

Electricity and Magnetism, The Netherlands, VSL

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty						Comments	NMI Service Identifier
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		
DC voltage sources: single values	Standard cell, solid state voltage standards	Direct comparison with standard	1	1.018	V	Voltage	1 V, 1.018 V	0.1	μV/V	2	95%	Yes		Approved on 22 February 2008	1
DC voltage sources: single values	Standard cell, solid state voltage standards	Direct comparison with standard	10	10	V			0.05	μV/V	2	95%	Yes		Approved on 22 February 2008	1a
DC voltage sources: single values	Standard cell, solid state voltage standards	Direct comparison	1	1.018	V	Voltage	1 V, 1.018 V	0.5	μV/V	2	95%	Yes		Approved on 22 February 2008	2
DC voltage sources: single values	Standard cell, solid state voltage standards	Direct comparison	10	10	V			0.3	μV/V	2	95%	Yes		Approved on 22 February 2008	2a
DC voltage sources: low values	DC voltage source, multifunction calibrator	Direct measurement	1	1	mV			0.11	mV/V	2	95%	Yes		Approved on 22 February 2008	3a
DC voltage sources: low values	DC voltage source, multifunction calibrator	Direct measurement	10	10	mV			11	μV/V	2	95%	Yes		Approved on 22 February 2008	3b
DC voltage sources: low values	DC voltage source, multifunction calibrator	Direct measurement	100	100	mV			1.4	μV/V	2	95%	Yes		Approved on 22 February 2008	3c
DC voltage sources: low values	DC voltage source, multifunction calibrator	Comparison with standard	1	1	V			1.7	μV/V	2	95%	Yes		Approved on 22 February 2008	3d
DC voltage sources: low values	DC voltage source, multifunction calibrator	Comparison with standard	10	10	V			1.1	μV/V	2	95%	Yes		Approved on 22 February 2008	3e
DC voltage sources: low values	DC voltage source, multifunction calibrator	Direct measurement	0.1	100	mV			(0.003U to 0.2U + 2E-05), U in V	mV	2	95%	No		Approved on 22 February 2008	4a
DC voltage sources: low values	DC voltage source, multifunction calibrator	Direct measurement	0.1	10	V			2 to 3	μV/V	2	95%	Yes		Approved on 22 February 2008	4b
DC voltage sources: intermediate values	DC voltage source, multifunction calibrator	Comparison with standard	100	100	V			1.6	μV/V	2	95%	Yes		Approved on 22 February 2008	5c

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DC voltage sources: intermediate values	DC voltage source, multifunction calibrator	Comparison with standard	1000	1000	V			1.7	$\mu\text{V/V}$	2	95%	Yes		Approved on 22 February 2008	5d
DC voltage sources: intermediate values	DC voltage source, multifunction calibrator	Direct measurement	10	1100	V			2 to 5	$\mu\text{V/V}$	2	95%	Yes		Approved on 22 February 2008	6a
DC voltage meters: very low values	Nanovoltmeter, microvoltmeter	Comparison with standard	1	1	mV			0.21	μV	2	95%	No		Approved on 22 February 2008	7c
DC voltage meters: very low values	Nanovoltmeter, microvoltmeter	Comparison with standard	0.1	1	mV			0.3	mV/V	2	95%	No		Approved on 22 February 2008	7d
DC voltage meters: intermediate values	Nanovoltmeter, microvoltmeter	Comparison with standard	10	10	mV			21	$\mu\text{V/V}$	2	95%	Yes		Approved on 22 February 2008	7e
DC voltage meters: intermediate values	Nanovoltmeter, microvoltmeter, DC voltmeter, multimeter	Comparison with standard	100	100	mV			2.7	$\mu\text{V/V}$	2	95%	Yes		Approved on 22 February 2008	7f
DC voltage meters: intermediate values	DC voltmeter, multimeter	Direct measurement	1	1	V			1.3	$\mu\text{V/V}$	2	95%	Yes		Approved on 22 February 2008	7g
DC voltage meters: intermediate values	DC voltmeter, multimeter	Direct measurement	10	10	V			0.6	$\mu\text{V/V}$	2	95%	Yes		Approved on 22 February 2008	7h
DC voltage meters: intermediate values	DC voltmeter, multimeter	Direct measurement	100	100	V			0.8	$\mu\text{V/V}$	2	95%	Yes		Approved on 22 February 2008	7i
DC voltage meters: intermediate values	DC voltmeter, multimeter	Direct measurement	1000	1000	V			1.2	$\mu\text{V/V}$	2	95%	Yes		Approved on 22 February 2008	7j
DC voltage meters: intermediate values	Nanovoltmeter, microvoltmeter	Comparison with standard	1	10	mV			0.03 to 0.3	mV/V	2	95%	Yes		Minimum value of uncertainty for the upper range limit Approved on 22 February 2008	8a
DC voltage meters: intermediate values	Nanovoltmeter, microvoltmeter	Comparison with standard	10	100	mV			3 to 30	$\mu\text{V/V}$	2	95%	Yes		Minimum value of uncertainty for the upper range limit Approved on 22 February 2008	8b
DC voltage meters: intermediate values	DC voltmeter, multimeter	Direct measurement	0.1	1100	V			2	$\mu\text{V/V}$	2	95%	Yes		Approved on 22 February 2008	8

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DC voltage ratio: up to 1100 V	DC voltage divider	Comparison	0.01	0.01		Input voltage	10 V to 1000 V	2.7E-06 to 1.2E-06		2	95%	No		Approved on 22 February 2008	9a
DC voltage ratio: up to 1100 V	DC voltage divider	Comparison	0.1	0.1		Input voltage	10 V to 1000 V	1.3E-06 to 0.8E-06		2	95%	No		Approved on 22 February 2008	9b
DC resistance standards and sources: low values	Standard fixed resistor	DCC bridge	1	1	$\mu\Omega$	Power	10 mW	40	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	10a
DC resistance standards and sources: low values	Standard fixed resistor	DCC bridge	10	10	$\mu\Omega$	Power	100 mW	4	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	10b
DC resistance standards and sources: low values	Standard fixed resistor	DCC bridge	100	100	$\mu\Omega$	Power	100 mW	1.5	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	10c
DC resistance standards and sources: low values	Standard fixed resistor	DCC bridge	1	1	m Ω	Power	100 mW	1	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	11a
DC resistance standards and sources: low values	Standard fixed resistor	DCC bridge	10	10	m Ω	Power	10 mW	0.4	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	11b
DC resistance standards and sources: low values	Standard fixed resistor	DCC bridge	100	100	m Ω	Power	10 mW	0.2	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	11c
DC resistance standards and sources: low values	Standard fixed resistor	DCC bridge	1	1	Ω	Power	10 mW	0.15	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	11d
DC resistance standards and sources: intermediate values	Standard fixed resistor	DCC bridge	10	10	Ω	Power	10 mW	0.13	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	12b
DC resistance standards and sources: intermediate values	Standard fixed resistor	DCC bridge	25	25	Ω	Power	10 mW	0.13	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	12c
DC resistance standards and sources: intermediate values	Standard fixed resistor	DCC bridge	100	100	Ω	Power	10 mW	0.11	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	12d
DC resistance standards and sources: intermediate values	Standard fixed resistor	DCC bridge	1	1	k Ω	Power	10 mW	0.09	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	12e
DC resistance standards and sources: intermediate values	Standard fixed resistor	DCC bridge	10	10	k Ω	Power	1 mW	0.12	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	12f
DC resistance standards and sources: intermediate values	Standard fixed resistor	CCC bridge	1	1	Ω	Power	1 mW	0.05	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	12g
DC resistance standards and sources: intermediate values	Standard fixed resistor	CCC bridge	10	10	Ω	Power	1 mW	0.03	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	12h

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DC resistance standards and sources: intermediate values	Standard fixed resistor	DCC bridge	25	25	Ω	Power	1 mW	0.03	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	12i
DC resistance standards and sources: intermediate values	Standard fixed resistor	CCC bridge	100	100	Ω	Power	1 mW	0.02	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	12j
DC resistance standards and sources: intermediate values	Standard fixed resistor	CCC bridge	1	1	$k\Omega$	Power	1 mW	0.02	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	12k
DC resistance standards and sources: intermediate values	Standard fixed resistor	CCC bridge	10	10	$k\Omega$	Power	1 mW	0.02	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	12l
DC resistance standards and sources: intermediate values	Standard fixed resistor	Potentiometer system	6.45	12.9	$k\Omega$	Resistance	6.45 $k\Omega$, 10 $k\Omega$, 12.9 $k\Omega$	0.03	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	12m
DC resistance standards and sources: intermediate values	Standard fixed resistor	Potentiometer bridge	10	10	$k\Omega$	Voltage	5 V to 10 V	0.2	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	13c
DC resistance standards and sources: intermediate values	Standard fixed resistor	Potentiometer bridge	100	100	$k\Omega$	Voltage	9 V to 30 V	0.4	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	13d
DC resistance standards and sources: intermediate values	Standard fixed resistor	Potentiometer bridge	1	1	$M\Omega$	Voltage	9 V to 90 V	1	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	13e
DC resistance standards and sources: high values	Standard fixed resistor	Potentiometer bridge	10	10	$M\Omega$	Voltage	9 V to 90 V	3	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	13f
DC resistance standards and sources: high values	Standard fixed resistor	Potentiometer bridge	100	100	$M\Omega$	Voltage	9 V to 90 V	7	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	13g
DC resistance standards and sources: high values	Standard fixed resistor	Potentiometer bridge	1	1	$G\Omega$	Voltage	9 V to 90 V	20	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	13h
DC resistance standards and sources: high values	Standard fixed resistor	Modified Wheatstone bridge	10	10	$M\Omega$	Voltage	9 V to 90 V	2	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	13i
DC resistance standards and sources: high values	Standard fixed resistor	Modified Wheatstone bridge	100	100	$M\Omega$	Voltage	9 V to 90 V	3	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	13j
DC resistance standards and sources: high values	Standard fixed resistor	Modified Wheatstone bridge	1	1	$G\Omega$	Voltage	9 V to 90 V	10	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	13k
DC resistance standards and sources: high values	Standard fixed resistor	Modified Wheatstone bridge	10	10	$G\Omega$	Voltage	9 V to 90 V	40	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	13l
DC resistance standards and sources: high values	Standard fixed resistor	Modified Wheatstone bridge	100	100	$G\Omega$	Voltage	9 V to 90 V	100	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	13m

