/A OR	Comparison to Calibrator FLUKE 5520A, AC Clamp meter used as transfer standard
DC Resistance Measuring Instruments [1]	0 mΩ 100 µΩ 1 mΩ 10 mΩ	4.6 µΩ 38 µΩ/Ω 34 µΩ/Ω 56 µΩ/Ω	IEC 60051-9 IEC 60477 IEC 60564 Short measurement
DC Resistance Measuring Instruments [1]	100 mΩ 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ 10 kΩ	824 µΩ/Ω 9.3 µΩ/Ω 15 µΩ/Ω 9.3 µΩ/Ω 37 µΩ/Ω 12 µΩ/Ω 24 µΩ/Ω 11 µΩ/Ω 18 µΩ/Ω 11 µΩ/Ω	Comparison to Standard Resistors: Tettex 3200, Tettex 3201 Tettex 3202, Tettex 3203 Tettex 3274, Tettex 3275 Calibrator Datron 4708 Calibrator Fluke 5700A Calibrator Keithley 263

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Electrical – DC/Low Frequency

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DC Resistance Measuring Instruments [1]	19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ 1 GΩ	17 μΩ/Ω 14 μΩ/Ω 20 μΩ/Ω 32 μΩ/Ω 30 μΩ/Ω 63 μΩ/Ω 67 μΩ/Ω 214 μΩ/Ω 5.1 mΩ/Ω	Comparison to Standard Resistors: Tettex 3200, Tettex 3201 Tettex 3202, Tettex 3203 Tettex 3274, Tettex 3275 Calibrator Datron 4708 Calibrator Fluke 5700A Calibrator Keithley 263
DC Resistance Measuring Instruments [1,2]	(1 to 20] mΩ (20 to 200] mΩ (200 mΩ to 2 Ω] (2 to 19] Ω (19 to 190] Ω 90) Ω to 1.9 kΩ] (1.9 to 19] kΩ (19 to 190] kΩ (190 k Ω to 1.9 MΩ] (1.9 to 19] MΩ (19 to 190] MΩ	$\sqrt{\left(347\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (10.8\ \mu\Omega)^2} + 830\ n\Omega$ $\sqrt{\left(347\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (108\ \mu\Omega)^2} + 8.3\ \mu\Omega$ $\sqrt{\left(347\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (1.08\ m\Omega)^2} + 83\ \mu\Omega$ $\sqrt{\left(17.4\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (302\ \mu\Omega)^2} + 15.2\ \mu\Omega$ $\sqrt{\left(12.7\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (1.2\ m\Omega)^2} + 65.8\ \mu\Omega$ $\sqrt{\left(10.4\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (11\ m\Omega)^2} + 619\ \mu\Omega$ $\sqrt{\left(10.4\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (110\ m\Omega)^2} + 6.19\ m\Omega$ $\sqrt{\left(10.4\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (1.4\ \Omega)^2} + 58.6\ m\Omega$ $\sqrt{\left(16.2\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (32.1\ \Omega)^2} + 1.07\ \Omega$ $\sqrt{\left(34.7\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (638\ \Omega)^2} + 61.2\ \Omega$ $\sqrt{\left(347\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (23.3\ k\Omega)^2} + 8.78\ k\Omega$	Comparison to Resistance decades, micro-ommeter Tettex 2226 or DMM Datron 1281 used as transfer standards
DC Resistance Measuring Instruments [1,2]	(190 MΩ to 1.9 GΩ] (1.9 to 10] GΩ	$\sqrt{(0.35\%\ OR)^2 + (1.01\ M\Omega)^2} + 916\ k\Omega$ 12 mΩ/Ω	Comparison to Resistance decades, micro-ommeter Tettex 2226 or DMM Datron 1281 used as transfer standards
DC Resistance Measuring Instruments [1,2]	(10 to 90] GΩ	58 mΩ/Ω	Comparison to Resistance decades, micro-ommeter Tettex 2226 or DMM Datron 1281 used as transfer standards

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Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Resistance, Resistors [1,2]	0 mΩ	290 nΩ	Comparison to Micro-ohmmeter Tettex 2226 DMM Datron 1281 OR – Of Reading
	(100 µΩ to 2 mΩ]	$\sqrt{\left(347\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (1.08\ \mu\Omega)^2} + 83\ n\Omega$	
	(2 to 20] mΩ	$\sqrt{\left(347\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (10.8\ \mu\Omega)^2} + 830\ n\Omega$	
	(20 to 200] mΩ	$\sqrt{\left(347\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (108\ \mu\Omega)^2} + 8.3\ \mu\Omega$	
	(200 mΩ to 2 Ω]	$\sqrt{\left(347\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (1.08\ m\Omega)^2} + 83\ \mu\Omega$	
	(2 to 19] Ω	$\sqrt{\left(17.4\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (302\ \mu\Omega)^2} + 15.2\ \mu\Omega$	
	(19 to 190] Ω	$\sqrt{\left(12.7\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (1.2\ m\Omega)^2} + 65.8\ \mu\Omega$	
	(190 Ω to 1.9 kΩ]	$\sqrt{\left(10.4\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (11\ m\Omega)^2} + 619\ \mu\Omega$	
	(1.9 to 19] kΩ	$\sqrt{\left(10.4\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (110\ m\Omega)^2} + 6.19\ m\Omega$	
	(19 to 190] kΩ	$\sqrt{\left(10.4\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (1.4\ \Omega)^2} + 58.6\ m\Omega$	
	(190 kΩ to 1.9 MΩ]	$\sqrt{\left(16.2\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (32.1\ \Omega)^2} + 1.07\ \Omega$	
	(1.9 to 19] MΩ	$\sqrt{\left(34.7\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (638\ \Omega)^2} + 61.2\ \Omega$	
	(19 to 190] MΩ	$\sqrt{\left(347\ \frac{\mu\Omega}{\Omega}\cdot OR\right)^2 + (23.3\ k\Omega)^2} + 8.78\ k\Omega$	
	(190 MΩ to 1.9 GΩ]	$\sqrt{(0.35\ \%\cdot OR)^2 + (1.01\ M\Omega)^2} + 916\ k\Omega$	
AC Resistance. Measuring Instruments [1,2]	[1 to 6.25) Ω [12 to 30) Hz [30 to 100) Hz	 $\sqrt{(0.59\ \%\cdot OR)^2 + (1.42\ m\Omega)^2}$ $\sqrt{(0.30\ \%\cdot OR)^2 + (1.42\ m\Omega)^2}$	Comparison to Resistance decades GENRAD 1433-F; 1433-H, Digibridge GENRAD 1689M used as transfer standard
AC Resistance. Measuring Instruments [1,2]	[1 to 6.25) Ω [100 to 250) Hz [250 to 1 000) Hz	 $\sqrt{(0.23\ \%\cdot OR)^2 + (1.42\ m\Omega)^2}$ $\sqrt{(0.16\ \%\cdot OR)^2 + (1.42\ m\Omega)^2}$	Comparison to Resistance decades GENRAD 1433-F; 1433-H Comparison to Digibridge GENRAD 1689M used as transfer standard

Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Resistance. Measuring Instruments [1,2]	[1 to 6.25) Ω		Comparison to Resistance decades GENRAD 1433-F; 1433-H Comparison to Digibridge GENRAD 1689M used as transfer standard
	1 kHz	$\sqrt{(0.08\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	(1 to 3] kHz	$\sqrt{(0.16\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	(3 to 6] kHz	$\sqrt{(0.23\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	(6 to 10] kHz	$\sqrt{(0.30\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	(10 to 20] kHz	$\sqrt{(0.45\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	(20 to 50] kHz	$\sqrt{(1.21\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	(50 to 100] kHz	$\sqrt{(2.39\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
AC Resistance. Measuring Instruments [1,2]	[6.25 to 100) Ω		Comparison to Resistance decades GENRAD 1433-F; 1433-H Digibridge GENRAD 1689M used as transfer standard
	[12 to 30) Hz	$\sqrt{(0.10\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	[30 to 100) Hz	$\sqrt{(0.06\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	[100 to 250) Hz	$\sqrt{(0.05\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	[250 to 1 000) Hz	$\sqrt{(0.03\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	1 kHz	$\sqrt{(0.02\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	(1 to 3] kHz	$\sqrt{(0.03\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	(3 to 6] kHz	$\sqrt{(0.05\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	(6 to 10] kHz	$\sqrt{(0.06\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	(10 to 20] kHz	$\sqrt{(0.08\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	(20 to 50] kHz	$\sqrt{(0.20\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
	(50 to 100] kHz	$\sqrt{(037\ \% \cdot OR)^2 + (1.42\ m\Omega)^2}$	
AC Resistance. Measuring Instruments [1,2]	[100 Ω to 1.6 k Ω)		Comparison to Resistance decades GENRAD 1433-F; 1433-H Digibridge GENRAD 1689M used as transfer standard
	[12 to 30) Hz	$\sqrt{(0.10\ \% \cdot OR)^2 + (1.02\ \Omega)^2}$	
	[30 to 100) Hz	$\sqrt{(0.06\ \% \cdot OR)^2 + (1.02\ \Omega)^2}$	
	[100 to 250) Hz	$\sqrt{(0.05\ \% \cdot OR)^2 + (1.02\ \Omega)^2}$	
	]250 to 1 000) Hz	$\sqrt{(0.03\ \% \cdot OR)^2 + (1.02\ \Omega)^2}$	
	1 kHz	$\sqrt{(0.02\ \% \cdot OR)^2 + (1.02\ \Omega)^2}$	
	(1 to 3] kHz	$\sqrt{(0.03\ \% \cdot OR)^2 + (1.02\ \Omega)^2}$	
	(3 to 6] kHz	$\sqrt{(0.05\ \% \cdot OR)^2 + (1.02\ \Omega)^2}$	
	(6 to 10)] kHz	$\sqrt{(0.06\ \% \cdot OR)^2 + (1.02\ \Omega)^2}$	
	(10 to 20] kHz	$\sqrt{(0.10\ \% \cdot OR)^2 + (1.02\ \Omega)^2}$	
	(20 to 50] kHz	$\sqrt{(0.20\ \% \cdot OR)^2 + (1.02\ \Omega)^2}$	
	(50 to 100] kHz	$\sqrt{(037\ \% \cdot OR)^2 + (1.02\ \Omega)^2}$	

Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
	(1.6 to 25.6] kΩ		
AC Resistance. Measuring Instruments [1,2]	[12 to 30) Hz	$\sqrt{(0.10\ \%\cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	Comparison to Resistance decades GENRAD 1433-F; 1433-H Digibridge GENRAD 1689M used as transfer standard
	[30 to 100) Hz	$\sqrt{(0.06\ \%\cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	[100 to 250) Hz	$\sqrt{(0.05\ \%\cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	[250 to 1 000) Hz	$\sqrt{(0.03\ \%\cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	1 kHz	$\sqrt{(0.02\ \%\cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(1 to 3] kHz	$\sqrt{(0.03\ \%\cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(3 to 6] kHz	$\sqrt{(0.05\ \%\cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(6 to 10] kHz	$\sqrt{(0.06\ \%\cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(10 to 20] kHz	$\sqrt{(0.08\ \%\cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(20 to 50] kHz	$\sqrt{(0.20\ \%\cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(50 to 100] kHz	$\sqrt{(037\ \%\cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(25.6 to 410] kΩ		
AC Resistance. Measuring Instruments [1,2]	[12 to 30) Hz	$\sqrt{(0.10\ \%\cdot \mathrm{OR})^2 + (102\ \Omega)^2}$	Comparison to Resistance decades GENRAD 1433-F; 1433-H Digibridge GENRAD 1689M used as transfer standard
	[30 to 100) Hz	$\sqrt{(0.06\ \%\cdot \mathrm{OR})^2 + (102\ \Omega)^2}$	
	[100 to 250) Hz	$\sqrt{(0.05\ \%\cdot \mathrm{OR})^2 + (102\ \Omega)^2}$	
	[250 to 1 000) Hz	$\sqrt{(0.03\ \%\cdot \mathrm{OR})^2 + (102\ \Omega)^2}$	
	1 kHz	$\sqrt{(0.02\ \%\cdot \mathrm{OR})^2 + (102\ \Omega)^2}$	
	(1 to 3] kHz	$\sqrt{(0.05\ \%\cdot \mathrm{OR})^2 + (102\ \Omega)^2}$	
	(3 to 6] kHz	$\sqrt{(0.09\ \%\cdot \mathrm{OR})^2 + (102\ \Omega)^2}$	
	(6 to 10] kHz	$\sqrt{(0.20\%\cdot \mathrm{OR})^2 + (102\ \Omega)^2}$	
	(10 to 20] kHz	$\sqrt{(0.60\ \%\cdot \mathrm{OR})^2 + (102\ \Omega)^2}$	

Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Resistance, Resistors [1,2]	(1 to 6.25] Ω		Comparison to Digibridge Genrad 1689M, Resistors that have a serial inductance not exceeding 10 µH. The uncertainties will be increased for resistors with higher inductance.
	[12 to 30) Hz	$\sqrt{(0.59\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	[30 to 100) Hz	$\sqrt{(0.30\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	[100 to 250) Hz	$\sqrt{(0.23\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	[250 to 1 000) Hz	$\sqrt{(0.16\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	1 kHz	$\sqrt{(0.08\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	(1 to 3] kHz	$\sqrt{(0.16\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	(3 to 6] kHz	$\sqrt{(0.23\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	(6 to 10] kHz	$\sqrt{(0.30\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	(10 to 20] kHz	$\sqrt{(0.45\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	(20 to 50] kHz	$\sqrt{(1.21\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	(50 to 100] kHz	$\sqrt{(2.39\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
AC Resistance, Resistors [1,2]	(6.25 to 100] Ω		Comparison to Digibridge Genrad 1689M Resistors that have a serial inductance not exceeding 10 µH. The uncertainties will be increased for resistors with higher inductance.
	[12 to 30) Hz	$\sqrt{(0.10\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	[30 to 100) Hz	$\sqrt{(0.06\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	[100 to 250) Hz	$\sqrt{(0.05\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	[250 to 1 000) Hz	$\sqrt{(0.03\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	1 kHz	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	(1 to 3] kHz	$\sqrt{(0.03\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	(3 to 6] kHz	$\sqrt{(0.05\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	(6 to 10] kHz	$\sqrt{(0.06\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	(10 to 20] kHz	$\sqrt{(0.08\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	(20 to 50] kHz	$\sqrt{(0.20\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	
	(50 to 100] kHz	$\sqrt{(037\ \% \cdot \mathrm{OR})^2 + (1.42\ \mathrm{m\Omega})^2}$	

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Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Resistance, Resistors [1,2]	(100 Ω to 1.6 k Ω]		Comparison to Digibridge Genrad 1689M Resistors that have a serial inductance not exceeding 10 µH. The uncertainties will be increased for resistors with higher inductance
	[12 to 30) Hz	$\sqrt{(0.10\ \% \cdot \mathrm{OR})^2 + (1.02\ \Omega)^2}$	
	[30 to 100) Hz	$\sqrt{(0.06\ \% \cdot \mathrm{OR})^2 + (1.02\ \Omega)^2}$	
	[100 to 250) Hz	$\sqrt{(0.05\ \% \cdot \mathrm{OR})^2 + (1.02\ \Omega)^2}$	
	[250 to 1 000) Hz	$\sqrt{(0.03\ \% \cdot \mathrm{OR})^2 + (1.02\ \Omega)^2}$	
	1 kHz	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (1.02\ \Omega)^2}$	
	(1 to 3] kHz	$\sqrt{(0.03\ \% \cdot \mathrm{OR})^2 + (1.02\ \Omega)^2}$	
	(3 to 6] kHz	$\sqrt{(0.05\ \% \cdot \mathrm{OR})^2 + (1.02\ \Omega)^2}$	
	(6 to 10] kHz	$\sqrt{(0.06\ \% \cdot \mathrm{OR})^2 + (1.02\ \Omega)^2}$	
	(10 to 20] kHz	$\sqrt{(0.10\ \% \cdot \mathrm{OR})^2 + (1.02\ \Omega)^2}$	
	(20 to 50] kHz	$\sqrt{(0.20\ \% \cdot \mathrm{OR})^2 + (1.02\ \Omega)^2}$	
	(50 to 100] kHz	$\sqrt{(037\ \% \cdot \mathrm{OR})^2 + (1.02\ \Omega)^2}$	
AC Resistance, Resistors [1,2]	(1.6 Ω to 25.6 k Ω]		Comparison to Digibridge Genrad 1689M Resistors that have a serial inductance not exceeding 10 µH. The uncertainties will be increased for resistors with higher inductance
	[12 to 30) Hz	$\sqrt{(0.10\ \% \cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	[30 to 100) Hz	$\sqrt{(0.06\ \% \cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	[100 to 250) Hz	$\sqrt{(0.05\ \% \cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	[250 to 1000) Hz	$\sqrt{(0.03\ \% \cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	1 kHz	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(1 to 3] kHz	$\sqrt{(0.03\ \% \cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(3 to 6] kHz	$\sqrt{(0.05\ \% \cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(6 to10] kHz	$\sqrt{(0.06\ \% \cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(10 to 20] kHz	$\sqrt{(0.08\ \% \cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(20 to 50] kHz	$\sqrt{(0.20\ \% \cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	
	(50 to 100] kHz	$\sqrt{(037\ \% \cdot \mathrm{OR})^2 + (11.7\ \Omega)^2}$	

