Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC voltage sources: single values	Solid state voltage standard	Comparison, difference measurement	1	10	V			0.05 to 3	µV	2 to 2.13	95%	No	Mx1.1.1	1.1.1	Approved on 31 October 2016
DC voltage sources: low value ranges	DC voltage source, multifunction calibrator	Comparison with standard via resistive divider	0.001	10	V			0.4 to 700	µV/V	2	95%	Yes	Mx1.1.2	1.1.2	Approved on 31 October 2016
DC voltage sources: intermediate values	DC voltage source, multifunction calibrator	Comparison with standard via resistive divider	100	1000	V			0.7 to 6	µV/V	2	95%	Yes	Mx1.1.3	1.1.3	Approved on 31 October 2016
DC voltage meters: very low values	DC voltmeter, multimeter	Direct measurement	1	1	mV			0.7	mV/V	2	95%	Yes		1.2.1	Approved on 31 October 2016
DC voltage meters: intermediate values	DC voltmeter, multimeter	Direct measurement	0.01	1000	V			0.4 to 70	µV/V	2	95%	Yes	Mx1.2.2	1.2.2	Approved on 31 October 2016
DC resistance standards and sources: low values	Fixed resistor, resistance box	DCC bridge, difference measurement	0.0001	1	Ω	Temperature	23 °C, 25 °C	0.24 to 13	µΩ/Ω	2 to 3.18	95%	Yes	Mx2.1	2.1.1	Approved on 31 October 2016
						Test current	0.01 A to 30 A								

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Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
DC resistance standards and sources: intermediate values	Fixed resistor, resistance box	QHR, DCC bridge, difference measurement	0.01	1000	kΩ	Temperature	23 °C, 25 °C	0.08 to 9	μΩ/Ω	2 to 3.18	95%	Yes	Mx2.1	2.1.2	Approved on 31 October 2016
						Test current	0.005 mA to 10 mA								
DC resistance standards and sources: high values	Fixed resistor	Difference measurement	0.01	1000	GΩ	Temperature	23 °C, 25 °C	0.013 to 0.6	mΩ/Ω	2	95%	Yes	Mx2.1	2.1.3	Approved on 31 October 2016
						Test current (10 MΩ)	0.0005 mA								
						Test voltage	5 V to 500 V								
DC resistance meters: low values	Multimeter	Direct measurement	0.001	1	Ω	Temperature	23 °C	2.1 to 8	μΩ/Ω	2 to 3.18	95%	Yes	Mx2.2	2.2.1	Approved on 31 October 2016
						Maximum power	10 mW								
DC resistance meters: intermediate values	Multimeter, teraohmmeter	Direct measurement	0.00001	1000	MΩ	Temperature	23 °C	0.3 to 180	μΩ/Ω	2 to 3.18	95%	Yes	Mx2.2	2.2.2	Approved on 31 October 2016
						Maximum power	10 mW								

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Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
						Test voltage (100 MΩ, 1000 MΩ)	5 V to 50 V								
DC resistance meters: high values	Teraohmmeter	Direct measurement	10	1000	GΩ	Temperature	23 °C	0.19 to 0.6	mΩ/Ω	2	95%	Yes	Mx2.2	2.2.3	Approved on 31 October 2016
						Test voltage	200 V to 500 V								
DC current sources: low values	Current generator, multifunction calibrator	Comparison, voltage drop across standard resistor	1E-05	100	µA			17 to 900	µA/A	2	95%	Yes	Mx3.1	3.1.1	Approved on 31 October 2016
DC current sources: intermediate values	Current generator, multifunction calibrator	Voltage drop across standard resistor	0.001	10	A			17 to 22	µA/A	2	95%	Yes	Mx3.1	3.1.2	Approved on 31 October 2016
DC current sources: high values	Current generator	Voltage drop across standard resistor	20	100	A			60 to 67	µA/A	2	95%	Yes	Mx3.1	3.1.3	Approved on 31 October 2016
DC current meters: intermediate values	Current transducer	Direct measurement	2	10	A			20 to 22	µA/A	2	95%	Yes	Mx3.2	3.2.2	Approved on 31 October 2016
DC current meters: high values	Current transducer	Direct measurement	20	100	A			60 to 67	µA/A	2	95%	Yes	Mx3.3	3.2.3	Approved on 31 October 2016