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DC resistance standards and sources: high values	Standard fixed resistor	Teraohmmeter	100	100	MΩ	Voltage	1 V to 1000 V	0.1	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	14a
DC resistance standards and sources: high values	Standard fixed resistor	Teraohmmeter	1	1	GΩ	Voltage	10 V to 1000 V	0.1	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	14b
DC resistance standards and sources: high values	Standard fixed resistor	Teraohmmeter	10	10	GΩ	Voltage	10 V to 1000 V	0.2	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	14c
DC resistance standards and sources: high values	Standard fixed resistor	Teraohmmeter	100	100	GΩ	Voltage	10 V to 1000 V	0.5	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	14d
DC resistance standards and sources: high values	Standard fixed resistor	Teraohmmeter	1	1	TΩ	Voltage	10 V to 1000 V	1	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	14e
DC resistance standards and sources: high values	Standard fixed resistor	Teraohmmeter	10	10	TΩ	Voltage	10 V to 1000 V	2	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	14f
DC resistance standards and sources: high values	Standard fixed resistor	Teraohmmeter	100	100	TΩ	Voltage	100 V to 1000 V	5	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	14g
DC resistance standards and sources: high values	Standard fixed resistor	Teraohmmeter	1	1	PΩ	Voltage	100 V to 1000 V	0.01	Ω/Ω	2	95%	Yes		Approved on 22 February 2008	14h
DC resistance standards and sources: high values	Standard fixed resistor	Teraohmmeter	10	10	PΩ	Voltage	100 V to 1000 V	0.1	Ω/Ω	2	95%	Yes		Approved on 22 February 2008	14i
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Comparison with standard	1	1	Ω			0.07	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	15a
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Comparison with standard	10	10	Ω			20	μΩ/Ω	2	95%	Yes		Approved on 22 February 2008	15b
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Comparison with standard	100	100	Ω			15	μΩ/Ω	2	95%	Yes		Approved on 22 February 2008	15c
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Comparison with standard	1	1	kΩ			10	μΩ/Ω	2	95%	Yes		Approved on 22 February 2008	15d
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Comparison with standard	10	10	kΩ			10	μΩ/Ω	2	95%	Yes		Approved on 22 February 2008	15e
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Comparison with standard	100	100	kΩ			10	μΩ/Ω	2	95%	Yes		Approved on 22 February 2008	15f
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Comparison with standard	1	1	MΩ			15	μΩ/Ω	2	95%	Yes		Approved on 22 February 2008	15g

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DC resistance standards and sources: multiple ranges	Multifunction calibrator	Comparison with standard	10	10	MΩ			0.06	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	15h
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Comparison with standard	100	100	MΩ			0.6	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	15i
DC resistance standards and sources: multiple ranges	Non-decade resistors	DCC bridge	1	1E+04	Ω			0.04 to 0.02	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	15j
DC resistance standards and sources: multiple ranges	Non-decade resistors	Direct measurement	1	1E+04	Ω			0.04 to 0.02	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	15k
DC resistance standards and sources: multiple ranges	Non-decade resistors	Direct measurement	1E+04	1E+08	Ω			0.02 to 0.7	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	15l
DC resistance standards and sources: temperature coefficient	Standard fixed resistor	DCC bridge	0	5	μΩ/Ω/K	Stirred oil bath or air bath temperature	15 °C to 30 °C	0.015	μΩ/Ω/K	2	95%	No		Resistors in the range of 1 Ω to 10 kΩ Approved on 22 February 2008	15m1
DC resistance standards and sources: temperature coefficient	Standard fixed resistor	DCC bridge	5	200	μΩ/Ω/K	Stirred oil bath or air bath temperature	15 °C to 30 °C	0.015 to 0.3	μΩ/Ω/K	2	95%	No		Resistors in the range of 1 Ω to 10 kΩ; uncertainties are minimum and maximum values Approved on 22 February 2008	15m2
DC resistance standards and sources: temperature coefficient	Standard fixed resistor	Potentiometer bridge	0	5	μΩ/Ω/K	Stirred oil bath or air bath temperature	15 °C to 30 °C	0.1	μΩ/Ω/K	2	95%	No		Resistors in the range of 10 kΩ to 10 MΩ Approved on 22 February 2008	15n1
DC resistance standards and sources: temperature coefficient	Standard fixed resistor	Potentiometer bridge	5	200	μΩ/Ω/K	Stirred oil bath or air bath temperature	15 °C to 30 °C	0.1 to 0.3	μΩ/Ω/K	2	95%	No		Resistors in the range of 10 kΩ to 10 MΩ; uncertainties are minimum and maximum values Approved on 22 February 2008	15n2
DC resistance meters: low values	Multimeter	Direct measurement	1	1	Ω			18	μΩ/Ω	2	95%	Yes		Approved on 22 February 2008	16a

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DC resistance meters: intermediate values	Multimeter	Direct measurement	1.9	1.9	Ω			18	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	16b
DC resistance meters: intermediate values	Multimeter	Direct measurement	10	19	Ω	Resistance	10 Ω , 19 Ω	5	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	16c
DC resistance meters: intermediate values	Multimeter	Direct measurement	100	190	Ω	Resistance	100 Ω , 190 Ω	1.7	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	16d
DC resistance meters: intermediate values	Multimeter	Direct measurement	1	1.9	$k\Omega$	Resistance	1 $k\Omega$, 1.9 $k\Omega$	2.4	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	16e
DC resistance meters: intermediate values	Multimeter	Direct measurement	10	19	$k\Omega$	Resistance	10 $k\Omega$, 19 $k\Omega$	2.4	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	16f
DC resistance meters: intermediate values	Multimeter	Direct measurement	100	190	$k\Omega$	Resistance	100 $k\Omega$, 190 $k\Omega$	4	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	16g
DC resistance meters: intermediate values	Multimeter	Direct measurement	1	1.9	$M\Omega$	Resistance	1 $M\Omega$, 1.9 $M\Omega$	7	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	16h
DC resistance meters: intermediate values	Multimeter	Direct measurement	10	19	$M\Omega$	Resistance	10 $M\Omega$, 19 $M\Omega$	22	$\mu\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	16i
DC resistance meters: intermediate values	Multimeter	Direct measurement	100	100	$M\Omega$			0.1	$m\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	16j
DC resistance meters: high values	Multimeter, Teraohmmeter	Direct measurement	1	100	$G\Omega$	Resistance	decadic values	0.1 to 0.5	$m\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	16k
DC resistance meters: high values	Multimeter, Teraohmmeter	Direct measurement	1	100	$T\Omega$	Resistance	decadic values	1 to 5	$m\Omega/\Omega$	2	95%	Yes		Approved on 22 February 2008	16l
DC current sources: low values	I-sources	Comparison with standard	0.01	1	pA			0.2	fA	2	95%	No		Approved on 22 February 2008	17
DC current sources: low values	I-sources	Comparison with standard	1	20	pA			0.2 to 0.05	mA/A	2	95%	Yes		Approved on 22 February 2008	18a
DC current sources: low values	I-sources	Comparison with standard	20	200	pA			0.05	mA/A	2	95%	Yes		Approved on 22 February 2008	18b
DC current sources: low values	I-sources	Direct buffered measurement	0.2	2	nA			0.3 to 0.1	mA/A	2	95%	Yes		Approved on 22 February 2008	18c
DC current sources: low values	I-sources	Direct buffered measurement	2	20	nA			0.1 to 0.03	mA/A	2	95%	Yes		Approved on 22 February 2008	18d

