

# Schedule of Accreditation

issued by

## United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

 <b>0147</b>  <b>Accredited to ISO/IEC 17025:2017</b>	<b>Keysight Technologies UK Limited</b>  <b>Issue No: 098    Issue date: 11 February 2026</b>	
	<b>610 Wharfedale Road Winnersh Triangle Wokingham Berkshire RG41 5TP United Kingdom</b>	<b>Contact: Contact Centre Tel: +44 (0)118 927 6201 E-Mail: <a href="mailto:contactcentre_UK@keysight.com">contactcentre_UK@keysight.com</a> Website: <a href="http://www.keysight.com">www.keysight.com</a></b>

**Calibration performed by the Organisations at the locations specified overleaf**

The Calibration and Measurement Capabilities (CMCs) presented in this Schedule represent the smallest uncertainties for which the laboratory is accredited and are normally obtained at the Winnersh facility. Measurement systems are also available at the locations listed overleaf and include some or all of the quantities included in this Schedule. Customers' equipment will be calibrated at a location with a capability appropriate for that particular type of equipment. The assigned uncertainties will be such as to properly demonstrate the performance of the equipment and may be greater than the CMCs stated in this Schedule. Where more than one location is able to calibrate a specific item of equipment, the quoted uncertainties will normally be identical.

For further information regarding Calibration and Measurement Capabilities, see the last page of this Schedule.

### Coverage factor

The coverage factor  $k$  stated herein is the number by which the combined standard uncertainty  $u(y)$  is multiplied to obtain the expanded uncertainty  $U$  for a coverage probability of 95 %. The coverage factor is provided so that the user can determine  $u(y)$  for use in subsequent uncertainty budgets.

For certain calibrations, Monte Carlo Simulation (MCS) is used for uncertainty evaluation, based on the processes described in JCGM 101:2008, *Evaluation of measurement data - Supplement 1 to the "Guide to the expression of uncertainty in measurement" - Propagation of distributions using a Monte Carlo method*.

If an MCS evaluation reveals that an asymmetric probability density function is associated with the estimate  $y$  of the output quantity  $Y$ , the value of  $k$  may not be relevant or available. In such cases, the stated CMCs represent the endpoints of the 95 % coverage interval and the following information will be provided in calibration certificates:

- The combined standard uncertainty  $u(y)$ . This may be used directly in subsequent uncertainty budgets without the need for a divisor or, where one is required, with a divisor of 1.
- The endpoints of the 95 % coverage interval. This information may be used, for example, to assist in evaluating compliance with specification limits or to otherwise assess fitness for purpose.



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**Laboratory locations:**

Location details	Activity
<p><b>Address</b> Keysight Technologies UK Limited 610 Wharfedale Road Winnersh Triangle Wokingham Berkshire RG41 5TP United Kingdom</p> <p><b>Local contact</b> Contact Centre  Tel: +44 (0) 118 927 6201 E-mail: contactcentre_UK@keysight.com</p>	<p><u>Calibration</u>  DC and LF electrical quantities RF and Microwave electrical quantities</p>
<p><b>Address</b> Keysight Technologies Servicezentrum Herrenberger Straße 130 71034 Böblingen Germany</p> <p><b>Local contact</b> Contact Centre  Tel: +49 (0) 7031 464 6333 E-mail: contactcenter_germany@keysight.com</p>	<p><u>Calibration</u>  DC and LF electrical quantities RF and Microwave electrical quantities</p>
<p><b>Address</b> Keysight Technologies Suttner-Nobel-Allee 21 44803 Bochum Germany</p> <p><b>Local contact</b> Contact Centre  Tel: +49 (0) 7031 464 6333 E-mail: contactcenter_germany@keysight.com</p>	<p><u>Calibration</u>  Calibration of Battery Test Systems and similar devices.</p>
<p><b>Address</b> Keysight Technologies Building A, Floor 2, 4 Dolev St, Ra'anana 4366204 Israel</p> <p><b>Local contact</b> Contact Centre  Tel: +972 (0) 3 9288 600 E-mail: servicecenter_pdl-israel@keysight.com</p>	<p><u>Calibration</u>  DC and LF electrical quantities RF and Microwave electrical quantities</p>
<p><b>Address</b> Keysight Technologies Calibration Centre, MSD. The Millenia, Second floor, Tower 'D', No.1 &amp; 2, Murphy Road, Ulsoor, Bangalore Karnataka 560 008 India</p> <p><b>Local contact</b> Contact Centre  Tel. (international): +91-124-4864809 Tel. (local): 1-800-572-6073 or 1-800-11-2626 E-mail: support_india@keysight.com</p>	<p><u>Calibration</u>  DC and LF electrical quantities RF and Microwave electrical quantities</p>



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<p><b>Address:</b> Keysight Technologies Parc Technopolis Bâtiment Olympe 3 avenue du Canada Les Ulis 91940 France</p>	<p><b>Local contact</b> Contact Centre  Tel. (international): +33 0805980333 E-mail: contactcenter_france@keysight.com</p>	<p><u>Calibration</u>  DC and LF electrical quantities RF and Microwave electrical quantities</p>
<p><b>Address:</b> Keysight Technologies C/ Jacinto Benavente, 2 Complejo Tripark Las Rozas Edificio B, 3a plta, Modulo B 28232 Las Rozas, Madrid España</p>	<p><b>Local contact</b> Contact Centre  Tel. (international): +34 913 534 834 Tel. (local): 800-000-154  E-mail: contactcenter_spain@keysight.com</p>	<p><u>Calibration</u>  DC and LF electrical quantities RF and Microwave electrical quantities</p>

**Site activities performed away from the locations listed above:**

<p><b>Customers' sites or premises</b></p> <p>Calibrations may be performed in an air-conditioned mobile laboratory that is taken to the customers' sites, or in suitable areas within the customers' premises. The customers' premises must be appropriate for the nature of the particular calibrations undertaken and will be the subject of contract review arrangements between the laboratory and the customer.</p>	<p><b>Local contact</b></p> <p><u>Contact Centre (UK)</u> Tel: +44 (0) 118 927 6201 E-mail: contactcentre_UK@keysight.com</p> <p><u>Contact Centre (Germany)</u> Tel: +49 (0) 7031 464 6333 E-mail: contactcenter_germany@keysight.com</p> <p><u>Contact Centre (Israel)</u> Tel: +972 (0) 3 9288 600 E-mail: servicecenter_pdl-israel@keysight.com</p> <p><u>Contact Centre (India)</u> Tel. (international): +91-124-4864809 Tel. (local): 1-800-572-6073 or 1-800-11-2626 E-mail: support_india@keysight.com</p> <p><u>Contact Centre (France)</u> Tel. (international): +33 0805980333 E-mail: contactcenter_france@keysight.com</p> <p><u>Contact Centre (Italy)</u> Tel. +800 599100 E-mail: contactcenter_italy@keysight.com</p> <p>Tel. 800-000-154</p> <p>E-mail: contactcenter_spain@keysight.com</p>	<p><u>Calibration</u></p> <p>DC and LF electrical quantities RF and Microwave electrical quantities.</p> <p>Calibration of Battery Test Systems and similar devices.</p>
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CALIBRATION AND MEASUREMENT CAPABILITY (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
DC RESISTANCE				
Specific Values	100 $\mu\Omega$ 1 m $\Omega$ 10 m $\Omega$ 100 m $\Omega$ 1 $\Omega$ 10 $\Omega$ 100 $\Omega$ 1 k $\Omega$ 10 k $\Omega$ 100 k $\Omega$ 1 M $\Omega$ 10 M $\Omega$	63 $\mu\Omega/\Omega$ 16 $\mu\Omega/\Omega$ 14 $\mu\Omega/\Omega$ 3.2 $\mu\Omega/\Omega$ 1.7 $\mu\Omega/\Omega$ 1.3 $\mu\Omega/\Omega$ 0.74 $\mu\Omega/\Omega$ 1.2 $\mu\Omega/\Omega$ 0.32 $\mu\Omega/\Omega$ 1.3 $\mu\Omega/\Omega$ 1.2 $\mu\Omega/\Omega$ 3.2 $\mu\Omega/\Omega$	Measurement of resistors with negligible power dissipation. The uncertainties up to 10 M $\Omega$ are obtained at 20 °C in a temperature-controlled oil bath. Measurements in air at 23 °C $\pm$ 1 °C are also possible but may have an increased uncertainty.	See Pages 2 and 3
	19 k $\Omega$ 190 k $\Omega$ 300 k $\Omega$ 330 k $\Omega$ 1.09 M $\Omega$ 1.19 M $\Omega$ 1.9 M $\Omega$ 3 M $\Omega$ 3.3 M $\Omega$ 19 M $\Omega$ 30 M $\Omega$ 33 M $\Omega$ 100 M $\Omega$ 109 M $\Omega$ 119 M $\Omega$ 290 M $\Omega$ 1 G $\Omega$	2.6 $\mu\Omega/\Omega$ 2.9 $\mu\Omega/\Omega$ 5.5 $\mu\Omega/\Omega$ 4.9 $\mu\Omega/\Omega$ 4.7 $\mu\Omega/\Omega$ 4.4 $\mu\Omega/\Omega$ 4.8 $\mu\Omega/\Omega$ 7.3 $\mu\Omega/\Omega$ 10 $\mu\Omega/\Omega$ 11 $\mu\Omega/\Omega$ 12 $\mu\Omega/\Omega$ 11 $\mu\Omega/\Omega$ 13 $\mu\Omega/\Omega$ 56 $\mu\Omega/\Omega$ 230 $\mu\Omega/\Omega$ 68 $\mu\Omega/\Omega$ 86 $\mu\Omega/\Omega$	Measured in air 23 °C $\pm$ 1 °C	
Other Values	0 $\Omega$ $\pm$ 10 $\mu\Omega$	0.40 $\mu\Omega$	Sourcing only, relative to a reference established using a low thermal emf, 4-terminal short circuit.	
	0 $\Omega$ $\pm$ 100 $\mu\Omega$	5.9 $\mu\Omega$	Measurement only, relative to a reference established using a low thermal emf, 4-terminal short circuit.	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
DC RESISTANCE (continued)				See Pages 2 and 3
Other Values (continued)	10 $\mu\Omega$ to 100 $\mu\Omega$	580 $\mu\Omega/\Omega$		
	100 $\mu\Omega$ to 1 m $\Omega$	60 $\mu\Omega/\Omega$		
	1 m $\Omega$ to 10 m $\Omega$	60 $\mu\Omega/\Omega$		
	10 m $\Omega$ to 100 m $\Omega$	17 $\mu\Omega/\Omega$		
	0.1 $\Omega$ to 1 $\Omega$	6.5 $\mu\Omega/\Omega$		
	1 $\Omega$ to 10 $\Omega$	6.5 $\mu\Omega/\Omega$		
	10 $\Omega$ to 100 $\Omega$	1.6 $\mu\Omega/\Omega$		
	100 $\Omega$ to 1 k $\Omega$	1.9 $\mu\Omega/\Omega$		
	1 k $\Omega$ to 10 k $\Omega$	1.5 $\mu\Omega/\Omega$		
	10 k $\Omega$ to 12 k $\Omega$	11 $\mu\Omega/\Omega + 7.5$ m $\Omega$		
	12 k $\Omega$ to 120 k $\Omega$	11 $\mu\Omega/\Omega + 75$ m $\Omega$		
	120 k $\Omega$ to 1.2 M $\Omega$	14 $\mu\Omega/\Omega + 2.3$ $\Omega$		
	1.2 M $\Omega$ to 12 M $\Omega$	51 $\mu\Omega/\Omega + 100$ $\Omega$		
	12 M $\Omega$ to 120 M $\Omega$	480 $\mu\Omega/\Omega + 3.7$ k $\Omega$		
	190 M $\Omega$ specific value	0.25 %		
	120 M $\Omega$ to 1.2 G $\Omega$	0.48 % + 280 k $\Omega$		
	10 G $\Omega$	0.10 %	Calibration of resistance measuring equipment and standard resistors at test voltages of 100 V, 250 V and 500 V.	
	100 G $\Omega$	0.10 %		
	1 T $\Omega$	0.10 %		
	10 T $\Omega$	0.20 %		
Differential DC Resistance	1 k $\Omega$ range: 0 m $\Omega$ to 10 m $\Omega$	0.88 m $\Omega$	For verification of the 2-wire resistance compensation feature in multifunction calibrators.	
DC VOLTAGE				
Specific Values	10 mV	0.13 $\mu\text{V}$	Using DC voltage standard and voltage ratio techniques. Applicable to measurement and generation of DC voltages within the stated ranges.	
	100 mV	0.16 $\mu\text{V}$		
	1 V	0.40 $\mu\text{V}$		
	10 V	3.3 $\mu\text{V}$		
	100 V	56 $\mu\text{V}$		
	1 kV	1.1 mV		
	1 mV	13 $\mu\text{V}/\text{V}$	With respect to a zero reference established with a low-thermal emf short.	
	10 mV	11 $\mu\text{V}/\text{V}$		
Other Values	-10 $\mu\text{V}$ to +10 $\mu\text{V}$	38 nV		
	10 $\mu\text{V}$ to 100 mV	0.42 $\mu\text{V}$		
	100 mV to 1 V	77 nV/V + 0.55 $\mu\text{V}$		
	1 V to 10 V	0.18 $\mu\text{V}/\text{V} + 1.6$ $\mu\text{V}$		
	10 V to 100 V	0.30 $\mu\text{V}/\text{V} + 3.3$ $\mu\text{V}$		
	100 V to 1100 V	1.3 $\mu\text{V}/\text{V}$		
	1000 V to 3000 V	110 $\mu\text{V}/\text{V}$		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
Differential DC Voltage	For measured voltages in the ranges: 0.1 V to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.14 $\mu$ V to 0.43 $\mu$ V 0.59 $\mu$ V to 1.1 $\mu$ V 16 $\mu$ V to 65 $\mu$ V 0.22 mV to 1.7 mV	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p>These capabilities are for measurement of small differences in DC voltage and will be typically applied to load and line regulation checks on DC power supplies and similar devices.</p> </div>	See Pages 2 and 3
DC CURRENT	0 A	1.0 pA	For calibration of precision digital multimeters (open circuit input).	
	0 A	2.0 fA	For calibration of very low current sensing devices (picoammeters, semiconductor analysers etc.)	
	0.1 pA to 1 pA 1 pA to 10 pA 10 pA to 100 pA 100 pA to 1 nA 1 nA to 10 nA 10 nA to 100 nA	3.0 fA to 2.0 fA 2.0 fA to 7.0 fA 7.0 fA to 55 fA 55 fA to 270 fA 0.27 pA to 1.4 pA 140 $\mu$ A/A to 39 $\mu$ A/A	Using DC voltmeter and current shunts. Applicable to measurement and generation of DC currents within the stated ranges.	
	100 nA to 1.2 $\mu$ A 1.2 $\mu$ A to 12 $\mu$ A 12 $\mu$ A to 120 $\mu$ A 120 $\mu$ A to 1.2 mA 1.2 mA to 12 mA 12 mA to 100 mA 100 mA to 200 mA 200 mA to 1 A 1 A to 10 A 10 A to 20 A 20 A to 40 A 40 A to 200 A 200 A to 400 A 400 A to 500 A 500 A to 800 A 800 A to 1000 A	41 $\mu$ A/A to 14 $\mu$ A/A 14 $\mu$ A/A to 13 $\mu$ A/A 7.3 $\mu$ A/A to 4.3 $\mu$ A/A 7.4 $\mu$ A/A to 4.5 $\mu$ A/A 7.3 $\mu$ A/A to 4.3 $\mu$ A/A 7.3 $\mu$ A/A to 4.2 $\mu$ A/A 8.0 $\mu$ A/A to 6.5 $\mu$ A/A 22 $\mu$ A/A to 11 $\mu$ A/A 42 $\mu$ A/A to 22 $\mu$ A/A 23 $\mu$ A/A to 39 $\mu$ A/A 30 $\mu$ A/A to 33 $\mu$ A/A 110 $\mu$ A/A to 71 $\mu$ A/A 55 $\mu$ A/A 48 $\mu$ A/A 55 $\mu$ A/A 62 $\mu$ A/A		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
DC CURRENT (continued) Current probe calibration DC Current Accuracy of Oscilloscope Probes DC Current Accuracy of Oscilloscope Probes and Current Clamps Differential DC Current Method 1 Method 2	10 mA to 1 A 1 A to 2 A 2 A to 1000 A For measured currents in the ranges: 10 mA to 100 mA 100 mA to 1 A 1 A to 10 A 10 A to 30 A 30 A to 100 A 100 A to 200 A 10 $\mu$ A to 100 $\mu$ A 100 $\mu$ A to 1 mA 1 mA to 10 mA	0.41 % 0.29 % 0.20 % 0.059 $\mu$ A to 0.11 $\mu$ A 0.59 $\mu$ A to 1.1 $\mu$ A 1.4 $\mu$ A to 4.3 $\mu$ A 5.9 $\mu$ A to 7.0 $\mu$ A 20 $\mu$ A to 43 $\mu$ A 0.14 mA 1.1 nA to 3.0 nA 7.5 nA to 27 nA 0.075 $\mu$ A to 0.27 $\mu$ A	Simulated current using multi-turn coil arrangement.  These capabilities are for measurement of small differences in DC current and will be typically applied to load and line regulation checks on DC power supplies and similar devices.  Method 1: Measurements are made using a digital multimeter and a current shunt.  Method 2: Measurements are made using a digital multimeter directly.	See Pages 2 and 3
AC VOLTAGE Several methods are in use for dissemination of AC voltage measurement traceability, each with different frequency ranges, voltage ranges and uncertainties: <b>Method 1</b> employs an AC Measurement Standard to measure an unknown AC voltage or to monitor a source for calibration of measuring instruments. <b>Method 2</b> uses fast DC sampling techniques and is of particular relevance to low frequency measurements. <b>Method 3</b> uses similar methodology to Method 1 but is used for measurements of frequency response with respect to a reference value established at 1 kHz. <b>Method 4</b> is for calculated peak-to-peak voltage from rms measurement by a digital multimeter. It is typically used for the calibration of an oscilloscope calibrator output of a multifunction calibrator. <b>Method 5</b> uses the synchronous sub-sampled mode of a digital multimeter to measure an unknown AC voltage.  The uncertainties for each method are presented separately in this Schedule; these capabilities are listed on the following six pages.				