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Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
Capacitance: capacitance for low loss capacitors	Standard capacitor	Ratio bridge	1	1000	pF	Frequency	1 kHz, 1.592 kHz	0.22 to 0.58	µF/F	2	95%	Yes	Mx4.2.1	4.2.1	Approved on 31 October 2016
Capacitance: capacitance for dielectric capacitors	Fixed capacitor	Automatic capacitance bridge	0.01	1	µF	Frequency	1 kHz	30 to 70	µF/F	2	95%	Yes	Mx4.2.1	4.2.2	Approved on 31 October 2016
Capacitance: meters	Capacitance bridge	Direct measurement	1E-06	1	µF	Frequency	1 kHz	0.7 to 70	µF/F	2	95%	Yes	Mx4.2.4	4.2.4	Approved on 31 October 2016
Inductance: self inductance, low values	Fixed inductor	Difference measurement	100	100	µH	Frequency	100 Hz, 1 kHz	1.2	mH/H	2	95%	Yes		4.3.1	Approved on 31 October 2016
Inductance: self inductance, intermediate values	Fixed inductor	Difference measurement	0.001	1	H	Frequency	100 Hz, 1 kHz	0.22 to 0.52	mH/H	2	95%	Yes	Mx4.3.2	4.3.2	Approved on 31 October 2016
Inductance: self inductance, high values	Fixed inductor	Difference measurement	10	10	H	Frequency	100 Hz, 1 kHz	0.22 to 2	mH/H	2	95%	Yes	Mx4.3.2	4.3.3	Approved on 31 October 2016
Inductance: meters	LCR meter	Direct measurement	0.0001	10	H	Frequency	100 Hz, 1 kHz	0.22 to 2	mH/H	2	95%	Yes	Mx4.3.5	4.3.5	Approved on 31 October 2016

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Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
AC-DC voltage transfer: AC-DC transfer difference at low voltages	Micropotentiometer and LVTVC	Difference measurement	0.001	0.1	V	Frequency	20 Hz to 1 MHz	29 to 500	µV/V	2	95%	Yes	Mx5.1	5.1.1	Approved on 31 October 2016
AC-DC voltage transfer: AC-DC transfer difference at medium voltages	Thermal voltage converter	Difference measurement	0.2	5	V	Frequency	20 Hz to 1 MHz	4 to 60	µV/V	2	95%	Yes	Mx5.1	5.1.2	Approved on 31 October 2016
AC-DC voltage transfer: AC-DC transfer difference at higher voltages	Thermal voltage converter	Difference measurement	5	1000	V	Frequency	20 Hz to 1 MHz	10 to 60	µV/V	2	95%	Yes	Mx5.1	5.1.3	Approved on 31 October 2016
AC voltage up to 1000 V: sources	Multifunction calibrator, ACV source	AC-DC comparison	0.001	1000	V	Frequency	20 Hz to 1 MHz	20 to 1020	µV/V	2	95%	Yes	Mx5.2	5.2.1	Approved on 31 October 2016
AC voltage up to 1000 V: meters	Multimeter, AC voltmeter	AC-DC comparison	0.001	1000	V	Frequency	20 Hz to 1 MHz	20 to 1020	µV/V	2	95%	Yes	Mx5.2	5.2.2	Approved on 31 October 2016
AC-DC current transfer: AC-DC transfer difference	Thermal current converter	AC-DC comparison	0.001	20	A	Frequency	20 Hz to 100 kHz	11 to 120	µA/A	2	95%	Yes	Mx6.1.1a	6.1.1a	Approved on 31 October 2016