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DC current sources: low values	I-sources	Direct buffered measurement	20	200	nA			0.03	mA/A	2	95%	Yes		Approved on 22 February 2008	19a
DC current sources: low values	I-sources	Direct buffered measurement	0.2	2	μA			30 to 9	μA/A	2	95%	Yes		Approved on 22 February 2008	19b
DC current sources: low values	I-sources	Direct buffered measurement	2	20	μA			7	μA/A	2	95%	Yes		Approved on 22 February 2008	20d
DC current sources: low values	I-sources	Direct measurement	20	100	μA			7 to 5	μA/A	2	95%	Yes		Approved on 22 February 2008	20e
DC current sources: intermediate values	I-sources	Direct measurement	0.1	1	mA			5	μA/A	2	95%	Yes		Approved on 22 February 2008	20f
DC current sources: intermediate values	I-sources	Direct measurement	0.1	10	mA			5	μA/A	2	95%	Yes		Approved on 22 February 2008	20g
DC current sources: intermediate values	I-sources	Direct measurement	10	100	mA			5	μA/A	2	95%	Yes		Approved on 22 February 2008	20c
DC current sources: intermediate values	I-sources	Direct measurement	0.1	1	A			0.08	mA/A	2	95%	Yes		Approved on 22 February 2008	21
DC current meters: low values	I-meters	Direct measurement	0.01	1	pA			0.2	fA	2	95%	No		Approved on 22 February 2008	23
DC current meters: low values	I-meters	Direct measurement	1	20	pA			0.2 to 0.05	mA/A	2	95%	Yes		Approved on 22 February 2008	24a
DC current meters: low values	I-meters	Direct measurement	20	200	pA			0.05	mA/A	2	95%	Yes		Approved on 22 February 2008	24b
DC current meters: low values	I-meters	Direct measurement	0.2	2	nA			0.3 to 0.1	mA/A	2	95%	Yes		Approved on 22 February 2008	24c
DC current meters: low values	I-meters	Direct measurement	2	20	nA			0.1 to 0.03	mA/A	2	95%	Yes		Approved on 22 February 2008	24d
DC current meters: low values	I-meters	Direct measurement	20	200	nA			0.03	mA/A	2	95%	Yes		Approved on 22 February 2008	25a
DC current meters: low values	I-meters	Direct measurement	0.2	2	μA			0.03 to 0.01	mA/A	2	95%	Yes		Approved on 22 February 2008	25b
DC current meters: low values	I-meters	Direct measurement	2	20	μA			10	μA/A	2	95%	Yes		Approved on 22 February 2008	26d

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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		
DC current meters: low values	I-meters	Direct measurement	20	100	μA			5 to 3	μA/A	2	95%	Yes		Approved on 22 February 2008	26e
DC current meters: intermediate values	I-meters	Direct measurement	0.1	100	mA			3	μA/A	2	95%	Yes		Approved on 22 February 2008	26b
DC current meters: intermediate values	I-meters	Direct measurement	0.1	1	A			60	μA/A	2	95%	Yes		Approved on 22 February 2008	27a
DC current meters: intermediate values	I-meters	Direct measurement	1	10	A			100	μA/A	2	95%	Yes		Approved on 22 February 2008	27b
AC resistance: modulus	Standard resistor	DC comparison + AC-DC current shunt	0.1	1.0E+05	Ω	Frequency	0.05 kHz to 100 kHz	1 to 0.5	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	29
AC resistance: modulus	Standard resistor	DC comparison + AC-DC current shunt	0.1	10	MΩ	Frequency	0.05 kHz to 10 kHz	1 to 0.5	mΩ/Ω	2	95%	Yes		Approved on 22 February 2008	30
Capacitance for low loss capacitors	Standard capacitor	Capacitance ratiobridge	10	10	pF	Frequency	1 kHz and 1.592 kHz	0.3	μF/F	2	95%	Yes		Approved on 22 February 2008	32b
Capacitance for low loss capacitors	Standard capacitor	Capacitance ratiobridge	100	100	pF	Frequency	1 kHz and 1.592 kHz	0.3	μF/F	2	95%	Yes		Approved on 22 February 2008	32c
Capacitance for low loss capacitors	Standard capacitor	Capacitance ratiobridge	1	1	nF	Frequency	1 kHz and 1.592 kHz	0.5	μF/F	2	95%	Yes		Approved on 22 February 2008	32d
Capacitance for dielectric capacitors	Fixed capacitor	Capacitance ratiobridge	1	1.00E+06	pF	Frequency	0.05 kHz to 50 kHz	3 to 5000	μF/F	2	95%	Yes	Capacitance	Approved on 22 February 2008	33a
Capacitance meters	Capacitance bridge, LCR meter	Substitution	1	1	pF	Frequency	1 kHz	5	μF/F	2	95%	Yes		Approved on 22 February 2008	33b
Capacitance meters	Capacitance bridge, LCR meter	Substitution	10	10	pF	Frequency	1 kHz	3	μF/F	2	95%	Yes		Approved on 22 February 2008	33c
Capacitance meters	Capacitance bridge, LCR meter	Substitution	100	100	pF	Frequency	1 kHz	3	μF/F	2	95%	Yes		Approved on 22 February 2008	33d
Capacitance meters	Capacitance bridge, LCR meter	Substitution	1	1	nF	Frequency	1 kHz	5	μF/F	2	95%	Yes		Approved on 22 February 2008	33e
Capacitance meters	Capacitance bridge, LCR meter	Substitution	10	10	nF	Frequency	1 kHz	10	μF/F	2	95%	Yes		Approved on 22 February 2008	33f
Capacitance meters	Capacitance bridge, LCR meter	Substitution	100	100	nF	Frequency	1 kHz	25	μF/F	2	95%	Yes		Approved on 22 February 2008	33g

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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
Capacitance meters	Capacitance bridge, LCR meter	Substitution	1	1	μH	Frequency	1 kHz	50	μF/F	2	95%	Yes		Approved on 22 February 2008	33h
Inductance: self inductance, low values	Standard inductor	Substitution	100	100	μH	Frequency	1 kHz	0.3	mH/H	2	95%	Yes		Approved on 22 February 2008	34
Inductance: self inductance, intermediate values	Standard inductor	Substitution	0.001	1	H	Frequency	1 kHz, 400 Hz, 200 Hz, 100 Hz	0.15 to 0.3	mH/H	2	95%	Yes	Inductance	Approved on 22 February 2008	36a
						Inductance	decadic values								
Inductance: self inductance, high values	Standard inductor	Impedance meter	10	10	H	Frequency	1kHz, 400 Hz, 200 Hz, 100 Hz	0.1 to 1	mH/H	2	95%	Yes		Approved on 22 February 2008	37
Inductance meters	LCR meter	Direct measurement	0.1	100	mH	Frequency	1 kHz	1 to 0.5	mH/H	2	95%	Yes		Approved on 22 February 2008	39a
						Inductance	decadic values								
Inductance meters	LCR meter	Direct measurement	1	10	H	Frequency	1 kHz, 400 Hz	0.5	mH/H	2	95%	Yes		Approved on 22 February 2008	39b
						Inductance	decadic values								
AC voltage: AC-DC transfer difference at low voltages	AC-DC transfer standard	Comparison	10	500	mV	Frequency	10 Hz to 1 MHz	5 to 400	μV/V	2	95%	Yes	AV-DV	Approved on 22 February 2008	41a
AC voltage: AC-DC transfer difference at medium voltages	AC-DC transfer standard	Comparison	0.5	5	V	Frequency	10 Hz to 1 MHz	2 to 40	μV/V	2	95%	Yes	AV-DV	Approved on 22 February 2008	42c
AC voltage: AC-DC transfer difference at higher voltages	AC-DC transfer standard	Comparison	5	1000	V	Frequency	10 Hz to 1 MHz	3 to 100	μV/V	2	95%	Yes	AV-DV	Approved on 22 February 2008	44a
AC voltage up to 1000 V: sources	Calibrator	AC-DC difference	0.1	1000	V	Frequency	10 Hz to 1 MHz	0.09 to 16	mV/V	2	95%	Yes	AV source	Approved on 22 February 2008	47a
AC voltage up to 1000 V: meters	Meters	AC-DC difference	0.1	1000	V	Frequency	10 Hz to 1 MHz	0.02 to 1.3	mV/V	2	95%	Yes	AV meter	Approved on 22 February 2008	52a
AC voltage ratio: real component	IVD, transformers	Self calibration	5.00E-07	1		Frequency	400 Hz to 1600 Hz	1.0E-07		2	95%	No		Approved on 22 February 2008	57
AC voltage ratio: imaginary component	IVD, transformers	Self calibration	5.00E-07	1		Frequency	400 Hz to 1600 Hz	1.0E-06		2	95%	No		Approved on 22 February 2008	57a
AC voltage ratio: real component	IVD, transformers	Self calibration	2.00E-06	1		Frequency	50 Hz to 5000 Hz	2.0E-06		2	95%	No		Approved on 22 February 2008	58
AC voltage ratio: imaginary component	IVD, transformers	Self calibration	2.00E-06	1		Frequency	50 Hz to 5000 Hz	1.0E-05		2	95%	No		Approved on 22 February 2008	58a

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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
AC current: AC-DC transfer difference	Thermal converter plus shunt	Comparison	0.01	20	A	Frequency	10 Hz to 100 kHz	30 to 680	μA/A	2	95%	Yes	AC-DC	Approved on 22 February 2008	60a
AC current up to 100 A: sources	Calibrator	Direct	0.2	10000	mA	Frequency	10 Hz to 10 kHz	0.03 to 1.0	mA/A	2	95%	Yes	AC Calibrator	Approved on 22 February 2008	64a
AC current up to 100 A: meters	Multimeter	Direct	0.2	10000	mA	Frequency	10 Hz to 10 kHz	0.03 to 1.0	mA/A	2	95%	Yes	AC multimeter	Approved on 22 February 2008	68a
AC power and energy: single phase ($f \leq 400$ Hz), active power	Power meter, power converter, wattmeter	Direct comparison	0	1200	W	Voltage	120 V and 240 V	20	μW/VA	2	95%	Yes		Approved on 22 February 2008	72a
						Current	1 A and 5 A								
						Power factor	1 to 0, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								
AC power and energy: single phase ($f \leq 400$ Hz), active power	Power meter, power converter, wattmeter	Direct measurement	0.01	20000	W	Voltage	1 V to 1000 V	0.2 to 0.4	mW/VA	2	95%	Yes		Uncertainties only define minimum and maximum values Approved on 22 February 2008	72b
						Current	10 mA to 20 A								
						Power factor	1								
						Frequency	20 Hz to 400 Hz								
AC power and energy: single phase ($f \leq 400$ Hz), active power	Power meter, power converter, wattmeter	Direct measurement	0.008	20000	W	Voltage	1 V to 1000 V	0.2 to 3	mW/VA	2	95%	Yes		Uncertainties are minimum and maximum values, depending on the power factor Approved on 22 February 2008	72c1
						Current	10 mA to 20 A								
						Power factor	1 to 0.866, inductive or capacitive								
						Frequency	20 Hz to 400 Hz								