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location																	
AC VOLTAGE (continued)																					
Methods 1 and 2 Specific Values																					
Voltage	Expanded measurement uncertainties ( $k = 2$ ) expressed as $\mu\text{V/V}$ for specific values of AC voltages at the stated frequencies, shown below in Hz.																				
	1	3	5	9.5	10	20	40	45	100	500	1 k	10 k	20 k	30 k	50 k	100 k	200 k	300 k	500 k	1 M	
0.6 mV											1700										
1 mV											1100										
2 mV					220	210	210			210	230	220	210		220	220	280	310	640	2100	
3 mV								31			370										
6 mV					84	87	84			100	86	110	82		85	100	160	230	230	400	
10 mV								200			56		58								
20 mV					66	45	43			36	37	38	39		43	40	49	220	230	660	
30 mV				65	12			14			61										
33 mV								27													
60 mV					66	41	38			37	37	39	32		34	35	52	190	190	540	
100 mV	22	22	51		22	16	15			13	19	21	22		21	24	91	160	100	400	
200 mV					22	16	15			13	19	21	20		21	24	91	120	100	400	
300 mV				13	11			15			53										
330 mV								24													
500 mV							22											110			
600 mV					14	14	14			12	9.0	8.0	10		8.0	12	23	87	42	78	
1 V			14		7.0	5.0	5.0			6.0	7.0	6.0	8.0		7.0	14	17	76	30	200	
2 V					19	11	7.0			7.0	7.0	8.0	7.0		6.0	10	11	71	56	44	
3 V				13	11			13			54										
3.3 V								43													
5 V				24	57			31			62										
6 V					18	10	7.0			11	8.0	11	9.0		14	17	18	120	74	550	
10 V					12	12	12			9.0	11	11	12		13	19	19		70	400	
20 V					17	14	8.0			10	10	12	10		14	19	20	120	70	400	
30 V				44	23			31													
33 V								32													
60 V					19	13	12			13	10	10	10		13	28		120			
100 V					28	17	15			15	18	16	15		16	36					
200 V					28	17	11			15	12	16	12		15	52					
300 V								33													
330 V								49													
600 V					18	15	14			15	12	15	23		86	390					
1000 V					19	15	15		18	14	14	14	23	31	97	390					

See Pages 2 and 3



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )		Remarks	Location		
Method 1 Other values					See Pages 2 and 3		
Voltage range	Expanded measurement uncertainties ( $k = 2$ ) expressed as ( $\mu\text{V}/\text{V} + \mu\text{V}$ ) for other values of AC voltages over the stated frequency ranges, shown below in Hz. The maximum voltage is constrained by a maximum V.Hz product of $10^8$ .						
	10 to 20	20 to 40	40 to 20 k	20 k to 50 k		50 k to 100 k	100 k to 300 k
0.6 mV to 2.2 mV	240 + 1.0	230 + 1.0	240 + 1.0	230 + 1.6		240 + 2.0	330 + 3.1
2.2 mV to 7 mV	110 + 1.0	90 + 1.0	110 + 1.0	87 + 1.6		110 + 2.0	240 + 3.1
7 mV to 22 mV	83 + 1.1	51 + 1.1	51 + 1.0	52 + 1.6		58 + 2.0	220 + 3.2
22 mV to 70 mV	77 + 1.3	46 + 1.3	42 + 1.2	43 + 1.6		52 + 2.0	200 + 3.2
70 mV to 220 mV	50 + 3.8	26 + 1.6	23 + 1.3	22 + 1.7		43 + 2.5	150 + 5.8
220 mV to 700 mV	49 + 1.6	26 + 1.6	20 + 2.0	19 + 2.3		41 + 3.6	110 + 8.4
700 mV to 2.2 V	48	22	18	18		39	90
2.2 V to 7 V	49	24	18	21		50	120
7 V to 22 V	49	25	18	21		51	120
22 V to 70 V	50	26	21	22		54	120
70 V to 220 V	29	23	29	57		140	390
220 V to 700 V	52	28	23	86		390	
700 V to 1050 V	52	29	25	91	390		
Voltage range	300 k to 500 k	500 k to 1.2 M	1.2 M to 2 M	2 M to 10 M	10 M to 20 M	20 M to 30 M	
0.6 mV to 2.2 mV	660 + 6.2	1900 + 0.78	1900 + 0.78	2300 + 0.78	3000 + 0.78	5900 + 1.6	
2.2 mV to 7 mV	430 + 6.2	870 + 0.78	870 + 0.78	1100 + 0.78	1600 + 0.78	3300 + 0.78	
7 mV to 22 mV	400 + 6.4	640	640	900	1500	3200	
22 mV to 70 mV	320 + 6.4	510	510	890	1300	3100	
70 mV to 220 mV	250 + 11	510	510	890	1300	3000	
220 mV to 700 mV	220 + 10	510	510	890	1300	3000	
700 mV to 2.2 V	180	510	510	890	1300	3000	
2.2 V to 7 V	300	500	500	890	1300	3000	
7 V to 22 V	300	930					
22 V to 70 V	310	930					



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location							
AC VOLTAGE (continued)				See Pages 2 and 3							
Method 3											
AC Voltage frequency response with respect to a reference at 1 kHz.											
Frequency range	Expanded measurement uncertainty ( $k = 2$ ) for the AC voltages shown below										
	1 mV	3 mV	10 mV		30 mV	100 mV	300 mV	1 V	1.11 V	2 V	3 V
10 Hz to 30 Hz	0.79 $\mu$ V	2.3 $\mu$ V	7.8 $\mu$ V		23 $\mu$ V	78 $\mu$ V	0.23 mV	0.78 mV	0.86 mV	1.6 mV	2.3 mV
30 Hz to 50 Hz	0.42 $\mu$ V	1.2 $\mu$ V	3.9 $\mu$ V		12 $\mu$ V	31 $\mu$ V	71 $\mu$ V	0.24 mV	0.26 mV	0.47 mV	0.72 mV
At 50 Hz	0.40 $\mu$ V	1.2 $\mu$ V	3.9 $\mu$ V		12 $\mu$ V	31 $\mu$ V	71 $\mu$ V	0.24 mV	0.26 mV	0.47 mV	0.72 mV
50 Hz to 100 kHz	0.40 $\mu$ V	1.2 $\mu$ V	3.9 $\mu$ V		12 $\mu$ V	31 $\mu$ V	71 $\mu$ V	0.24 mV	0.26 mV	0.47 mV	0.73 mV
100 kHz to 120 kHz	0.40 $\mu$ V	1.2 $\mu$ V	3.9 $\mu$ V		12 $\mu$ V	31 $\mu$ V	71 $\mu$ V	0.24 mV	0.26 mV	0.47 mV	0.72 mV
120 kHz to 500 kHz	1.3 $\mu$ V	2.4 $\mu$ V	5.5 $\mu$ V		12 $\mu$ V	31 $\mu$ V	71 $\mu$ V	0.24 mV	0.26 mV	0.47 mV	0.72 mV
500 kHz to 2 MHz	1.3 $\mu$ V	2.4 $\mu$ V	5.5 $\mu$ V		12 $\mu$ V	39 $\mu$ V	0.12 mV	0.39 mV	0.43 mV	0.78 mV	1.2 mV
2 MHz to 5 MHz	2.1 $\mu$ V	3.1 $\mu$ V	7.8 $\mu$ V		23 $\mu$ V	78 $\mu$ V	0.23 mV	0.78 mV	0.87 mV	1.6 mV	2.3 mV
5 MHz to 10 MHz	2.1 $\mu$ V	3.1 $\mu$ V	7.9 $\mu$ V		24 $\mu$ V	79 $\mu$ V	0.24 mV	0.79 mV	0.87 mV	1.6 mV	2.4 mV
10 MHz to 15 MHz	3.1 $\mu$ V	4.8 $\mu$ V	13 $\mu$ V	35 $\mu$ V	0.12 mV	0.35 mV	1.2 mV	1.3 mV	2.4 mV	3.5 mV	
15 MHz to 20 MHz	3.1 $\mu$ V	4.8 $\mu$ V	13 $\mu$ V	36 $\mu$ V	0.12 mV	0.35 mV	1.2 mV	1.3 mV	2.4 mV	3.6 mV	
20 MHz to 25 MHz	7.0 $\mu$ V	9.4 $\mu$ V	29 $\mu$ V	82 $\mu$ V	0.27 mV	0.82 mV	2.7 mV	3.0 mV	5.5 mV	8.2 mV	
25 MHz to 30 MHz	7.0 $\mu$ V	9.5 $\mu$ V	29 $\mu$ V	82 $\mu$ V	0.27 mV	0.82 mV	2.7 mV	3.0 mV	5.5 mV	8.2 mV	



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**Keysight Technologies UK Limited**  
Issue No: 098 Issue date: February 2026

Calibration performed by the Organisation at the locations specified

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location																																																																																																																																																																														
AC VOLTAGE (continued) (Method 4)  Calculated peak-to-peak voltage from rms measurement by a digital multimeter. For the calibration of an oscilloscope calibrator output of a multifunction calibrator.		All uncertainties are in % terms																																																																																																																																																																																
		<table border="1"> <tr> <td></td> <td align="center" colspan="3">Sine wave</td> </tr> <tr> <td></td> <td align="center" colspan="3">Square wave</td> </tr> <tr> <td></td> <td align="center" colspan="3">Triangle wave</td> </tr> <tr> <td></td> <td align="center" colspan="3">Into 1 MΩ load</td> </tr> <tr> <td>1.8 mV, 1 kHz</td> <td align="center">3.2</td> <td align="center">2.4</td> <td align="center">4.0</td> </tr> <tr> <td>11.9 mV, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.13</td> </tr> <tr> <td>21.9 mV, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.10</td> </tr> <tr> <td>22 mV, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.10</td> </tr> <tr> <td>56 mV, 1 kHz</td> <td align="center">0.10</td> <td align="center">1.1</td> <td align="center">0.13</td> </tr> <tr> <td>89.9 mV, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.10</td> </tr> <tr> <td>90 mV, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.13</td> </tr> <tr> <td>155 mV, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.10</td> </tr> <tr> <td>219 mV, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.13</td> </tr> <tr> <td>220 mV, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.10</td> </tr> <tr> <td>560 mV, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.13</td> </tr> <tr> <td>899 mV, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.13</td> </tr> <tr> <td>0.90 V, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.10</td> </tr> <tr> <td>3.75 V, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.13</td> </tr> <tr> <td>6.59 V, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.13</td> </tr> <tr> <td>6.6 V, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.10</td> </tr> <tr> <td>30.8 V, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.13</td> </tr> <tr> <td>55 V, 1 kHz</td> <td align="center">0.10</td> <td align="center">0.10</td> <td align="center">0.13</td> </tr> <tr> <td>55 V, 10 Hz</td> <td></td> <td align="center">0.30</td> <td></td> </tr> <tr> <td>55 V, 100 Hz</td> <td></td> <td align="center">0.85</td> <td></td> </tr> <tr> <td>55 V, 10 kHz</td> <td></td> <td align="center">0.95</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td align="center">Into 50 Ω load</td> </tr> <tr> <td>1.8 mV, 1 kHz</td> <td align="center">3.2</td> <td align="center">2.4</td> <td align="center">3.9</td> </tr> <tr> <td>6.4 mV, 1 kHz</td> <td></td> <td align="center">0.55</td> <td></td> </tr> <tr> <td>10.9 mV, 1 kHz</td> <td align="center">0.40</td> <td align="center">0.55</td> <td align="center">0.45</td> </tr> <tr> <td>11 mV, 1 kHz</td> <td></td> <td align="center">0.55</td> <td></td> </tr> <tr> <td>28 mV, 1 kHz</td> <td></td> <td align="center">2.5</td> <td></td> </tr> <tr> <td>44.9 mV, 1 kHz</td> <td align="center">0.40</td> <td align="center">0.45</td> <td align="center">0.45</td> </tr> <tr> <td>45 mV, 1 kHz</td> <td></td> <td align="center">0.45</td> <td></td> </tr> <tr> <td>78 mV, 1 kHz</td> <td></td> <td align="center">0.45</td> <td></td> </tr> <tr> <td>109 mV, 1 kHz</td> <td align="center">0.40</td> <td align="center">0.45</td> <td align="center">0.45</td> </tr> <tr> <td>110 mV, 1 kHz</td> <td></td> <td align="center">0.45</td> <td></td> </tr> <tr> <td>280 mV, 1 kHz</td> <td></td> <td align="center">0.45</td> <td></td> </tr> <tr> <td>449 mV, 1 kHz</td> <td align="center">0.40</td> <td align="center">0.45</td> <td align="center">0.45</td> </tr> <tr> <td>450 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kHz	0.10	0.10	0.10	3.75 V, 1 kHz	0.10	0.10	0.13	6.59 V, 1 kHz	0.10	0.10	0.13	6.6 V, 1 kHz	0.10	0.10	0.10	30.8 V, 1 kHz	0.10	0.10	0.13	55 V, 1 kHz	0.10	0.10	0.13	55 V, 10 Hz		0.30		55 V, 100 Hz		0.85		55 V, 10 kHz		0.95					Into 50 Ω load	1.8 mV, 1 kHz	3.2	2.4	3.9	6.4 mV, 1 kHz		0.55		10.9 mV, 1 kHz	0.40	0.55	0.45	11 mV, 1 kHz		0.55		28 mV, 1 kHz		2.5		44.9 mV, 1 kHz	0.40	0.45	0.45	45 mV, 1 kHz		0.45		78 mV, 1 kHz		0.45		109 mV, 1 kHz	0.40	0.45	0.45	110 mV, 1 kHz		0.45		280 mV, 1 kHz		0.45		449 mV, 1 kHz	0.40	0.45	0.45	450 mV, 1 kHz		0.45		780 mV, 1 kHz		0.45		1.09 V, 1 kHz	0.40	0.45	0.45	1.1 V, 1 kHz		0.45		1.8 V, 1 kHz		0.45		2.5 V, 1 kHz	0.40	0.45	0.45
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See Pages 2 and 3



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Calibration performed by the Organisation at the locations specified