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Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
AC-DC current transfer: AC-DC transfer difference	Current shunt	AC-DC comparison	0.001	20	A	Frequency	20 Hz to 10 kHz	70 to 130	µA/A	2	95%	Yes	Mx6.1.1b	6.1.1b	Approved on 31 October 2016
AC current up to 100 A: sources	Multfunction calibrator, transconductance amplifier	AC-DC comparison	0.001	20	A	Frequency	20 Hz to 10 kHz	40 to 120	µA/A	2	95%	Yes	Mx6.2	6.2.1	Approved on 31 October 2016
AC current up to 100 A: meters	AC ammeter, multimeter	AC-DC comparison	0.001	20	A	Frequency	20 Hz to 10 kHz	40 to 120	µA/A	2	95%	Yes	Mx6.2	6.2.2	Approved on 31 October 2016
AC power and energy: single phase	Wattmeter, power converter	Power comparator	0	1200	W	Voltage	120 V, 240 V	15 to 43	µW/VA	2	95%	Yes		7.1.1a	Approved on 31 October 2016
						Current	1 A, 5 A								
						Frequency	50 Hz, 60 Hz								
						Power factor	any								
AC power and energy: single phase, active power	Power calibrator, wattmeter, watt converter	Comparison	55	2400	W	Voltage	110 V, 120 V, 220 V, 240 V	0.1	mW/VA	2	95%	Yes		7.1.1b	Approved on 31 October 2016
						Current	1 A, 5 A, 10 A								
						Frequency	60 Hz								
						Power factor	0.5 Lead / Lag, 1.0								

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Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
AC power and energy: single phase, active energy	Watthour meter	Difference measurement	4.58	2400	Wh	Voltage	110 V, 120 V, 220 V, 240 V	0.1	mWh/VAh	2	95%	Yes		7.1.1c	Approved on 31 October 2016
						Current	1 A, 5 A, 10 A								
						Frequency	60 Hz								
						Power factor	0.5 Lead / Lag, 1.0								
						Measurement time	300 s to 3600 s								
AC power and energy: three phase, active power	Power calibrator, wattmeter, watt converter	Comparison	165	6600	W	Voltage	110 V, 220 V	0.2	mW/VA	2	95%	Yes		7.1.3a	Approved on 31 October 2016
						Current	1 A, 5 A, 10 A								
						Frequency	60 Hz								
						Power factor	0.5 Lead / Lag, 1.0								
AC power and energy: three phase, active energy	Watthour meter	Comparison	13.75	6600	Wh	Voltage	110 V, 220 V	0.2	mWh/VAh	2	95%	Yes		7.1.3b	Approved on 31 October 2016
						Current	1 A, 5 A, 10 A								
						Frequency	60 Hz								
						Power factor	0.5 Lead / Lag, 1.0								

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Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
						Measurement time	300 s to 3600 s								
High DC voltage: high voltage sources	DC kilovolt source	Comparison	1	100	kV			0.1	mV/V	2	95%	Yes		8.1.1	Approved on 31 October 2016
High DC voltage: high voltage meters	DC kilovolt meter	Direct measurement	1	100	kV			0.1	mV/V	2	95%	Yes		8.1.2	Approved on 31 October 2016
High DC voltage: ratios	Resistive divider	Comparison	1E-05	1E-03		Input voltage	1 kV to 100 kV	1E-04		2	95%	Yes		8.1.3	Approved on 31 October 2016
AC high voltage: ratio error	Potential transformer	Difference measurement	0	0.02		Voltage	1 kV to 100 kV	8.2E-05		2	95%	No		8.3.4a	Approved on 31 October 2016
						Frequency	60 Hz								
AC high voltage: phase displacement	Potential transformer	Difference measurement	0	30	mrad	Voltage	1 kV to 100 kV	60	µrad	2	95%	No		8.3.4b	Approved on 31 October 2016
						Frequency	60 Hz								
High AC current: ratio error	Current transformer	Difference measurement	0	0.02		Current	5 A to 5 kA	6.6E-05		2	95%	No		8.6.3a	Approved on 31 October 2016
						Frequency	60 Hz								
High AC current: phase displacement	Current transformer	Difference measurement	0	30	mrad	Current	5 A to 5 kA	23	µrad	2	95%	No		8.6.3b	Approved on 31 October 2016
						Frequency	60 Hz								