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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
AC power and energy: single phase ($f \leq 400$ Hz), active power	Power meter, power converter, wattmeter	Direct measurement	0	20000	W	Voltage	1 V to 1000 V	3 to 30	mW/VA	2	95%	Yes		Uncertainties are minimum and maximum values, depending on the power factor Approved on 22 February 2008	72c2
						Current	10 mA to 20 A								
						Power factor	0.866 to 0, inductive or capacitive								
						Frequency	20 Hz to 400 Hz								
AC power and energy: single phase ($f > 400$ Hz), active power	Power meter, power converter, wattmeter	Direct measurement	0.01	20000	W	Voltage	1 V to 1000 V	0.4	mW/VA	2	95%	Yes		Approved on 22 February 2008	72d
						Current	10 mA to 20 A								
						Power factor	1								
						Frequency	400 Hz to 5 kHz								
AC power and energy: single phase ($f > 400$ Hz), active power	Power meter, power converter, wattmeter	Direct measurement	0.008	20000	W	Voltage	1 V to 1000 V	0.4 to 4	mW/VA	2	95%	Yes		Uncertainties are minimum and maximum values, depending on the power factor Approved on 22 February 2008	72e1
						Current	10 mA to 20 A								
						Power factor	1 to 0.866, inductive or capacitive								
						Frequency	400 Hz to 5 kHz								
AC power and energy: single phase ($f > 400$ Hz), active power	Power meter, power converter, wattmeter	Direct measurement	0	20000	W	Voltage	1 V to 1000 V	4 to 30	mW/VA	2	95%	Yes		Uncertainties are minimum and maximum values, depending on the power factor Approved on 22 February 2008	72e2
						Current	10 mA to 20 A								

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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
						Power factor	0.866 to 0, inductive or capacitive								
						Frequency	400 Hz to 5 kHz								
AC power and energy: single phase ($f > 400$ Hz), active power	Power meter, power converter, wattmeter	Direct measurement	0.01	5000	W	Voltage	1 V to 1000 V	0.4 to 0.6	mW/VA	2	95%	Yes		Uncertainties only define minimum and maximum values Approved on 22 February 2008	72f
						Current	10 mA to 5 A								
						Power factor	1								
						Frequency	5 kHz to 100 kHz								
AC power and energy: single phase ($f > 400$ Hz), active power	Power meter, power converter, wattmeter	Direct measurement	0.008	5000	W	Voltage	1 V to 1000 V	0.4 to 5	mW/VA	2	95%	Yes		Uncertainties are minimum and maximum values, depending on the power factor Approved on 22 February 2008	72g1
						Current	10 mA to 5 A								
						Power factor	1 to 0.866, inductive or capacitive								
						Frequency	5 kHz to 100 kHz								
AC power and energy: single phase ($f > 400$ Hz), active power	Power meter, power converter, wattmeter	Direct measurement	0	5000	W	Voltage	1 V to 1000 V	5 to 35	mW/VA	2	95%	Yes		Uncertainties are minimum and maximum values, depending on the power factor Approved on 22 February 2008	72g2
						Current	10 mA to 5 A								
						Power factor	0.866 to 0, inductive or capacitive								
						Frequency	5 kHz to 100 kHz								

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Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty						Comments	NMI Service Identifier
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		
High DC voltage: high voltage sources	DC kV-sources	Direct	1	70	kV			0.05	mV/V	2	95%	Yes		Approved on 22 February 2008	73 a
High DC voltage: high voltage sources	DC kV-sources	Direct	70	100	kV			0.06	mV/V	2	95%	Yes		Approved on 22 February 2008	73 b
High DC voltage: high voltage meters	DC kV-meters	Comparison	1	70	kV			0.05	mV/V	2	95%	Yes		Approved on 22 February 2008	74 a
High DC voltage: high voltage meters	DC kV-meters	Comparison	70	100	kV			0.06	mV/V	2	95%	Yes		Approved on 22 February 2008	74 b
High DC voltage: ratios	DC high voltage divider	Comparison	10	0.000001	V/V	Input voltage	1 kV to 70 kV	50	µV/V	2	95%	Yes		Approved on 22 February 2008	76a
High DC voltage: ratios	DC high voltage divider	Comparison	10	0.000001	V/V	Input voltage	70 kV to 100 kV	60	µV/V	2	95%	Yes		Approved on 22 February 2008	76b
						Output voltage	0.1 V to 10 V								
AC high voltage: sources	AC high voltage source	Direct	1	100	kV	Frequency	45 Hz to 65 Hz	1.0	mV/V	2	95%	Yes		Sine wave only Approved on 22 February 2008	77
AC high voltage: meters	AC high voltage meter	Comparison	1	100	kV	Frequency	45 Hz to 65 Hz	1.0	mV/V	2	95%	Yes		Sine wave only Approved on 22 February 2008	78
AC high voltage: ratio error and phase displacement	AC high voltage transformer	Comparison	1	100	kV	Frequency	45 Hz to 65 Hz	1.0	mV/V	2	95%	Yes		Sine wave only Approved on 22 February 2008	78a
AC high voltage: ratio error and phase displacement	AC high voltage power transformer	Comparison	-180	+180	degrees	Frequency	45 Hz to 65 Hz	0.05	degrees	2	95%	No		Sine wave only Approved on 22 February 2008	78b
Electric charge: sources	Q-sources	Direct	0	20	pC			20	fC	2	95%	No		Approved on 22 February 2008	79
Electric charge: sources	Q-sources	Direct	20	200	pC			2 to 0.4	mC/C	2	95%	Yes		Approved on 22 February 2008	80
Electric charge: sources	Q-sources	Direct	0.2	200	nC			0.4 to 0.3	mC/C	2	95%	Yes		Approved on 22 February 2008	80a
Electric charge: meters	Q-meters	Substitution	0	20	pC			20	fC	2	95%	No		Approved on 22 February 2008	81
Electric charge: meters	Q-meters	Substitution	20	200	pC			2 to 0.4	mC/C	2	95%	Yes		Approved on 22 February 2008	82

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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
Electric charge: sources	Q-meters	Substitution	0.2	200	nC			0.4 to 0.3	mC/C	2	95%	Yes		Approved on 22 February 2008	82a
Electric fields below 50 kHz: electrostatic field strength	Probes	Direct using parallel plates	1	20000	V/m			5E-03		2	95%	Yes			85a
Electric fields below 50 kHz: electric field strength	Probes	Direct using parallel plates	1	20000	V/m	Frequency	10 Hz to 10 kHz	5E-03 to 15E-03		2	95%	Yes			85b
Electric fields below 50 kHz: electric field strength	Field strength meter	Direct in TEM-cell	0.01	100	V/m	Frequency	0.001 MHz to 0.05 MHz	0.05		2	95%	Yes			93a
						Sensor size	< 0.5 m								
Magnetic fields below 50 kHz: DC magnetic flux density	Flux gate, Hall probes	Direct	5	50000	μT			2 to 1	mT/T	2	95%	Yes			86
Magnetic fields below 50 kHz: DC magnetic flux density	Reference magnets	direct	10	2000	mT			1	mT/T	2	95%	Yes			87
Magnetic fields below 50 kHz: DC magnetic flux density	Hall probes, NMR probes	Substitution	50	2000	mT			0.2	mT/T	2	95%	Yes			88
Magnetic fields below 50 kHz: DC magnetic field strength	Flux gate, Hall probes	Direct	4	40000	A/m			0.002 to 0.001		2	95%	Yes			89
Magnetic fields below 50 kHz: DC magnetic field strength	Hall probes, NMR probes	Substitution	40	1600	kA/m			2.E-04		2	95%	Yes			90
Magnetic fields below 50 kHz: AC magnetic flux density	Pick-up coils, Hall probes	Direct	5	20000	μT	Frequency	10 Hz to 1 kHz	5	mT/T	2	95%	Yes			91
Magnetic fields below 50 kHz: AC magnetic field strength	Pick-up coils, Hall probes	Direct	4	15000	A/m	Frequency	10 Hz to 1 kHz	5E-03		2	95%	Yes			92
Magnetic fields below 50 kHz: AC magnetic field strength	Field probes	Direct in TEM-cell	3E-08	0.5	A/m	Frequency	0.01 MHz to 0.05 MHz	0.05		2	95%	Yes			98a
Electromagnetic fields above 50 kHz: electric field strength	Field strength meter	Direct in TEM-cell	0.01	100	V/m	Frequency	0.05 MHz to 100 MHz	0.05		2	95%	Yes			93b
						Sensor size	< 0.5 m								
Electromagnetic fields above 50 kHz: electric field strength	Field strength meter	Direct in TEM-cell	5E-05	350	V/m	Frequency	100 MHz to 500 MHz	0.03		2	95%	Yes			94
						Sensor size	< 30 mm								
Electromagnetic fields above 50 kHz: electric field strength	Field strength meter	Direct in TEM-cell	1	100	V/m	Frequency	1 MHz to 1300 MHz	0.02 to 0.03		2	95%	Yes			95
						Sensor size	< 3 mm								