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Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Resistance, Resistors [1,2]	(25.6 Ω to 410 kΩ] [12 to 30) Hz [30 to 100) Hz [100 to 250) Hz [250 to 1 000) Hz 1 kHz (1 to 3] kHz (3 to 6] kHz (6 to 10] kHz (10 to 20] kHz	$\sqrt{(0.10\ \% \cdot OR)^2 + (102\ \Omega)^2}$ $\sqrt{(0.06\ \% \cdot OR)^2 + (102\ \Omega)^2}$ $\sqrt{(0.05\ \% \cdot OR)^2 + (102\ \Omega)^2}$ $\sqrt{(0.03\ \% \cdot OR)^2 + (102\ \Omega)^2}$ $\sqrt{(0.02\ \% \cdot OR)^2 + (102\ \Omega)^2}$ $\sqrt{(0.05\ \% \cdot OR)^2 + (102\ \Omega)^2}$ $\sqrt{(0.09\ \% \cdot OR)^2 + (102\ \Omega)^2}$ $\sqrt{(0.20\% \cdot OR)^2 + (102\ \Omega)^2}$ $\sqrt{(0.60\ \% \cdot OR)^2 + (102\ \Omega)^2}$	Comparison to Digibridge Genrad 1689M Resistors that have a serial inductance not exceeding 10 µH. The uncertainties will be increased for resistors with higher inductance
Capacitance, Measuring Instruments [1,2]	1kHz 1 pF 10 pF 100 pF 1000 pF 10 nF 100 nF 1 µF [1 to 10) pF (10 to 1 000] pF (1 to 1.5] nF (1.5 to 6.4] nF (6.4 to 10] nF (10 to 25] nF (25 to 100] nF (100 to 200] nF (200 to 400] nF (400 to 1 000) nF	 0.19 fF 1.3 fF 11 fF 110 fF 1.5 pF 15 pF 150 pF $\sqrt{(0.02\ \% \cdot OR)^2 + (2.2\ fF)^2}$ $\sqrt{(0.02\ \% \cdot OR)^2 + (7.4\ fF)^2}$ $\sqrt{(0.02\ \% \cdot OR)^2 + (240\ fF)^2}$ $\sqrt{(0.02\ \% \cdot OR)^2 + (680\ fF)^2}$ $\sqrt{(0.02\ \% \cdot OR)^2 + (740\ fF)^2}$ $\sqrt{(0.02\ \% \cdot OR)^2 + (3.3\ pF)^2}$ $\sqrt{(0.02\ \% \cdot OR)^2 + (11\ pF)^2}$ $\sqrt{(0.02\ \% \cdot OR)^2 + (29\ pF)^2}$ $\sqrt{(0.02\ \% \cdot OR)^2 + (46\ pF)^2}$ $\sqrt{(0.02\ \% \cdot OR)^2 + (102\ pF)^2}$	IEC 60477 IEC 60564 HP 16381A, HP 16382A HP 16383A, HP 16384A St. Capacitors Genrad 1409 Y, Genrad 1409 L, Genrad 1409 T, Capacitance Decades + Digibridge Genrad 1689M used as a transfer standard

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Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance, Capacitors [1,2]	1 kHz		Comparison to Digibridge Genrad 1689M The uncertainties measurement of capacitors that have a dissipation factor ≤ 1% of a lossless capacitor
	[1 to 10] pF	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (2.2\ \mathrm{fF})^2}$	
	(10 to 1 000] pF	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (7.4\ \mathrm{fF})^2}$	
	(1 to 1.5] nF	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (240\ \mathrm{fF})^2}$	
	(1.5 to 6.4] nF	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (680\ \mathrm{fF})^2}$	
	(6.4 to 10] nF	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (740\ \mathrm{fF})^2}$	
	(10 to 25] nF	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (3.3\ \mathrm{pF})^2}$	
	(25 to 100] nF	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (11\ \mathrm{pF})^2}$	
	(100 to 200] nF	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (29\ \mathrm{pF})^2}$	
	(200 to 400] nF	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (46\ \mathrm{pF})^2}$	
	(400 to 1 000) nF	$\sqrt{(0.02\ \% \cdot \mathrm{OR})^2 + (102\ \mathrm{pF})^2}$	
Inductance Measuring Instruments [1,2]	100 µH 100 Hz 400 Hz 1 kHz	1.1 µH	IEC 60477 IEC 60 564 St. Inductors Genrad 1482- B, Genrad 1482-E, Genrad 1482-H, Genrad 1482-L, Genrad 1482-P, Genrad 1482-T, +Digibridge Genrad 1689M Used as a transfer standard
	1 mH 100 Hz 400 Hz 1 kHz	1.2 µH	
	10 mH 100 Hz 400 Hz 1kHz	11 µH	
	100 mH 100 Hz 400 Hz 1 kHz	33 µH	
	1 H 100 Hz 400 Hz	1.2 mH 1.3 mH	
	10 H 100 Hz	13 mH	

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Electrical – DC/Low Frequency

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Inductance Measuring Instruments [1,2]	100 Hz [10 µH to 1 mH] (1 to 9] mH (9 to 90] mH (90 to 900] mH (0.9 to 9] H (9 to 10] H	 $\sqrt{(9.10\ \%\cdot OR)^2+(5.1\ \mu H)^2}$ $\sqrt{(0.07\ \%\cdot OR)^2+(5.1\ \mu H)^2}$ $\sqrt{(0.11\ \%\cdot OR)^2+(3.1\ \mu H)^2}$ $\sqrt{(0.17\ \%\cdot OR)^2+(55\ \mu H)^2}$ $\sqrt{(0.05\ \%\cdot OR)^2+(11\ mH)^2}$ $\sqrt{(0.06\ \%\cdot OR)^2+(24\ mH)^2}$	IEC 60477 IEC 60 564 St. Inductors Genrad 1482- B, Genrad 1482-E, Genrad 1482-H, Genrad 1482-L, Genrad 1482-P, Genrad 1482-T, Inductance Decade +Digibridge Genrad 1689M Used as a transfer standard
Inductance, Inductors [1,2]	100 Hz [10 µH to 1 mH] (1 to 9] mH (9 to 90] mH (90 to 900] mH (0.9 to 9] H (9 to 90] H (90 to 900] H	 $\sqrt{(9.10\ \%\cdot OR)^2+(5.1\ \mu H)^2}$ $\sqrt{(0.07\ \%\cdot OR)^2+(5.1\ \mu H)^2}$ $\sqrt{(0.11\ \%\cdot OR)^2+(3.1\ \mu H)^2}$ $\sqrt{(0.17\ \%\cdot OR)^2+(55\ \mu H)^2}$ $\sqrt{(0.05\ \%\cdot OR)^2+(11\ mH)^2}$ $\sqrt{(0.06\ \%\cdot OR)^2+(24\ mH)^2}$ $\sqrt{(0.49\ \%\cdot OR)^2+(21\ mH)^2}$	Comparison to Digibridge Genrad 1689M The uncertainties apply to the measurement of inductors that have a quality factor ≤ 1% of series impedance of an ideal inductor
AC Power, Measuring Instruments [1,2]	[1 to 1 008] V, (0 to 40] Hz, [0 to 20] A [0.00 to 20 160.00] VA PF = 1 20160.00 W PF = 0.8 8 064.00 W 6 048.00 VAR PF = 0.5 5 040.00 W 8 729.54 VAR PF = 0.2 2 016.00 W 19 752.69 VAR	 0.06 % OR 0.08 % OR 0.09 % OR 0.05 % OR 0.13 % OR 0.06 % OR 0.32 % OR 0.04 % OR	Comparison to Calibrator FLUKE 6100B
AC Power, Measuring Instruments [1,2]	(40 to 65] Hz, [0 to 5] A (0.00 to 5 040.00] VA PF = 1 5 040.00 W	 0.04 % OR 0.07 % OR	Comparison to Calibrator FLUKE 6100B

Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power, Measuring Instruments [1,2]	(0 to 40] Hz, [0 to 20] A PF = 0.8 4 032.00 W 3 024.00 VAR PF = 0.5 2520.00 W 3 117.69 VAR PF = 0.2 720.00 W / 3 527.27 VAR	 0.09 % OR 0.05 % OR 0.13 % OR 0.04 % OR 0.32 % OR 0.04 % OR	Comparison to Calibrator FLUKE 6100B
AC Power, Measuring Instruments [1,2]	(40 to 65] Hz, (5 to 80] A (5 040.00 to 80 640.0] VA PF = 1 80 640.00 W PF = 0.8 64 512.00 W/ 48 384.00 VAR PF = 0.5 40 320.00 W/ 698.29 VAR	 0.05 % OR 0.07 % OR 0.09 % OR 0.05 % OR 0.13 % OR 0.05 % OR	Comparison to Calibrator FLUKE 6100B
AC Power, AC current Measuring Instruments [1,2]	(65 to 850] Hz, (20 to 80] A (20 160.0 to 80 640.0] VA PF = 1 8 0640.00 W PF = 0.8 64 512.00 W 48 384.00 VAR PF = 0.5 4 0320.00 W 6 9836.29 VAR PF = 0.2 16 128.00 W 79 010.74 VAR	 0.06 % OR 0.08 % OR 0.13 % OR 0.18 % OR 0.24 % OR 0.09 % OR 0.65 % OR 0.06 % OR	Comparison to Calibrator FLUKE 6100B
AC Power, AC Current Measuring Instruments [1,2]	(65 to 850] Hz (20 to 800 A (20 160.0 to 80 640.0] VA PF = 1 8 0640.00 W	 0.06 % OR 0.08 % OR	Comparison to Calibrator FLUKE 6100B