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
AC VOLTAGE (continued) Method 5	1.2 mV to 12 mV 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz 1 MHz to 2 MHz 2 MHz to 3 MHz 3 MHz to 4 MHz 4 MHz to 6 MHz 6 MHz to 8 MHz	0.035 % + 3.5 $\mu$ V 0.024 % + 1.3 $\mu$ V 0.035 % + 1.3 $\mu$ V 0.12 % + 1.3 $\mu$ V 0.58 % + 1.3 $\mu$ V 4.6 % + 2.3 $\mu$ V 1.4 % + 5.8 $\mu$ V 8.1 % + 8.1 $\mu$ V 8.2 % + 8.1 $\mu$ V 8.3 % + 8.1 $\mu$ V 23 % + 9.2 $\mu$ V 24 % + 9.2 $\mu$ V	Using digital multimeter	See Pages 2 and 3
	12 mV to 120 mV 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz 1 MHz to 2 MHz 2 MHz to 3 MHz 3 MHz to 4 MHz 4 MHz to 5 MHz 5 MHz to 6 MHz 6 MHz to 7 MHz 7 MHz to 8 MHz 8 MHz to 9 MHz 9 MHz to 10 MHz	0.010 % + 4.6 $\mu$ V 0.010 % + 2.3 $\mu$ V 0.018 % + 2.3 $\mu$ V 0.035 % + 2.3 $\mu$ V 0.093 % + 2.3 $\mu$ V 0.35 % + 12 $\mu$ V 1.2 % + 12 $\mu$ V 1.8 % + 12 $\mu$ V 4.7 % + 81 $\mu$ V 4.9 % + 81 $\mu$ V 5.4 % + 92 $\mu$ V 6.0 % + 92 $\mu$ V 6.9 % + 92 $\mu$ V 8.0 % + 92 $\mu$ V 19 % + 120 $\mu$ V 20 % + 120 $\mu$ V		
	120 mV to 1.2 V 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz 1 MHz to 2 MHz 2 MHz to 4 MHz 4 MHz to 8 MHz 8 MHz to 10 MHz	0.0084 % + 46 $\mu$ V 0.0084 % + 23 $\mu$ V 0.016 % + 23 $\mu$ V 0.035 % + 23 $\mu$ V 0.093 % + 23 $\mu$ V 0.35 % + 120 $\mu$ V 1.2 % + 120 $\mu$ V 1.7 % + 120 $\mu$ V 4.6 % + 0.81 mV 4.6 % + 0.92 mV 17 % + 1.2 mV		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
AC VOLTAGE (continued) Method 5	1.2 V to 12 V 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz 1 MHz to 2 MHz 2 MHz to 4 MHz 4 MHz to 8 MHz 8 MHz to 10 MHz  12 V to 120 V 10 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz  120 V to 700 V 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz	0.0084 % + 0.46 mV 0.0084 % + 0.23 mV 0.016 % + 0.23 mV 0.035 % + 0.23 mV 0.093 % + 0.23 mV 0.35 % + 1.2 mV 1.2 % + 1.2 mV 1.7 % + 1.2 mV 4.6 % + 8.1 mV 4.6 % + 9.2 mV 17 % + 12 mV  0.023 % + 4.6 mV 0.023 % + 2.3 mV 0.023 % + 2.3 mV 0.041 % + 2.3 mV 0.14 % + 2.3 mV 0.46 % + 12 mV 1.7 % + 12 mV  0.046 % + 23 mV 0.070 % + 23 mV 0.14 % + 23 mV 0.35 % + 23 mV	Using digital multimeter	See Pages 2 and 3



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )		Remarks	Location
AC PHASE ANGLE	Phase angle uncertainty ( $k = 2$ )				See Pages 2 and 3
Specific Values					
Voltage: Voltage	3 V : 3 V	At 0°	At 60°	At 90°	
	65 Hz	0.016°	0.016°	0.016°	
	400 Hz	0.016°	0.020°	0.019°	
	1 kHz	0.027°	0.032°	0.027°	
	5 kHz	0.13°	0.090°	0.076°	
	10 kHz	0.15°	0.12°	0.15°	
	30 kHz	0.16°	0.27°	0.14°	
	30 V : 3 V	At 0°	At 60°	At 90°	
	65 Hz			0.016°	
	50 V : 3 V	At 0°	At 60°	At 90°	
	65 Hz			0.024°	
Voltage: Current	30 mV : 300 mA	At 0°	At 60°	At 90°	
	65 Hz	0.012°	0.016°		
	1 kHz	0.026°			
	30 kHz	0.36			
	200 mV : 2 A	At 0°	At 60°	At 90°	
	65 Hz	0.018°	0.016°		
	50 mV : 5 A	At 0°	At 60°	At 90°	
	65 Hz	0.021°			
	400 Hz	0.020°			
	200 mV : 20 A	At 0°	At 60°	At 90°	
	65 Hz		0.016°		
	400 Hz		0.020°		
	3.3 V : 300 mA	At 0°	At 60°	At 90°	
	65 Hz	0.026°		0.024°	
	3.3 V : 2 A	At 0°	At 60°	At 90°	
	65 Hz	0.012°		0.018°	
	3.3 V : 5 A	At 0°	At 60°	At 90°	
	65 Hz	0.024°			
	400 Hz	0.020°			
	3.3 V : 20 A	At 0°	At 60°	At 90°	
	65 Hz			0.025°	
	400 Hz			0.020°	
	33 V : 300 mA	At 0°	At 60°	At 90°	
	65 Hz	0.018°		0.018°	
	33 V : 2 A	At 0°	At 60°	At 90°	
	65 Hz	0.018°		0.016°	
	33 V : 5 A	At 0°	At 60°	At 90°	
	65 Hz	0.032°			
	400 Hz	0.026°			
	33 V : 20 A	At 0°	At 60°	At 90°	
	65 Hz			0.029°	
	400 Hz			0.027°	







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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
AC CURRENT (continued) Specific Values (continued)	1.9 mA 1 kHz 10 kHz 30 kHz  3.29 mA 10 Hz 45 Hz 1 kHz 5 kHz 10 kHz 30 kHz  3.3 mA 1 kHz 5 kHz 30 kHz  19 mA 1 kHz 10 kHz 30 kHz  32.9 mA 10 Hz 45 Hz 1 kHz 5 kHz 10 kHz 30 kHz  33 mA 1 kHz 5 kHz 30 kHz  190 mA 1 kHz 10 kHz 30 kHz  329 mA 10 Hz 45 Hz 1 kHz 5 kHz 10 kHz 30 kHz	20 $\mu$ A/A 19 $\mu$ A/A 19 $\mu$ A/A  25 $\mu$ A/A 25 $\mu$ A/A 40 $\mu$ A/A 18 $\mu$ A/A 18 $\mu$ A/A 18 $\mu$ A/A  55 $\mu$ A/A 18 $\mu$ A/A 18 $\mu$ A/A  25 $\mu$ A/A 18 $\mu$ A/A 18 $\mu$ A/A  19 $\mu$ A/A 40 $\mu$ A/A 18 $\mu$ A/A 18 $\mu$ A/A 18 $\mu$ A/A 18 $\mu$ A/A  18 $\mu$ A/A 18 $\mu$ A/A 18 $\mu$ A/A  32 $\mu$ A/A 29 $\mu$ A/A 29 $\mu$ A/A  24 $\mu$ A/A 24 $\mu$ A/A 24 $\mu$ A/A 24 $\mu$ A/A 24 $\mu$ A/A 24 $\mu$ A/A	For calibration of Fluke 552x series and similar calibrators.	See Pages 2 and 3



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**United Kingdom Accreditation Service**  
2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

**Keysight Technologies UK Limited**  
Issue No: 098 Issue date: February 2026

Calibration performed by the Organisation at the locations specified

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
AC CURRENT (continued)  Specific Values (continued)	0.33 A 1 kHz 5 kHz 10 kHz  1.09 A 10 Hz 45 Hz 1 kHz 5 kHz 10 kHz  2.99 A 10 Hz 45 Hz 1 kHz 5 kHz 10 kHz  3.3 A 500 Hz 1 kHz 5 kHz  10.9 A 45 Hz 65 Hz 500 Hz 1 kHz 5 kHz  20 A 45 Hz 65 Hz 500 Hz 1 kHz 5 kHz	24 $\mu$ A/A 24 $\mu$ A/A 24 $\mu$ A/A  53 $\mu$ A/A 33 $\mu$ A/A 32 $\mu$ A/A 32 $\mu$ A/A 64 $\mu$ A/A  29 $\mu$ A/A 29 $\mu$ A/A 29 $\mu$ A/A 29 $\mu$ A/A 29 $\mu$ A/A  29 $\mu$ A/A 28 $\mu$ A/A 28 $\mu$ A/A  65 $\mu$ A/A 65 $\mu$ A/A 65 $\mu$ A/A 65 $\mu$ A/A 65 $\mu$ A/A  45 $\mu$ A/A 44 $\mu$ A/A 45 $\mu$ A/A 45 $\mu$ A/A 45 $\mu$ A/A	For calibration of Fluke 552x series and similar calibrators.	See Pages 2 and 3
Other Values	9 $\mu$ A to 220 $\mu$ A 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz  29 $\mu$ A to 330 $\mu$ A 10 kHz to 30 kHz	230 $\mu$ A/A + 16 nA 160 $\mu$ A/A + 9.3 nA 110 $\mu$ A/A + 7.8 nA 270 $\mu$ A/A + 12 nA 1000 $\mu$ A/A + 62 nA  1.2 % + 0.31 $\mu$ A		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location	
AC CURRENT (continued) Other Values (continued)	220 $\mu$ A to 2.2 mA 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz  330 $\mu$ A to 3.3 mA 10 kHz to 30 kHz  2.2 mA to 22 mA 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz  3.3 mA to 33 mA 10 kHz to 30 kHz  22 mA to 220 mA 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz  33 mA to 330 mA 10 kHz to 30 kHz  220 mA to 330 mA 10 Hz to 20 Hz  220 mA to 2.2 A 20 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz  330 mA to 2.2 A 10 Hz to 20 Hz  2.2 A to 3 A 10 Hz to 40 Hz  2.2 A to 11 A 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	230 $\mu$ A/A + 39 nA 160 $\mu$ A/A + 31 nA 110 $\mu$ A/A + 31 nA 190 $\mu$ A/A + 100 nA 1000 $\mu$ A/A + 620 nA  0.78 % + 0.47 $\mu$ A  230 $\mu$ A/A + 390 nA 160 $\mu$ A/A + 310 nA 110 $\mu$ A/A + 310 nA 190 $\mu$ A/A + 540 nA 1000 $\mu$ A/A + 4.7 $\mu$ A  0.31 % + 3.1 $\mu$ A  230 $\mu$ A/A + 3.9 $\mu$ A 160 $\mu$ A/A + 3.1 $\mu$ A 110 $\mu$ A/A + 2.3 $\mu$ A 190 $\mu$ A/A + 3.1 $\mu$ A 0.10 % + 9.3 $\mu$ A  0.31 % + 160 $\mu$ A  620 $\mu$ A/A + 31 $\mu$ A  250 $\mu$ A/A + 31 $\mu$ A 390 $\mu$ A/A + 78 $\mu$ A 0.62 % + 160 $\mu$ A  930 $\mu$ A/A + 0.16 mA  0.093 % + 160 $\mu$ A  360 $\mu$ A/A + 0.13 mA 740 $\mu$ A/A + 0.30 mA 0.28 % + 0.58 mA			See Pages 2 and 3



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
AC CURRENT (continued) Other Values (continued)  Calibration of current probes	<p>11 A to 20.5 A 45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 5 kHz</p> <p>10 Hz to 20 Hz: 0.1 mA to 1 mA 1 mA to 3 mA 3 mA to 10 mA 10 mA to 30 mA 30 mA to 300 mA 0.3 A to 1 A 1 A to 2.5 A</p> <p>20 Hz to 45 Hz: 0.1 mA to 1 mA 1 mA to 3 mA 3 mA to 30 mA 30 mA to 300 mA 0.3 A to 1 A 1 A to 2.5 A</p> <p>45 Hz to 1 kHz: 0.1 mA to 1 mA 1 mA to 3 mA 3 mA to 30 mA 30 mA to 300 mA 0.3 A to 1 A</p> <p>45 Hz to 100 Hz 1 A to 3 A 3 A to 10 A 10 A to 20 A</p> <p>45 Hz to 65 Hz 20 A to 30 A 30 A to 150 A 150 A to 300 A 300 A to 1020 A</p> <p>100 Hz to 1 kHz 1 A to 3 A 3 A to 10 A 10 A to 20 A</p>	<p>0.093 % + 1.6 mA 0.12 % + 3.9 mA 2.3 % + 3.9 mA</p> <p>0.13 % + 0.43 <math>\mu</math>A 0.15 % + 0.25 <math>\mu</math>A 0.11 % + 5.0 <math>\mu</math>A 0.14 % + 3.0 <math>\mu</math>A 0.12 % + 48 <math>\mu</math>A 0.15 % + 86 <math>\mu</math>A 0.67 % - 0.50 mA</p> <p>0.078 % + 0.47 <math>\mu</math>A 0.095 % + 0.35 <math>\mu</math>A 0.063 % + 4.4 <math>\mu</math>A 0.063 % + 44 <math>\mu</math>A 0.12 % + 0.40 mA 0.46 % - 0.50 mA</p> <p>0.058 % + 0.50 <math>\mu</math>A 0.075 % + 0.35 <math>\mu</math>A 0.020 % + 5.3 <math>\mu</math>A 0.020 % + 54 <math>\mu</math>A 0.020 % + 0.52 mA</p> <p>0.10 % 0.034 % + 5.1 mA 0.15 % - 6.8 mA</p> <p>0.24 % + 23 mA 0.21 % + 44 mA 0.23 % + 94 mA 0.25 % + 0.19 A</p> <p>0.14 % 0.058 % + 5.2 mA 0.18 % - 7 mA</p>	<p>Using single or multi-turn coils.</p> <p>Single turn coil</p> <p>Single turn coil</p> <p>Single turn coil</p> <p>Single turn coil</p> <p>Multi turn coil</p> <p>Single turn coil</p>	See Pages 2 and 3



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
AC CURRENT (continued)  Calibration of current probes (continued)	<i>65 Hz to 440 Hz</i> 20 A to 30 A 30 A to 150 A 150 A to 300 A 300 A to 1020 A  <i>1 kHz to 5 kHz:</i> 0.1 mA to 1 mA 1 mA to 3 mA 3 mA to 30 mA 30 mA to 300 mA 300 mA to 1 A 1 A to 2.5 A 2.5 A to 20 A	0.58 % + 34 mA 0.63 % + 25 mA 0.64 % + 71 mA 0.64 % + 60 mA  0.13 % + 0.53 $\mu$ A 0.15 % + 0.35 $\mu$ A 0.050 % + 5.0 $\mu$ A 0.077 % + 58 $\mu$ A 0.46 % + 1.0 mA 0.56 % + 0.75 mA 2.3 % + 5.0 mA	Multi turn coil. Not all combinations of current and frequency may be available within these ranges.  Single turn coil	See Pages 2 and 3
Current probe bandwidth	<i>100 kHz to 100 MHz</i> Current ratio 0.7 to 1.1	0.058	Reference frequency 50 kHz to 10 MHz	
AC RESISTANCE  Specific Values	10 m $\Omega$ 1 kHz  100 m $\Omega$ 100 Hz 1 kHz  1 $\Omega$ 1 kHz  10 $\Omega$ 20 Hz to 100 Hz 100 Hz to 1 MHz 1 kHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.37 %  0.030 % 0.030 %  0.0068 %  0.036 % 0.093 % 0.0059 % 0.094 % 0.10 % 0.10 % 0.12 % 0.40 % 0.60 %	For the calibration of meters and standards with 4-terminal pair BNC connectors. Other configurations can be calibrated but the uncertainties may be increased.	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
AC RESISTANCE (continued)  Specific values (continued)	100 $\Omega$ 20 Hz 20 Hz to 100 Hz 100 Hz to 1 MHz 125 Hz 1 kHz 12.5 kHz 48 kHz 96 kHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz  1 k $\Omega$ 20 Hz 20 Hz to 100 Hz 100 Hz to 100 kHz 125 Hz 1 kHz 12.5 kHz 48 kHz 96 kHz 100 kHz 100 kHz to 1 MHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz  10 k $\Omega$ 20 Hz to 100 kHz 100 kHz 100 kHz to 1 MHz 1 MHz  100 k $\Omega$ 20 Hz to 100 kHz 100 kHz 100 kHz to 1 MHz 1 MHz	0.0045 % 0.044 % 0.043 % 0.0043 % 0.0044 % 0.0043 % 0.0047 % 0.0055 % 0.0050 % 0.040 % 0.050 % 0.050 % 0.050 % 0.20 % 0.30 %  0.0050 % 0.049 % 0.033 % 0.0049 % 0.0044 % 0.0043 % 0.0047 % 0.0055 % 0.030 % 0.033 % 0.0045 % 0.030 % 0.030 % 0.040 % 0.050 % 0.20 % 0.30 %  0.023 % 0.020 % 0.032 % 0.030 %  0.088 % 0.0041 % 0.089 % 0.0043 %		See Pages 2 and 3