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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
Electromagnetic fields above 50 kHz: electric field strength	Field strength meter	Direct in tapered GTEM-cell	1	30	V/m	Frequency	0.6 GHz to 3 GHz	0.05 to 0.10		2	95%	Yes			96
						Sensor size	< 50 mm								
Electromagnetic fields above 50 kHz: electric field strength	Probes, horn antennas	Calculation from known antenna	1E-04	30	V/m	Frequency	1.7 GHz to 40 GHz	0.05 to 0.10		2	95%	Yes			97
Electromagnetic fields above 50 kHz: magnetic field strength	Field probes	Direct in TEM-cell	3E-08	0.5	A/m	Frequency	0.05 MHz to 100 MHz	0.05		2	95%	Yes			98b
Electromagnetic fields above 50 kHz: magnetic field strength	Field probes	Direct in TEM-cell	1.5E-07	1	A/m	Frequency	0.3 MHz to 500 MHz	0.1		2	95%	Yes			99
Electromagnetic fields above 50 kHz: magnetic field strength	Field probes	Direct in TEM-cell	3	300	mA/m	Frequency	1 MHz to 1300 MHz	0.1		2	95%	Yes			100
Electromagnetic fields above 50 kHz: power flux density	Field probes	Direct in TEM-cell	1E-12	100	W/m²	Frequency	0.01 MHz to 100 MHz	0.05		2	95%	Yes			101
Electromagnetic fields above 50 kHz: power flux density	Field probes	Direct in TEM-cell	1E-11	300	W/m²	Frequency	0.3 MHz to 500 MHz	0.01		2	95%	Yes			102
Electromagnetic fields above 50 kHz: power flux density	Field probes	Direct in TEM-cell	2.5E-03	25	W/m²	Frequency	1 MHz to 1300 MHz	0.05		2	95%	Yes			103
Electromagnetic fields above 50 kHz: power flux density	Probes, horn antennas	Calculation from known antenna	2.5E-11	25	W/m²	Frequency	1.7 GHz to 40 GHz	0.03 to 0.07		2	95%	Yes			104
RF power: absolute power on coaxials	Power meter	Direct	0.1	10	mW	Frequency	DC to 40 GHz	0.005 to 0.025		2	95%	Yes			105
						Connector	50 Ω								
RF power: calibration factor on coaxials	Power sensor	Substitution	0.8	1		Frequency	DC to 1 GHz	0.005		2	95%	No			106
						Power	1 µW to 10 mW								
						Connector	50 Ω								
RF power: calibration factor on coaxials	Power sensor	Substitution	0.8	1		Frequency	1 GHz to 18 GHz	0.005 to 0.015		2	95%	No			107
						Power	1 µW to 10 mW								
						Connector	50 Ω								
RF power: calibration factor on coaxials	Power sensor	Substitution	0.8	1		Frequency	0.1 MHz to 2000 MHz	0.005 to 0.020		2	95%	No			108
						Power	1 mW to 10 mW								
						Connector	N 75 Ω								
RF power: calibration factor on coaxials	Power sensor	Substitution	0.8	1		Frequency	0.05 GHz to 40 GHz	0.005 to 0.020		2	95%	No			109
						Power	1 µW to 10 mW								
						Connector	PC 3.5, K								
RF power: calibration factor on waveguides	Power sensor	Substitution	0.8	1		Frequency	18 GHz to 40 GHz	0.01 to 0.02		2	95%	No			110

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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
						Power	1 mW to 10 mW								
						Connector	R220, R330								
Scalar RF attenuation: on coaxials	Passive devices: attenuation A	Substitution	0	100	dB	Frequency	30 MHz	(0.003 + 0.00034), A in dB	dB	2	95%	No			111
						Connector	50 Ω								
Scattering parameters: reflection coefficient (Sii) on coaxials, real and imaginary	One- and two-port devices	Vector network analyser	-1	1		Frequency	50 kHz to 18 GHz	0.003 to 0.029		2	95%	No	Scat reflect P C7		118b
						Connector	PC-7								
Scattering parameters: reflection coefficient (Sii) on coaxials, real and imaginary	One- and two-port devices	Vector network analyser	-1	1		Frequency	50 kHz to 18 GHz	0.003 to 0.017		2	95%	No	Scat reflect N		119b
						Connector	Type N								
Scattering parameters: reflection coefficient (Sii) on coaxials, real and imaginary	One- and two-port devices	Vector network analyser	-1	1		Frequency	50 kHz to 26.5 GHz	0.004 to 0.013		2	95%	No	Scat reflect 3.5mm		122b
						Connector	PC-3.5								
Scattering parameters: reflection coefficient (Sii) on coaxials, real and imaginary	One- and two-port devices	Vector network analyser	-1	1		Frequency	50 kHz to 40 GHz	0.004 to 0.029		2	95%	No	Scat reflect K		123b
						Connector	PC-2.9 / K								
Scattering parameters: reflection coefficient (Sii) on coaxials, real and imaginary	One- and two-port devices	Vector network analyser	-1	1		Frequency	50 kHz to 50 GHz	0.003 to 0.029		2	95%	No	Scat reflect 2.4mm		123d
						Connector	PC-2.4								
Scattering parameters: reflection coefficient (Sii) on coaxials, real and imaginary	One- and two-port devices	Vector network analyser	-1	1		Frequency	50 kHz to 2 GHz	0.003 to 0.012		2	95%	No	Scat reflect N 75		121b
						Connector	N75 Ω								
Scattering parameters: reflection coefficient (Sii) on waveguides, real and imaginary	Passive device, magnitude of reflection coefficient <i>r</i>	Vector network analyser	0	1		Frequency	8 GHz to 40 GHz	(0.02 + 0.1 <i>r</i> ²)		2	95%	No			124
						Connector	R100, R150, R220, R330								
Scattering parameters: transmission coefficient (Sij) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1	Frequency		0.05 MHz to 18 GHz	0.004 to 2.4	1E-03	2	95%	No	Scat atten PC 7	See next entry for uncertainty matrix in dB	112
						Connector	PC-7								
						S11 and S22	< 0.1								

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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
Scattering parameters: transmission coefficient (Sij) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1	Frequency		0.05 MHz to 18 GHz	0.004 to 2.4	1E-03	2	95%	No	Scat_atten_PC7_log	See matrix for logarithmic presentation of the magnitude between 0 dB and 80 dB	112
						Connector S11 and S22	PC-7 < 0.1								
Scattering parameters: transmission coefficient (Sij) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	0.05 MHz to 18 GHz	0.004 to 2.4	1E-03	2	95%	No	Scat_atten_N	See next entry for uncertainty matrix in dB	113
						Connector S11 and S22	Type N < 0.1								
Scattering parameters: transmission coefficient (Sij) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	0.05 MHz to 18 GHz	0.004 to 2.4	1E-03	2	95%	No	Scat_atten_N_log	See matrix for logarithmic presentation of the magnitude between 0 dB and 80 dB	113
						Connector S11 and S22	Type N < 0.1								
Scattering parameters: transmission coefficient (Sij) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	0.05 MHz to 2 GHz	0.018 to 2.3	1E-03	2	95%	No	Scat_atten_N75	See next entry for uncertainty matrix in dB	114
						Connector S11 and S22	N 75 Ω < 0.1								
Scattering parameters: transmission coefficient (Sij) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	0.05 MHz to 2 GHz	0.018 to 2.3	1E-03	2	95%	No	Scat_atten_N75_log	See matrix for logarithmic presentation of the magnitude between 0 dB and 60 dB	114
						Connector S11 and S22	N 75 Ω < 0.1								
Scattering parameters: transmission coefficient (Sij) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	50 kHz to 26.5 GHz	0.036 to 2.5	1E-03	2	95%	No	Scat_atten_3.5mm	See next entry for uncertainty matrix in dB	115a
						Connector S11 and S22	PC-3.5 < 0.1								
Scattering parameters: transmission coefficient (Sij) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	50 kHz to 26.5 GHz	0.036 to 2.5	1E-03	2	95%	No	Scat_atten_3.5mm_log	See matrix for logarithmic presentation of the magnitude between 0 dB and 60 dB	115a
						Connector S11 and S22	PC-3.5 < 0.1								

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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
Scattering parameters: transmission coefficient (Sij) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	50 kHz to 40 GHz	0.14 to 2.4	1E-03	2	95%	No	Scat atten K	See next entry for uncertainty matrix in dB	115b
						Connector S11 and S22	PC-2.9 / K < 0.1								
Scattering parameters: transmission coefficient (Sij) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	50 kHz to 40 GHz	0.14 to 2.4	1E-03	2	95%	No	Scat atten K log	See matrix for logarithmic presentation of the magnitude between 0 dB and 40 dB	115b
						Connector S11 and S22	PC-2.9 / K < 0.1								
Scattering parameters: transmission coefficient (Sij) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	50 kHz to 50 GHz	0.13 to 2.8	1E-03	2	95%	No	Scat atten 2.4 mm	See next entry for uncertainty matrix in dB	115c
						Connector S11 and S22	PC-2.4 < 0.1								
Scattering parameters: transmission coefficient (Sij) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	50 kHz to 50 GHz	0.13 to 2.8	1E-03	2	95%	No	Scat atten 2.4 mm log	See matrix for logarithmic presentation of the magnitude between 0 dB and 40 dB	115c
						Connector S11 and S22	PC-2.4 < 0.1								
Antenna properties: antenna gain	Antennas	Three antenna method	0	40	dB	Frequency	1 GHz to 40 GHz	0.1	dB	2	95%	No			126
Antena properties: attenuation	Tunable dipoles	SNA	0	40	dB	Frequency	0.3 MHz to 1300 MHz	0.1	dB	2	95%	No			127
Signal and pulse characteristics: pulse amplitude	ESD targets	IEC standard	1	8	kV	Rise time	> 0.7 ns	5	%	2	95%	Yes			128
Signal and pulse characteristics: pulse time parameters	ESD targets	VNA	0.5	5	ns	Pulse shape	calculated from frequency response	1	ns	2	95%	No			129
Signal and pulse characteristics: pulse amplitude	Oscilloscopes	Direct	0.05	10	V	Frequency	DC to 1 GHz	5	%	2	95%	Yes			130
Signal and pulse characteristics: pulse time parameters	Oscilloscopes	Comparison	5	100	ns			1	ns	2	95%	No			131
RF voltage: RF-DC transfer difference	Thermal converter	Comparison	4	4	V	Frequency	1 MHz to 30 MHz	2E-05 to 18E-05		2	95%	Yes			132a
RF voltage: RF-DC transfer difference	Thermal converter	Comparison	4	4	V	Frequency	30 MHz to 100 MHz	0.2E-03 to 2E-03		2	95%	Yes			132b
RF voltage: RF-DC transfer difference	Thermal converter	Comparison	0.2	50	V	Frequency	1 MHz to 30 MHz	0.05E-03 to 1E-03		2	95%	Yes			132c