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Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power, Generating instruments [1]	(45 to 1 000] Hz [11 to 749] V PF range [(0.1 to 1] [1 to 4) W (4 W to 1.42 kW] (1.42 to 75] kW	 2.3 mW/W 1 mW/W 3.5 mW/W	Comparison to DMM DATRON 1281 DMM DATRON 1271 CLAPMETER FLUKE 801-1000S
Power factor (PF) Measurement Instruments [1,2,4]	[1 to 1008] V [16 to 850) Hz [0.01 to 80] A PF = 1 PF = 0.9 PF = 0.8 PF = 0.7 PF = 0.6 PF = 0.5 PF = 0.4 PF = 0.3 PF = 0.2 PF = 0.1	 0.005 5 0.006 7 0.007 9 0.008 9 0.009 6 0.01 0.011 0.011 0.011 0.011	Comparison to Calibrator FLUKE 6100B
Power factor Generating Instruments [1,2,4]	[45 to75] Hz Up to 500 V] Up to 10 A] PF range [0.1 to 1]	0.03	IEC 60051-9
AC Energy, Single phase Measuring Instruments [1,2]	[1 to 1 008] V [0.01 to 80] A [16 to 850] Hz Max: 1 000 h	0.08 % OR	Comparison to Calibrator FLUKE 6100B
Temperature, Temperature indicators and simulators for Noble metal thermocouples [1]	[-200 to 500) °C (500 to 1 800] °C	0.5 °C 0.3 °C	Euramet cg11 Calibration by means of electrical simulation Including cold junction compensation
Temperature, Temperature indicators and simulators for Base metal thermocouples [1]	[-200 to 1 380] °C	0.15 °C	Euramet cg11 Calibration by means of electrical simulation Including cold junction compensation

Electrical – DC/Low Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature, Temperature indicators and simulators for Base metal thermocouples [2]	Type E [-250 to -100) °C (-100 to 1 000] °C Type J [-210 to -100) °C (-100 to -1 200] °C Type K [-200 to 1 000) °C (1 000 to 1 372] °C Type N [-200 to -100) °C (-100 to 1 300) °C Type T [-250 to -150) °C (-150 to 0] °C (0 to 400] °C	 0.6 °C 0.3 °C 0.4 °C 0.3 °C 0.3 °C 0.5 °C 0.5 °C 0.3 °C 0.7 °C 0.3 °C 0.2 °C	Euramet cg11 Calibration by means of electrical simulation Including cold junction compensation
Temperature, Temperature indicators and simulators for Noble metal thermocouples [2]	Type R, S [-200 to 1 800) °C	0.8 °C	Euramet cg11
Temperature, Temperature indicators and simulators for Resistance sensors [1]	[-200 to 100] °C (100 to 300] °C (300 to 500] °C (500 to 850] °C	0.01 °C 0.02 °C 0.03 °C 0.04 °C	Euramet cg11

Electrical – RF/Microwave

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calibration Factor for Power Sensors [1,2]	[100 to 150) kHz [0.15 to 1) MHz [1 to 10) MHz	1.7 % 1.6 % 1.3 %	Comparison to RF Reference Source Fluke 96270A With Power Sensors: R&S Z55-1

Electrical – RF/Microwave

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calibration Factor for Power Sensors [1,2,4]	[10 to 499) MHz [499 to 580) MHz [580 to 820) MHz (0.82 to 2.6] GHz (2.6 to 3.3] GHz (3.3 to 4.0] GHz (4.0 to 4.5] GHz (4.5 to 5.0] GHz (5.0 to 6.0] GHz	1.1 % 1.2 % 1.3 % 1.4 % 1.5 % 1.6 % 1.7 % 1.8 % 1.9 %	Comparison to RF REFERENCE SOURCE FLOUKE 96270A With Power Sensors: R & S Z55-1
Calibration Factor for Power Sensors [1,2,4]	(6 to 8] GHz (8 to 10] GHz (10 to 12] GHz (12 to 15] GHz (15 to 18] GHz	2.0 % 2.1 % 2.2 % 2.3 % 2.4 %	Comparison to RF Reference Source Fluke 96270A With Power Sensors: R&S Z55-1
RF Attenuation [1,2]	(0 to 4) dB [300 kHz to 3 GHz] (3 to 6] GHz (6 to 18] GHz (4 to 6) dB [300 kHz to 3 GHz] (3 to 6] GHz (6 to 18] GHz	 0.09 dB 0.1 dB 0.27 dB 0.1 dB 0.12 dB 0.27 dB	Comparison to Network analyzers: HP 8757A, HP 8753C The uncertainties apply to the measurements of devices fitted with connectors that have input/ output VSWR not exceeding 1.1 The uncertainties will be increased for devices with higher VSWR

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Electrical – RF/Microwave

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Attenuation [1,2]	(6 to 40) dB [300 kHz to 10 MHz) (40 to 45) dB [300 kHz to 10 MHz) (45 to 50) dB [300 kHz to 10 MHz) (50 to 55) dB [300 kHz to 10 MHz) (55 to 60) dB [300 kHz to 10 MHz) (60 to 65) dB [300 kHz to 10 MHz) (65 to 70) dB [300 kHz to 10 MHz) (70 to 75) dB [300 kHz to 10 MHz) (75 to 80) dB [300 kHz to 10 MHz) (80 to 85) dB [300 kHz to 10 MHz) (85 to 90) dB [300 kHz to 10 MHz)	 0.13 dB 0.2 dB 0.41 dB 0.51 dB 0.54 dB 0.56 dB 0.64 dB 0.86 dB 1.4 dB 2.1 dB 3.4 dB	Comparison to Spectrum analyzer Agilent N9030A
RF Attenuation [1,2]	(6 to 25) dB [10 MHz to 3.6 GHz] (3.6 to 8.4] GHz (8.4 to 17.1] GHz (17.1 to 18] GHz [25 to 40) dB [10 MHz to 3.6 GHz] (3.6 to 8.4] GHz (8.4 to 17.1] GHz (17.1 to 18] GHz [40 to 80] dB [10 MHz to 3.6 GHz] (3.6 to 8.4] GHz (8.4 to 13.6] GHz (13.6 to 17.1] GHz (17.1 to 18] GHz	 0.13 dB 0.14 dB 0.16 dB 0.17 dB 0.1 dB 0.12 dB 0.16 dB 0.17 dB 0.1 dB 0.12 dB 0.13 dB 0.14 dB 0.15 dB	Comparison to Spectrum analyzer Agilent N9030A

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Electrical – RF/Microwave

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Power Source [1,2]	[-100 to -35) dBm) (100 kHz to 60 MHz] (60 MHz to 16 GHz] (8 to 16] GHz (16 to 26.5] GHz	 0.16 dB 0.3 dB 0.41 dB 0.52 dB	Comparison to RF Reference Source FLUKE 96270A for absolute power offset measurement + Spectrum analyzer Agilent N9030A for power measurement exceeding 1.1 The uncertainties will be increased for devices with higher VSWR
Power Source [1,2]	(-35 to 20) dBm [100 kHz to 26.5 GHz]	0.078 dB	Comparison to RF Reference Source FLUKE 96270A
Power Source [1,2]	(20 to 44) dBm [10 MHz- 2 GHz] (2 to 6] GHz (6 to 9] GHz (9 to 13] GHz (13 to 16] GHz (16 to 18] GHz	 0.23 dB 0.24 dB 0.25 dB 0.27 dB 0.31 dB 0.39 dB	Comparison to RF Reference Source Fluke 96270A With Power Sensors: R&S Z55-1
Power, Measuring Instruments [1,2]	[-130 to -110) dBm [10 to 240) MHz [240 MHz to 3 GHz]	 0.92 dB 2 dB	Comparison to RF Reference Source FLUKE 96270A
Power, Measuring Instruments [1,2]	[-110 to -35) dBm [100 to 300) kHz [300 kHz to 4] GHz] (4 to 26.5] GHz	 0.054 dB 0.049 dB 0.1 dB	Comparison to RF Reference Source Fluke 96270A With Power Sensors: R&S Z55-1 with automatic dynamic attenuator and generator error correction
Power, Measuring Instruments [1,2]	[-35 to 20) dBm [100 kHz to 14 GHz] (14 to 26.5] GHz	 0.02 dB 0.026 dB	Comparison to RF Reference Source Fluke 96270A With Power Sensors: R&S Z55-1

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Electrical – RF/Microwave

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Power, Measuring Instruments [1,2]	20 dBm [100 kHz to 18 GHz] (20 to 44] dBm (10 MHz to 6 GHz] (2 to 6] GHz (6 to 9] GHz (9 to 13] GHz (13 to 16] GHz (16 to 18] GHz	0.026 dB 0.23 dB 0.24 dB 0.25 dB 0.27 dB 0.3 dB 0.38 dB	Comparison to Power sensor HP 8481B, HP 8482A, HP 8485A
Relative Power Sources [1,2]	[-80 to -35] dB [100 kHz to 3.6 GHz) (3.6 to 8.4) GHz (8.4 to 13.6) GHz (13.6 to 26.5] GHz	0.15 dB 0.27 dB 0.35 dB 0.41 dB	Comparison to Spectrum Analyzer Agilent N9030A
Relative Power Sources [1,2]	[-35 to 20) dB [100 kHz to 26.5 GHz]	0.08 dB	Comparison to RF Reference Source FLUKE 96270A Power sensor R & S
	(20 to 44] dB [10 MHz to 18 GHz] (6 to 9] GHz (9 to 13] GHz (13 to 16] GHz (16 to 26.5] GHz	0.08 dB 0.09 dB 0.01 dB 0.11 dB 0.12 dB	Comparison to High Frequency Power sensor HP 8481B
Relative Power Measuring Instruments [1,2]	[-110 to -35) dBm (100 kHz to 10 MHz) [10 MHz to 4 GHz] (4 to 18] GHz (18 to 26.5] GHz	0.054 dB 0.044 dB 0.098 dB 0.1 dB	Comparison to RF Reference Source Fluke 96270A With Power Sensors: R&S Z55-1 with automatic dynamic attenuator and generator error correction
Relative Power Measuring Instruments [1,2]	(-35 to 20) dB [100 kHz to 26.5 GHz]	0.014 dB	Comparison to RF Reference Source Fluke 96270A With Power Sensors: R&S Z55-1
Relative Power Measuring Instruments [1,2]	(20 to 44) dB [10 MHz to 18 GHz]	0.08 dB	Comparison to High Frequency Power sensor HP 8481B