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
IMPEDANCE			For the calibration of impedance analysers	See Pages 2 and 3
Impedance Magnitude	1 $\Omega$ to 60 k $\Omega$ 1 MHz	39 $\Omega$	Airline with open	
	1.5 k $\Omega$ to 4 k $\Omega$ 10 MHz	3.9 $\Omega$		
	200 $\Omega$ to 430 $\Omega$ 100 MHz	0.38 $\Omega$		
	50 $\Omega$ to 200 $\Omega$ 200 MHz	0.22 $\Omega$		
	50 $\Omega$ to 120 $\Omega$ 300 MHz	0.13 $\Omega$		
	20 $\Omega$ to 50 $\Omega$ 500 MHz	72 m $\Omega$		
	5 $\Omega$ to 20 $\Omega$ 600 MHz	53 m $\Omega$		
	10 $\Omega$ to 30 $\Omega$ 800 MHz	77 m $\Omega$		
	40 $\Omega$ to 90 $\Omega$ 1 GHz	0.24 $\Omega$		
	80 $\Omega$ to 170 $\Omega$ 1.6 GHz	0.62 $\Omega$		
	30 $\Omega$ to 70 $\Omega$ 1.8 GHz	0.25 $\Omega$		
	5 $\Omega$ to 15 $\Omega$ 2 GHz	80 m $\Omega$		
	15 $\Omega$ to 40 $\Omega$ 2.2 GHz	0.18 $\Omega$		
	40 $\Omega$ to 100 $\Omega$ 2.4 GHz	0.53 $\Omega$		
	100 $\Omega$ to 290 $\Omega$ 2.6 GHz	2.1 $\Omega$		
	60 $\Omega$ to 150 $\Omega$ 3 GHz	1.0 $\Omega$		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
Impedance Magnitude (continued)	1 m $\Omega$ to 0.3 $\Omega$ 1 MHz	0.25 m $\Omega$	Airline with short	See Pages 2 and 3
	0.9 $\Omega$ to 2 $\Omega$ 10 MHz	2.2 m $\Omega$		
	10 $\Omega$ to 22 $\Omega$ 100 MHz	23 m $\Omega$		
	20 $\Omega$ to 45 $\Omega$ 200 MHz	53 m $\Omega$		
	35 $\Omega$ to 73 $\Omega$ 300 MHz	87 m $\Omega$		
	80 $\Omega$ to 180 $\Omega$ 500 MHz	0.30 $\Omega$		
	140 $\Omega$ to 310 $\Omega$ 600 MHz	0.72 $\Omega$		
	80 $\Omega$ to 170 $\Omega$ 1 GHz	0.46 $\Omega$		
	20 $\Omega$ to 45 $\Omega$ 1.3 GHz	0.14 $\Omega$		
	9 $\Omega$ to 25 $\Omega$ 1.6 GHz	92 m $\Omega$		
	30 $\Omega$ to 75 $\Omega$ 1.8 GHz	0.28 $\Omega$		
	80 $\Omega$ to 170 $\Omega$ 2 GHz	0.92 $\Omega$		
	130 $\Omega$ to 290 $\Omega$ 2.4 GHz	1.7 $\Omega$		
50 $\Omega$ to 110 $\Omega$ 2.6 GHz	0.58 $\Omega$			
19 $\Omega$ to 42 $\Omega$ 2.8 GHz	0.23 $\Omega$			



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
Impedance Magnitude (continued)	0 $\Omega \pm$ 50 m $\Omega$ 1 MHz 10 MHz	2.5 m $\Omega$ 3.5 m $\Omega$	Short circuit	See Pages 2 and 3
	0 $\Omega \pm$ 0.1 $\Omega$ 100 MHz	14 m $\Omega$		
	0 $\Omega \pm$ 0.2 $\Omega$ 200 MHz 300 MHz	25 m $\Omega$ 30 m $\Omega$		
	0 $\Omega \pm$ 0.5 $\Omega$ 500 MHz and 600 MHz	40 m $\Omega$		
	0 $\Omega \pm$ 1 $\Omega$ 800 MHz and 1 GHz 1.3 GHz, 1.6 GHz and 1.8 GHz	50 m $\Omega$ 0.10 $\Omega$		
	0 $\Omega \pm$ 2 $\Omega$ 2 GHz, 2.2 GHz, 2.4 GHz, 2.6 GHz, 2.8 GHz and 3 GHz	0.20 $\Omega$		
	50 $\Omega$ termination 1 kHz 1 MHz 10 MHz 100 MHz 200 MHz and 300 MHz 500 MHz 600 MHz 800 MHz 1 GHz 1.3 GHz 1.6 GHz 1.8 GHz 2 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.8 GHz 3 GHz	81 m $\Omega$ 81 m $\Omega$ 79 m $\Omega$ 77 m $\Omega$ 0.12 $\Omega$ 0.16 $\Omega$ 0.21 $\Omega$ 0.22 $\Omega$ 0.25 $\Omega$ 0.30 $\Omega$ 0.35 $\Omega$ 0.36 $\Omega$ 0.50 $\Omega$ 0.49 $\Omega$ 0.47 $\Omega$ 0.43 $\Omega$ 0.41 $\Omega$ 0.42 $\Omega$		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
IMPEDANCE (continued) Impedance phase angle	+90° and -90° 1 MHz, 10 MHz and 100 MHz 200 MHz and 300 MHz 500 MHz 600 MHz 800 MHz 1 GHz 1.6 GHz 1.8 GHz 2 GHz 2.2 GHz 2.4 GHz 2.6 GHz and 3 GHz	1.7 mrad 2.1 mrad 3.1 mrad 5.4 mrad 5.6 mrad 5.4 mrad 7.2 mrad 7.4 mrad 12 mrad 11 mrad 10 mrad 14 mrad	Using airline and open-circuit	See Pages 2 and 3
	+90° and -90° 1 MHz and 10 MHz 100 MHz 200 MHz and 300 MHz 500 MHz 600 MHz 1 GHz 1.3 GHz 1.6 GHz 1.8 GHz 2 GHz 2.4 GHz, 2.6 GHz and 2.8 GHz	2.1 mrad 2.2 mrad 2.4 mrad 3.4 mrad 4.6 mrad 5.2 mrad 6.2 mrad 8.3 mrad 7.5 mrad 10 mrad 11 mrad	Using airline and short-circuit	
	0° ± 2.5° 1 kHz, 1 MHz and 10 MHz 100 MHz 200 MHz and 300 MHz 500 MHz 600 MHz 800 MHz	1.5 mrad 1.4 mrad 2.2 mrad 3.2 mrad 4.1 mrad 4.4 mrad	Using 50 Ω resistive termination.	
	0° ± 5° 1 GHz 1.3 GHz 1.6 GHz 1.8 GHz 2 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.8 GHz 3 GHz	5.0 mrad 6.0 mrad 6.9 mrad 7.3 mrad 10 mrad 9.8 mrad 9.3 mrad 8.7 mrad 8.2 mrad 8.3 mrad		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location	
Admittance magnitude	1 $\mu$ S to 12 $\mu$ S 1 MHz	0.18 $\mu$ S	Referenced to open circuit	See Pages 2 and 3	
	29 $\mu$ S to 70 $\mu$ S 10 MHz	0.23 $\mu$ S			
	0.36 mS to 7.7 mS 100 MHz	2.2 $\mu$ S			
	0.74 mS to 1.6 mS 200 MHz	6.9 $\mu$ S			
	1 mS to 2.4 mS 300 MHz	10 $\mu$ S			
	1.8 mS to 3.9 mS 500 MHz	17 $\mu$ S			
	1 $\mu$ S to 12 $\mu$ S 1 MHz	0.18 $\mu$ S			
	2.1 mS to 4.7 mS 600 MHz	20 $\mu$ S			
	3 mS to 6.2 mS 800 MHz	27 $\mu$ S			
	3.7 mS to 7.8 mS 1 GHz	33 $\mu$ S			
	4 mS to 11 mS 1.3 GHz	43 $\mu$ S			
	6 mS to 13 mS 1.6 GHz	60 $\mu$ S			
	6 mS to 15 mS 1.8 GHz	68 $\mu$ S			
	7 mS to 16 mS 2 GHz	85 $\mu$ S			
	8 mS to 18 mS 2.2 GHz	95 $\mu$ S			
	9 mS to 20 mS 2.4 GHz	0.11 mS			
	10 mS to 22 mS 2.6 GHz	0.13 mS			
	11 mS to 24 mS 2.8 GHz	0.14 mS			
	12 mS to 26 mS 3 GHz	0.16 mS			
CAPACITANCE	1 pF	7.7 %			For the calibration of meters and standards with 4-terminal pair BNC connectors. Other configurations can be calibrated but the uncertainties may be increased.
	20 Hz to 100 Hz	5.2 %			
	100 Hz to 1 kHz	0.26 %			
	1 kHz to 1 MHz	0.26 %			
	1 MHz	0.033 %			
	2 MHz	0.039 %			
	3 MHz	0.052 %			
	4 MHz	0.070 %			
	5 MHz	0.091 %			
	10 MHz	0.25 %			
	13 MHz	0.37 %			



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CAPACITANCE (continued)	10 pF			See Pages 2 and 3	
	20 Hz to 100 Hz	5.8 %			
	100 Hz to 1 kHz	0.53 %			
	1 kHz	0.020 %			
	12.5 kHz	0.019 %			
	48 kHz, 96 kHz, 100 kHz and 300 kHz	0.018 %			
	500 kHz	0.018 %			
	1 kHz to 1 MHz	0.023 %			
	1 MHz	0.018 %			
	2 MHz	0.018 %			
	3 MHz and 4 MHz	0.018 %			
	5 MHz	0.019 %			
	10 MHz	0.022 %			
	13 MHz	0.024 %			
	100 pF				
	20 Hz to 100 Hz	0.85 %			
	100 Hz to 1 kHz	0.046 %			
	1 kHz	0.014 %			
	1 kHz to 1 MHz	0.014 %			
	1 MHz	0.014 %			
	2 MHz	0.014 %			
	3 MHz	0.015 %			
	4 MHz	0.016 %			
	5 MHz	0.020 %			
	10 MHz	0.036 %			
	13 MHz	0.051 %			
	1000 pF				
	20 Hz to 100 Hz	0.084 %			
	100 Hz to 1 kHz	0.075 %			
	125 Hz	0.018 %			
	1 kHz	0.014 %			
	10 kHz	0.020 %			
	12.5 kHz	0.015 %			
	48 kHz	0.014 %			
	96 kHz	0.015 %			
	100 kHz	0.020 %			
300 kHz	0.016 %				
500 kHz	0.019 %				
1 kHz to 1 MHz	0.076 %				
1 MHz	0.015 %				
2 MHz	0.020 %				
3 MHz	0.031 %				
4 MHz	0.046 %				
5 MHz	0.064 %				
10 MHz	0.19 %				
13 MHz	0.28 %				



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CAPACITANCE (continued)	10 nF			See Pages 2 and 3
	100 Hz	0.0097 %		
	120 Hz	0.0097 %		
	1 kHz	0.0095 %		
	10 kHz	0.0096 %		
	100 kHz	0.0097 %		
	100 nF			
	100 Hz	0.0093 %		
	120 Hz	0.0093 %		
	1 kHz	0.0094 %		
	10 kHz	0.0094 %		
	100 kHz	0.0094 %		
	1 $\mu$ F			
	100 Hz	0.0097 %		
	120 Hz	0.0097 %		
	1 kHz	0.0093 %		
	10 kHz	0.0093 %		
	100 kHz	0.012 %		
	10 $\mu$ F			
	20 Hz to 120 Hz	0.012 %		
20 Hz	0.017 %			
100 Hz	0.011 %			
120 Hz	0.011 %			
1 kHz	0.011 %			
10 kHz	0.019 %			
100 kHz	0.071 %			



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CAPACITANCE (continued) Measurement	<p><i>At 1 kHz:</i> 100 pF to 200 pF 200 pF to 400 pF 400 pF to 1 nF 1 nF to 20 nF 20 mF to 500 nF</p> <p><i>At 100 Hz:</i> 500 nF to 4 <math>\mu</math>F 4 <math>\mu</math>F to 10 <math>\mu</math>F 10 <math>\mu</math>F to 50 <math>\mu</math>F</p> <p><i>At 50 Hz:</i> 50 <math>\mu</math>F to 100 <math>\mu</math>F 100 <math>\mu</math>F to 200 <math>\mu</math>F</p> <p>200 <math>\mu</math>F to 300 <math>\mu</math>F 300 <math>\mu</math>F to 400 <math>\mu</math>F 400 <math>\mu</math>F to 600 <math>\mu</math>F 600 <math>\mu</math>F to 1 mF 1 mF to 20 mF 20 mF to 40 mF 40 mF to 90 mF 90 mF to 100 mF 100 mF to 110 mF</p>	<p>0.097 % + 0.13 pF 0.098 % + 0.12 pF 0.092 % + 0.15 pF 0.093 %</p> <p>0.093 % 0.094 % + 40 pF 0.11 % - 1.8 nF</p> <p>0.16 % 0.28 % - 60 nF</p> <p>0.020 % 0.017 % 0.015 % 0.014 % 0.013 % 0.012 % 0.013 % 0.014 % 0.013 %</p>	<p>Measurement by capacitance meter.</p> <p>Capacitance calculated from measured voltage and time after application of a known direct current (<math>\Delta V / \Delta T</math> method).</p>	See Pages 2 and 3
Generation	0 pF	0.53 pF	For calibration of the capacitance function on digital multimeters (open circuit input). The quoted uncertainty may be increased depending on the resolution of the meter on the particular range selected.	
	<p><i>At 10 MHz:</i> 5 pF 29 pF 49 pF</p>	<p>0.12 pF 0.41 pF 0.66 pF</p>	For calibration of the capacitance measurement function of oscilloscope calibrators, using two-terminal transfer standard capacitors.	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
CAPACITANCE (continued) Generation (continued)				See Pages 2 and 3
Other values	0.19 nF to 3.3 nF 3.3 nF to 11 nF 11 nF to 33 nF 33 nF to 110 nF 110 nF to 330 nF 0.33 $\mu$ F to 1.1 $\mu$ F 1.1 $\mu$ F to 3.3 $\mu$ F 3.3 $\mu$ F to 11 $\mu$ F 11 $\mu$ F to 33 $\mu$ F 33 $\mu$ F to 110 $\mu$ F 110 $\mu$ F to 330 $\mu$ F 0.33 mF to 1.1 mF 1.1 mF to 3.3 mF 3.3 mF to 11 mF 11 mF to 33 mF 33 mF to 110 mF	0.39 % + 0.0078 nF 0.20 % + 0.0078 nF 0.19 % + 0.078 nF 0.19 % + 0.078 nF 0.19 % + 0.23 nF 0.19 % + 0.78 nF 0.19 % + 2.3 nF 0.19 % + 7.8 nF 0.31 % + 23 nF 0.35 % + 78 nF 0.35 % + 230 nF 0.35 % + 0.78 $\mu$ F 0.35 % + 2.3 $\mu$ F 0.35 % + 7.8 $\mu$ F 0.58 % + 23 $\mu$ F 0.85 % + 78 $\mu$ F	The CMCs apply to the capacitance ranges of digital multimeters that use current charge/discharge time to calculate the applied capacitance.	
DISSIPATION FACTOR	D (tan $\delta$ ) values between 0 and 0.01 at the following nominal values of capacitance:  1 pF 1 kHz to 1 MHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	  0.0024 0.000069 0.00010 0.00041 0.00042 0.00023 0.00058 0.00084	For the calibration of meters and standards with 4-terminal pair BNC connectors. Other configurations can be calibrated but the uncertainties may be increased.	