Electricity and Magnetism, The Netherlands, VSL

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		
RF voltage: RF-DC transfer difference	Thermal converter	Comparison	0.2	50	V	Frequency	30 MHz to 50 MHz	0.3E-03 to 5E-03		2	95%	Yes			132d
RF voltage: RF-DC transfer difference	Thermal converter	Comparison	0.2	50	V	Frequency	50 MHz to 100 MHz	0.7E-03 to 10E-03		2	95%	Yes			132e
RF voltage: RF-DC transfer difference	Thermal converter	Comparison	0.2	5	V	Frequency	100 MHz to 1000 MHz	3000	µV/V	2	95%	Yes			132
RF voltage sources	Generators	Comparison	0.2	5	V	Frequency	1 MHz to 1000 MHz	3000	µV/V	2	95%	Yes			133
RF voltage meters	Voltmeters	Comparison	0.2	5	V	Frequency	1 MHz to 1000 MHz	3000	µV/V	2	95%	Yes			134

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Capacitance

Capacitance for dielectric capacitors, VSL Internal Identifier: 33a

	50 Hz	100 Hz	200 Hz	500 Hz	1 kHz	2 kHz	5 kHz	10 kHz	20 kHz	50 kHz
1 pF	60	20	15	10	5	10	15	20	60	120
10 pF	40	12	9	6	3	6	9	12	40	70
100 pF	40	12	9	6	3	6	9	12	40	70
1 nF	60	20	15	10	5	10	15	20	60	120
10 nF	120	40	31	19	10	19	31	40	120	240
100 nF	310	100	80	50	25	50	80	100	300	700
1 μ F	600	200	150	100	50	100	170	300	1300	5000

The expanded uncertainties given in this table are expressed in μ F/F

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Inductance

Inductance: self inductance, intermediate values, VSL Internal Identifier: 36a

	100 Hz	200 Hz	400 Hz	1 kHz	1.592 kHz
1 mH	-	-	-	0.2	-
10 mH	-	-	-	0.2	-
100 mH	-	-	0.15	0.15	0.15
1 H	0.3	0.2	0.15	0.15	0.15

The expanded uncertainties given in this table are expressed in mH/H

Electricity and Magnetism, The Netherlands, VSL**uncertainties table: AV-DV**

AC voltage: AC/DC transfer difference at low voltages, VSL Internal Identifier: 41a

AC voltage: AC/DC transfer difference at medium voltages, VSL Internal Identifier: 42c

AC voltage: AC/DC transfer difference at higher voltages, VSL Internal Identifier: 44a

	0.01 kHz	0.02 kHz	0.04 kHz	0.1 kHz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz	200 kHz	300 kHz	500 kHz	700 kHz	1000 kHz
0.01 V	200	150	150	150	120	120	120	150	150	200	200	250	300	400
0.02 V	150	120	100	100	80	80	80	100	120	150	200	200	250	300
0.05 V	100	80	50	50	40	40	40	50	60	80	120	150	200	250
0.1 V	50	40	25	25	20	20	20	25	30	50	80	100	150	200
0.2 V	50	40	20	20	15	15	15	20	25	30	40	50	80	100
0.5 V	7	7	7	7	5	5	7	7	10	15	20	25	30	40
1 V	5	5	3	2	2	2	5	5	7	12	15	20	25	30
2 V	15	10	5	5	3	3	3	5	10	15	20	25	30	40
3 V	15	10	5	5	3	3	3	5	10	15	20	25	30	40
6 V	15	10	5	5	3	3	3	5	10	15	20	25	30	40
10 V	20	10	10	10	5	5	5	10	12	15	20	25	30	40
20 V	25	15	10	10	7	7	7	10	15	20	25	30	40	50
30 V	25	15	15	15	7	7	7	15	15	20	30	40	50	60
60 V	30	20	15	15	10	10	10	15	20	30	40	50	-	-
100 V	40	25	15	15	10	10	10	20	25	30	40	-	-	-
200 V	40	25	20	20	15	15	15	20	25	-	-	-	-	-
300 V	40	25	20	20	15	15	15	20	30	-	-	-	-	-
600 V	50	30	20	20	20	20	25	40	60	-	-	-	-	-
1000 V	50	30	30	30	30	30	50	80	100	-	-	-	-	-

The expanded uncertainties given in this table are expressed in $\mu\text{V/V}$

Electricity and Magnetism, The Netherlands, VSL**uncertainties table: AV source**

AC voltage up to 1000 V: sources, VSL Internal Identifier: 47a

	10 Hz	20 Hz	40 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz	300 kHz	500 kHz	1 MHz
0.1 V	0.11	0.11	0.09	0.16	0.16	0.32	0.9	3.2	10	10	10
0.2 V	0.27	0.27	0.17	0.24	0.24	0.40	1.0	3.6	11	11	11
0.5 V	0.15	0.15	0.11	0.18	0.18	0.34	0.9	3.3	10	10	10
1 V	0.11	0.11	0.09	0.16	0.16	0.32	0.9	3.2	10	10	10
2 V	0.27	0.27	0.27	0.24	0.24	0.40	1.0	3.6	11	11	11
5 V	0.15	0.15	0.11	0.18	0.18	0.34	0.9	3.3	10	10	10
10 V	0.11	0.11	0.09	0.16	0.16	0.32	0.9	3.2	10	10	10
20 V	0.40	0.40	0.30	0.30	0.30	0.45	1.4	4.6	16	16	16
50 V	0.28	0.28	0.24	0.24	0.24	0.39	1.3	4.3	15	-	-
100 V	0.28	0.28	0.22	0.22	0.22	0.37	1.3	4.2	-	-	-
200 V	0.60	0.60	0.50	0.70	0.70	1.40	3.2	-	-	-	-
500 V	-	0.48	0.44	0.64	0.64	1.30	3.1	-	-	-	-
1000 V	-	0.44	0.42	0.62	0.62	1.30	3.1	-	-	-	-

The expanded uncertainties given in this table are expressed in mV/V

Electricity and Magnetism, The Netherlands, VSL**uncertainties table: AV meter**

AC voltage up to 1000 V: meters, VSL Internal Identifier: 52a

	10 Hz	20 Hz	40 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz	300 kHz	500 kHz	1 MHz
0.1 V	0.23	0.11	0.06	0.06	0.05	0.09	0.19	0.29	0.46	1.1	1.2
0.2 V	0.23	0.10	0.05	0.05	0.05	0.08	0.17	0.27	0.42	1.1	1.2
0.5 V	0.22	0.09	0.04	0.04	0.04	0.06	0.09	0.19	0.32	1.0	1.1
1 V	0.21	0.07	0.03	0.03	0.03	0.05	0.07	0.16	0.26	1.0	1.0
2 V	0.21	0.08	0.03	0.04	0.02	0.05	0.07	0.16	0.26	1.0	1.0
5 V	0.21	0.08	0.03	0.04	0.03	0.05	0.08	0.19	0.40	1.3	1.3
10 V	0.21	0.07	0.03	0.03	0.03	0.05	0.08	0.19	0.40	1.3	1.3
20 V	0.21	0.07	0.03	0.03	0.03	0.05	0.08	0.19	0.40	1.3	1.3
50 V	0.21	0.08	0.03	0.04	0.03	0.06	0.10	0.20	0.42	-	-
100 V	0.21	0.08	0.03	0.04	0.03	0.07	0.10	0.21	-	-	-
200 V	0.21	0.07	0.03	0.04	0.03	0.07	0.10	0.21	-	-	-
500 V	-	0.11	0.04	0.05	0.04	0.13	0.50	-	-	-	-
1000 V	-	0.11	0.04	0.04	0.04	0.13	0.50	-	-	-	-

The expanded uncertainties given in this table are expressed in mV/V

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Scat_reflect_PC7

Scattering parameters: reflection coefficient (Sii) on coaxials, VSL Internal Identifier: 118b

