

Electricity and Magnetism, Costa Rica, ICE-LMVE (Instituto Costarricense de Electricidad, Laboratorio Metrológico de Variables Eléctricas)



Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		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	Comments	NMI Service Identifier
DC voltage, DC voltage sources, low value ranges	DC voltage source, multifunction calibrator	Direct comparison	0.01	1000	V			4.9 to 161	μV/V	2	95%	Yes	Matrix 11201	Approved on 16 April 2016	11201
DC voltage, DC voltage meters, intermediate values	DC voltmeter, multimeter	Direct comparison	> 0.001	1000	V			3.8 to 416	μV/V	2	95%	Yes	Matrix 12201	Approved on 16 April 2016	12201
DC resistance, DC resistance standards and sources, low values	Fixed resistor, resistance box	Direct comparison	0.1	100 000 000	Ω			10 to 468	μΩ/Ω	2	95%	Yes	Matrix 21101	Approved on 16 April 2016	21101
DC resistance: DC resistance standards and sources: High values	Fixed resistor, resistance box	Direct comparison	2	200 000	MΩ	Temperature	23 °C	25 to 1100	μΩ/Ω	2	95%	Yes	Matrix 21301	Approved on 16 April 2016	21303
						Voltage	1 V to 1000 V								
DC resistance, DC resistance meters, low values	Multimeter	Direct comparison	1	1	Ω			97	μΩ/Ω	2	95%	Yes		Approved on 16 April 2016	22101
DC resistance, DC resistance meters, intermediate values	Multimeter	Direct comparison	1.9	100000000	Ω	Resistance, fixed values	1.9 Ω, 10 Ω, 19 Ω, 100 Ω, 190 Ω, 1 kΩ, 1.9 kΩ, 10 kΩ, 19 kΩ, 100 kΩ, 190 kΩ, 1 MΩ, 1.9 MΩ, 10 MΩ, 19 MΩ, 100 MΩ	8.7 to 102	μΩ/Ω	2	95%	Yes	Matrix 22201	Approved on 16 April 2016	22201
DC resistance: DC resistance meters: Intermediate values	Teraohmmeter	Direct comparison	10	100 000	MΩ	Temperature	23 °C	25 to 1100	μΩ/Ω	2	95%	Yes	Matrix 22202	Approved on 16 April 2016	22202
						Voltage	1 V to 1000 V							Approved on 16 April 2016	
DC current, DC current sources, low values	Multifunction calibrator, current generator	Direct comparison	1.00E-05	10	mA			23 to 418	μA/A	2	95%	Yes	Matrix 31101	Approved on 16 April 2016	31101
DC current, DC current meters, low values	Multimeter	Direct comparison	1.00E-05	11	mA			40 to 840	μA/A	2	95%	Yes	Matrix 32101	Approved on 16 April 2016	32101

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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	Comments	NMI Service Identifier	
Impedance (up to the MHz range): Capacitance: Capacitance and dissipation factor for dielectric capacitors	Fixed capacitor, capacitance box	Substitution	10	1000	pF	Frequency	1 kHz	5.0E+01	μF/F	2	95%	Yes	Matrix 42201	Approved on 16 April 2016	42201	
						Voltage	1.5 V to 15 V									
Inductance: self inductance, low values	Fixed inductor	Substitution using an LCR meter	10	100	mH	Frequency Current	1 kHz 1.5 mA to 7.7 mA	5.0E+01	μH/H	2	95%	Yes	Matrix 43201	Approved on 16 April 2016	43201	
AC voltage (up to the MHz range), AC voltage up to 1100 V, sources	Multifunction calibrator, source, oscilloscope calibrator	Direct comparison	0.01	1000	V	Frequency	10 Hz to 500 kHz	72 to 31213	μV/V	2	95%	Yes	Matrix 52101	Approved on 23 March 2010	52101	
AC voltage (up to the MHz range), AC voltage up to 1100 V, meters	AC voltmeter, multimeter, multifunction calibrator	Direct comparison	0.01	1000	V	Frequency	10 Hz to 1 MHz	50 to 10667	μV/V	2	95%	Yes	Matrix 52201	Approved on 23 March 2010	52201	
AC current, AC current up to 100 A, sources	Multifunction calibrator, source	Direct comparison	0.0001	10	A	Frequency	10 Hz to 100 kHz	392 to 8803	μA/A	2	95%	Yes	Matrix 62101	Approved on 23 March 2010	62101	
AC current, AC current up to 100 A, meters	AC ammeter, multimeter, multifunction calibrator	Direct comparison	0.0001	11	A	Frequency	10 Hz to 10 kHz	113 to 5849	μA/A	2	95%	Yes	Matrix 62201	Approved on 23 March 2010	62201	
AC power, AC power and energy, single phase (frequencies below or equal to 400 Hz)	Watt-hour meter, wattmeter	Comparison	15	12000	W	Frequency	60 Hz	289	μQVA	2	95%	Yes		Approved on 23 March 2010	71101	
						Applied voltage	120 V and 240 V									
						Current	(0.25 A at 120 V and 0.3 A at 240 V) to 50 A									
						Power factor	1, 0.5 lead, 0.5 lag									