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Issue No: 098 Issue date: February 2026

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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
DISSIPATION FACTOR (continued)	D (tan $\delta$ ) values between 0 and 0.01 at the following nominal values of capacitance:		For the calibration of meters and standards with 4-terminal pair BNC connectors. Other configurations can be calibrated but the uncertainties may be increased.	See Pages 2 and 3
	10 pF 1 kHz 12.5 kHz 48 kHz 96 kHz 100 kHz 300 kHz 500 kHz 1 kHz to 1 MHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.000071 0.000061 0.000061 0.000061 0.000061 0.000061 0.000061 0.000061 0.00024 0.000061 0.000061 0.00011 0.00011 0.000067 0.00012 0.00013		
	100 pF 100 Hz to 1 kHz 1 kHz 12.5 kHz 48 kHz 96 kHz 100 kHz 300 kHz 500 kHz 1 kHz to 1 MHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.00043 0.000061 0.000061 0.000061 0.000061 0.000061 0.000061 0.000061 0.000061 0.000086 0.000061 0.000061 0.000089 0.000097 0.000087 0.00018 0.00025		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
DISSIPATION FACTOR (continued)	D (tan $\delta$ ) values between 0 and 0.01 at the following nominal values of capacitance:		For the calibration of meters and standards with 4-terminal pair BNC connectors. Other configurations can be calibrated but the uncertainties may be increased.	See Pages 2 and 3
	1000 pF	0.00031		
	20 Hz	0.00054		
	20 Hz to 100 Hz	0.00046		
	100 Hz to 1 kHz	0.00077		
	125 Hz	0.00061		
	1 kHz	0.00065		
	10 kHz	0.00065		
	12.5 kHz	0.00065		
	48 kHz	0.00065		
	96 kHz	0.00065		
	100 kHz	0.00065		
	300 kHz	0.00065		
	500 kHz	0.00065		
	1 kHz to 1 MHz	0.00085		
	1 MHz	0.00065		
	2 MHz	0.00083		
	3 MHz	0.00013		
	4 MHz	0.00017		
	5 MHz	0.00022		
	10 MHz	0.00059		
	13 MHz	0.00085		
	10 nF			
	100 Hz	0.00062		
	120 Hz	0.00062		
	1 kHz	0.00061		
	10 kHz	0.00061		
	100 kHz	0.00061		
	100 nF			
	100 Hz	0.00065		
	120 Hz	0.00065		
	1 kHz	0.00061		
	10 kHz	0.00061		
	100 kHz	0.00065		
	1 $\mu$ F			
	100 Hz	0.00071		
	120 Hz	0.00071		
	1 kHz	0.00061		
	10 kHz	0.00065		
	100 kHz	0.00080		
	10 $\mu$ F			
	20 Hz	0.00073		
	100 Hz	0.00070		
	120 Hz	0.00070		
	1 kHz	0.00065		
	10 kHz	0.00029		
	100 kHz	0.00070		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location	
<b>TEMPERATURE SIMULATION</b>					
Sensor Type					
TC Type J	23 °C nominal	0.050 °C	For calibration of Fluke 55xx series internal temperature reference.	See Pages 2 and 3	
TC Type J	-210 °C to -100 °C -100 °C to -30 °C -30 °C to +150 °C 150 °C to 760 °C 760 °C to 1200 °C	0.22 °C 0.14 °C 0.12 °C 0.14 °C 0.19 °C	For the calibration of temperature indicators, including cold junction compensation, using a multifunction calibrator.		
TC Type K	-200 °C to -100 °C -100 °C to -25 °C -25 °C to +120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.26 °C 0.15 °C 0.14 °C 0.21 °C 0.32 °C	For the calibration of temperature indicators, including cold junction compensation, using a multifunction calibrator.		
Pt 385, 100 Ω	-200 °C to -80 °C	0.039 °C	For the calibration of temperature indicators, using a multifunction calibrator.		
Pt 385, 100 Ω	-80 °C to 0 °C	0.039 °C			
Pt 385, 100 Ω	0 °C to 100 °C	0.055 °C			
Pt 385, 100 Ω	100 °C to 300 °C	0.070 °C			
Pt 385, 100 Ω	300 °C to 400 °C	0.078 °C			
Pt 385, 100 Ω	400 °C to 630 °C	0.093 °C			
Pt 385, 100 Ω	630 °C to 800 °C	0.18 °C			
Pt 3926, 100 Ω	-200 °C to -80 °C	0.039 °C	For the calibration of temperature indicators, using a multifunction calibrator.		
Pt 3926, 100 Ω	-80 °C to 0 °C	0.039 °C			
Pt 3926, 100 Ω	0 °C to 100 °C	0.055 °C			
Pt 3926, 100 Ω	100 °C to 300 °C	0.070 °C			
Pt 3926, 100 Ω	300 °C to 400 °C	0.078 °C			
Pt 3926, 100 Ω	400 °C to 630 °C	0.093 °C			
<b>DISTORTION</b>					
	From 20 Hz to 20 kHz 0 % to 0.1 % distortion factor	12 % of reading	Normally for residual distortion of audio analysers, where tested.		
	0.1 % to 10 % distortion factor	13 % of reading			
	From 20 kHz to 100 kHz 0 % to 0.1 % distortion factor	25 % of reading			
	0.1 % to 10 % distortion factor	25 % of reading			



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location
FREQUENCY				See Pages 2 and 3
Specific Values	1 MHz, offsets <math>2 \times 10^{-10}</math> 5 MHz, offsets <math>2 \times 10^{-10}</math> 10 MHz, offsets <math>2 \times 10^{-10}</math>	$1.1 \times 10^{-12}$ $1.1 \times 10^{-12}$ to $1.6 \times 10^{-12}$ $1.1 \times 10^{-12}$ to $2.5 \times 10^{-12}$	Direct comparison against Cs standard. If the offset from nominal is >math>2 \times 10^{-10}</math> then the quoted uncertainty may be increased.	
Other Values	0.1 Hz to 500 MHz 500 MHz to 1 GHz 1 GHz to 11 GHz 11 GHz to 50 GHz	6.0 in $10^{11} + 0.020$ nHz $1.1 \times 10^{-10}$ to $5.5 \times 10^{-10}$ $1.0 \times 10^{-11}$ to $5.5 \times 10^{-11}$ $2.8 \times 10^{-12}$ to $9.2 \times 10^{-12}$	Using frequency counter or signal analyser.	
PULSE CHARACTERISTICS			Using high speed oscilloscope.	
Aberrations	0.1 % to 30 % of pulse amplitude	0.0325 x aberration, expressed as percentage of amplitude.		
Pulse amplitude	25 mV to 100 mV 100 mV to 200 mV 200 mV to 400 mV 400 mV to 750 mV 750 mV to 10 V 10 V to 70 V	3.2 mV 4.0 mV 5.4 mV 7.8 mV 1.5 % to 2.0 % 1.5 %		
Period	20 ps to 66 ps 66 ps to 100 ms 100 ms to 1 s 1 s to 10 s	1.3 ps to 2.0 ps 0.64 ns/s 0.64 ns/s to 0.74 ns/s 0.74 ns/s to 1.1 ns/s	For repetitive sine wave and pulsed waveforms.	
Pulse width and transition time	20 ps to 100 ps 100 ps to 700 ps 700 ps to 3.8 ns 3.8 ns to 250 ns 250 ns to 100 ms	1.3 ps to 2.0 ps 1.1 % + 0.90 ps 8.5 ps 0.10 % + 8.5 ps 0.27 ns		
Pulse width	100 ms to 1 s 1 s to 10 s	0.50 ns/s + 0.18 ns 0.63 ns/s		
Jitter	0.5 ps to 140 ps	0.031 ps rms to 2.0 ps rms	For repetitive sine wave and pulsed waveforms. The capability is for measuring instruments (e.g. oscilloscopes). Pulse generators may also be calibrated over the frequency range 200 kHz to 15 GHz.	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location																																	
<p>MODULATION</p> <p>Two systems are in place for modulation measurements</p> <p>System 1 is based on a modulation analyser and associated equipment; it covers amplitude modulation and frequency modulation.</p> <p>System 2 is based on a PXA (performance signal analyser). It covers amplitude modulation, frequency modulation, phase modulation and digital modulation.</p>				See Pages 2 and 3																																	
<p>MODULATION: System 1</p> <p>AMPLITUDE MODULATION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Carrier Frequency</th> <th>Rate</th> <th>AM Depth</th> <th></th> </tr> </thead> <tbody> <tr> <td rowspan="2">150 kHz to 10MHz</td> <td>50 Hz to 10 kHz</td> <td>40 % to 99 % 5 % to 40%</td> <td>2.0 % of rdg. + 0.10% AM 2.0 % of rdg. + 0.010% AM</td> </tr> <tr> <td>20 Hz to 50 kHz</td> <td>40 % to 99% 0 % to 40 %</td> <td>3.0 % of rdg. + 0.10% AM 3.0 % of rdg. + 0.010% AM</td> </tr> <tr> <td rowspan="3">10 MHz to 1.3 GHz</td> <td>50 Hz to 50 kHz</td> <td>40 to 99% 5 % to 40 %</td> <td>1.0 % of rdg. + 0.10% AM 1.0 % of rdg. + 0.010% AM</td> </tr> <tr> <td>20 Hz to 50 Hz and 50 kHz to 100 kHz</td> <td>40 % to 99 %  0 % to 40 %</td> <td>3.0 % of rdg. + 0.10% AM  3.0 % of rdg. + 0.010% AM</td> </tr> <tr> <td>1.3 GHz to 26.5 GHz</td> <td>50 Hz to 50 kHz</td> <td>40 % to 99 % 5 % to 40 %</td> <td>1.5 % of rdg. + 0.10% AM 1.5 % of rdg. + 0.010% AM</td> </tr> <tr> <td>10 MHz to 26.5 GHz</td> <td>20 Hz to 100 kHz</td> <td>40 % to 99 % 0 % to 40%</td> <td>3.0 % of rdg. + 0.10% AM 3.0 % of rdg. + 0.010% AM</td> </tr> </tbody> </table> <p>The uncertainties are with respect to the modulation depth and are appropriate for signals with harmonic distortion not exceeding -40 dBc. The uncertainties may be increased for higher levels of distortion at modulation depths less than 30%.</p>					Carrier Frequency	Rate	AM Depth		150 kHz to 10MHz	50 Hz to 10 kHz	40 % to 99 % 5 % to 40%	2.0 % of rdg. + 0.10% AM 2.0 % of rdg. + 0.010% AM	20 Hz to 50 kHz	40 % to 99% 0 % to 40 %	3.0 % of rdg. + 0.10% AM 3.0 % of rdg. + 0.010% AM	10 MHz to 1.3 GHz	50 Hz to 50 kHz	40 to 99% 5 % to 40 %	1.0 % of rdg. + 0.10% AM 1.0 % of rdg. + 0.010% AM	20 Hz to 50 Hz and 50 kHz to 100 kHz	40 % to 99 %  0 % to 40 %	3.0 % of rdg. + 0.10% AM  3.0 % of rdg. + 0.010% AM	1.3 GHz to 26.5 GHz	50 Hz to 50 kHz	40 % to 99 % 5 % to 40 %	1.5 % of rdg. + 0.10% AM 1.5 % of rdg. + 0.010% AM	10 MHz to 26.5 GHz	20 Hz to 100 kHz	40 % to 99 % 0 % to 40%	3.0 % of rdg. + 0.10% AM 3.0 % of rdg. + 0.010% AM							
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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location	
MODULATION: System 1 (continued)					
FREQUENCY MODULATION					
Carrier Frequency	Rate	FM deviation	Uncertainty	See Pages 2 and 3	
150 kHz to 10 MHz	20 Hz to 10 kHz	4 kHz to 40 kHz 0 kHz to 4 kHz	1.9 % + 10 Hz 1.9 % + 1.0 Hz		
10 MHz to 1.3 GHz	50 Hz to 100 kHz	40 kHz to 400 kHz 4 kHz to 40 kHz 0 kHz to 4 kHz	1.0 % + 100 Hz 1.0 % + 10 Hz 1.0 % + 1.0 Hz		
10 MHz to 26.5 GHz	20 Hz to 50 Hz and 100 kHz to 200 kHz	40 kHz to 400 kHz 4 kHz to 40 kHz 0 kHz to 4 kHz	4.8 % + 100 Hz 4.8 % + 10 Hz 4.8 % + 1.0 Hz		
	50 Hz to 100 kHz	40 kHz to 400 kHz 4 kHz to 40 kHz 0 kHz to 4 kHz	1.0 % + 100 Hz 1.0 % + 10 Hz 1.0 % + 1.0 Hz		
	20 Hz to 200 kHz	40 kHz to 400 kHz 4 kHz to 40 kHz 0 kHz to 4 kHz	4.8% + 100 Hz 4.8% + 10 Hz 4.8% + 1.0 Hz		
8901/2 FM calibrator					
Peak Deviation	Rate	Uncertainty			
34 kHz	10 kHz	0.050 %			
8901/2 FM Accuracy					
Peak Deviation	Rate	8901/2 IF Setting	Uncertainty		
100 kHz	50 kHz	1.5 MHz	0.12 kHz		
100 kHz	100 kHz	1.5 MHz	0.17 kHz		
100 kHz	50 Hz	1.5 MHz	0.14 kHz		
100 kHz	20 Hz	1.5 MHz	0.14 kHz		
10 kHz	20 Hz	455 kHz	36 Hz		
10 kHz	10 kHz	455 kHz	18 Hz		

Measured via 11793A



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
MODULATION: System 2  AMPLITUDE MODULATION   FREQUENCY MODULATION   PHASE MODULATION	$f_c$ 2 MHz to 50 GHz $f_m$ 10 Hz to 100 kHz 5 % to 95 %  $f_c$ 2 MHz to 3.5 GHz $f_m$ 20 Hz to 200 kHz 200 Hz to 400 kHz  0.2 rad to 1 rad $f_m$ 50 Hz to 50 kHz  $f_c$ 100 kHz to 3.6 GHz $f_c$ 3.6 GHz to 17.1 GHz $f_c$ 17.1 GHz to 34.5 GHz $f_c$ 34.5 GHz to 50 GHz  1 rad to 10 rad $f_m$ 50 Hz to 50 kHz  $f_c$ 100 kHz to 3.6 GHz $f_c$ 3.6 GHz to 17.1 GHz $f_c$ 17.1 GHz to 34.5 GHz $f_c$ 34.5 GHz to 50 GHz	0.028 % to 0.35 %   0.35 % of reading + 0.20 % of modulation rate   0.10 % + 0.0010 rad 0.10 % + 0.0020 rad 0.10 % + 0.0025 rad 0.10 % + 0.0049 rad   0.0081 % + 0.0020 rad 0.015 % + 0.0030 rad 0.020 % + 0.0035 rad 0.058 % + 0.0058 rad	Using signal analyser          Derived from FM measurements	See Pages 2 and 3
Frequency Response	Deviation 1 rad 100 Hz to 100 kHz  Deviation 4 rad 80 Hz to 100 kHz	0.14 dB to 0.51 dB   0.057 dB		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
RESIDUAL FM	$f_c$ 250 kHz to 6 GHz 0.01 Hz to 0.1 Hz 0.1 Hz to 0.5 Hz 0.5 Hz to 5 Hz 5 Hz to 500 Hz  $f_c$ 3.6 GHz to 6 GHz 0.01 Hz to 0.1 Hz 0.1 Hz to 15 Hz 15 Hz to 500 Hz  $f_c$ 6 GHz to 8.4 GHz 15 Hz to 500 Hz  $f_c$ 8.4 GHz to 13.6 GHz 17 Hz to 500 Hz  $f_c$ 13.6 GHz to 17.1 GHz 18 Hz to 500 Hz  $f_c$ 17.1 GHz to 26.5 GHz 20 Hz to 500 Hz  $f_c$ 26.5 GHz to 34.5 GHz 23 Hz to 500 Hz  $f_c$ 34.5 GHz to 50 GHz 27 Hz to 500 Hz	5.8 mHz 0.88 % + 4.8 mHz 3.0 % 0.12 Hz  8.0 % + 4.5 mHz 12 % 0.31 Hz  0.31 Hz  0.34 Hz  0.36 Hz  0.40 Hz  0.46 Hz  0.54 Hz	Using signal analyser or measuring receiver.	See Pages 2 and 3



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
DIGITAL MODULATION <u>Coding Scheme</u>				See Pages 2 and 3
GSM EDGE	800 MHz to 1900 MHz EDGE: residual EVM (rms) 0 % to 1.5 %	0.015 %		
	GMSK: rms residual phase error 0° to 1°	0.010°		
	GMSK: peak residual phase error 0° to 3°	0.12°		
CDMA2000, IS95, 1xEV-DO	800 MHz to 2100 MHz Residual EVM, 0 % to 2 %	0.023 %		
W-CDMA	1800 MHz to 2200 MHz Residual EVM, 0 % to 1.5 %	0.025 %		
QPSK	Residual EVM 0 % to 2.5 % 1 GHz to 3 GHz 3 GHz to 6 GHz	0.35 % 0.50 %	Using E4448A	
	0.5 GHz to 6 GHz 6 GHz to 32 GHz 32 GHz to 44 GHz	0.010 % to 0.045 % 0.050 % 0.065 %	Using N9030A	
BPSK	Residual EVM 0 % to 1.4 % 0.5 GHz to 3 GHz 3 GHz to 32 GHz 32 GHz to 44 GHz	0.020 % 0.055 % 0.070 %	Using N9030A	
$\pi/4$ DQPSK	1 GHz to 6 GHz Residual EVM, 0 % to 2.5 %	0.025 % to 0.11 %		
16, 64 and 256 QAM	Residual EVM 0 % to 2.5 % 1 GHz to 6 GHz 6 GHz to 32 GHz 32 GHz to 44 GHz	0.015 % to 0.15 % 0.030 % 0.045 %		
2FSK (including DECT)	1 GHz to 6 GHz Shift error or frequency deviation 0 kHz to 10 kHz	120 Hz		
NADC	750 MHz to 950 MHz Residual EVM 0 % to 2 %	0.042 %		