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Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
High DC current: sources	Current source	Voltage drop across standard resistor	300	1000	A			0.43 to 0.46	mA/A	2	95%	Yes	Mx8.7.1	8.7.1	Approved on 31 October 2016
Phase angle: sources	Phase source	Comparison	0	360	°	Voltage	5 V to 100 V with equal input levels	0.02	°	2	95%	No		9.2.1	Approved on 31 October 2016
						Frequency	60 Hz to 50 kHz								
Phase angle: meters	Phase meter	Comparison	0	360	°	Voltage	5 V to 100 V with equal input levels	0.02	°	2	95%	No		9.2.2	Approved on 31 October 2016
						Frequency	60 Hz to 50 kHz								
RF power: calibration factor on coaxial lines	Thermistor mount, power sensor, power sensor with 30 dB Pad (50 Ω, N)	DC substitution, reflection measurement	0.8	1		Power	1 µW, 1 mW	1.4 to 2.7	%	2	95%	Yes	Mx11.1.3	11.1.3	Approved on 31 October 2016
						Frequency	10 MHz to 18 GHz								

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Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
Electrical conductivity: semiconducting materials	Standard reference materials (bulk silicon wafers)	Four-point probe measurement	0.5	10000	S/m			8.6E-03		2.2	95%	Yes		12.1.3	Approved on 31 October 2016

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Matrix Mx1.1.1

	Method	Expanded uncertainty / (μV)	*k*	Standard
1.018 V	Comparison	0.05	2	Josephson array voltage standard
10 V	Comparison	0.098	2	Josephson array voltage standard
1 V	Difference measurement	0.3	2.13	Solid state voltage standard
1.018 V	Difference measurement	0.3	2.13	Solid state voltage standard
10 V	Difference measurement	3	2.13	Solid state voltage standard

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Matrix Mx1.1.2

	Relative expanded uncertainty / (μV/V)
1 mV	700
10 mV	70
100 mV	7
1 V	0.8
10 V	0.4

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Matrix Mx1.1.3

	Relative expanded uncertainty / (μV/V)
100 V	0.7
1000 V	6

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Matrix Mx1.2.2

	Relative expanded uncertainty / (μV/V)
10 mV	70
100 mV	7
1 V	0.8
10 V	0.4
100 V	0.7
1000 V	6

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Matrix Mx2.1

	Method	Range	Temperature	Relative expanded uncertainty	*k*	Standard
Fixed resistor	DCC bridge	0.0001 Ω	Oil bath: (25 ± 0.005) °C	13 μΩ/Ω	2	Standard resistor
Fixed resistor	DCC bridge	0.001 Ω	Oil bath: (25 ± 0.005) °C	5.1 μΩ/Ω	2	Standard resistor
Fixed resistor	DCC bridge	0.01 Ω	Oil bath: (25 ± 0.005) °C	3.1 μΩ/Ω	2	Standard resistor
Fixed resistor	DCC bridge	0.1 Ω	Oil bath: (25 ± 0.005) °C	2.1 μΩ/Ω	2	Standard resistor
Fixed resistor	DCC bridge	1 Ω	Oil bath: (25 ± 0.005) °C	0.24 μΩ/Ω	2	Standard resistor
Resistance box	Difference measurement	1 Ω	-	8 μΩ/Ω	3.18	Standard resistor
Fixed resistor	DCC bridge	0.01 kΩ	Oil bath: (25 ± 0.005) °C	0.22 μΩ/Ω	2	Standard resistor
Resistance box	Difference measurement	0.01 kΩ	-	1.2 μΩ/Ω	3.18	Standard resistor
Fixed resistor	DCC bridge	0.1 kΩ	Oil bath: (25 ± 0.005) °C	0.23 μΩ/Ω	2	Standard resistor
Resistance box	Difference measurement	0.1 kΩ	-	0.3 μΩ/Ω	2	Standard resistor
Fixed resistor	QHR, DCC bridge	1 kΩ	Oil bath: (25 ± 0.005) °C	0.08 μΩ/Ω	2	Quantum Hall resistance standard
Resistance box	Difference measurement	1 kΩ	-	0.4 μΩ/Ω	2.2	Standard resistor
Fixed resistor	DCC bridge	10 kΩ	Oil bath: (25 ± 0.006) °C	0.24 μΩ/Ω	2	Standard resistor
Resistance box	Difference measurement	10 kΩ	-	0.6 μΩ/Ω	2.36	Standard resistor
Fixed resistor	Difference measurement	100 kΩ	Oil bath: (25 ± 0.005) °C	6 μΩ/Ω	2	Standard resistor
Fixed resistor	Difference measurement	1 MΩ	Oil bath: (25 ± 0.005) °C	9 μΩ/Ω	2	Standard resistor
Fixed resistor	Difference measurement	10 MΩ	Oil bath: (25 ± 0.005) °C	13 μΩ/Ω	2	Standard resistor
Fixed resistor	Difference measurement	100 MΩ	Air bath: (23 ± 0.03) °C	0.1 mΩ/Ω	2	Standard resistor
Fixed resistor	Difference measurement	1 GΩ	Air bath: (23 ± 0.03) °C	0.18 mΩ/Ω	2	Standard resistor
Fixed resistor	Difference measurement	10 GΩ	Air bath: (23 ± 0.03) °C	0.19 mΩ/Ω	2	Standard resistor
Fixed resistor	Difference measurement	100 GΩ	Air bath: (23 ± 0.03) °C	0.23 mΩ/Ω	2	Standard resistor
Fixed resistor	Difference measurement	1 TΩ	Air bath: (23 ± 0.03) °C	0.6 mΩ/Ω	2	Standard resistor