Connector: PC-7

	50 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
-1.0	0.007	0.012	0.029
-0.9	0.006	0.011	0.025
-0.8	0.006	0.010	0.022
-0.7	0.005	0.009	0.019
-0.6	0.005	0.008	0.016
-0.5	0.004	0.008	0.014
-0.4	0.004	0.007	0.012
-0.3	0.004	0.007	0.010
-0.2	0.003	0.006	0.009
-0.1	0.003	0.006	0.008
0.0	0.003	0.006	0.008
0.1	0.003	0.006	0.008
0.2	0.003	0.006	0.009
0.3	0.004	0.007	0.010
0.4	0.004	0.007	0.012
0.5	0.004	0.008	0.014
0.6	0.005	0.008	0.016
0.7	0.005	0.009	0.019
0.8	0.006	0.010	0.022
0.9	0.006	0.011	0.025
1.0	0.007	0.012	0.029

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, The Netherlands, VSL**uncertainties table: Scat_reflect_N**

Scattering parameters: reflection coefficient (Sii) on coaxials, VSL Internal Identifier: 119b

Connector: Type N

	50 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
-1.0	0.009	0.012	0.017
-0.9	0.008	0.011	0.015
-0.8	0.007	0.010	0.014
-0.7	0.006	0.009	0.013
-0.6	0.005	0.008	0.011
-0.5	0.005	0.008	0.011
-0.4	0.004	0.007	0.010
-0.3	0.004	0.007	0.009
-0.2	0.003	0.006	0.009
-0.1	0.003	0.006	0.008
0.0	0.003	0.006	0.008
0.1	0.003	0.006	0.008
0.2	0.003	0.006	0.009
0.3	0.004	0.007	0.009
0.4	0.004	0.007	0.010
0.5	0.005	0.008	0.011
0.6	0.005	0.008	0.011
0.7	0.006	0.009	0.013
0.8	0.007	0.010	0.014
0.9	0.008	0.011	0.015
1.0	0.009	0.012	0.017

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, The Netherlands, VSL**uncertainties table: Scat_reflect_3.5mm**

Scattering parameters: reflection coefficient (Sii) on coaxials, VSL Internal Identifier: 122b

Connector: PC-3.5

	50 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz	18 GHz to 26.5 GHz
-1.0	0.012	0.009	0.013	0.013
-0.9	0.011	0.008	0.011	0.011
-0.8	0.009	0.007	0.010	0.010
-0.7	0.008	0.007	0.009	0.009
-0.6	0.007	0.006	0.007	0.007
-0.5	0.006	0.006	0.007	0.007
-0.4	0.006	0.005	0.006	0.006
-0.3	0.005	0.005	0.005	0.005
-0.2	0.004	0.004	0.005	0.005
-0.1	0.004	0.004	0.004	0.004
0.0	0.004	0.004	0.004	0.004
0.1	0.004	0.004	0.004	0.004
0.2	0.004	0.004	0.005	0.005
0.3	0.005	0.005	0.005	0.005
0.4	0.006	0.005	0.006	0.006
0.5	0.006	0.006	0.007	0.007
0.6	0.007	0.006	0.007	0.007
0.7	0.008	0.007	0.009	0.009
0.8	0.009	0.007	0.010	0.010
0.9	0.011	0.008	0.011	0.011
1.0	0.012	0.009	0.013	0.013

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, The Netherlands, VSL**uncertainties table: Scat_reflect_K**

Scattering parameters: reflection coefficient (Sii) on coaxials, VSL Internal Identifier: 123b

Connector: PC-2.9 / K

	50 kHz to 2 GHz	2 GHz to 18 GHz	18 GHz to 26 GHz	26 GHz to 40 GHz
-1.0	0.011	0.009	0.019	0.029
-0.9	0.010	0.008	0.017	0.025
-0.8	0.009	0.007	0.015	0.022
-0.7	0.009	0.007	0.014	0.019
-0.6	0.008	0.006	0.012	0.016
-0.5	0.008	0.006	0.011	0.014
-0.4	0.007	0.005	0.010	0.012
-0.3	0.007	0.005	0.009	0.010
-0.2	0.006	0.004	0.009	0.009
-0.1	0.006	0.004	0.008	0.008
0.0	0.006	0.004	0.008	0.008
0.1	0.006	0.004	0.008	0.008
0.2	0.006	0.004	0.009	0.009
0.3	0.007	0.005	0.009	0.010
0.4	0.007	0.005	0.010	0.012
0.5	0.008	0.006	0.011	0.014
0.6	0.008	0.006	0.012	0.016
0.7	0.009	0.007	0.014	0.019
0.8	0.009	0.007	0.015	0.022
0.9	0.010	0.008	0.017	0.025
1.0	0.011	0.009	0.019	0.029

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, The Netherlands, VSL**uncertainties table: Scat_reflect_2.4mm**

Scattering parameters: reflection coefficient (Sii) on coaxials, VSL Internal Identifier: 123d

Connector: PC-2.4

	50 kHz to 2 GHz	2 GHz to 20 GHz	20 GHz to 40 GHz	40 GHz to 50 GHz
-1.0	0.007	0.012	0.029	0.029
-0.9	0.006	0.011	0.025	0.025
-0.8	0.006	0.010	0.022	0.022
-0.7	0.005	0.009	0.019	0.019
-0.6	0.005	0.008	0.016	0.016
-0.5	0.004	0.008	0.014	0.014
-0.4	0.004	0.007	0.012	0.012
-0.3	0.004	0.007	0.010	0.010
-0.2	0.003	0.006	0.009	0.009
-0.1	0.003	0.006	0.008	0.008
0.0	0.003	0.006	0.008	0.008
0.1	0.003	0.006	0.008	0.008
0.2	0.003	0.006	0.009	0.009
0.3	0.004	0.007	0.010	0.010
0.4	0.004	0.007	0.012	0.012
0.5	0.004	0.008	0.014	0.014
0.6	0.005	0.008	0.016	0.016
0.7	0.005	0.009	0.019	0.019
0.8	0.006	0.010	0.022	0.022
0.9	0.006	0.011	0.025	0.025
1.0	0.007	0.012	0.029	0.029

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Scat_reflect_N75

Scattering parameters: reflection coefficient (Sii) on coaxials, VSL Internal Identifier: 121b

Connector: N75 Ω

	50 kHz to 1 GHz	1 GHz to 2 GHz
-1.0	0.007	0.012
-0.9	0.006	0.011
-0.8	0.006	0.010
-0.7	0.005	0.009
-0.6	0.005	0.008
-0.5	0.004	0.008
-0.4	0.004	0.007
-0.3	0.004	0.007
-0.2	0.003	0.006
-0.1	0.003	0.006
0.0	0.003	0.006
0.1	0.003	0.006
0.2	0.003	0.006
0.3	0.004	0.007
0.4	0.004	0.007
0.5	0.004	0.008
0.6	0.005	0.008
0.7	0.005	0.009
0.8	0.006	0.010
0.9	0.006	0.011
1.0	0.007	0.012

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, The Netherlands, VSL**uncertainties table: Scat_atten_PC7**

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, VSL Internal Identifier: 112

Connector: PC-7

	50 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
-1.000	2.307	2.330	2.355
-0.707	2.124	2.147	2.172
-0.501	1.851	1.875	1.900
-0.316	1.461	1.485	1.510
-0.100	0.695	0.718	0.743
-0.032	0.294	0.318	0.343
-0.010	0.117	0.141	0.166
-0.003	0.045	0.069	0.094
-0.001	0.018	0.041	0.066
-0.0003	0.007	0.031	0.056
-0.0001	0.004	0.027	0.052
0.0001	0.004	0.027	0.052
0.0003	0.007	0.031	0.056
0.001	0.018	0.041	0.066
0.003	0.045	0.069	0.094
0.010	0.117	0.141	0.166
0.032	0.294	0.318	0.343
0.100	0.695	0.718	0.743
0.316	1.461	1.485	1.510
0.501	1.851	1.875	1.900
0.707	2.124	2.147	2.172
1.000	2.307	2.330	2.355

The expanded uncertainties given in this table are expressed in 1E-03

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Scat_atten_PC7_log

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, VSL Internal Identifier: 112

Connector: PC-7

	50 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
0 dB	0.02	0.02	0.02
-3 dB	0.03	0.03	0.03
-6 dB	0.03	0.03	0.03
-10 dB	0.04	0.04	0.04
-20 dB	0.06	0.06	0.06
-30 dB	0.08	0.09	0.09
-40 dB	0.10	0.12	0.14
-50 dB	0.12	0.19	0.25
-60 dB	0.15	0.35	0.56
-70 dB	0.20	-	-
-80 dB	0.31	-	-

The expanded uncertainties given in this table are expressed in dB

Electricity and Magnetism, The Netherlands, VSL**uncertainties table: Scat_atten_N**

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, VSL Internal Identifier: 113

Connector: Type N

	50 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
-1.000	2.307	2.330	2.355
-0.707	2.124	2.147	2.172
-0.501	1.851	1.875	1.900
-0.316	1.461	1.485	1.510
-0.100	0.695	0.718	0.743
-0.032	0.294	0.318	0.343
-0.010	0.117	0.141	0.166
-0.003	0.045	0.069	0.094
-0.001	0.018	0.041	0.066
-0.0003	0.007	0.031	0.056
-0.0001	0.004	0.027	0.052
0.0001	0.004	0.027	0.052
0.0003	0.007	0.031	0.056
0.001	0.018	0.041	0.066
0.003	0.045	0.069	0.094
0.010	0.117	0.141	0.166
0.032	0.294	0.318	0.343
0.100	0.695	0.718	0.743
0.316	1.461	1.485	1.510
0.501	1.851	1.875	1.900
0.707	2.124	2.147	2.172
1.000	2.307	2.330	2.355

The expanded uncertainties given in this table are expressed in 1E-03

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Scat_atten_N_log

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, VSL Internal Identifier: 113