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DIGITAL MODULATION (continued)					
<u>Coding Scheme</u>					
PDC	810 MHz to 1501 MHz Residual EVM 0 % to 2 %	0.055 %		See Pages 2 and 3	
PHS	1800 MHz to 2000 MHz Residual EVM 0 % to 2 %	0.035%			
TETRA	350 MHz to 1000 MHz Residual EVM 0 % to 2 %	0.044%			
MODULATION DISTORTION					
Amplitude Modulation Carrier frequency 500 kHz to 50 GHz	0.01 % to 0.3 %	0.0020 % to 0.0040 %			
	0.3 % to 15 %	1.1 % of measured distortion			
Frequency Modulation and Phase Modulation Carrier frequency 1 MHz to 50 GHz	0.01 % to 15 %	2.3 % of measured distortion			
RF POWER					
Reference sources					
Output power	1 mW, 50 MHz	0.22 %	For sources with female Type-N connectors.		
Source reflection coefficient	0 to 0.1	0.012	Where the output reflection phase is known to be $0^\circ \pm 40^\circ$ or $180^\circ \pm 40^\circ$ .		
For the calibration of sources and receivers.	2 MHz to 26.5 GHz: 0 dBm to -50 dBm -50 dBm to -90 dBm -90 dBm to -127 dBm	0.15 dB 0.25 dB 0.35 dB	For EMC receivers the results may also be presented in terms of dB $\mu$ V in a 50 $\Omega$ system.		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )		Remarks	Location					
<p>The following <i>Calibration and Measurement Capabilities</i> are for the calibration of 50 <math>\Omega</math> RF power sources fitted with Type N, APC-2.4, APC-3.5 or 1.85 mm coaxial connectors. The uncertainties are for the measurement of sources with an output VSWR of 1.2:1 or less (up to 26.5 GHz) or 1.6:1 or less (26.5 GHz to 67 GHz), with connectors that are in good condition. Instruments that are not well matched, fitted with different connectors to those shown, or which have connectors that are in poor condition will be assigned larger uncertainties. 75 <math>\Omega</math> RF power sources may also be calibrated, with the same uncertainties, subject to an upper frequency limit of 3 GHz. The uncertainties are expressed in dB terms.</p>										
Frequency	-130 dBm to -110 dBm	-110 dBm to -90 dBm	-90 dBm to -30 dBm	-30 dBm to -10 dBm	-10 dBm to -3 dBm	-3 dBm to +3 dBm	+3 dBm to +14 dBm	+14 dBm to +20 dBm	+20 dBm to +25 dBm	+25 dBm to +35 dBm
900 Hz to 9 kHz				0.044	0.044	0.027	0.032	0.043		
9 kHz to 100 kHz	0.17	0.16	0.16	0.044	0.044	0.027	0.032	0.32	0.034	0.036
100 kHz to 10 MHz	0.071	0.054	0.045	0.043	0.042	0.027	0.032	0.032	0.034	0.037
10 MHz to 100 MHz	0.068	0.050	0.040	0.038	0.037	0.027	0.029	0.032	0.034	0.036
0.1 GHz to 4 GHz	0.067	0.049	0.039	0.036	0.035	0.024	0.027	0.037	0.038	0.041
4 GHz to 8 GHz	0.068	0.050	0.040	0.038	0.037	0.027	0.032	0.039	0.041	0.043
8 GHz to 18 GHz	0.071	0.053	0.043	0.040	0.039	0.029	0.035	0.038	0.040	0.042
18 GHz to 24 GHz	0.076	0.069	0.050	0.048	0.047	0.031	0.044	0.053	0.061	0.063
24 GHz to 40 GHz	0.11	0.10	0.091	0.069	0.069	0.059	0.061	0.068	0.069	0.076
40 GHz to 50 GHz	0.10	0.098	0.085	0.083	0.083	0.079	0.081	0.086	0.11	0.11
50 GHz to 60 GHz	0.13	0.12	0.10	0.099	0.099	0.093	0.094	0.099		
60 GHz to 67 GHz	0.22	0.22	0.21	0.099	0.099	0.093	0.094	0.099		
67 GHz to 80 GHz				0.31 dB	0.31 dB	0.30 dB	0.31 dB	0.31 dB		
80 GHz to 90 GHz				0.35 dB	0.35 dB	0.35 dB	0.35 dB	0.35 dB		
90 GHz to 100 GHz				0.32 dB	0.32 dB	0.32 dB	0.32 dB	0.32 dB		
100 GHz to 110 GHz				0.31 dB	0.31 dB	0.30 dB	0.30 dB	0.31 dB		
50 MHz	0.066	0.048	0.037	0.034	0.032	0.020	0.027	0.023	0.024	0.029



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
CALIBRATION OF RF POWER SOURCES (continued)				See Pages 2 and 3
<p>The following <i>Calibration and Measurement Capabilities</i> are for the calibration of the output power linearity of signal sources at a given frequency, where the VRC of the source remains constant over the power range concerned. In cases where the source VRC is not constant the quoted uncertainties may be increased.</p> <p>The CMCs apply to calibration of 50 <math>\Omega</math> RF power sources fitted with Type N, APC-2.4, APC-3.5 or 1.85 mm coaxial connectors that are in good condition. They also apply to 75 <math>\Omega</math> RF power sources fitted with Type N connectors but only over the frequency range 100 kHz to 3 GHz. Instruments fitted with different connectors to those shown, or which have connectors that are in poor condition, will be assigned larger uncertainties.</p>				
Relative RF Power	<p><b>900Hz to 9 kHz</b> -40 dB to -35 dB -35 dB to -30 dB -30 dB to -3 dB -3 dB to +3 dB +3 dB to +10 dB +10 dB to +30 dB</p> <p><b>9 kHz to 50 GHz</b> -130 dB to -110 dB -110 dB to -100 dB -100 dB to -90 dB -90 dB to -70 dB -70 dB to -50 dB -50 dB to -30 dB -30 dB to -10 dB -10 dB to -5 dB -5 dB to +5 dB +5 dB to +10 dB +10 dB to +20 dB +20 dB to +30 dB</p> <p><b>50 GHz to 67 GHz</b> -130 dB to -120 dB -120 dB to -80 dB -80 dB to -70 dB -70 dB to -60 dB -60 dB to -50 dB -50 dB to -40 dB -40 dB to -35 dB -35 dB to -30 dB -30 dB to -3 dB -3 dB to +3 dB +3 dB to +10 dB +10 dB to +30 dB</p>	<p>0.14 dB 0.051 dB 0.026 dB 0.0061 dB 0.014 dB 0.023 dB</p> <p>0.17 dB See below 0.044 dB 0.034 dB 0.029 dB 0.018 dB 0.0092 dB 0.0065 dB 0.0022 dB 0.0065 dB 0.092 dB 0.026 dB</p> <p>0.22 dB 0.17 dB 0.21 dB 0.050 dB 0.033 dB 0.025 dB 0.021 dB 0.019 dB 0.0056 dB 0.0022 dB 0.014 dB 0.023 dB</p>	With respect to reference power levels between -36 dBm and +11 dBm.	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
Relative RF Power (continued)	67 GHz to 110 GHz -40 dB to -35 dB -35 dB to -30 dB -30 dB to -3 dB -3 dB to +3 dB +3 dB to +10 dB +10 dB to +30 dB  -110 dB to -100 dB 9 kHz to 100 kHz 100 kHz to 3.6 GHz 3.6 GHz to 30 GHz 30 GHz to 50 GHz	0.18 dB 0.063 dB 0.026 dB 0.0061 dB 0.014 dB 0.023 dB  0.064 dB 0.050 dB 0.070 dB 0.074 dB		See Pages 2 and 3



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location			
RELATIVE RF POWER (continued)	At 30.6 MHz, 49.6 MHz and 99.6 MHz		For dynamic accuracy of vector network analysers with reference to power levels as shown below.  Two tone method for dynamic accuracy of vector network analysers with reference to a power level between 10 dBm and -20 dBm from 1 MHz to 2 GHz.	See Pages 2 and 3			
	Power dBm	Reference power					
		-20 dBm			-35 dBm	-55 dBm	-80dBm
	-80					0.013 dB	
	-80 to -75					0.0072 dB	0.0077 dB
	-75 to -70					0.0054 dB	0.0079 dB
	-70 to -65					0.0043 dB	0.0094 dB
	-65 to -60				0.013 dB	0.0034 dB	0.010 dB
	-60 to -55	0.0026 dB			0.0070 dB	0.0034 dB	0.011 dB
	-55 to -50	0.0026 dB			0.0056 dB	0.0034 dB	
	-50 to -45	0.0016 dB			0.0043 dB	0.0035 dB	
	-45 to -40	0.0016 dB			0.0028 dB	0.0040 dB	
	-40 to -35	0.0017 dB			0.0028 dB	0.0040 dB	
	-35 to -30	0.0010 dB			0.0032 dB	0.0044 dB	
	-30 to -25	0.0013 dB			0.0029 dB	0.0044 dB	
	-25 to -20	0.0013 dB			0.0033 dB		
	-20 to -15	0.0013 dB			0.0033 dB		
	-15 to -10	0.0014 dB			0.0035 dB		
	-10 to -5	0.0016 dB			0.0037 dB		
	-5 to 0	0.0015 dB					
	-60 dBm		0.0051 dB				
	-60 dBm to -50 dBm		0.0015 dB				
	-50 dBm to -40 dBm		0.00084 dB				
	-40 dBm to -30 dBm		0.00076 dB				
	-30 dBm to -20 dBm		0.00023 dB				
	-20 dBm to -10 dBm		0.000097 dB				
	-10 dBm to -5 dBm		0.00011 dB				
	-5 dBm to +5 dBm		0.00032 dB				



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
RELATIVE RF POWER (continued)	<p><i>At 1.195 GHz</i></p> <p>-80 dBm to -70.5 dBm -70 dBm to -60.5 dBm -60 dBm to -50.5 dBm -50 dBm to -40.5 dBm -40 dBm to -30.5 dBm -30 dBm to -20.5 dBm -20 dBm to 0 dBm +0.5 dBm to +10 dBm</p> <p><i>At 1.99877 GHz</i></p> <p>-60 dBm to -21 dBm -19 dBm to +5 dBm</p>	<p>0.041 dB to 0.022 dB 0.021 dB to 0.016 dB 0.016 dB to 0.012 dB 0.012 dB to 0.0092 dB 0.0088 dB to 0.0058 dB 0.0052 dB to 0.0038 dB 0.0037 dB 0.0053 dB</p> <p>0.0071 to 0.0012 dB 0.0010 to 0.0057 dB</p>	<p>For dynamic accuracy of vector network analysers with reference to a power level between -10 dBm and -22 dBm.</p> <p>For dynamic accuracy of vector network analysers with reference to a power level of -20 dBm.</p>	See Pages 2 and 3
RF OUTPUT POWER	<p>+ 5 dBm to +35 dBm <i>50 GHz to 67 GHz</i> <i>67 GHz to 90 GHz</i> <i>90 GHz to 95 GHz</i> <i>95 GHz to 100 GHz</i> <i>100 GHz to 110 GHz</i></p>	<p>0.42 dB to 0.46 dB 0.51 dB to 0.57 dB 0.60 dB to 0.64 dB 0.77 dB to 0.84 dB 0.89 dB to 1.2 dB</p>	For the calibration of E, V and W band frequency extenders.	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location
Power Sensor Calibration System				See Pages 2 and 3
<p>This system provides calibration of calibration factor, VSWR and, for suitable types of sensor, transition time.</p> <p>The uncertainties associated with this system are shown below. Results intermediate frequencies can also be stated, the uncertainties being derived through linear interpolation between those at the points listed.</p> <p>This system provides calibration of calibration factor, VSWR and, for suitable types of sensor, transition time.</p> <p>The uncertainties associated with this system are shown below. Results at intermediate frequencies can also be stated, the uncertainties being derived through linear interpolation between those at the points listed.</p> <p>Unless otherwise indicated, the capabilities below show the CMC in percent of the measured calibration factor. When reported in a certificate, the uncertainty will be expressed as an absolute percentage. For calibration of RF power sensors by comparison with standard sensors. Values of calibration factor between 30 % and 140 % may be reported.</p>				
Calibration Factor				
Frequency	Type N sensors	Expanded uncertainty (k = 2)		
		3.5 mm sensors	2.4 mm sensors	
9 kHz to 10 MHz	0.48 %		0.76 %	
10 MHz to 50 MHz	0.54 %	0.78 %	reference	
50 MHz	reference	reference	0.69 %	
50 MHz to 3 GHz	0.38 %	0.62 %	0.78 % to 1.0 %	
3 GHz to 9 GHz	0.43 %	0.69 %	1.2 %	
9 GHz to 13 GHz	0.51 %	0.98 %	1.2 %	
13 GHz to 17 GHz	0.60 %	1.1 %	1.3 %	
17 GHz to 18 GHz	0.91 %	1.1 %	1.6 %	
18 GHz to 33 GHz		1.5 %	1.6 %	
33 GHz to 34 GHz			1.9 %	
34 GHz to 46 GHz			2.5 %	
46 GHz to 50 GHz				
Power Sensor Calibration System - Linearity	+ 30 dBm to +20 dBm + 20 dBm to +9 dBm + 9 dBm to -1 dBm -1 dBm to -7 dBm -7 dBm to -10 dBm -10 dBm to -14 dBm -14 dBm to -21 dBm -21 dBm to -30 dBm -30 dBm to -37 dBm	0.39 % 0.24 % 0.17 % 0.29 % 0.35 % 0.31 % 0.36 % 0.40 % 0.46 %	Relative to 0 dBm at 50 MHz; all connector types.	
Power Sensor Calibration System - VSWR	Refer to the <a href="#">VECTOR NETWORK ANALYSIS</a> section of this Schedule			
Power Sensor Calibration System - Transition time				
Rise time	6 ns to 20 ns	0.35 ns	N1921/2A and U2021/2XA sensors only.	
Fall time	6 ns to 20 ns	0.35 ns		
Rise time	50 ns to 110 ns	12 ns	U2042/4/9XA sensors only.	
Fall time	50 ns to 110 ns	4.7 ns		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
DC calibration of power sensors				See Pages 2 and 3
VSWR Calibration factor	1.0:1 to 2.0:1 Dependent on sensor	0.00032 VSWR 0.40 %		
Calibration of millimetre wave power sensors			Uncertainties are expressed as absolute percentage.	
<u>Calibration Factor</u>				
V band sensors	50 GHz to 75 GHz	3.5 % to 4.9 %		
E band sensors	54 GHz to 95 GHz	3.1 % to 7.0 %		
W band sensors	75 GHz to 110 GHz	4.8 % to 6.1 %		
1.85 mm coaxial	9 kHz to 5 MHz 5 MHz to 500 MHz 500 MHz to 31 GHz 31 GHz to 67 GHz 67 GHz to 70 GHz	0.57 % to 1.2 % 1.7 % to 2.5 % 0.82 % to 2.1 % 1.4 % to 3.2 % 4.0 % to 4.5 %		
<u>VSWR</u>				
V band sensors	50 GHz to 75 GHz	0.011		
E band sensors	54 GHz to 95 GHz	0.013		
W band sensors	75 GHz to 110 GHz	0.0069		
<u>Linearity</u>	Power Range -36 dBm to -30 dBm -30 dBm to -22 dBm -22 dBm to -15 dBm -15 dBm to -11 dBm -11 dBm to -1 dBm 0 dBm 1 dBm to 9 dBm 9 dBm to 12 dBm 12 dBm to 17 dBm 17 dBm to 20 dBm	0.24% 0.20% 0.15% 0.12% 0.097% reference 0.061% 0.10% 0.11% 0.12%	The uncertainties are shown as a percentage of the absolute power corresponding to the stated dBm levels.  The frequency and power ranges will be consistent with the specifications for individual power sensors.	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
NOISE SOURCE CALIBRATION				
Excess Noise ratio (ENR)	ENR nominal values of 5 dB, 15 dB and 21 dB		Y-factor method	See Pages 2 and 3
	APC-7 connectors: 10 MHz to 18 GHz	0.052 dB		
	Type N connectors: 10 MHz to 18 GHz	0.063 dB		
	APC-3.5 connectors: 10 MHz to 18 GHz 18 GHz to 26.5 GHz	0.063 dB 0.056 dB		
Excess Noise ratio (ENR)	ENR values from 5 dB to 21 dB		Cold source method	
	500 MHz to 6 GHz	0.10 dB		
	6 GHz to 18 GHz	0.11 dB		
	18 GHz to 26.5 GHz	0.13 dB		
	26.5 GHz to 33 GHz	0.14 dB		
	33 GHz to 36 GHz	0.15 dB		
	36 GHz to 39 GHz	0.16 dB		
	39 GHz to 40 GHz	0.17 dB		
	40 GHz to 48 GHz	0.20 dB		
	48 GHz to 50 GHz	0.21 dB		
	50 GHz to 60 GHz	0.27 dB		
	60 GHz to 64 GHz	0.29 dB		
	64 GHz to 65 GHz	0.31 dB		
	65 GHz to 67 GHz	0.29 dB		
VRC Magnitude	See <i>Voltage Reflection Coefficient</i> entries elsewhere in this Schedule.			
Difference in VRC Magnitude between On and Off states	0 to 0.01 10 MHz to 18 GHz	0.00054		
Noise Figure	5 dB to 26 dB 50 MHz to 44 GHz	0.32 dB	For calibration of VNA receiver noise figure.	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )		Remarks	Location
RF VOLTAGE  Calibration of voltmeters and sources	0.25 V to 5 V 20 Hz to 1 MHz 1 MHz to 10 MHz 10 MHz to 30 MHz 30 MHz to 60 MHz 60 MHz to 80 MHz 80 MHz to 100 MHz  5 V to 10 V 20 Hz to 3 MHz 3 MHz to 10 MHz  10 MHz to 1 GHz 5 mV to 10 mV 25 mV to 100 mV 0.25 V to 1.3 V 3.4 V to 5.5 V	Generation 0.15 % 0.31 % 0.31 % 0.50 % 0.82 % 0.82 %  0.16 % 0.26 %  1.0 % 1.2 % 1.0 % 1.3 %	Measurement 0.32 % 0.39 % 0.59 % 0.70 % 0.89 % 1.3 %  0.16 % 0.26 %  - - - -	10 MHz maximum for voltages between 3 V and 5 V.          Sine wave peak-to-peak voltage calculated from measured RF Power in 50 $\Omega$ .	See Pages 2 and 3
Calibration of sources: absolute voltage	10 mV to 2 V 9 kHz to 2 GHz	1.0 %		For source VSWR $\leq 1.2$ (0.091 VRC). A larger mismatch may result in an increased uncertainty being assigned.	
Calibration of sources: relative voltage	100 kHz to 10 MHz 0.1 V to 8 V  10 MHz to 50 MHz 0.1 V to 8 V  At 50 MHz 0.01 V to 0.1 V 0.1 V to 8 V  50 MHz to 80 MHz 0.01 V to 0.1 V 0.1 V to 8 V  80 MHz to 300 MHz 0.01 V to 0.1 V 0.1 V to 5.5 V  300 MHz to 1.1 GHz 0.01 V to 5.5 V	0.025 dB  0.028 dB  0.027 dB 0.018 dB  0.027 dB 0.023 dB  0.032 dB 0.023 dB  0.033 dB		For the calibration of 50 $\Omega$ source amplitude flatness using RMS sensing. The voltage ranges are shown in peak to peak terms.	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
RF ATTENUATION  Specific combinations of attenuation and frequency	1 dB to 11 dB in 1 dB steps <i>20 Hz to 100 MHz</i> <i>100 MHz to 1 GHz</i>  10 dB to 30 dB <i>20 Hz to 100 MHz</i>  <i>100 MHz to 1 GHz</i>  40 dB to 60 dB <i>20 Hz to 100 MHz</i>  <i>100 MHz to 1 GHz</i>  70 dB to 90 dB <i>20 Hz to 100 MHz</i>  <i>100 MHz to 1 GHz</i>  100 dB to 110 dB <i>20 Hz to 100 MHz</i>  <i>100 MHz to 1 GHz</i>	0.0028 dB 0.0075 dB  0.0035 dB + 0.00040 dB per 10 dB step  0.0055 dB + 0.0020 dB per 10 dB step  0.00050 dB + 0.0017 dB per 10 dB step  0.0011 dB + 0.0035 dB per 10 dB step  0.0030 dB per 10 dB step -0.0050 dB  0.0065 dB per 10 dB step -0.013 dB  0.0070 dB per 10 dB step -0.038 dB  0.010 dB per 10 dB step -0.036 dB	For the calibration of spectrum analysers, receivers, network analysers, signal generators etc.	See Pages 2 and 3