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Matrix Mx2.2

	Relative expanded uncertainty	*k*
0.001 Ω	5.1 μΩ/Ω	2
0.01 Ω	3.1 μΩ/Ω	2
0.1 Ω	2.1 μΩ/Ω	2
1 Ω	8 μΩ/Ω	3.18
10 Ω	1.2 μΩ/Ω	3.18
100 Ω	0.3 μΩ/Ω	2
1 kΩ	0.4 μΩ/Ω	2.2
10 kΩ	0.6 μΩ/Ω	2.36
100 kΩ	6 μΩ/Ω	2
1 MΩ	9 μΩ/Ω	2
10 MΩ	13 μΩ/Ω	2
100 MΩ	90 μΩ/Ω	2
1 GΩ	180 μΩ/Ω	2
10 GΩ	0.19 mΩ/Ω	2
100 GΩ	0.23 mΩ/Ω	2
1 TΩ	0.6 mΩ/Ω	2

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Matrix Mx3.1

	Instrument or Artifact	Method	Relative expanded uncertainty / (μA/A)
10 pA	Current generator	Comparison	900
100 pA	Current generator	Comparison	450
1 nA	Current generator	Comparison	170
10 nA	Current generator	Comparison	70
100 nA	Current generator	Comparison	70
1 μA	Current generator	Comparison	70
10 μA	Current generator, multifunction calibrator	Voltage drop across standard resistor	19
100 μA	Current generator, multifunction calibrator	Voltage drop across standard resistor	17
1 mA	Current generator, multifunction calibrator	Voltage drop across standard resistor	17
10 mA	Current generator, multifunction calibrator	Voltage drop across standard resistor	17
100 mA	Current generator, multifunction calibrator	Voltage drop across standard resistor	17
1 A	Current generator, multifunction calibrator	Voltage drop across standard resistor	19
2 A	Current generator, multifunction calibrator	Voltage drop across standard resistor	22
5 A	Current generator, multifunction calibrator	Voltage drop across standard resistor	20
10 A	Current generator, multifunction calibrator	Voltage drop across standard resistor	20
20 A	Current generator, multifunction calibrator	Voltage drop across standard resistor	60
50 A	Current generator, multifunction calibrator	Voltage drop across standard resistor	60
100 A	Current generator, multifunction calibrator	Voltage drop across standard resistor	67