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Electrical – RF/Microwave

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resolution Bandwidth	(-35 to 20) dB (10 Hz - 15 MHz)	0.07 dB	Comparison to FLUKE 96270A
Amplitude Modulation, Sources [1,2]	carrier: [1 MHz to 26.5 GHz] modulation rate: [50 Hz to 10 kHz] modulation depth: [1 to 99] %	0.00164 x MODULATION DEPTH + 0.022	Comparison to Spectrum Analyzer Agilent N9030A
Frequency Modulation, Sources [1,2]	carrier: [1 MHz to 26.5 GHz] modulation rate: [20 Hz to 20 kHz) frequency deviation: 200 Hz to 4 kHz	$\sqrt{1.57\% \text{ of rdg.}^2 + 3\text{Hz}^2}$	Comparison to Spectrum Analyzer Agilent N9030A
Frequency Modulation, Sources [1,2]	carrier: [1 MHz to 26.5 GHz] modulation rate: [20 to 50] kHz frequency deviation: [4 to 40] kHz	$\sqrt{3.30\% \text{ of rdg.}^2 + 30\text{Hz}^2}$	Comparison to Spectrum Analyzer Agilent N9030A
Frequency Modulation, Sources [1,2]	carrier: [1 MHz to 26.5 GHz] modulation rate: [20 to 50] kHz frequency deviation: [40 to 400] kHz	$\sqrt{0.69\% \text{ of rdg.}^2 + 210\text{Hz}^2}$	Comparison to Spectrum Analyzer Agilent N9030A
Phase Modulation Sources [1,2]	carrier: [1 MHz to 26.5 GHz] modulation rate: [50 Hz to 50 kHz] phase deviation: [0.2 to 100] rad	$0.12\ \%\text{of rdg.} + 0.02\ \text{rad}$	Comparison to Spectrum Analyzer Agilent N9030A
Distortion, Sources	[0.001 to 100] %: [20 Hz to 20 kHz] (20 to 100] kHz	$\sqrt{(13.9\%\ \text{OR})^2 + (0.00058\ \%)^2}$ $\sqrt{(29.0\%\ \text{OR})^2 + (0.00058\ \%)^2}$	Comparison to HP 8903 Audio Analyzer

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Electrical – RF/Microwave

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Voltage reflection coefficient (VRC) [1,2,4]	[300 kHz to 3 GHz] (0 to 0.01) (0.01 to 0.1) (0.1 to 0.2) (0.2 to 0.3) (0.3 to 0.4) (0.4 to 0.5) (0.5 to 0.6) (0.6 to 0.7) (0.7 to 0.8) (0.4 to 0.5) (0.5 to 0.6) (0.6 to 0.7) (0.7 to 0.8) (0.8 to 0.9) (0.9 to 1.0)	 0.008 0.009 0.01 0.012 0.014 0.016 0.019 0.023 0.026 0.016 0.019 0.023 0.026 0.03 0.034	The results may also be expressed in terms of VSWR or Return Loss (dB) with uncertainties stated in the appropriated units. Comparison to Network Analyzer HP 8753C The uncertainties are for one-port or two -port device with greater than 25 dB transmission loss.
Voltage reflection coefficient (VRC) [1,2,4]	(3 to 6] GHz (0 to 0.01) (0.01 to 0.1) (0.1 to 0.2) (0.2 to 0.3) (0.3 to 0.4) (0.4 to 0.5) (0.5 to 0.6) (0.6 to 0.7) (0.7 to 0.8) (0.8 to 0.9) (0.9 to 1.0)	 0.012 0.013 0.015 0.018 0.022 0.025 0.03 0.035 0.04 0.046 0.052	The results may also be expressed in terms of VSWR or Return Loss (dB) with uncertainties stated in the appropriated units. Comparison to Network Analyzer HP 8753C The uncertainties are for one-port or tow -port device with greater than 25 dB transmission loss.
Voltage reflection coefficient (VRC) [1,2,4]	(6 to 12] GHz (0.00 to 1.00] (12 to 18] GHz (0.01 to 1.00] GHz	 0.034 0.042	Comparison to Network Analyzer HP 8757A

Length – Dimensional Metrology

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Length, Dimensions of Traffic Camera's Loop Field [2,3]	[1 to 5] m	(1 + L/2) mm	Comparison to Reference Measuring Tape

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Length – Dimensional Metrology

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Traffic Speed, Gatso Loop Detector Traffic Cameras [1,2]	[20 to 250] km/h	1 km/h	Calibration of Gatso loop detector traffic speed cameras by means of 4 lanes simulator. The scope of accreditation comprises conducting camera self-tests and speed limit accuracy tests. The results of these tests may be included in the calibration certificates.
Distance- Calibration of City Train Tachograph [2]	(400 to 1000) m	2 m	Comparison to Reference Measuring Tape CP 25.240
Speed -Calibration of City Train Tachograph [2]	(10 to 70) km/h	0.45 km/h	Comparison to GPS Standard Instrument The scope of accreditation comprises tests hereafter. The results may be included in the certificates. Tachograph, Functional tests according regulator's specification Functional tests will cover items (a), (b), (c), (d), (e), (f), (g), (h), (i), (j), (k), (l), (m). Chapter 5 paragraph 20(5) of Railroad Regulations.
Perpendicularity, Height Gauge [1]	(-1 to 1) mm (gauge height up to 600 mm)	5 µm	JIS B7517; BS 1643 Gauge blocks, Angle Plate WYLER
Perpendicularity, Squares [1]	[0 to 300] mm (300 to 600] mm	3 µm 5 µm	JIS B 7526; DIN 875 Height up to 600 mm Grade "00" Standard Angle plate WYLER, Gauge blocks.
Angle, Sine Bars [1]	[0 to 45]°	22 µrad	DIN 2273; JIS B 7523 BS 3064 Base length up to 200 mm Grade "1" Gauge blocks, Angle gauges
Angle, Bevel protractors [1]	(-90 to 90)°	0.6 mrad	BS 1685; GGG-P-676b Angle gauges TSUGAMI Scale interval 5´

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Length – Dimensional Metrology

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Angle, Levels [1]	Up to ± 3' ± (3 to ±10]' ± (10 to ±20]' ± (20 to ±30]'	0.5" 1" 2" 3"	JIS B 7510; DIN 877; BS 958; BS 3509 Small angles generator, 1 µm/m sensitivity
Form, Flatness, Surface Plates, Granite [1,2,3]	ISO 8512-2, BS 817, DIN 876 Grades	(2 + 0.5×L) µm	Comparison to Surface Plate 250 x 250 mm minimum size up to 4 m in diagonal Grade "0" Electronic level WYLER
Gauge Blocks [1,3]	[0.5 to 100] mm	(0.1 + L) µm	ISO 3650; DIN 861; BS 888; ISO 3650; BS 4311 Gauge blocks, Comparator Tesa, The calibration method is the comparison
Length Bars [1,3]	[1 to 1 000] mm	(1+5×L) µm	BS 870; JIS B 7502; DIN 863-1 Gauge blocks, Comparator (Dial indicator MAHR, length measuring instrument MAHR) The calibration method is the comparison
Caliper [1,2,3]	[0.5 to 1 000] mm	(15+20×L) µm	ISO 6906; ISO 3599; DIN 862; JIS B 7507 Gauge blocks, CMC stands for caliper resolution 0.01 mm.
Depth Caliper [1,2,3]	Up to 200 mm	(10+10×L) µm	DIN 862 CMC stands for caliper resolution 0.01 mm. Gauge blocks, Depth micro checker
Micrometer External [1,2,3]	Up to 100 mm[1] Up to 100 mm[2] (100 to 1 000] mm[1]	2 µm 3 µm (2+8×L) µm	IS0 3611; DIN 863; JIS B 7502 Gauge blocks CMC stands for resolution 0.001 mm
Micrometer Internal, Duo-bore [1]	[30 to 100] mm	3 µm	DIN 863 Standard Plain rings

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Length – Dimensional Metrology

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Micrometer Depth [1]	Up to 200 mm	2 µm	DIN 863 Depth micro checker, Mitutoyo, Measuring machine
Micrometers, Indicating, Main Scale [1]	Up to 100 mm	2 µm	JIS B 7520 Gauge blocks CMC stands for resolution 0.001 mm
Micrometers, Indicating Indicator Scale [1]	± 0.06 mm	1 µm	JIS B 7520
Micrometer Internal, Tri-o- Bore[1]	[5 to 100] mm	2 µm	DIN 863 Standard Plain Rings
Height Gauge [1,2,3]	Up to 1 000 mm	(2+4×L) µm	JIS B7517; BS 1643 Gauge blocks CMC stands for resolution 0.001 mm
Dial Gauge [1]	Up to 100 mm	1 µm	DIN 878; JIS B7503; ANSI/ASME B89.1.10M XPE-11-056 Calibration Testers Mitutoyo, Measuring machine, CMC stands for resolution 0.1 µm
Dial Gauge Lever [1]	(-0.1 to 0.1) mm	1.5 µm	DIN 2270; JIS B 7533 Calibration Testers Mitutoyo, Measuring machine CMC stands for resolution of 0.2 µm
Dial Indicator Symmetric Scale [1]	(-0.25 to 0.25) mm	1 µm	DIN 879 Calibration testers Mitutoyo, Plain Rings CMC stands for resolution of 0.1 µm
Bore Gauges [1]	[3.6 to 100] mm	2 µm	JIS B 7515 Calibration Testers Mitutoyo, Plain rings CMC stands for resolution of 0.5 µm
Extensometer [1,2]	Up to 5 mm	3.5 µm	ISO 9513; JIS B 7741; ASTME B3; BS 3846 Standard Extensometer Standard Dial Gauge