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RF ATTENUATION (continued)	Incremental attenuation	30 MHz and 50 MHz      60 MHz <sup>[1]</sup>	[1] Includes step attenuators	See Pages 2 and 3
	10 dB and 20 dB 30 dB 40 dB 50 dB 60 dB 70 dB and 80 dB 90 dB 100 dB 110 dB 120 dB	0.0007 dB per 10 dB step + 0.0030 dB	0.010 dB 0.010 dB 0.012 dB 0.012 dB 0.012 dB 0.013 dB 0.014 dB 0.016 dB 0.024 dB -	
	30 dB 50 MHz	0.0070 dB	For the calibration of Model 11708A fixed attenuators	
Step attenuator calibration at 1 kHz	0 dB 1 dB to 12 dB in 1 dB steps 20 dB to 60 dB in 10 dB steps	0.0022 dB 0.0093 dB to 0.0094 dB 0.0094 dB to 0.012 dB	Using voltage ratio method	
Step attenuator calibration (RF)				
Calibration is performed using T-matrix calculations from measurements of individual attenuator stages. Because of the different available models and attenuation configurations, it is impractical to capture the CMC at individual attenuation steps. Therefore, the uncertainties are tabulated in terms of the number of attenuation segments calibrated and typical ranges are given. All attenuator configurations up to 40 dB are considered as a single segment, regardless of the number used, with the exception of the 8496A/B and 355D/F models, which are treated as single segments up to 50 dB and 60 dB respectively. This capability may also be used for calibration of dynamic range of receivers and similar instruments.				
<b>Number of attenuation segments</b>	<b>Frequency</b>	<b>Typical range</b>	<b>Expanded uncertainty (<math>k = 2</math>)</b>	
Insertion loss or zero segments	See <a href="#">VECTOR NETWORK ANALYSIS</a> CMCs	0 dB to 2 dB	See <a href="#">VECTOR NETWORK ANALYSIS</a> CMCs	
1 segment (see above for calibration conditions).	300 kHz to 500 MHz 500 MHz to 2 GHz 2 GHz to 18 GHz  18 GHz to 40 GHz 40 GHz to 50 GHz	1 dB to 40 dB (Type-N, 3.5 mm and 2.4 mm)	0.0034 dB 0.0047 dB ((0.011% * $f$ ) + 0.0049) dB, where $f$ is the frequency in GHz 0.0089 dB 0.012 dB	
2 segments	300 kHz to 8 GHz 8 GHz to 18 GHz 18 GHz to 40 GHz 40 GHz to 50 GHz	50 dB to 80 dB (Type-N) 50 dB and 60 dB (3.5 mm) 50 dB (2.4 mm)	0.025 dB 0.029 dB 0.034 dB 0.037 dB	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
Step attenuator calibration (continued)				See Pages 2 and 3
<b>Number of attenuation segments</b>	<b>Frequency</b>	<b>Typical range</b>	<b>Expanded uncertainty (<math>k = 2</math>)</b>	
3 segments	300 kHz to 18 GHz 18 GHz to 20 GHz 20 GHz to 40 GHz 40 GHz to 50 GHz	70 dB to 100 dB (Type-N) 70 dB or 80 dB (3.5 mm)	0.048 dB 0.056 dB 0.059 dB 0.065 dB	
4 segments	300 kHz to 18 GHz 18 GHz to 20 GHz 20 GHz to 40 GHz 40 GHz to 50 GHz	110 dB or 120 dB (Type-N) 90 dB (3.5 mm) 65 dB or 90 dB (2.4 mm)	0.072 dB 0.080 dB 0.084 dB 0.094 dB	
Further attenuation capabilities are described in the <a href="#">VECTOR NETWORK ANALYSIS</a> section of this Schedule.				



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location
SPECTRUM ANALYSIS	Harmonic level 0 dBc to -130 dBc <i>Fundamental frequency</i> 10 Hz to 9 kHz	0.73 dB	Calibration of the spectral content, including harmonic distortion, of signal sources in a 50 $\Omega$ coaxial system.  The capability includes sub-harmonics and non-harmonically related signals. Close-in signals may also be measured using the <i>output power linearity</i> (relative power) capabilities elsewhere in this Schedule.  The minimum level is -101 dBc for the 2nd harmonic and -109 dBc for the 3rd harmonic.	See Pages 2 and 3
	<i>Fundamental frequency</i> 9 kHz to 67 GHz	0.26 dB	The minimum level is -110 dBc for the 2nd and 3rd harmonics. The maximum harmonic frequency is 67 GHz.	
DIRECTIVITY of VRC bridges				
Type N connectors	16 dB to 50 dB 10 MHz to 2 GHz 2 GHz to 18 GHz	0.017 to 0.0060 0.019 to 0.010	This capability is for the measurement of directivity of 50 $\Omega$ VRC bridges and similar devices. The uncertainties are given in linear quantities (VRC) where the range applies to the range of measured directivity. The values and uncertainties may be reported in dB terms, calculated from the linear values and uncertainties.	
3.5 mm connectors	16 dB to 50 dB 10 MHz to 3 GHz 3 GHz to 18 GHz 18 GHz to 26.5 GHz	0.018 to 0.0060 0.018 to 0.0080 0.019 to 0.0080		
7 mm connectors	16 dB to 50 dB 10 MHz to 18 GHz	0.017 to 0.0040		
2.4 mm connectors	16 dB to 50 dB 10 MHz to 4 GHz 4 GHz to 20 GHz 20 GHz to 36 GHz 36 GHz to 40 GHz 40 GHz to 50 GHz	0.019 to 0.0090 0.019 to 0.010 0.021 to 0.013 0.023 to 0.016 0.026 to 0.020		



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**Keysight Technologies UK Limited**  
Issue No: 098 Issue date: February 2026

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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location
DIRECTIVITY of directional couplers	0.0005 to 0.32 300 kHz to 2 GHz 2 GHz to 3 GHz 3 GHz to 4 GHz 4 GHz to 6 GHz 6 GHz to 8 GHz 8 GHz to 20 GHz 20 GHz to 26.5 GHz 26.5 GHz to 50 GHz	0.00080 0.0012 0.0015 0.0023 0.0029 0.0037 0.0046 0.012	The uncertainties are given in linear quantities (VRC) where the range applies to the range of measured directivity. The values and uncertainties may be reported in dB terms, calculated from the linear values and uncertainties. The uncertainties are based on 3-port coupler measurements. 4-port coupler measurements may also be undertaken but may attract slightly larger uncertainties.	See Pages 2 and 3
PHASE NOISE				
Signal analysers at 1 GHz				
Offset from carrier	Analyser phase noise specification dBc/Hz	Uncertainty (dB)		
10 Hz	> -80	0.51 dB		
100 Hz	> -107	0.51 dB		
1 kHz	> -126	0.40 dB		
10 kHz	> -140	0.37 dB		
30 kHz	> -142	0.36 dB		
100 kHz	> -144	0.53 dB		
1 MHz	> -153	0.54 dB		
6 MHz	> -155	0.54 dB		
9.9 MHz and 10 MHz	> -155	0.66 dB		
100 Hz to 1 kHz	> -105	0.37 dB	For carrier frequencies between 70 MHz and 1 GHz.	
1 kHz to 10 kHz	> -120	0.37 dB		
10 kHz to 100 kHz	> -130	0.37 dB		
100 kHz to 1 MHz	> -130	0.40 dB		
1 MHz to 10 MHz	> -145	0.40 dB		
Single-sided phase noise for signal sources	Minimum -187 dBc/Hz Carrier: 50 kHz to 54 GHz Offsets 1 Hz to 1 MHz Offset 1 MHz to 100 MHz	+1.8 dB; -∞ dB +3.6 dB; -∞ dB	The stated uncertainties assume that the relative noise difference between the DUT and the reference is sufficiently large to have negligible effect.	
RESIDUAL PERFORMANCE AND NOISE				
Measurement of the residual noise performance of receivers, signal analysers, VNAs and similar devices.	-174 dBm to -120 dBm 10 kHz to 110 GHz  -174 dBm to -90 dBm 50 GHz to 115 GHz	0.068 dB  2.7 dB	Coaxial devices.  Millimetre wave devices.	



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CISPR16 PULSE RESPONSE			Using characterised impulse generator	See Pages 2 and 3
Quasi-Peak Absolute Amplitude	PRF 25 Hz PRF 100 Hz	0.29 dB 0.29 dB	Band A Bands B and C	
Quasi-Peak detector response variation with PRF	Single (isolated) pulse and PRFs of 1 Hz, 2 Hz, 5 Hz, 10 Hz, 60 Hz and 100 Hz	0.12 dB	Band A	
	Single (isolated) pulse and PRFs of 1 Hz, 2 Hz, 10 Hz and 20 Hz	0.12 dB	Bands B, C and D	
Response to Pulses (Peak Detector)	PRF 25 Hz PRF 100 Hz PRF 100 Hz PRF 100 Hz	0.42 dB 0.35 dB 0.33 dB <i>Refer to RF Power CMC</i>	Band A Band B Bands C and D Band E	
Response to Pulses (Average Detector)	PRF 25 Hz PRF 500 Hz PRF 5 kHz PRF 50 kHz	0.42 dB 0.37 dB 0.34 dB <i>Refer to RF Power CMC</i>	Band A Band B Bands C and D Band E	
Response to Pulses (RMS Detector)	PRF 25 Hz PRF 1000 Hz PRF 1000 Hz PRF 1000 Hz	0.42 dB 0.37 dB 0.34 dB <i>Refer to RF Power CMC</i>	Band A Band B Bands C and D Band E	
NOISE VOLTAGE AND CURRENT				
Noise voltage (peak to peak)	<i>Bandwidth 20 MHz or 1 GHz</i> 0.07 mV to 2 mV 2 mV to 2 V	0.070 mV 2.0 %	For PARD (ripple and noise) measurements on power supplies and similar devices.	
Noise voltage (rms)	<i>Bandwidth 20 MHz</i> 0.01 mV to 0.5 mV 0.5 mV to 1 mV 1 mV to 1 V	21 % 6.5 % 2.0 %		
Noise current (rms)	<i>Bandwidth 20 MHz</i> 0.1 mA to 250 mA	15 %		
Probe noise current	<i>Bandwidth 20 MHz</i> 0.01 mA to 0.5 mA 0.5 mA to 1 mA 1 mA to 1 A	21 % 6.5 % 2.0 %	Noise measurements on current probes.	