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Matrix Mx3.2

	Relative expanded uncertainty / (μA/A)
2 A	22
5 A	20
10 A	20

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Matrix Mx3.3

	Relative expanded uncertainty / (μA/A)
20 A	60
50 A	60
100 A	67

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Matrix Mx4.2.1

	Method	Frequency	Relative expanded uncertainty / (μF/F)	Standard
1 pF	Ratio bridge	1 kHz	0.58	Standard capacitor
1 pF	Ratio bridge	1.592 kHz	0.26	Standard capacitor
10 pF	Ratio bridge	1 kHz	0.55	Standard capacitor
10 pF	Ratio bridge	1.592 kHz	0.23	Standard capacitor
100 pF	Ratio bridge	1 kHz	0.56	Standard capacitor
100 pF	Ratio bridge	1.592 kHz	0.23	Standard capacitor
1000 pF	Ratio bridge	1 kHz	0.56	DC quantum Hall resistance standard
1000 pF	Ratio bridge	1.592 kHz	0.22	DC quantum Hall resistance standard
0.01 μF	Automatic capacitance bridge	1 kHz	60	Standard capacitor
0.1 μF	Automatic capacitance bridge	1 kHz	30	Standard capacitor
1 μF	Automatic capacitance bridge	1 kHz	70	Standard capacitor

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Matrix Mx4.2.4

	Frequency	Relative expanded uncertainty / (μF/F)
1 pF	1 kHz	2
10 pF	1 kHz	0.9
100 pF	1 kHz	0.7
1000 pF	1 kHz	1.2
0.01 μF	1 kHz	60
0.1 μF	1 kHz	30
1 μF	1 kHz	70

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Matrix Mx4.3.2

	Frequency	Relative expanded uncertainty / (mH/H)
1 mH	100 Hz	0.22
1 mH	1 kHz	0.22
10 mH	100 Hz	0.22
10 mH	1 kHz	0.22
100 mH	100 Hz	0.22
100 mH	1 kHz	0.22
1 H	100 Hz	0.22
1 H	1 kHz	0.52
10 H	100 Hz	0.22
10 H	1 kHz	2

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Matrix Mx4.3.5

	Frequency	Relative expanded uncertainty / (mH/H)
100 µH	100 Hz	1.2
100 µH	1 kHz	1.2
1 mH	100 Hz	0.22
1 mH	1 kHz	0.22
10 mH	100 Hz	0.22
10 mH	1 kHz	0.22
100 mH	100 Hz	0.22
100 mH	1 kHz	0.22
1 H	100 Hz	0.22
1 H	1 kHz	0.52
10 H	100 Hz	0.22
10 H	1 kHz	2

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Matrix Mx5.1

	Relative expanded uncertainty / (μV/V)										
	20 Hz	40 Hz	60 Hz	1 kHz	10 kHz	30 kHz	100 kHz	300 kHz	500 kHz	800 kHz	1 MHz
1 mV	170	170	170	170	170	170	200	230	290	400	500
2 mV	130	130	130	130	130	130	170	190	250	310	420
5 mV	110	110	110	110	110	110	140	170	220	280	400
10 mV	90	90	90	83	83	83	120	140	190	230	320
20 mV	70	70	70	70	70	70	100	110	150	190	240
50 mV	41	41	41	41	41	41	62	70	90	120	140
100 mV	30	30	30	29	29	29	44	50	70	90	120
200 mV	13	13	13	13	13	13	16	29	44	53	60
0.5 V	10	10	10	10	10	10	13	25	40	50	60
1 V	8	8	8	8	8	8	10	20	33	40	50
2 V	5	5	5	4	4	4	8	18	30	40	50
4 V	8	8	8	8	8	8	10	20	33	40	50
10 V	10	10	10	10	10	10	13	25	40	50	60
20 V	13	13	13	13	13	13	16	29	44	53	60
40 V	16	16	16	16	16	16	18	32	-	-	-
100 V	19	19	19	19	19	19	23	-	-	-	-
400 V	28	28	28	28	28	28	40	-	-	-	-
1000 V	40	40	40	40	40	41	-	-	-	-	-