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Length – Dimensional Metrology

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Measuring table scale, Microscope [1,2]	Up to 275 mm	5 µm	JIS B 7153 Standard Glass Scale CMC stands for magnification of x50 and resolution of 1 µm
Comparator- Tesa Modul UPC [1]	(-0.01 to 0.01) mm	0.05 µm	EURAMET/ cg-02 Gauge blocks, CMC stands for max. nom. Length for comparison 100 mm.
Horizontal Measuring Machine [1,3]	Up to 250 mm	(0.12+3×L) µm	Comparison to Gauge blocks CMC stands for resolution of 0.1 µm
Depth Microchecker [1,3]	Up to 300 mm	(1+3×L) µm	Comparison to Gauge blocks
Length, Electrical Comparator [1]	(-1 to 1) mm	0.3 µm	Comparison to Gauge blocks CMC stands for resolution of 0.1 µm
Length, Calibration Testers For Dial Gauges [1]	Up to 25 mm	0.8 µm	Comparison to Gauge blocks Electrical Comparator L-in meters CMC stands for resolution of 0.5 µm
Length, Calibration Testers For Precision Dial Gauges [1]	Up to 5 mm	0.4 µm	Comparison to Gauge blocks Electrical Comparator L-in meters CMC stands for resolution of 0.1 µm
Length, Metal Rulers [1]	Up to 1 m (1 to 2] m	0.2 mm 0.3 mm	Standard 1 m long Engineering Metal Rule JIS B 7516-1987
Metal Rulers [1] Straightness, Squareness	Up to 1 mm	0.04 mm 0.003 mm	Standard 1 m long Engineering Metal Rule JIS B 7516-1987
Length, Steel Tape Measures [1,3]	Up to 4 m (4 to 50] m	0.4mm (0.4 + 0.3xL/4) mm	Standard 4 m long Metal Rule OIML R 35-1
Length, Non-metallic Tape Measures [1,3]	Up to 4 m (4 to 50] m	1.4 mm (1 + 0.35xL) mm	Standard 4 m long Metal Rule OIML R 35-1
Length Laser Distance Measurer [1]	Up to 4 m 24 m	1 mm 3 mm	Standard 4 m long rule Standard 24 m long set up

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Length – Dimensional Metrology

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thickness, Feeler Gauge [1]	[0.01 to 2] mm	1 µm	JIS B 7524; DIN 2275 Measuring machine Standard Gauge Block
Thickness, Thickness Gage [1,2] Resolution 0.5 µm	Up to 50 mm	1 µm	Comparison to Standard Gauge Block
Thickness, Dial Caliper Gage [1,2] Resolution 0.01 µm	Up to 150 mm	0.01 mm	Comparison to Standard Gauge Block
Diameter Plain Plug Gauges [1,3]	[0.5 to 150] mm	(1+3×D) µm	BS 969; ISO/R 1938; DIN 7150; DIN 7162; DIN 2269 Measuring machine Standard Plugs
Major Diameter, Thread Plug Gauges, Parallel [1]	[0.5 to 150] mm	2 µm	ISO 965; ISO 724; ISO 1502; FED - STD H28/6A; ANSI/ASME B1.2; ISO 5864; ISO 228/1; ISO 228/2; ANSI/ASME B1.20.1; FED-STD H28/7A; BS 84; BS 919; MIL-ST-21309E; BS 3409; BS 2710; Measuring Machine, Standard Plugs
Simple Pitch Diameter, Thread Plug Gauges, Parallel [1]	[0.5 to 150] mm	3 µm	ISO 965; ISO 724; ISO 1502; FED - STD H28/6A; ANSI/ASME B1.2; ISO 5864; ISO 228/1; ISO 228/2; ANSI/ASME B1.20.1; FED-STD H28/7A; BS 84; BS 919; MIL-ST-21309E; BS 3409; BS 2710 Measuring machine, Wires for screw thread measuring, Standard Plugs

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Length – Dimensional Metrology

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pitch Diameter, Thread Plug Gauges, Tapered [1]	[1.5 to 150] mm	5 µm	ANSI/ASME B1.20.1; BS 21; ISO 7; DIN 2999; ASME B1.20.5; AS 2710 Measuring machine, Wires for screw thread measuring Standard Plugs
Major Diameter, Thread Plug Gauges, Tapered [1]	[1.5 to 150] mm	3 µm	ANSI/ASME B1.20.1; BS 21; ISO 7; DIN 2999; ASME B1.20.5; AS 2710 Measuring machine, Standard Plugs
Stand off from Reference Plane Thread Ring Gauges, Tapered sizes 1/16" to 3" [1]	[-5 to 5] mm	20 µm	ISO 7-2; ANSI/ASME B1.20.1 Standard Check Plug Gauges
Dimension Thread Ring Gauges, Tapered sizes 1/16" to 6" [1]	[1 to 50] mm	4 µm	ISO 7-2; ANSI/ASME B1.20.1 Length dimensions
Diameter, Plain Ring Gauges, Parallel [1]	[2.5 to 200] mm	1.5 µm	BS 969; ISO/R 1938; DIN 7150; DIN 7162; BS 4064; ANSI/ASME B89. 1.6 M Standard Ring Gauges, Measuring machine
Diameter, Thread Measuring, Wires [1]	[0.15 to 4] mm	0.6 µm	JIS B 0271; BS 5590 Measuring machine, Standard Wires

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Length – Dimensional Metrology

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Simple Pitch Diameter, Minor Diameter Thread Ring Gauges, Parallel [1]	[4 to 200] mm	3 µm	ISO 965; ISO 724; ISO 1502; ANSI/ASME B.1.2; ISO 5864; ISO 228/1; ISO 228/2; ANSI/ASME B.1.20.1; FED-STD H28/7A; BS 919; AS 2710 Measuring machine, Standard Feelers for the thread measurement Standard Ring Gauge Parallel
Measuring table scale, Profile Projector [1,2]	Up to 275 mm	5 µm	JIS B 7153; JIS B 7184 Standard Glass Scale CMC stands for magnification of x50 and resolution of 1 µm
Opening size, Test sieves [1,2]	[20 µm to 5.6. mm] [1] [6.3 mm to 125 mm] [1,2]	4 µm or ¼ of Y whichever greater 0.5 mm or ¼ of Y whichever lower	BS 410-1; BS410-2; ASTM E11; ASTM E323-09 Y – tolerance of average opening size for wire test sieves or individual hole size tolerance for perforated sieve. Caliper Optical projector

Mass and Mass Related

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Torque Wrenches and Drivers [1]	[0.05 to 1 000) N·m	0.75 % of Readings of Standard Instrument	Standard BS EN ISO 6789; ASME B107.300 Transducer
Torque Torque Wrenches and Drivers [2]	[0.05 to 50] N·m	1 % of Readings of Standard Instrument	Standard BS EN ISO 6789; ASME B107.300 Transducer

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Mass and Mass Related

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Mechanical and Electronic Torque Calibration Equipment [1]	[0.05 to 1 000] N·m	0.1 % of Readings	Standard BS 7882; ASME B107.300; Euramet cg-14 Mass and Lever
Force Compression [1,2] Tension [1,2]	(0 to 1.5] kN	0.03 % of Readings of Standard Instrument	Standard ISO 376 Standard ISO 7500-1 Standard weights
Force Compression [1,2] Tension[1,2]	[1.5 to 100] kN	0.15 % of Readings of Standard Instrument	Standard ISO 376 Standard ISO 7500-1 Standard load Cell
Force Compression [1,2] Tension[1,2]	[100 to 400] kN	0.08 % of Readings of Standard Instrument	Standard ISO 376 Standard ISO 7500-1 Standard load Cell
Force Compression [1,2] Tension [2]	[400 to 1 000] kN	0.08 % of Readings of Standard Instrument	Standard ISO 376 Standard ISO 7500-1 Standard load Cell
Force Compression [1,2]	(1 000 to 2 000] kN	0.08 % of Readings	Standard ISO 376 Standard ISO 7500-1 Standard load Cell
Force Compression [2]	(2 000 to 5 000] kN	0.33 % of Readings	Standard ISO 376 Standard ISO 7500-1 Standard load Cell
Mass, Weights [1]	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g	0.003 3 mg 0.003 3 mg 0.003 3 mg 0.003 3 mg 0.003 3 mg 0.004 mg 0.005 mg 0.006 mg 0.007 mg 0.007 mg 0.01 mg 0.01 mg	OIML R111-1; OIML R52; Standard Weights Class E1, Standard Comparator, Comparison.