Connector: Type N

	50 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
0 dB	0.02	0.02	0.02
-3 dB	0.03	0.03	0.03
-6 dB	0.03	0.03	0.03
-10 dB	0.04	0.04	0.04
-20 dB	0.06	0.06	0.06
-30 dB	0.08	0.09	0.09
-40 dB	0.10	0.12	0.14
-50 dB	0.12	0.19	0.25
-60 dB	0.15	0.35	0.56
-70 dB	0.20	-	-
-80 dB	0.31	-	-

The expanded uncertainties given in this table are expressed in dB

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Scat_atten_N75

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, VSL Internal Identifier: 114

Connector: N 75 Ω

	50 kHz to 1 GHz	1 GHz to 2 GHz
-1.000	2.307	2.308
-0.707	2.124	2.125
-0.501	1.851	1.852
-0.316	1.461	1.462
-0.100	0.695	0.696
-0.032	0.294	0.295
-0.010	0.117	0.118
-0.003	0.045	0.046
-0.001	0.018	0.019
0.001	0.018	0.019
0.003	0.045	0.046
0.010	0.117	0.118
0.032	0.294	0.295
0.100	0.695	0.696
0.316	1.461	1.462
0.501	1.851	1.852
0.707	2.124	2.125
1.000	2.307	2.308

The expanded uncertainties given in this table are expressed in 1E-03

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Scat_atten_N75_log

Scattering parameters: transmission coefficient (Sij) on coaxials, VSL Internal Identifier: 114

Connector: N 75 Ω

	50 kHz to 1 GHz	1 GHz to 2 GHz
0 dB	0.02	0.02
-3 dB	0.03	0.03
-6 dB	0.03	0.03
-10 dB	0.04	0.04
-20 dB	0.06	0.06
-30 dB	0.08	0.08
-40 dB	0.10	0.10
-50 dB	0.12	0.13
-60 dB	0.15	0.16

The expanded uncertainties given in this table are expressed in dB

Electricity and Magnetism, The Netherlands, VSL**uncertainties table: Scat_atten_3.5mm**Scattering parameters: transmission coefficient (S_{ij}) on coaxials, VSL Internal Identifier: 115a

Connector: PC-3.5

	50 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 20 GHz	20 GHz to 26.5 GHz
-1.000	2.325	2.345	2.385	2.455
-0.707	2.142	2.162	2.202	2.272
-0.501	1.870	1.890	1.930	2.000
-0.316	1.480	1.500	1.540	1.610
-0.100	0.713	0.733	0.773	0.843
-0.032	0.313	0.333	0.373	0.443
-0.010	0.136	0.156	0.196	0.266
-0.003	0.064	0.084	0.124	0.194
-0.001	0.036	0.056	0.096	0.166
0.001	0.036	0.056	0.096	0.166
0.003	0.064	0.084	0.124	0.194
0.010	0.136	0.156	0.196	0.266
0.032	0.313	0.333	0.373	0.443
0.100	0.713	0.733	0.773	0.843
0.316	1.480	1.500	1.540	1.610
0.501	1.870	1.890	1.930	2.000
0.707	2.142	2.162	2.202	2.272
1.000	2.325	2.345	2.385	2.455

The expanded uncertainties given in this table are expressed in 1E-03

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Scat_atten_3.5mm_log

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, VSL Internal Identifier: 115a

Connector: PC-3.5

	50 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 20 GHz	20 GHz to 26.5 GHz
0 dB	0.02	0.02	0.02	0.02
-3 dB	0.03	0.03	0.03	0.03
-6 dB	0.03	0.03	0.03	0.03
-10 dB	0.04	0.04	0.04	0.04
-20 dB	0.06	0.06	0.07	0.07
-30 dB	0.09	0.09	0.10	0.12
-40 dB	0.12	0.13	0.17	0.23
-50 dB	0.17	0.23	0.33	0.52
-60 dB	0.31	0.48	0.80	1.34

The expanded uncertainties given in this table are expressed in dB

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Scat_atten_K

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, VSL Internal Identifier: 115b

Connector: PC-2.9 / K

	50 kHz to 2 GHz	2 GHz to 18 GHz	18 GHz to 26 GHz	26 GHz to 40 GHz
-1.000	2.41	2.33	2.37	2.41
-0.707	2.22	2.15	2.19	2.22
-0.501	1.95	1.87	1.91	1.95
-0.316	1.56	1.48	1.52	1.56
-0.100	0.79	0.72	0.76	0.79
-0.032	0.39	0.32	0.36	0.39
-0.010	0.22	0.14	0.18	0.22
0.010	0.22	0.14	0.18	0.22
0.032	0.39	0.32	0.36	0.39
0.100	0.79	0.72	0.76	0.79
0.316	1.56	1.48	1.52	1.56
0.501	1.95	1.87	1.91	1.95
0.707	2.22	2.15	2.19	2.22
1.000	2.41	2.33	2.37	2.41

The expanded uncertainties given in this table are expressed in 1E-03

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Scat_atten_K_log

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, VSL Internal Identifier: 115b

Connector: PC-2.9 / K

	50 kHz to 2 GHz	2 GHz to 18 GHz	18 GHz to 26 GHz	26 GHz to 40 GHz
0 dB	0.02	0.02	0.02	0.02
-3 dB	0.03	0.03	0.03	0.03
-6 dB	0.03	0.03	0.03	0.03
-10 dB	0.04	0.04	0.04	0.04
-20 dB	0.07	0.06	0.07	0.07
-30 dB	0.11	0.09	0.10	0.11
-40 dB	0.19	0.12	0.15	0.19

The expanded uncertainties given in this table are expressed in dB

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Scat_atten_2.4mm

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, VSL Internal Identifier: 115c

Connector: PC-2.4

	50 kHz to 2 GHz	2 GHz to 20 GHz	20 GHz to 40 GHz	40 GHz to 50 GHz
-1.000	2.32	2.33	2.38	2.81
-0.707	2.13	2.15	2.19	2.62
-0.501	1.86	1.87	1.92	2.35
-0.316	1.47	1.48	1.53	1.96
-0.100	0.70	0.72	0.76	1.19
-0.032	0.30	0.32	0.36	0.79
-0.010	0.13	0.14	0.19	0.62
0.010	0.13	0.14	0.19	0.62
0.032	0.30	0.32	0.36	0.79
0.100	0.70	0.72	0.76	1.19
0.316	1.47	1.48	1.53	1.96
0.501	1.86	1.87	1.92	2.35
0.707	2.13	2.15	2.19	2.62
1.000	2.32	2.33	2.38	2.81

The expanded uncertainties given in this table are expressed in 1E-03

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: Scat_atten_2.4mm_log

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, VSL Internal Identifier: 115c

Connector: PC-2.4

	50 kHz to 2 GHz	2 GHz to 20 GHz	20 GHz to 40 GHz	40 GHz to 50 GHz
0 dB	0.02	0.02	0.02	0.02
-3 dB	0.03	0.03	0.03	0.03
-6 dB	0.03	0.03	0.03	0.04
-10 dB	0.04	0.04	0.04	0.05
-20 dB	0.06	0.06	0.07	0.10
-30 dB	0.08	0.09	0.10	0.22
-40 dB	0.11	0.12	0.16	0.52

The expanded uncertainties given in this table are expressed in dB

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: AC-DC

AC current: AC-DC transfer difference, VSL Internal Identifier: 60a

	10 Hz	20 Hz	40 Hz	100 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz
10 mA	60	50	40	40	40	40	50	90	130
25 mA	60	50	30	30	30	30	30	40	50
50 mA	60	50	30	30	30	30	30	30	40
100 mA	60	50	30	30	30	30	30	40	50
250 mA	60	50	30	30	30	30	40	50	70
0.5 A	70	60	40	40	40	40	50	70	130
1 A	80	70	50	50	50	50	70	120	180
2.5 A	90	80	60	60	60	60	90	150	210
5 A	100	90	70	70	70	70	110	180	250
10 A	110	100	80	80	80	80	130	220	330
20 A	130	110	100	100	100	100	160	420	680

The expanded uncertainties given in this table are expressed in $\mu\text{A/A}$

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: AC Calibrator

AC current up to 100 A: sources, VSL Internal Identifier: 64a

	10 Hz	20 Hz	40 Hz	1 kHz	5 kHz	10 kHz
0.2 mA	1.0	1.0	0.03	0.03	0.03	0.03
2 mA	0.23	0.21	0.05	0.05	0.05	0.05
20 mA	0.23	0.21	0.05	0.05	0.06	0.06
200 mA	0.23	0.21	0.06	0.07	0.08	0.08
2 A	0.23	0.21	0.15	0.15	0.15	0.15
10 A	-	-	0.21	0.21	0.21	0.5

The expanded uncertainties given in this table are expressed in mA/A

Electricity and Magnetism, The Netherlands, VSL

uncertainties table: AC Multimeter

AC current up to 100 A: meters, VSL Internal Identifier: 68a

	10 Hz	20 Hz	40 Hz	1 kHz	5 kHz	10 kHz
0.2 mA	1.0	1.0	0.03	0.03	0.03	0.03
2 mA	0.23	0.21	0.05	0.05	0.05	0.05
20 mA	0.23	0.21	0.05	0.05	0.06	0.06
200 mA	0.23	0.21	0.06	0.07	0.08	0.08
2 A	0.23	0.21	0.15	0.15	0.15	0.15
10 A	-	-	0.21	0.21	0.21	0.5

The expanded uncertainties given in this table are expressed in mA/A