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VECTOR NETWORK ANALYSIS																																																																																																																																												
<p>This section of the Schedule presents the uncertainties for a range of vector network analysis systems. Unless otherwise indicated, these systems provide measurements of reflection magnitude, reflection phase, transmission magnitude and transmission phase. The transmission magnitude capabilities are expressed in dB as this aspect of the capability will normally be used for the calibration of attenuators and amplifiers. Reflection magnitude is expressed in terms of voltage reflection coefficient (VRC) however this may be reported in terms of voltage standing wave ratio (VSWR) or return loss (dB). Measurements are made in a 50 <math>\Omega</math> coaxial system or a 75 <math>\Omega</math> coaxial system. The 75 <math>\Omega</math> coaxial system has an upper frequency limit of 3 GHz. The uncertainties listed below are a consolidation of the lowest uncertainties available across all of the systems.</p> <p>VRC magnitude and phase</p> <table border="1"> <thead> <tr> <th rowspan="2">Frequency</th> <th colspan="2">VRC 0 to 0.1</th> <th colspan="2">VRC 0.1 to 1</th> </tr> <tr> <th>Magnitude</th> <th>Phase</th> <th>Magnitude</th> <th>Phase</th> </tr> </thead> <tbody> <tr> <td>900 Hz to 9 kHz</td> <td>0.0017 to 0.0020</td> <td>1.2° to 180°</td> <td>0.0020 to 0.0052</td> <td>0.30° to 1.1°</td> </tr> <tr> <td>9 kHz to 100 kHz</td> <td>0.0012 to 0.0017</td> <td>0.94° to 180°</td> <td>0.0015 to 0.0043</td> <td>0.23° to 0.99°</td> </tr> <tr> <td>100 kHz to 10 MHz</td> <td>0.0012 to 0.0015</td> <td>0.95° to 180°</td> <td>0.0015 to 0.0048</td> <td>0.23° to 0.89°</td> </tr> <tr> <td>10 MHz to 50 MHz</td> <td>0.0012 to 0.0015</td> <td>0.97° to 180°</td> <td>0.0015 to 0.0048</td> <td>0.27° to 0.89°</td> </tr> <tr> <td>50 MHz to 20 GHz</td> <td>0.0012 to 0.0050</td> <td>0.96° to 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VECTOR NETWORK ANALYSIS (continued)										
Gain magnitude										
Frequency	Gain magnitude uncertainty (dB)									
	0 dB to 20 dB	20 dB to 30 dB	30 dB to 40 dB							
900 Hz to 9 kHz	0.038 to 0.049	0.052 to 0.087	0.11 to 0.62							
9 kHz to 100 kHz	0.025 to 0.038	0.041 to 0.075	0.068 to 0.31							
100 kHz to 10 MHz	0.022 to 0.046	0.039 to 0.068	0.068 to 0.33							
10 MHz to 2 GHz	0.024 to 0.046	0.038 to 0.085	0.079 to 0.57							
2 GHz to 10 GHz	0.031 to 0.050	0.046 to 0.13	0.11 to 1.3							
10 GHz to 20 GHz	0.041 to 0.090	0.059 to 0.42	0.18 to 4.6							
20 GHz to 40 GHz	0.082 to 0.14	0.15 to 0.54	0.71 to 5.4							
40 GHz to 50 GHz	0.086 to 0.13	0.16 to 0.49	0.72 to 4.9							
50 GHz to 67 GHz	0.12 to 0.21	0.24 to 0.83	1.2 to 7.4							
VECTOR NETWORK ANALYSIS BY ELECTRICAL COMPARISON WITH REFERENCE CALIBRATION KITS										
The uncertainties are shown in terms of reflection coefficient magnitude, transmission coefficient magnitude and phase. For low values of reflection coefficient, where the magnitude is close to its own uncertainty, the phase uncertainty tends to 180°.										
Type N calibration kits										
Frequency	Reflection coefficient magnitude and phase									
	0 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
DC to 200 MHz	0.00090 0.53°	0.00095 0.28°	0.00099 0.20°	0.0010 0.16°	0.0011 0.13°	0.0011 0.11°	0.0012 0.094°	0.0012 0.085°	0.0013 0.080°	0.0013 0.074°
200 MHz to 2 GHz	0.0010 0.61°	0.0011 0.31°	0.0011 0.22°	0.0011 0.17°	0.0011 0.13°	0.0011 0.11°	0.0012 0.096°	0.0012 0.086°	0.0013 0.080°	0.0013 0.074°
2 GHz to 8 GHz	0.0012 0.69°	0.0012 0.36°	0.0012 0.25°	0.0012 0.19°	0.0012 0.15°	0.0012 0.13°	0.0012 0.11°	0.0012 0.092°	0.0013 0.084°	0.0013 0.076°
8 GHz to 18 GHz	0.0020 1.2°	0.0020 0.60°	0.0020 0.42°	0.0020 0.32°	0.0021 0.25°	0.0019 0.21°	0.0019 0.17°	0.0019 0.14°	0.0019 0.13°	0.0019 0.12°
Frequency	Transmission coefficient magnitude and phase									
	At 0 dB	0 dB to 10 dB			10 dB to 20 dB					
DC to 200 MHz	0.0094 dB 0.093°	0.011 dB 0.10°			0.015 dB 0.12°					
200 MHz to 2 GHz	0.0094 dB 0.094°	0.011 dB 0.10°			0.014 dB 0.12°					
2 GHz to 8 GHz	0.013 dB 0.13°	0.014 dB 0.14°			0.016 dB 0.15°					
8 GHz to 18 GHz	0.024 dB 0.23°	0.025 dB 0.24°			0.026 dB 0.24°					

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2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

**Keysight Technologies UK Limited**  
Issue No: 098 Issue date: February 2026

Calibration performed by the Organisation at the locations specified

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location						
VECTOR NETWORK ANALYSIS BY ELECTRICAL COMPARISON WITH REFERENCE CALIBRATION KITS (continued)										
3.5 mm calibration kits										
Frequency	Reflection coefficient magnitude and phase									
	0 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
DC to 200 MHz	0.00015 0.15°	0.00035 0.13°	0.00048 0.12°	0.00059 0.12°	0.00072 0.11°	0.00085 0.11°	0.00099 0.11°	0.0012 0.11°	0.0013 0.12°	0.0014 0.11°
200 MHz to 2 GHz	0.00050 0.30°	0.00055 0.14°	0.00061 0.14°	0.00067 0.13°	0.00076 0.12°	0.00087 0.12°	0.0010 0.13°	0.0012 0.13°	0.0013 0.13°	0.0014 0.13°
2 GHz to 8 GHz	0.00073 0.43°	0.00075 0.18°	0.00080 0.18°	0.00085 0.16°	0.00092 0.15°	0.0010 0.15°	0.0011 0.15°	0.0013 0.15°	0.0015 0.15°	0.0016 0.15°
8 GHz to 20 GHz	0.0013 0.77°	0.0013 0.30°	0.0013 0.30°	0.0014 0.28°	0.0014 0.24°	0.0015 0.23°	0.0015 0.23°	0.0016 0.23°	0.0018 0.24°	0.0021 0.24°
20 GHz to 26.5 GHz	0.0018 1.1°	0.0021 0.43°	0.0018 0.43°	0.0021 0.37°	0.0018 0.34°	0.0021 0.34°	0.0020 0.34°	0.0021 0.34°	0.0023 0.34°	0.0026 0.34°
26.5 GHz to 33 GHz	0.0031 1.8°	0.0033 0.92°	0.0030 0.65°	0.0032 0.53°	0.0030 0.47°	0.0032 0.45°	0.0031 0.44°	0.0033 0.45°	0.0036 0.47°	0.0040 0.47°
Frequency	Transmission coefficient magnitude and phase									
	At 0 dB			0 dB to 10 dB			10 dB to 20 dB			
DC to 200 MHz	0.0062 dB 0.068°			0.0084 dB 0.078°			0.013 dB 0.10°			
200 MHz to 2 GHz	0.0062 dB 0.069°			0.0081 dB 0.078°			0.012 dB 0.097°			
2 GHz to 8 GHz	0.0068 dB 0.081°			0.0088 dB 0.088°			0.012 dB 0.11°			
8 GHz to 20 GHz	0.0092 dB 0.12°			0.010 dB 0.13°			0.014 dB 0.14°			
20 GHz to 26.5 GHz	0.011 dB 0.19°			0.012 dB 0.19°			0.015 dB 0.20°			
26.5 GHz to 33 GHz	0.015 dB 0.23°			0.016 dB 0.23°			0.018 dB 0.24°			

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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location						
VECTOR NETWORK ANALYSIS BY ELECTRICAL COMPARISON WITH REFERENCE CALIBRATION KITS (continued)										
2.4 mm calibration kits										
Frequency	Reflection coefficient magnitude and phase									
	0 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
DC to 100 MHz	0.00028 0.20°	0.00042 0.14°	0.00050 0.11°	0.00055 0.092°	0.00058 0.078°	0.00060 0.068°	0.00061 0.055°	0.00061 0.047°	0.00062 0.040°	0.00037 0.021°
100 MHz to 2 GHz	0.00051 0.30°	0.00067 0.21°	0.00088 0.19°	0.0011 0.18°	0.0012 0.17°	0.0014 0.16°	0.0015 0.16°	0.0017 0.16°	0.0020 0.16°	0.0022 0.16°
2 GHz to 20 GHz	0.0011 0.65°	0.0012 0.35°	0.0012 0.26°	0.0013 0.21°	0.0013 0.19°	0.0014 0.18°	0.0015 0.17°	0.0016 0.18°	0.0016 0.18°	0.0018 0.18°
20 GHz to 35 GHz	0.0018 1.1°	0.0019 0.60°	0.0020 0.46°	0.0020 0.40°	0.0021 0.37°	0.0022 0.36°	0.0023 0.36°	0.0024 0.37°	0.0025 0.39°	0.0028 0.40°
35 GHz to 40 GHz	0.0025 1.5°	0.0025 0.94°	0.0036 0.71°	0.0027 0.60°	0.0028 0.55°	0.0028 0.53°	0.0039 0.51°	0.0030 0.51°	0.0032 0.53°	0.0037 0.55°
40 GHz to 50 GHz	0.0030 1.5°	0.0030 1.1°	0.0021 0.81°	0.0032 0.68°	0.0033 0.61°	0.0033 0.56°	0.0032 0.53°	0.0033 0.53°	0.0035 0.54°	0.0039 0.57°
Frequency	Transmission coefficient magnitude and phase									
	At 0 dB			0 dB to 10 dB			10 dB to 20 dB			
DC to 100 MHz	0.0096 dB 0.086°			0.011 dB 0.094°			0.015 dB 0.12°			
100 MHz to 2 GHz	0.010 dB 0.096°			0.012 dB 0.10°			0.014 dB 0.12°			
2 GHz to 20 GHz	0.013 dB 0.13°			0.014 dB 0.13°			0.016 dB 0.14°			
20 GHz to 36 GHz	0.022 dB 0.26°			0.023 dB 0.26°			0.024 dB 0.27°			
36 GHz to 40 GHz	0.028 dB 0.38°			0.028 dB 0.38°			0.030 dB 0.38°			
40 GHz to 50 GHz	0.032 dB 0.44°			0.033 dB 0.44°			0.034 dB 0.44°			

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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location						
VECTOR NETWORK ANALYSIS BY ELECTRICAL COMPARISON WITH REFERENCE CALIBRATION KITS (continued)										
2.92 mm calibration kits										
Frequency	Reflection coefficient magnitude and phase									
	0 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
DC to 10 MHz	0.0014 0.81°	0.0014 0.81°	0.0014 0.41°	0.0014 0.27°	0.0014 0.21°	0.0015 0.17°	0.0015 0.14°	0.0016 0.13°	0.0017 0.12°	0.0019 0.11°
10 MHz to 20 GHz	0.0014 0.82°	0.0014 0.82°	0.0015 0.43°	0.0015 0.30°	0.0016 0.24°	0.0018 0.20°	0.0020 0.18°	0.0022 0.17°	0.0024 0.16°	0.0026 0.16°
20 GHz to 40 GHz	0.0014 0.82°	0.0015 0.82°	0.0015 0.45°	0.0016 0.34°	0.0017 0.30°	0.0019 0.28°	0.0021 0.27°	0.0023 0.27°	0.0026 0.28°	0.0030 0.29°
Frequency	Transmission coefficient magnitude and phase									
	At 0 dB			0 dB to 10 dB			10 dB to 20 dB			
DC to 10 MHz	0.0063 dB 0.042°			0.0080 dB 0.053°			0.011 dB 0.074°			
10 MHz to 20 GHz	0.014 dB 0.099°			0.014 dB 0.10°			0.015 dB 0.11°			
20 GHz to 40 GHz	0.016 dB 0.18°			0.016 dB 0.18°			0.017 dB 0.19°			

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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location						
VECTOR NETWORK ANALYSIS BY ELECTRICAL COMPARISON WITH REFERENCE CALIBRATION KITS (continued)										
1.85 mm calibration kits										
Frequency	Reflection coefficient magnitude and phase									
	0 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
DC to 100 MHz	0.00028 0.17°	0.00037 0.10°	0.00043 0.079°	0.00047 0.086°	0.00050 0.057°	0.00053 0.050°	0.00055 0.045°	0.00058 0.042°	0.00061 0.039°	0.00037 0.021°
100 MHz to 2 GHz	0.00032 0.24°	0.00067 0.19°	0.00093 0.17°	0.0012 0.15°	0.0014 0.14°	0.0015 0.13°	0.0016 0.13°	0.0017 0.13°	0.0019 0.13°	0.0021 0.13°
2 GHz to 20 GHz	0.00057 0.40°	0.00090 0.28°	0.0012 0.25°	0.0015 0.24°	0.0018 0.24°	0.0021 0.24°	0.0025 0.24°	0.0029 0.25°	0.0034 0.26°	0.0039 0.27°
20 GHz to 36 GHz	0.00090 0.57°	0.0011 0.37°	0.0013 0.32°	0.0015 0.30°	0.0017 0.30°	0.0020 0.30°	0.0024 0.30°	0.0027 0.31°	0.0032 0.32°	0.0037 0.33°
36 GHz to 40 GHz	0.0011 0.71°	0.0013 0.44°	0.0014 0.36°	0.0015 0.33°	0.0017 0.32°	0.0019 0.31°	0.0022 0.30°	0.0025 0.31	0.0028 0.32°	0.0033 0.33°
40 GHz to 50 GHz	0.0014 0.86°	0.0015 0.51°	0.0016 0.41°	0.0018 0.37°	0.0020 0.34°	0.0022 0.33°	0.0024 0.32°	0.0027 0.32°	0.0031 0.33°	0.0036 0.34°
50 GHz to 67 GHz	0.0025 1.5°	0.0026 0.83°	0.0027 0.64°	0.0029 0.56°	0.0032 0.53°	0.0036 0.51°	0.0041 0.51°	0.0047 0.52°	0.0053 0.53°	0.0051 0.54°
Frequency	Transmission coefficient magnitude and phase									
	At 0 dB			0 dB to 10 dB				10 dB to 20 dB		
DC to 100 MHz	0.0018 dB 0.013°			0.0061 dB 0.041°				0.013 dB 0.089°		
100 MHz to 2 GHz	0.018 dB 0.13°			0.019 dB 0.14°				0.022 dB 0.15°		
2 GHz to 20 GHz	0.021 dB 0.16°			0.022 dB 0.17°				0.023 dB 0.18°		
20 GHz to 36 GHz	0.020 dB 0.24°			0.021 dB 0.24°				0.022 dB 0.24°		
36 GHz to 40 GHz	0.021 dB 0.28°			0.021 dB 0.28°				0.023 dB 0.28°		
40 GHz to 50 GHz	0.022 dB 0.29°			0.022 dB 0.29°				0.024 dB 0.30°		
50 GHz to 67 GHz	0.028 dB 0.38°			0.028 dB 0.38°				0.030 dB 0.38°		

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CALIBRATION OF BATTERY TEST SYSTEMS				
DC Voltage	-1 mV to +1 mV 1 V to 6 V 6 V to 20 V 20 V to 80 V 80 V to 600 V 600 V to 1000 V	50 $\mu$ V 55 $\mu$ V/V to 18 $\mu$ V/V 79 $\mu$ V/V to 30 $\mu$ V/V 21 $\mu$ V/V 18 $\mu$ V/V 20 $\mu$ V/V		See Pages 2 and 3
DC Current	0 A to 5 A  5 A to 20 A 20 A to 60 A 60 A to 85 A 85 A to 170 A 170 A to 300 A 300 A to 1000 A 1000 A to 2000 A	See DC Current on Page 6 93 $\mu$ A/A + 0.78 mA 140 $\mu$ A/A - 0.18 mA 115 $\mu$ A/A + 1.6 mA 87 $\mu$ A/A + 7.5 mA 200 $\mu$ A/A - 0.89 mA 170 $\mu$ A/A + 19 mA 150 $\mu$ A/A + 26 mA		
AC Current	45 Hz to 100 Hz 5 A to 20 A 20 A to 60 A 60 A to 85 A 85 A to 170 A	0.083 % + 2.8 mA 0.10 % - 2.1 mA 0.074 % + 18 mA 0.073 % + 36 mA		





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## Appendix - Calibration and Measurement Capabilities

### Introduction

The definitive statement of the accreditation status of a calibration laboratory is the Accreditation Certificate and the associated Schedule of Accreditation. This Schedule of Accreditation is a critical document, as it defines the measurement capabilities, ranges and boundaries of the calibration activities for which the organisation holds accreditation.

### Calibration and Measurement Capabilities (CMCs)

The capabilities provided by accredited calibration laboratories are described by the Calibration and Measurement Capability (CMC), which expresses the lowest measurement uncertainty that can be achieved during a calibration. If a particular device under calibration itself contributes significantly to the uncertainty (for example, if it has limited resolution or exhibits significant non-repeatability) then the uncertainty quoted on a calibration certificate will be increased to account for such factors.

The CMC is normally used to describe the uncertainty that appears in an accredited calibration laboratory's schedule of accreditation and is the uncertainty for which the laboratory has been accredited using the procedure that was the subject of assessment. The measurement uncertainty is calculated according to the procedures given in the GUM and is normally stated as an expanded uncertainty at a coverage probability of 95 %, which usually requires the use of a coverage factor of  $k = 2$ . An accredited laboratory is not permitted to quote an uncertainty that is smaller than the published measurement uncertainty in certificates issued under its accreditation.

### Expression of CMCs - symbols and units

It should be noted that the percentage symbol (%) represents the number 0.01. In cases where the measurement uncertainty is stated as a percentage, this is to be interpreted as meaning percentage of the measurand. Thus, for example, a measurement uncertainty of 1.5 % means  $1.5 \times 0.01 \times q$ , where  $q$  is the quantity value.

The notation  $Q[a, b]$  stands for the root-sum-square of the terms between brackets:  $Q[a, b] = [a^2 + b^2]^{1/2}$