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Mass and Mass Related

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass, Weights [1]	10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg	0.012 mg 0.026 mg 0.05 mg 0.06 mg 0.07 mg 0.17 mg 1.6 mg 2.0 mg 2.6 mg 16 mg 150 mg	OIML R111-1; OIML R52; Standard Weights Class E1, Standard Comparator, Comparison.
Non-automatic Weighing Instruments [1,2]	Up to 5 000 kg	$2 \times \sqrt{\left(\frac{res}{3.4}\right)^2 + \left(\frac{mpe}{1.7}\right)^2}$	OIML R 76-1 Euramet cg 18 res: the resolution of the balances at the calibration point mpe: maximum permissible error of the weights as defined in Table 1, OIML R 111-1 Available standard weights are: E1 from 1 mg to 5 kg, E2 from 1 mg to 5 kg, F1 from 1 mg to 10 kg F2 from 1 mg to10 kg M1 from 100 g to 10 kg M2 10 kg (100 pieces)
Pneumatic Pressure - Gauge Pressure measuring instruments [1]	[-98 to -20) kPa [-20 to -7) kPa [-7 to -2.5) kPa [-2.5 to 2.5] kPa (2.5 to 7] kPa (7 to 10) kPa [10 kPa to 7 MPa] (7 to 10] MPa	10 Pa +0.2 Pa/kPa 15 Pa 3 Pa 1 Pa 3 Pa 15 Pa 0.25 Pa/kPa 1 Pa/kPa	OIML R 101; OIML R 109; ASME B40.100; EURAMET cg 17; BS EN 837; BS EN ISO 5171 Gas Dead Weight Tester

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Mass and Mass Related

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pneumatic Pressure - Gauge Pressure measuring instruments [2]	[-95 to -20) kPa [-20 to -7) kPa [-7 to -2.5) kPa [-2.5 to 2.5] kPa (2.5 to 7] kPa (7 to 20] kPa (20 kPa to 6 MPa] (6 to 70] MPa	20 Pa +0.1 Pa/kPa 15 Pa 3 Pa 1 Pa 3 Pa 15 Pa 1 Pa/kPa 1 Pa/kPa	Pressure in 6 MPa to 70 MPa range generated by customer IDOS UPMP Transducer Standard Pressure Gauge
Pneumatic Pressure - Absolute. Pressure measuring instruments [1]	[2 to 80] kPa (80 to 115] kPa (115 kPa to 7.1 MPa]	35 Pa 20 Pa $\sqrt{[\mathbf{0.00025} * (\boldsymbol{P_i} - \boldsymbol{P_{barometric}})]^2 + \mathbf{20^2}}$ Pa	P_i – measured value of absolute pressure $P_{barometric}$ – ambient barometric pressure during the P_i measurement.
Pneumatic Pressure - Absolute. Pressure measuring instruments [2]	[5 to 200) kPa [200 kPa to 6.1 MPa]	120 Pa $\sqrt{[\mathbf{0.001} * (\boldsymbol{P_i} - \boldsymbol{P_{barometric}})]^2 + \mathbf{130^2}}$ Pa	P_i – measured value of absolute pressure $P_{barometric}$ – ambient barometric pressure during the P_i measurement
Hydraulic pressure - Gauge Pressure measuring instruments [1]	[0.1 to 0.16) MPa [0.16 to 120] MPa	0. 3 Pa/kPa 0. 25 Pa/kPa	Comparison to Oil Dead Weight Tester
Hydraulic pressure - Gauge Pressure measuring instruments [2]	[0.1 to 70] MPa (70 to 120] MPa	1 Pa/kPa 0.5 MPa	Comparison to Pressure Gauge

Thermodynamic

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature, Liquid in Glass Thermometers [1]	[-60 to 250] °C (250 to 500] °C	0.03 °C 0.095 °C	ASTM E1; ASTM E77; SPRT set, HART 1595A Superthermometer

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Thermodynamic

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature, Thermocouples, Base Metal Type K, N, thermocouples [1,2]	[-100 to -60) °C [1] [-60 to 0] °C [1] [0 to 50] °C [1] (50 to 100] °C [1] [100 to 250] °C [1] (250 to 500] °C [1] (500 to 600] °C [1] (600 to 1 100] °C [1] (1 100 to 1 300] °C [1] [-100 to 600] °C [2]	0.3 °C 0.1 °C 0.05 °C 0.1 ° C 0.15 °C 0.2 °C 0.4 °C 1.4 °C 2.3 °C 0.5 °C	ASTM E220; ASTM E230 SPRT set HART 1595A Superthermometer Type R standard thermocouple
Temperature, Thermocouples, Noble Metal Type S, R thermocouples [1,2]	[0 to 500] °C [1] (500 to 600] °C [1] (600 to 1 100] °C [1] (1 100 to 1 300] °C [1] [0 to 600] °C [2]	0.4 °C 1 °C 1.4 °C 2.3 °C 1°C	ASTM E220; ASTM E230 SPRT set, HART 1595A Superthermometer Type R standard thermocouple
Temperature, Extension cables [1]	[-100 to 1 300] °C	As for thermocouples of the same type	ASTM E220; ASTM E230 Extension cables calibrated at room temperatures
Temperature, Resistance thermometers [1]	0.01 °C	0.003 °C	Comparison to WTP Standard cell
Temperature, Resistance thermometers [1,2]	[-100 to -60] °C [1] (-60 to 230] °C [1] (230 to 500] °C [1] (500 to 600] °C [1] (600 to 960] °C [1] [-100 to 600] °C[2]	0.13 °C 0.023 °C 0.06 °C 0.3 °C 1.3 °C 0.3 °C	ASTM E1137; ASTM E644 SPRT set, HART 1595A Superthermometer
Temperature, Infrared Thermometers [1,6]	-15 °C 0 °C 15 °C 100 °C 120 °C 200 °C 300 °C 400 °C 500 °C	0.8 °C 0.8 °C 0.8 °C 0.9 °C 1 °C 1.2 °C 1.5 °C 2 °C 2.5 °C	Comparison to Infrared Calibrator Fluke 4180, 4181 $\varepsilon = 0.95$, $\lambda = (8 \text{ to } 14)$ µm
Temperature, Block Calibrators [1]	[-100 to 100] °C (100 to 250] °C (250 to 660] °C (660 to 1 100] °C (1 100 to 1 300] °C	0.07 °C 0.1 °C 0.17 °C 1.3 °C 3 °C	Euramet cg13

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Thermodynamic

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature, Block Calibrators Stability test [1]	[-100 to 250] °C (250 to 660] °C (660 to 1 300] °C	0.01 °C 0.03 °C 0.2 °C	Euramet cg13
Temperature Block Calibrators Uniformity test [1]	[-100 to 250] °C (250 to 660] °C (660 to 1 300] °C	0.0 3°C 0.06 °C 0.4 °C	Euramet cg13
Temperature, Liquid baths [1,2]	[-100 to 250] °C (250 to 500] °C	0.032 °C 0.07 °C	Comparison to SPRT Type 5699
Temperature Liquid baths Stability test [1]	[-100 to 550] °C	0.001 °C	Comparison to SPRT Type 5699
Temperature uniformity test, Baths [1]	[-100 to 550] °C	0.01 °C	Comparison to Standard Thermometer
Temperature, Temperature indicators and controllers in Furnaces, Freezers, Climatic Rooms/ Cells [1,2]	[-60 to 90] °C (90 to 120] °C (120 to 370] °C (370 to 800] °C (800 to 1 300] °C	0.5 °C 0.9 °C 1.8 °C 3.8 °C 6 °C	IEC 60397; IEC 60398 Secondary Standard Thermometer sets
Temperature uniformity test, Furnaces, Freezers, Climatic Rooms/ Cells [1,2]	[-60 to 90] °C (90 to 120] °C (120 to 370] °C (370 to 800] °C (800 to 1 300] °C	0.5 °C 0.9 °C 1.8 °C 3.8 °C 6 °C	IEC 60397; IEC 60398 Secondary Standard Thermometer sets
Relative Humidity, Hygrometers, Humidity Recorders [1]	23 °C ± 4 °C ambient [10 to 80] %RH)	0.8 %RH	Comparison to Standard humidity probe in Humidity Generator
Relative Humidity, Hygrometers, Humidity Recorders [1]	23 °C ± 4 °C ambient [4 to 95) %RH	0.5 %RH+ 2 % OR	Comparison to Standard GE Dew point humidity monitor with optical sensor in Humidity Generator
Relative Humidity, Hygrometers, Humidity Recorders [1]	(25 to 60) °C [35 to 95] %RH	0.5 %RH+ 2 % OR	Comparison to Standard GE Dew point humidity monitor with optical sensor in Temp & Humidity chamber.
Dew Point [1]	[-30 to 60] °C	0.3 °C	Comparison to Standard GE Dew point humidity monitor with optical sensor

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Thermodynamic

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Relative Humidity, Indicators and controllers, Humidity Rooms/ Cells, Uniformity test [1.2]	23 °C ± 4 °C [10 to 80] %RH [19 to 60] °C (4 to 95] %RH	1.5 %RH 2 %RH + 1.5 % OR	Comparison to Temperature and humidity sensors