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Matrix Mx5.2

	Relative expanded uncertainty / (μV/V)						
	20 Hz	60 Hz	10 kHz	30 kHz	100 kHz	300 kHz	1 MHz
1 mV	-	1020	1020	1020	-	-	-
5 mV	-	550	550	550	-	-	-
10 mV	-	300	300	300	-	-	-
20 mV	-	100	100	200	-	-	-
50 mV	-	70	70	100	-	-	-
100 mV	40	40	40	40	60	100	300
200 mV	20	20	20	20	30	50	100
0.5 V	20	20	20	20	30	50	100
1 V	20	20	20	20	30	50	100
2 V	20	20	20	20	30	50	100
4 V	20	20	20	20	30	50	100
10 V	20	20	20	20	30	50	100
20 V	20	20	20	20	30	50	100
40 V	30	30	30	30	50	70	-
100 V	40	40	40	40	60	-	-
400 V	50	50	50	50	80	-	-
1000 V	70	70	70	70	-	-	-

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Matrix Mx6.1.1a

	Relative expanded uncertainty / (μA/A)					
	20 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz
1 mA	18	18	18	24	40	50
5 mA	15	15	15	20	26	40
10 mA	11	11	11	15	19	24
20 mA	15	15	15	20	26	40
30 mA	18	18	18	24	40	50
50 mA	22	22	22	28	40	50
100 mA	24	24	24	40	50	60
200 mA	26	26	26	40	50	60
300 mA	28	28	28	40	50	70
500 mA	30	30	30	50	60	70
1 A	40	40	40	50	60	80
2 A	40	40	40	50	70	80
3 A	40	40	40	60	70	90
5 A	50	50	50	60	80	100
10 A	50	50	50	70	80	110
20 A	60	60	60	70	90	120

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Matrix Mx6.1.1b

	Relative expanded uncertainty / (μA/A)		
	20 Hz to 1 kHz	5 kHz	10 kHz
1 mA	70	90	90
5 mA	70	90	90
10 mA	70	90	90
20 mA	70	90	90
30 mA	70	90	90
50 mA	90	90	110
100 mA	90	90	110
200 mA	90	90	110
300 mA	90	90	110
500 mA	100	100	130
1 A	100	100	130
2 A	100	100	130
3 A	120	-	-
5 A	120	-	-
10 A	120	-	-
20 A	120	-	-

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Matrix Mx6.2

	Relative expanded uncertainty / (μA/A)		
	20 Hz to 1 kHz	5 kHz	10 kHz
1 mA	40	50	70
5 mA	40	50	70
10 mA	40	50	70
20 mA	40	50	70
30 mA	40	50	70
50 mA	50	60	90
100 mA	50	60	90
200 mA	50	60	90
300 mA	50	60	90
500 mA	60	70	110
1 A	60	70	110
2 A	60	70	110
3 A	120	-	-
5 A	120	-	-
10 A	120	-	-
20 A	120	-	-

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Matrix Mx8.7.1

	Relative expanded uncertainty / (mA/A)
300 A	0.46
500 A	0.46
1000 A	0.43

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Matrix Mx11.1.3

	Power	Frequency	Relative expanded uncertainty / (%)
Thermistor mount	1 mW	10 MHz	1.6
Thermistor mount	1 mW	50 MHz	1.4
Thermistor mount	1 mW	51 MHz to 4 GHz	1.7
Thermistor mount	1 mW	4001 MHz to 8 GHz	2.1
Thermistor mount	1 mW	8001 MHz to 18 GHz	2.3
Power sensor	1 mW	10 MHz	1.7
Power sensor	1 mW	50 MHz	1.5
Power sensor	1 mW	51 MHz to 4 GHz	1.8
Power sensor	1 mW	4001 MHz to 8 GHz	2.2
Power sensor	1 mW	8001 MHz to 18 GHz	2.3
Power sensor with 30 dB Pad	1 µW	10 MHz	2.0
Power sensor with 30 dB Pad	1 µW	50 MHz	1.9
Power sensor with 30 dB Pad	1 µW	51 MHz to 4 GHz	2.1
Power sensor with 30 dB Pad	1 µW	4001 MHz to 8 GHz	2.4
Power sensor with 30 dB Pad	1 µW	8001 MHz to 18 GHz	2.7