Time and Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Time Interval, Measuring instruments [1]	[150 ns to 10 s] (10 to 100] s (100 s to 2 h] (2 to 20] h (20 to 27] h	2×10^{-9} s 2.3×10^{-10} s 3.7×10^{-11} s 6.5×10^{-12} s 9.3×10^{-13} s	Comparison to Counter HP 53131 A locked to GPS
Time Interval, Mechanical Stopwatch [1]	[10 s- 24 h]	0.5 s	Comparison to Clock locked to GPS
Time Interval, Source instruments [1]	[150 ns to 100 s]	2×10^{-9} s	Comparison to Counter HP 53131A locked to GPS

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Time and Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes Horizontal Sensitivity [1,2]	1 ns/div	0.18 % OR	Comparison to Fluke 5522A Multiproduct Calibrator
	2 ns/div	0.18 % OR	
	5 ns/div	0.15 % OR	
	10 ns/div	0.18 % OR	
	20 ns/div	0.18 % OR	
	50 ns/div	0.15 % OR	
	100 ns/div	0.18 % OR	
	200 ns/div	0.18 % OR	
	500 ns/div	0.15 % OR	
	1 µs/div	0.18 % OR	
	2 µs/div	0.18 % OR	
	5 µs/div	0.15 % OR	
	10 µs/div	0.18 % OR	
	20 µs/div	0.18 % OR	
	50 µs/div	0.15 % OR	
	100 µs/div	0.18 % OR	
	200 µs/div	0.18 % OR	
	500 µs/div	0.15 % OR	
	1 ms/div	0.18 % OR	
	2 ms/div	0.18 % OR	
Oscilloscopes Horizontal Sensitivity [1,2]	5 ms/div	0.15 % OR	Comparison to Fluke 5522A Multiproduct Calibrator
	10 ms/div	0.18 % OR	
	20 ms/div	0.18 % OR	
	50 ms/div	0.15 % OR	
Oscilloscopes Vertical Sensitivity [1,2]	50 V/div	0.33 % OR	Comparison to Fluke 5522A Multiproduct Calibrator
	20 V/div	0.29 % OR	
	10 V/div	0.29 % OR	
	2 V/div	0.29 % OR	
	1 V/div	0.29 % OR	
	5 V/div	0.29 % OR	
	500 mV/div	0.29 % OR	
	200 mV/div	0.29 % OR	
	100 mV/div	0.3 % OR	
	50 mV/div	0.31 % OR	
	20 mV/div	0.33 % OR	
	10 mV/div	0.37 % OR	
	5 mV/div	0.45 % OR	
	2 mV/div	0.76 % OR	
	1 mV/div	1.1 % OR	

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Time and Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes Bandwidth [1,2]	[50 kHz to 100 MHz] Level= 4.0 %	1.2 minor divisions for a major graticule divided in 5 minor divisions	Uncertainties are for RF voltage displayed relative to a reference voltage level at 50 kHz, /6 graticules (=30 minor divisions).
	(100 MHz to 300 MHz] Level= 4.3 %	1.3 minor divisions for a major graticule divided in 5 minor divisions	
	(300 MHz to 500 MHz] Level= 5.9 %	1.8 minor divisions for a major graticule divided in 5 minor divisions	
Oscilloscopes Bandwidth [1,2]	(500 MHz to 1100 MHz] Level= 6.8 %	2.0 minor divisions for a major graticule divided in 5 minor divisions	Uncertainties are for RF voltage displayed relative to a reference voltage level at 50 kHz, /6 graticules (=30 minor divisions).
Frequency, Measuring Instruments [1]	100 µHz to 26 GHz	$2.8x 10^{-11}$ OR	IEC 60351; IEC 60548: IEC 60 624 Function Generator HP 33120A, Signal Generator HP 4432B, HP 8673B with the time base locked to GPS, Phase Comparator locked to GPS
Frequency Measuring Instruments [2]	100 µHz to 26 GHz	$5 x 10^{-10}$ OR	Comparison to Function Generator HP 33120A, Signal Generator HP 4432B, HP 8673B with the time base locked to the Fluke 910R
Frequency Sources [1] 24 h average	0.01 Hz 0.01 Hz 0.025 Hz 0.05 Hz 0.1 Hz 0.25 Hz 0.5 Hz 1 Hz 2.5 Hz 5 Hz	$9.6 x 10^{-6}$ OR $9.6 x 10^{-6}$ OR $9.6 x 10^{-6}$ OR $9.6 x 10^{-7}$ OR $9.6 x 10^{-7}$ OR $9.6 x 10^{-7}$ OR $9.6 x 10^{-8}$ OR $9.6 x 10^{-8}$ OR $9.6 x 10^{-8}$ OR $9.6 x 10^{-8}$ OR	The CMC is based on square wave. Comparison to Phase comparator STANFORD RESEARCH FS 700, Counter HP 53131A and counter HP 5351B locked to GPS

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Time and Frequency

Parameter/Equipment	Range [5] [including end point] (does not include end point)	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency Sources [1] 24 h average	10 Hz 25 Hz 50 Hz 100 Hz 250 Hz 500 Hz 1 kHz 2.5 kHz 5 kHz 10 kHz 25 kHz 50 kHz 100 kHz 250 kHz 500 kHz 1 MHz	9.6×10^{-9} OR 9.6×10^{-9} OR 9.6×10^{-10} OR 9.6×10^{-10} OR 9.6×10^{-10} OR 9.6×10^{-10} OR 9.6×10^{-11} OR 9.6×10^{-11} OR 9.6×10^{-11} OR 1×10^{-11} OR 1×10^{-11} OR 1×10^{-11} OR 0.18×10^{-12} OR 1×10^{-12} OR 1×10^{-12} OR 1×10^{-12} OR	The CMC is based on square wave. Comparison to Phase comparator STANFORD RESEARCH FS 700, Counter HP 53131A and counter HP 5351B locked to GPS and Fluke 910R
Frequency Sources [1] 24 h average	2.5 MHz 5 MHz 10 MHz [0.1 to 1] Hz (1 to 10] Hz (10 to 100] Hz (100 Hz to 1 kHz] (1 to 10] kHz (10 to 100] kHz (100 kHz to 3 GHz] (3 to 5] GHz (5 to 10] GHz (10 to 15] GHz (15 to 20] GHz (20 to 26] GHz	1×10^{-12} OR 1×10^{-12} OR 1×10^{-12} OR 4.4×10^{-10} OR 1.7×10^{-10} OR 8.3×10^{-11} OR 5.5×10^{-11} OR 4.7×10^{-11} OR 4.4×10^{-11} OR 4.3×10^{-11} OR 3.6×10^{-10} OR 2.3×10^{-10} OR 1.3×10^{-10} OR 9.4×10^{-11} OR 7.7×10^{-11} OR	The CMC is based on square wave. Comparison to Phase comparator STANFORD RESEARCH FS 700, Counter HP 53131A and counter HP 5351B locked to GPS and Fluke 910R
Frequency Sources [2] 24 h average	[10 Hz to 1 GHz) [1 to 10) GHz [10 to 15) GHz [15 to 20) GHz [20 to 26.5] GHz	5.8×10^{-10} OR 8.1×10^{-10} OR 6.9×10^{-10} OR 6.6×10^{-10} OR 6.4×10^{-10} OR	Comparison to Counter HP 53151A locked to Fluke 910R GPS Frequency Standard

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DIMENSIONAL MEASUREMENT

1 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Length Linear Dimensions Special Gauges [1]	(Up to 150 mm]	3 µm	Comparison to Length Meas. Machine SIP-302M Procedure 25.190
Length Linear Dimensions Special Gauges [1]	(Up to 150 mm]	0.01 mm	Comparison to Optical Comparator Procedure 25.190
Length Linear Dimensions Special Gauges [1,3]	(Up to 500 mm]	(2 + 20xL) µm	Comparison to Length Gauge Block by Comparison Procedure 25.190
Length Linear Dimensions Special Gauges [1,3]	(Up to 500 mm]	(5 + 20xL) µm	Comparison to Height Gauge Trimos Vertical 3 Procedure 25.190
Length Linear Dimensions Special Gauges [1,3]	(Up to 1 000 mm]	(0.03 + 0.1xL) mm	Comparison to Calipers Procedure 25.190
Length Linear Dimensions Special Gauges [1,3]	(Up to 1 000 mm]	(0.5 + 2xL) mm	Comparison to Metal Rulers Procedure 25.190
Length Linear Dimensions Distance [2,3]	(5 to 1 000 m]	0.1 % OR	Comparison to Steel Measuring Tape 50 m Procedure 25.190

2 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Angle Special Gauges [1]	(Up to 360°]	10 '	Comparison to Optical Comparator Angle Protractor Procedure 25.190
Radius Special Gauges [1]	(Up to 20 mm]	0.01 mm	Comparison to Optical Comparator Procedure 25.190

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%.

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Notes:

1. Available ranges and uncertainty for calibrations being performed on Permanent Site.
2. Available ranges and uncertainty for calibrations being performed on Temporary Site.
3. D = diameter in meters, L = length in meters, OR = “of reading”
4. Unitless linear measure.
5. The use of brackets “[]” indicate that the endpoints of the range are included within the range for the uncertainty of measurement listed and the use of parenthesis “()” indicate the endpoints are not included within the range for the uncertainty of measurement listed.
6. Intermediate measurement points are available for this parameter and will be estimated at time of service.

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